

Superseded

Technical Specification

**Transport and Main Roads Specifications
MRTS207 Traffic Monitoring Foundation Equipment**

July 2019

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1 Introduction

This Technical Specification applies to the supply, manufacture and installation of field cabinets for housing roadside field equipment for traffic monitoring purpose as an integral part of Transport and Main Roads wider requirement for road network traffic information. This Technical Specification is specific to the field equipment requirements inside a Traffic Monitoring roadside field cabinet.

The scope of this Technical Specification includes the following:

- power and communications equipment required for the operations of a traffic monitoring field cabinet
- equipment layout for traffic monitoring related field equipment housed within the cabinet
- wiring connections to traffic monitoring related field equipment housed within the cabinet
- shelf requirements and spacing
- specific operational requirements for traffic monitoring field cabinets
- connection to the department's telecommunications network (typically TSNet), and
- considerations for maintenance personnel.

This Technical Specification shall be read in conjunction with MRTS01 *Introduction to Technical Specifications*, MRTS50 *Specific Quality System Requirements*, MRTS226 *Telecommunications Field Cabinets* and other Technical Specifications as appropriate.

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

All equipment and material, where not otherwise specified or referenced in this document, shall be in accordance with the appropriate Australian Standards 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 *Electrical Installations*.

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

2 Definition of terms

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

Table 2 – Definition of terms

Term	Definition
ANPR	Automatic Number Plate Recognition
ACMA	Australian Communications and Media Authority
Administrator	Principal's Representative or Superintendent as defined in Clause 14 of MRTS01 <i>Introductions to Technical Specifications</i>

Term	Definition
Conduit	Refer to Transport and Main Roads Technical Specification MRTS91 <i>Conduits and Pits</i>
DVR	Digital Video Recorder
Electricity Act	Queensland Electricity Act and Regulations
ELV	Extra Low Voltage
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.
RU	Rack Units
SO	Socket Outlet
TSNet	Transport and Main Road's wireless virtual private network forms part of the ITS Network.
WiM	Weigh in Motion

3 Referenced 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 documents, the requirements specified in this Technical Specification take precedence.

Table 3 – Referenced documents

Document	Description
AS/CA S008	<i>Communications Alliance – Requirements for customer cabling products</i>
AS/CA S009	<i>Communications Alliance – Installation requirements for customer cabling</i>
AS/NZS 3000	<i>Electrical installations</i>
AS/NZS ISO 9001	<i>Quality management systems – Requirements</i>
MRTS01	<i>Introduction to Technical Specifications</i>
MRTS50	<i>Specific Quality System Requirements</i>
MRTS91	<i>Conduits and Pits</i>
MRTS201	<i>General Equipment Requirements</i>
MRTS203	<i>Provision of Weigh-in-Motion System</i>
MRTS226	<i>Telecommunications Field Cabinets</i>
MRTS250	<i>Provision of Automatic Number Plate Recognition System</i>
SD1901	<i>ITS – Traffic Monitoring Equipment Cabinet Base Installation Details</i>
SD1902	<i>ITS – Traffic Monitoring Surveillance Post Typical Details</i>
SD1903	<i>ITS – Traffic Monitoring Surveillance Post Wiring Details</i>
SD1905	<i>ITS – Traffic Monitoring Cabinet</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 of MRTS01 *Introduction to Technical Specifications*.

The Hold Points, Witness Points and Milestones applicable for this Technical Specification are summarised in Table 4.1. There are no Witness Points defined.

Quality system requirements for this Contract shall be in accordance with this Technical Specification, MRTS01 *Introduction to Technical Specifications*, MRTS50 *Specific Quality System Requirements* and MRTS201 *General Equipment Requirements*.

Table 4.1 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
8	1. Installation – equipment and shelf mounting		
11	2. Documentation – Fabrication 3. Documentation – Warranty and Compliance		
15	4. Acceptance testing and certification		
16			Program schedule

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 Technical Specification.

5 Traffic monitoring field cabinet requirements

All traffic monitoring field equipment shall be housed in a Transport and Main Roads type approved full sized ITS field cabinet as per MRTS226 *Telecommunications Field Cabinets*. The cabinet shall meet the requirements stated in MRTS226 but with the following exceptions:

- A single double SO with RCD protection and green escutcheon plates labelled "RCD protected" shall be provided
- the only piece of equipment that shall be hardwired to the switchboard is the 12V DC rectifier
- all permanently installed equipment inside the cabinet shall be electrically hardwired, and
- all permanently installed equipment shall be powered at Extra Low Voltage supplied by the 12V DC rectifier.

