

Technical Specification

MRTS217 Motorway Ramp Information Signs

July 2022

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1 Introduction

This Technical Specification defines the requirements of electronic message signs for motorway ramp controlling, metering and providing information on the condition of motorway. These signs are intended to provide the motorists with the information on the condition of motorway prior to entry. The signs will be placed on arterial roads leading to motorway and at motorway ramps.

This Technical Specification covers three types of electronic message signs. These signs are classified as Ramp Information Sign 1 (RIS1), Ramp Information Sign 2 (RIS2) and Ramp Information Sign 3 (RIS3). These signs use LEDs as illuminating technology and display messages in four colours Red, Yellow, Green and White. RIS3 uses LED matrix technology. The signs shall be remotely operated from the Traffic Management Centre using the Principal's Traffic Management System (TMS).

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 Definitions of terms

The terms defined in MRTS01 *Introduction to Technical Specifications* apply to this Technical Specification. Additional terminology relevant to this Technical Specification is defined in Table 2 below.

Table 2 – Definitions of terms

| Term | Definition |
|---------|--|
| FAT | Factory Acceptance Testing |
| LED | Light Emitting Diodes |
| NATA | National Association of Testing Authorities |
| PHCS | Product Host Control System |
| RIS1 | Ramp Information Sign 1 – An electronic variable message sign typically placed near the entrance of an on-ramp of a motorway |
| RIS2 | Ramp Information Sign 2 – An electronic variable message sign typically placed on the on-ramp of a motorway |
| RIS3 | Ramp Information Sign 3 – An electronic variable message sign typically placed in an arterial road advising motorists about roadworks, incidents, travel time or closure of the motorway |
| RPEQ | Registered Professional Engineer Queensland |
| TMS | Traffic Management System |
| SAT | STREAMS Acceptance Test |
| STREAMS | Transport and Main Roads Traffic Management System |
| VMS | Variable Message Sign |

3 Referenced documents

The requirements of the referenced documents listed in 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 shall take precedence.

Table 3 – Referenced documents

| Reference | Title |
|-------------------------|---|
| AS 1743 | <i>Road signs - Specifications</i> |
| AS 4852.1 | <i>Variable message signs, Part 1: Fixed signs</i> |
| AS/NZS 3000 | <i>Electrical installations (known as the Australian / New Zealand Wiring Rules)</i> |
| AS/NZS 3100 | <i>Approval and test specification – General requirements for electrical equipment</i> |
| AS/NZS 61000.6.1 | <i>Electromagnetic compatibility (EMC), Part 6.1: Generic standards – Immunity for residential, commercial and light-industrial environments</i> |
| AS/NZS 61000.6.3 | <i>Electromagnetic Compatibility (EMC), Part 6.3: Generic standards – Emission standard for equipment in residential environments (IEC 61000-6-3:2020 (ED 3.0) MOD)</i> |
| MRTS01 | <i>Introduction to Technical Specifications</i> |
| MRTS50 | <i>Specific Quality System Requirements</i> |
| MRTS61 | <i>Gantries and Support Structures for Road Signs, Tolling Systems and ITS Devices</i> |
| MRTS201 | <i>General Equipment Requirements</i> |
| MRTS202 | <i>Variable Message Signs</i> |
| MRTS226 | <i>Telecommunication Field Cabinets</i> |
| MRTS245 | <i>ITS Telecommunications Network (ITS TN)</i> |
| TC 2290 | <i>LED Lamp control signs</i> |
| QGTM Part 9 | <i>Queensland Guide to Traffic Management, Part 9: Transport Control Systems – Strategies and Operations</i> |
| TSI-SP-003 / NSW RMS | <i>Communication Protocol for Roadside Devices</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 to this Technical Specification are summarised in Table 4.1. There are no Milestones defined.

