

**Technical Specification**

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

**March 2023**

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## 1 Introduction

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

The scope of this Technical Specification includes the following:

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

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.

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

The terms defined in Clause 2 of MRTS01 *Introduction to Technical Specifications* and MRTS201 *General Equipment Requirements* apply to work under this Technical Specification. Additional terminology relevant under this Technical Specification are defined in Table 2.

**Table 2 – Definition of terms**

Term	Definition
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>
ANPR	Automatic Number Plate Recognition
CCTV	Closed Circuit Television
Electricity Act	Queensland Electricity Act and Regulations
ELV	Extra Low Voltage. Not exceeding 50V AC, or 120V, ripple free DC, as defined in AS 3000

<b>Term</b>	<b>Definition</b>
Low Voltage	Exceeding Extra Low Voltage but not exceeding 1000V AC or 1500V DC
NVR	Network Video Recorder
Principal	Queensland Department of Transport and Main Roads
PTZ	Pan-Tilt-Zoom
QTDF	Queensland Traffic Data Format
RU	Rack Units (one RU $\cong$ 44.45 mm)
SRCD	Socket Residual Current Device, as defined in AS 3000
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**

<b>Document</b>	<b>Description</b>
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>
MRTS214	<i>Provision of Wireless Traffic Sensors (WTS)</i>
MRTS226	<i>Telecommunications Field Cabinets</i>
MRTS250	<i>Provision of Automatic Number Plate Recognition System</i>
SD1901	<i>ITS – Traffic Survey Cabinet Base Installation Details</i>
SD1902	<i>ITS – Traffic Survey PTZ CCTV Multi-purpose Camera Post Typical Details</i>
SD1903	<i>ITS – Traffic Survey PTZ CCTV Multi-purpose Camera Post Wiring Details</i>
SD1905	<i>ITS – Traffic Survey Cabinet Typical Details</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 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 survey cabinet

All traffic survey field equipment shall be housed in a Transport and Main Roads product 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 SRCD 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 shall be powered at Extra Low Voltage (ELV) supplied by the 12V DC rectifier.

## 6 Equipment and cabinet layout

The traffic survey cabinet shall have provision for the functional needs of the site and include:

- a) All relevant surge and over current protection as per MRTS226 *Telecommunications Field Cabinets*
- b) ELV (12V DC) power system with battery supply back up
- c) communications equipment capable of connecting to the Principal's telecommunication network
- d) Network Video Recorder (NVR) equipment
- e) WiM system equipment – Refer MRTS203 *Provision of Weigh-in-Motion System*
- f) ANPR system equipment – Refer MRTS250 *Provision of Automatic Number Plate Recognition System*
- g) Bluetooth detector equipment, and
- h) Multi-purpose Closed Circuit Television (CCTV) equipment.

### 6.1 Equipment layout

#### 6.1.1 Modular design requirements

As traffic survey cabinets are mostly deployed in remote areas, a modular cabinet design is mandatory to simplify the remote maintenance and fault-finding process. The traffic survey 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 Survey Cabinet Typical Details* depicts the typical expectation of a modular traffic survey cabinet design and should be followed unless it is not possible to do so. Where it is not possible to follow SD1905 *ITS - Traffic Survey Cabinet Typical Details*, the Contractor shall liaise with the Principal's Representative to discuss alternative arrangements.

#### 6.1.2 Shelf layout

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

- the Battery / Surge equipment shall be installed at 8 Rack Units (RU) on a heavy duty fixed shelf
- the ELV power supply equipment shall be installed at 14 RU on a sliding shelf
- the Communications equipment shall be installed at 19 RU on a sliding shelf
- a sliding shelf left bare for maintenance use shall be installed at 22 RU
- the Network Video Recorder (NVR) equipment shall be installed at 28 RU on a sliding shelf, and
- the space between the NVR shelf and the maintenance shelf shall be reserved for a WiM logger.

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

### **6.1.3 Battery / Surge equipment**

Unless otherwise instructed, the Battery / Surge equipment shall be set out and attached to a fixed heavy-duty shelf as per Sheet 3 of SD1905 *ITS - Traffic Survey Cabinet Typical Details*. 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 power supply equipment**

Unless otherwise instructed, the ELV power supply equipment shall be set out and fixed to a 19 inch rack mounted sliding shelf at 8 RU as per Sheet 4 and Sheet 7 of SD1905 *ITS - Traffic Survey Cabinet Typical Details*. The following items shall be provided on the power shelf:

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

The power 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 19 RU as per Sheet 5 of SD1905 *ITS - Traffic Survey Cabinet Typical Details*. The following items shall be provided on the Communication shelf:

- ELV distribution components required for ELV 12V DC supply to communication equipment
- Communications equipment required to connect to the Principal's telecommunications network
- Bluetooth serial adapter and data logger
- Network switch, and
- Field Processor such as an 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 Network Video Recorder (NVR) equipment**

Unless otherwise instructed, the NVR equipment shall be set out and fixed to a 19 inch rack mounted sliding shelf at 28 RU as per Sheet 5 of SD1905 *ITS - Traffic Survey Cabinet Typical Details*. The following items shall be provided on the NVR shelf:

- ELV distribution components required for ELV 12V DC supply to NVR equipment



- Network Video Recorder, and
- video baluns / media converters, as necessary.

#### **6.1.7 WiM logger**

Unless otherwise instructed, the WiM logger as prescribed by the Principal shall be installed in the space between the Communication shelf and the sliding maintenance shelf. The WiM logger shall be installed as per the manufacturer's specifications and as per MRTS203 *Provision of Weigh-in-Motion System*.

#### **6.1.8 ANPR camera**

The Automatic Number Plate Recognition (ANPR) cameras shall be installed as per the manufacturer's specifications and as per MRTS250 *Provision of Automatic Number Plate Recognition System*.

#### **6.1.9 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 Survey Cabinet Typical Details*.

#### **6.1.10 Multi-purpose Closed Circuit Television (CCTV) equipment**

Where required, the Pan-Tilt-Zoom (PTZ) Multi-purpose Closed Circuit Television (CCTV) camera and post shall be installed as per SD1901 *ITS - Traffic Survey Cabinet Base Installation Details*, SD1902 *ITS – Traffic Survey PTZ CCTV Multi-purpose Camera Post Typical Details* and SD1903 *ITS - Traffic Survey PTZ CCTV Multi-purpose Camera Post Wiring Details* and connected to the NVR equipment.

### **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 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 low voltage, i.e., 230V 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, and
- internal resistance of less than or equal to 5 m $\Omega$  (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 Queensland Traffic Data Format (QTDF). 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, and
- 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°, and
- 3dB vertical beam width 70°.

Alternatively, for Wireless Traffic Sensors (WTS) consisting of MAC-address detector with antenna and a MAC-address processor either in a single enclosure or as separate components, see MRTS214 *Provision of Wireless Traffic Sensors (WTS)*.

## **8 Installation requirements**

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 requirements**

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 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, and
- 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, test sheets and processes required 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 and at commissioning.

### **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.