6 Equipment and cabinet layout

The traffic monitoring field cabinet shall include:

- a) 12 V DC (ELV) power system with battery supply back up
- b) communications equipment capable of connecting to the Principal's telecommunication network
- c) All relevant surge and over current protection as per MRTS226 *Telecommunications Field Cabinets*
- d) Bluetooth detector equipment
- e) ANPR system equipment – Refer MRTS250 *Provision of Automatic Number Plate Recognition System*
- f) WiM system equipment – Refer MRTS203 *Provision of Weigh-in-Motion System*, and
- g) Imaging surveillance equipment as per Sheet 5 of SD1905 *ITS - Traffic Monitoring Cabinet*, SD1902 *ITS - Traffic Monitoring Surveillance Post Typical Details* and SD1903 *ITS - Traffic Monitoring Surveillance Post Wiring Details*.

6.1 Equipment layout

6.1.1 Modular design requirements

As traffic monitoring cabinets are mostly deployed in remote areas, a modular cabinet design is mandatory to simplify the remote maintenance and fault-finding process. The traffic monitoring cabinet shall be set out in such a way that trained authorised personnel can easily replace damaged components with pre-configured working components via plug and socket connections. The plug and socket connections used shall be widely available and compliant with relevant industry standards. SD1905 *ITS - Traffic Monitoring Cabinet* depicts the typical expectation of a modular traffic monitoring cabinet design and should be followed unless it is not possible to do so. Where it is not possible to follow SD1905 *ITS - Traffic Monitoring Cabinet*, the Contractor shall liaise with the Principal's Representative to discuss alternative arrangements.

6.1.2 Shelf layout

The equipment required for a traffic Monitoring cabinet shall be set out and installed as per SD1905 *ITS - Traffic Monitoring Cabinet* where:

- The Battery equipment shall be installed at 10 rack units on a heavy duty fixed shelf.
- The ELV supply equipment shall be installed at 20 rack units on a sliding shelf.
- The Communications equipment shall be installed at 27 rack units on a sliding shelf.
- A sliding shelf left bare for maintenance use shall be installed at 33 rack units.
- The DVR equipment shall be installed at 42 rack units on a sliding shelf.
- The space between the DVR equipment and the Maintenance shelf shall be reserved for a data logger unit, for example WiM logger, per functional need of the site.

As such, any changes to the traffic monitoring cabinet layout shall be agreed in principle with the Principal's Representative prior to approval.

6.1.3 Battery equipment

Unless otherwise instructed, the Battery equipment shall be set out and attached to a fixed heavy-duty shelf as per Sheet 3 of SD1905 *ITS - Traffic Monitoring Cabinet*. The selection of the batteries shall be subject to the following conditions:

- Batteries shall be capable of operating a 12V DC system
- Batteries shall be of the type suitable for solar applications, and
- Batteries shall be non-spillable Valve Regulated Lead Acid gel cell type.

6.1.4 ELV supply equipment

Unless otherwise instructed, the ELV supply equipment shall be set out and fixed to a 19 inch rack mounted sliding shelf at 20 RU as per Sheet 4 and Sheet 7 of SD1905 *ITS - Traffic Monitoring Cabinet*. The following items shall be provided on the ELV power shelf:

- 12V DC rectifier capable of supplying the load requirements of the cabinet
- ELV distribution components required to supply ELV power to the components of the cabinet, and,
- Any DC power converters required for ANPR systems – Refer MRTS250 *Provision of Automatic Number Plate Recognition System*.

The ELV shelf shall be set out and installed to meet the requirements of Clause 6.1.1.

6.1.5 Communications equipment

Unless otherwise instructed, the Communications equipment shall be set out and fixed to a 19 inch rack mounted sliding shelf at 27 RU as per Sheet 5 of SD1905 *ITS - Traffic Monitoring Cabinet*. The following items shall be provided on the Communication Shelf:

- ELV distribution components required for ELV 12V DC supply to communication equipment
- equipment required to connect to the Principal's telecommunications network
- Bluetooth serial adapter and data logger
- network switch, and
- embedded fanless computer capable of running Linux OS – Refer MRTS250 *Provision for Automatic Number Plate Recognition System*.

The Communications Equipment Shelf shall be set out and installed to meet the requirements of Clause 6.1.1 Modular Design Requirements. Depending on the type of connection to the Principal's telecommunications network, variations to this shelf may be required. Refer Clause 10.2 Connection to the Principal's telecommunication network.

6.1.6 WiM Data logger

Unless otherwise instructed, the WiM data logger as prescribed by the Principal shall be installed in the space between the Communication Shelf and the Sliding Maintenance Shelf. The Data Logger Unit shall be installed as per the manufacturer's specifications and as per MRTS203 *Provision of Weigh-in-Motion System*.

6.1.7 DVR equipment

Unless otherwise stated, the DVR equipment shall be set out and fixed to a 19in rack mounted sliding shelf at 42 RU as per Sheet 5 of SD1905 *ITS - Traffic Monitoring Cabinet*. The following items shall be provided on the DVR shelf:

- ELV distribution components required for ELV 12V DC supply to DVR Equipment
- Digital Video Recorder
- Video Baluns/media converters

6.1.8 Bluetooth antenna

As prescribed by the Principal, the antenna of the Bluetooth serial adapter, shall be installed in a IP67 rated enclosure on the external side of the cabinet. The antenna shall be installed as per Sheet 6 of SD1905 *ITS - Traffic Monitoring Cabinet*.