Table 4.1 – Hold Points, Witness Points and Milestones

| Clause | Hold Point | Witness Point | Milestone |
|--------|--|---|-----------|
| 4.2 | 1. Detailed design documentation to be provided prior to manufacture 2. Optical performance test results to be provided prior to delivery to site | | |
| 13.2 | | 1. Factory acceptance test – NATA tests and STREAMS certification | |

4.2 Sample signs

Requirements of MRTS201 *General Equipment Requirements* apply to this Technical Specification. Detailed design of the sign layout, fabrication and assembly drawings, calculations, specifications and certifications of the RIS components (signed by the Contractor’s RPEQ) shall be submitted to the Principal for verification prior to manufacture.

These components include the RIS controller, sign face, LEDs, LED matrix boards, pixel arrangements showing horizontal and vertical pitch and total number of pixels, power supply (including surge protection and backup batteries), communication ports, cable termination, enclosure and mounting accessories. **Hold Point 1**

Test certificates from a NATA-accredited laboratory or NATA-endorsed by Mutual Recognition shall be submitted confirming that optical performance requirements of the RIS specified in this Technical Specification are complied with. Test certificates shall be submitted before the RIS is delivered to site. Test certificates shall have reference to the version of the optical module tested and shall be issued to the current version of the optical modules used in the RIS. Modifications of design of the optical modules such as change of LEDs, LED drivers requires the optical performance be retested. **Hold Point 2**

As specified in MRTS201 *General Equipment Requirements*, a sample RIS shall be made available for the SAT.

4.3 Warranty

The Contractor installing the RIS shall warrant the installation against defects for a minimum of five years in accordance with the requirements of MRTS201 *General Equipment Requirements*.

5 Design

5.1 General

The sign shall be designed in compliance with the requirements of AS 4852.1. The sign shall withstand the atmospheric and site conditions prevailing in the state of Queensland for the design life defined in this Technical Specification.

5.2 Design life

The sign shall be designed to have an operating life as per AS 4852.1 *Design life*.

5.3 Markings and labels

Markings and labels shall be provided as per AS 4852.1 *Markings and labels*.

6 Mechanical requirements

6.1 Sign enclosure

6.1.1 Construction material

The sign enclosure shall be constructed with materials in compliance with the requirements of AS 4852.1.

6.1.2 Surface finish

The surface finishes shall be compliant to Section 3.1.2 of AS 4852.1 with the external front face of the sign being matt Black and other external surfaces matt Grey. Any interior surfaces that may be visible from outside the sign shall be matt Black.

6.1.3 Viewing area

The viewing area shall comply with the requirements of AS 4852.1.

6.1.4 Access doors

RIS1 and RIS2 signs shall not have any access doors. RIS3 signs shall be provided with the access doors in compliance with AS 4852.1 *Access doors*.

6.1.5 Socket outlets

Socket outlets shall not be provided unless specifically required by the Contract.

6.1.6 Mounting

Mounting shall comply with the requirements of AS 4852.1 *Mounting*.

6.1.7 Border

RIS1 and RIS2 signs shall have a border with a minimum width of 175 mm. The RIS3 border shall comply with the requirements of AS 4852.1 *Border*. Conspicuity devices shall not be provided.

6.2 Roadside cabinet

Where required, a roadside cabinet complying with MRTS226 *Telecommunications Field Cabinets* shall be provided.

6.2.1 Facility switch

RIS1 and RIS2 signs shall not have a facility switch.

A facility switch complying with AS 4852.1 *Facility Switch*, shall be provided for RIS3 signs. The facility switch shall be mounted inside the sign enclosure or field cabinet.

7 Electrical requirements

7.1 Conformance to standards

The sign electrical system shall conform to AS/NZS 3000 and AS/NZS 3100.

7.2 Operating voltage

The input supply of the sign shall comply with the requirements of AS 4852.1 *Operating voltage*.

7.3 Battery backup

The battery backup system shall comply with AS 4852.1 *Battery backup*.

7.4 Lightning protection

Lightning and surge protection shall comply with AS 4852.1 *Lightning protection*.

7.5 Electromagnetic compatibility (EMC)

Immunity and electromagnetic emissions shall conform to AS /NZS 61000.6.1 and AS/NZS 61000.6.3.

8 Display and optical requirements

8.1 Display requirements

8.1.1 General

8.1.1.1 Display characteristics

RISs shall be LED display. RIS1 and RIS2 signs shall generate traffic control messages as per QGTM Part 9. The dimensions of the characters are shown in the respective TC sign. These signs shall have combination of messages as referred to in Table 8.1.1.1. The LEDs of RIS1 and RIS2 shall have a maximum spacing of two times the diameter of individual pixels.

All other display characteristics of RIS1 and RIS2 signs shall comply with AS 4852.1 *Display characteristics*.

Display characteristics of RIS3 signs shall comply with AS 4852.1 *Display characteristics*.

It is pertinent to note that RIS3s' LEDs forms a uniform matrix design, whilst RIS1 and RIS2 may not necessarily be of uniform matrix structure.

Table 8.1.1.1 – RIS type, enclosure and messages summary

| Sign name | Minimum enclosure size | | Minimum character height for text display frames | Operation | Text display frames | Graphic display frames |
|-----------|------------------------|--------|--|---------------|--|---|
| | Height | Width | | | | |
| RIS1 | 600 mm | 900 mm | 120 mm | Ramp metering | Traffic control messages as per QGTM Part 9, <u>and</u> Text / graphics and spacing shall comply with TC2290 as applicable | N/A |
| | | | | Ramp control | Traffic control messages as per QGTM Part 9, <u>and</u> Text / graphics and spacing shall comply with TC2290 as applicable | Traffic control messages as per QGTM Part 9, <u>and</u> Text / graphics and spacing shall comply with TC2290, TC2273 and TC2210 as applicable |

| Sign name | Minimum enclosure size | | Minimum character height for text display frames | Operation | Text display frames | Graphic display frames |
|-----------|------------------------|---------------|--|----------------------------|---|------------------------|
| | Height | Width | | | | |
| RIS2 | 600 mm | 900 mm | 120 mm | Ramp metering | Traffic control messages as per QGTM Part 9 <u>and</u> Text / graphics and spacing shall comply with TC2290 as applicable | N/A |
| RIS3 | 3 Lines of Characters | 18 Characters | 200mm | Road condition information | Text and spacing of information messages shall comply with AS 4852.1 | N/A |

8.1.1.2 Luminance output

The luminance output shall comply with AS 4852.1 *Luminance output*.

8.1.1.3 Pixel arrangement

The pixel arrangement shall comply with AS 4852.1 *Pixel arrangement*.

8.1.1.4 Pixel element service life

The pixel element service life shall comply with AS 4852.1 *Pixel element service life*.

8.1.1.5 Maintainability

RIS1 and RIS2 signs shall have an easily-detachable mounting mechanism with quick disconnect from the power and communication connection for the ease of maintenance. RIS1 and RIS2 signs shall have integrated sign controllers located within the sign enclosure. RIS1 and RIS2 signs shall be field-replaceable units and shall only be serviced at the manufacturer's factory. All other maintainability requirements shall comply to AS 4852.1 for RIS1 and RIS2 signs.

RIS3 signs shall consist of modular replaceable subsystems such as display boards, power supplies, and sign controllers. These subsystems shall be field-replaceable in a shorter duration not more than five minutes. All other maintainability requirements of RIS3 signs shall comply with AS 4852.1 *Maintainability*.

8.1.2 Display dimensional requirements

8.1.2.1 Text and spacing

The text and spacing requirements for RIS1 and RIS2 signs shall be in accordance with TC2290.

The text and spacing requirements for RIS3 signs shall comply with AS 4852.1 *Text and spacing*.