6.2 Cable management

Cable management shall be in the form of slotted ducts 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.

Every cable shall be labelled at both ends as a minimum and all cabling shall be grouped together neatly with similar voltage cable to allow for easy replacement of modular shelves. Cable ducts containing 240 V AC cable shall not house ELV cable and must be clearly labelled, such that authorised personnel may safely work on ELV equipment in the cabinet.

7 Operational requirements

7.1 General

The operational requirements defined in MRTS201 *General Equipment Requirements* apply to work under this Technical Specification. Additional operational requirements for equipment provided under this Technical Specification are described below.

7.2 12V DC rectifier

The 12V DC rectifier shall be capable of:

- battery charging management including temperature compensation
- steady 12V DC supply with a minimum current output capacity of 10A
- configurable low voltage disconnect setting
- configurable float and boost voltage settings

- configurable current limit setting
- handling power interruptions without damage
- seamless operation when the systems are switched between battery back-up power and mains power
- restarting operations when mains power resumes after back-up power is depleted, and
- retaining all configuration settings in the event of a power failure.

7.3 Batteries

The batteries shall have the following operational characteristics:

- nominal voltage of 12V DC
- capacity of 100 Ah per battery
- internal resistance of less than or equal to 5 mΩ (fully charged)

7.4 Wireless modem

The wireless modem, shall be an industrial grade, ACMA compliant, Telstra approved modem capable of the following functions:

1. Connecting to a Bluetooth serial adapter via a serial connection,
2. Processing Bluetooth data captured by the Bluetooth serial adapter and packaging the data per Transport and Main Roads QTDF data format. Details of this data format can be obtained from the Principal, and
3. Connecting to the Principal's wireless telecommunications network should the wired network be unavailable.

In addition, the wireless modem shall be equipped with at least one EIA RS232 serial port and an Ethernet port, and shall support industry-standard FTP, secure shell telnet and HTTPS over Ethernet™ protocols. Configuration of the modem may be required for connection to the Principal's telecommunication network, the Contractor shall liaise with the Principal to arrange for all necessary configuration parameters and software of the wireless modem.

The modem must cope with high latency network connections and be capable of retaining all data captured and configuration settings in the event of a power failure.

7.5 Bluetooth serial adapter and antenna

The Bluetooth serial adapter shall be Bluetooth V2.0 capable with the following characteristics:

- connects to the wireless modem via RS232 serial connection
- configurable serial communications protocol
- configurable power output
- supports AT command set
- capable of operation between 5 – 12V DC.

The antenna shall be a panel type 180 degree UV stabilised sector panel antenna, with SMA female connector and shall have the following characteristics:

- frequency range of 2400 – 2483 MHz
- nominal Gain of 4.6 dBi
- 3dB horizontal beam width 180°
- 3dB vertical beam width 70°.

8 Installation

The installation requirements defined in MRTS201 *General Equipment Requirements* apply to work under this Technical Specification. Additional installation requirements for equipment provided under this Technical Specification are described in clauses under Clause 6. The Contractor shall allow access for inspection of the cabinets and equipment by the Principal's Representative prior to delivery at site. **Hold Point 1**

9 Storage and transit

The Contractor shall take all reasonable care when storing field cabinets and equipment prior to installation. They shall be stored appropriately in a safe, dry and secure location until required. They shall not be stored directly on the ground. Where completed cabinets are required to be transported to site, the Contractor must make all necessary precautions to ensure the cabinet internals remain dry and secure in transit.

10 Telecommunication requirements

10.1 Provision for connection to telecommunication lines

Provision for telecommunications lines shall be provided in accordance with the requirements of AS/CA S008, AS/CA S009 and AS/NZS 3085.1.

The cabinet works incorporating conduits for communication cables shall comply with the requirements of the AS/CA S009.

10.2 Connection to Principal's telecommunications network

The Contractor shall arrange with the Principal all necessary data communication connections to the Principal's telecommunications network.

11 Documentation

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

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

- 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.

Hold Point 2

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

- a) a statement confirming the warranty provisions associated with the field cabinets and associated equipment
- b) compliance details of all components as required or implied under this document, and
- c) records of tests conducted by the Contractor to demonstrate compliance to this Technical Specification.

Hold Point 3

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 electronic copies of all FATs, Commissioning and Operating / Maintenance documentation to the satisfaction of the Administrator.

12 Guarantee / warranty

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

13 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.

14 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.

15 Acceptance testing and certification

The testing, commissioning and certification requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification. In addition, the test sheets provided by the Principal shall be completed to demonstrate compliance with the technical requirements of this Technical Specification prior to the delivery of the equipment to site. **Hold Point 4**

16 Program schedule

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

- detailed drawings, manufacturers specifications and schematic layout of components for approval by the Principal
- where applicable, witness of factory tests by the Principal, and submission of test certificates, and
- delivery.

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

17 Training

The training requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification.

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