8.1.2.2 Pixel lit area

The pixel lit area shall comply with AS 4852.1 *Pixel lit area*.

8.1.3 Light axis

RIS1 and RIS2 signs shall have a maximum light output in line with the mechanical axis of the sign display panel.

RIS3 signs shall have maximum light output complying with AS 4852.1 *Light axis*.

8.1.4 Character formats

8.1.4.1 General

RIS1 and RIS2 signs shall have character formats as per TC2290.

RIS3 sign font types shall comply with AS 4852.1 *Character formats*.

8.1.4.2 Font shapes

RIS1 and RIS2 font shapes shall be in accordance with TC2290.

RIS3 sign font shapes shall comply with AS 4852.1.

8.1.4.3 Justification

Signs shall be justified as per AS 4852 *Justification*.

8.1.5 Display changes

Signs shall have the capability to display changes complying with AS 4852.1 *Display changes*.

8.1.6 Display changes due to facility switch operations

RIS1 and RIS2 signs shall not be provided with facility switches.

RIS3 signs shall comply with AS 4852.1 *Display changes due to facility switch operations*.

8.1.7 Display changes due to external inputs

External inputs shall be provided and functioned complying with AS 4852.1 *Display changes due to external inputs* for RIS3 signs.

8.1.8 Graphic requirements

RIS1 signs shall display graphics NO RIGHT TURN, NO LEFT TURN and NO ENTRY as per AS 1743 R4-6 signs.

8.1.9 Sign dimming control

8.1.9.1 General

Sign shall have two light sensors mounted in the front and back. The sign dimming shall be controlled by the higher value of the two light sensors. All other requirements of the sign dimming system shall comply with AS 4852.1.

8.1.9.2 Monitoring of automatic dimming control

The monitoring system for the signs' automatic dimming control shall comply with AS 4852.1 *Monitoring of automatic dimming control* with the following amendment of the sub-clause (a) (iii).

- (a) (iii) The reported sign illuminance of the light-sensing device does not have a variation greater than 600 lx over a period of 48 h.

Additionally, the 1 minute and 15 minute average light sensor values shall be stored in the sign controller for a period of 12 months to be downloadable from the Product Host Control system (PHCS). Light levels and associated time shall be configurable parameters from the PHCS.

8.1.9.3 Time-based dimming control

The sign dimming control system shall have time-based dimming controls complying with AS 4852.1 *Time-based dimming control*.

8.1.9.4 Fixed dimming control

The sign dimming control system shall have a fixed dimming control complying with AS 4852.1 *Fixed dimming control*.

8.1.10 Conspicuity devices

Conspicuity devices shall not be provided.

8.1.11 Display flicker

Display flicker shall comply with AS4852.1 *Display flicker*.

8.2 Optical requirements

8.2.1 Luminance and luminance ratio

The sign's luminance and luminance ratio shall comply with AS 4852.1 *Luminance and luminance ratio*.

8.2.2 Luminance matching of colours

The sign's luminance matching of colours shall comply with AS 4852.1 *Luminance matching of colours*.

8.2.3 Luminance intensity uniformity

The luminous intensity uniformity shall comply with AS 4852.1 *Luminous intensity uniformity*.

8.2.4 Colours

Colours shall comply with AS 4852.1.

The RIS display shall be able to display individual pixels in either Yellow, White, Red or Green colours, against a matt Black background. LEDs shall be used within pixels to generate output colours. The individual pixels may generate colour with either discrete LED/s for each of the 4 colours or via a colour mixing arrangement with RGB LEDs or equivalent technologies. In the event of the use of colour mixing or equivalent technology, any colours non-compliant with AS 4852.1 shall neither be configurable nor displayed under any circumstances.

The VMS display's colours shall remain within their corresponding chromaticity coordinates, as specified in Section 5.2.4 of AS 4852.1, for every configurable brightness level. The sign's display colours shall remain within their corresponding specified chromaticity coordinates for at least 10 years of pixel service life specified in Section 5.1.1.4 of AS 4852.1. It should be noted that this requirement is additional to the warranty requirements outlined in Clause 4.3 of this Technical Specification.

9 Operation and control requirements

9.1 General

Signs shall be capable of connecting to STREAMS, the Principal's TMS. Signs shall be provided with PHCS complying with AS 4852.1.

The PHCS shall also provide network diagnostic through looping back of the interfacing ports to isolate the faults to a specific system.

9.2 Local control

Signs shall have an Ethernet port for onsite control, operation and fault diagnostic functions. The control port shall also support the fault diagnostics using PHCS software when connected to a local computer.

For RIS1 and RIS2 signs, the local control port shall be located outside of the sign enclosure or accessible via nearby cable termination infrastructure. The external port shall have a minimum ingress protection level of IP56.

Local control for RIS3 signs shall be accessible at the telecommunication field cabinet.

9.3 Remote control

Signs shall be connected to the Field Processor for remote operations through a RS422 interface. The communication parameters shall be configurable using the PHCS. All other requirements shall comply with AS 4852.1 *Remote control*.

9.4 Non-volatile memory capacity

RIS1 and RIS2 signs shall have enough memory capacity to store messages and display all frames required for the operation of RIS1 and RIS2 signs.

RIS3 signs shall have memory capacity complying with AS 4852.1 *Non-volatile memory capacity*.

In addition to requirements above, non-volatile memory shall be able to store the light sensor output data for a minimum 12 month period.

9.5 Programming

Signs shall have the capability to program the frames or messages complying with AS 4852.1 *Programming*.

9.6 Communication protocol

The signs shall be able to interface with the Principal's TMS, STREAMS through the Field Processor. STREAMS uses RMS protocol TSI-SP-003 with compatibility to operate with colours.

9.7 Monitoring, fault logging and reporting

The sign shall have monitoring, fault logging and reporting complying with AS 4852.1 *Monitoring, fault logging and reporting*.

9.8 Fall-back system

The fall-back display shall be blank.

The sign fall-back system shall comply with AS 4852.1 *Fall-back system*.

9.9 Software development

Any software for signs and PHCS shall be developed to comply with AS 4852.1 *Software development*.

9.10 Operation and maintenance manual

The sign shall be provided with an operation and maintenance manual complying with AS 4852.1 *Operation and maintenance manual*.

9.11 Real-time clock

Signs shall have a real-time clock with an accuracy within ± 5 s within a week. Real-time clock shall periodically synchronize with the Field Processor through the communication protocol.

The real-time clock shall have a backup battery system for uninterrupted operation.

9.12 Configuration

Parameters in Appendix B shall be configurable using the PHCS.

10 Environmental requirements

10.1 Temperature and humidity

Sign and supporting hardware shall comply with environmental conditions as per MRTS201 *General Equipment Requirements*.

10.2 Enclosure protection

The ingress protection of the sign and control enclosures shall comply with AS 4852.1 *Enclosure protection*.

11 Installation requirements

The installation requirements defined in MRTS201 *General Equipment Requirements* apply to this Technical Specification. Where the sign controller resides in a separate roadside cabinet, it should be placed at a location where the sign face can be visible. Consequently, ground-mounted cabinets should be located on the same side of the carriageway as the sign. The cabinets shall comply with the requirements of MRTS201 *General Equipment Requirements* and MRTS226 *Telecommunication Field Cabinets*.

RIS1 signs shall be placed at the entry of the motorway ramp at a height no less than 2.1 m.

RIS2 signs shall be placed on an on-ramp at a height not less than 2.1 m.

RIS1 and RIS2 signs shall be typically attached to Transport and Main Roads standard 4.1 m pole. The finial cap shall be used for supplying power. If the site conditions are not suitable for a typical installation, a site-specific design shall be provided to the Principal for approval.

RIS3 signs shall be placed on the side of the arterial road on a suitable mounting structure.

12 Telecommunication requirements

The telecommunications requirements defined in MRTS201 *General Equipment Requirements* and MRTS245 *ITS Telecommunications Network ITS TN*) apply to work provided under this Technical Specification.

RIS1 and RIS2 signs shall be connected to the same Field Processor that the ramp metering controller is connected to.

Wireless communication technologies through cellular mobile systems shall not be used as a communication channel unless approved by the Principal's representative.

13 Testing and commissioning

13.1 General

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

13.2 Factory acceptance testing

FAT shall include all the testing that can be conducted at the factory to ensure the equipment functioning to according to the performance measures in this Technical Specification.

Photometric test reports issued by a NATA-accredited laboratory or NATA-endorsed by Mutual Recognition shall be submitted for the verification by the representative of the Principal.

Ingress protection test reports issued by a NATA-accredited laboratory or NATA-endorsed by Mutual Recognition shall be submitted for verification.

STREAMS acceptance certificate issued by Transmax for the current firmware of the sign / Site controller shall be submitted to the Principal. **Witness Point 1**

14 Commissioning

Commissioning shall include both individual sign commissioning and commissioning of the Ramp Metering System as a whole. Signs shall be demonstrated as operating correctly with Ramp Metering in Operation and also in a Motorway Closed situation.

15 Documentation

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

16 Training

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

17 Maintenance

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

18 Handover

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

The Contractor shall provide asset data for the installed VMS in the format prescribed in the QADF document. The Contractor will need to contact the Principal with regards to data requirements such as asset attributes specific to the project, as these requirements may change from project to project.

19 Product approval

Refer to Appendix C for ramp information signs product approval checklist that can be used by suppliers and assessors in the type approval process.

Appendix A – Message IDs

Table A outlines the current STREAMS frames and messages requirement for RIS1 and RIS2 signs. QGTM Part 9 shall be referred for up-to-date frames and messages requirements.

Table A – Message and Frame IDs

| Message ID | Message name | Display type | Applicable sign type | Comments |
|------------|--------------------------------------|----------------|----------------------|-----------------|
| 0 | Blank | Nil | RIS1 and RIS2 | 1 frame message |
| 1 | Ramp Signals On | Text | RIS1 and RIS2 | 1 frame message |
| 2 | Prepare to Stop | Text | RIS2 | 1 frame message |
| 3 | Motorway Closed | Text | RIS1 | 1 frame message |
| 4 | No Left Turn | Graphic | RIS1 | 1 frame message |
| 5 | No Right Turn | Graphic | RIS1 | 1 frame message |
| 6 | No Entry | Graphic | RIS1 | 1 frame message |
| 7 | Ramp Signals On / Prepare to Stop | Text | RIS2 | 2 frame message |
| 8 | Motorway Closed / No Left Turn | Text / graphic | RIS1 | 2 frame message |
| 9 | Motorway Closed / No Right Turn | Text / graphic | RIS1 | 2 frame message |
| 10 | Motorway Closed / No Entry | Text / graphic | RIS1 | 2 frame message |

Appendix B – Configuration parameters

Table B – Sign configurable parameters

| Description | Range of values | Factory default | Device(s), systems affected |
|---|--------------------------------|-------------------------|---|
| TMS Communications Session Time-out (STO) | 1 – 600 seconds | 300 seconds | control unit / configuration software |
| Communications check frequency (Controller with sign display) (CST) | 0 – 30 seconds | Once every 5 seconds | control unit / sign display |
| Communication Timeout Setting (Controller to Sign Display) | 0 – 30 seconds | 5 seconds | control unit / sign display |
| Enclosure Over-Temperature Setting (OTS) | 0 – 70°C in increments of 1°C | Max Alarm set at 42°C | control unit / sign display / enclosure |
| Over Temperature Shutdown | 0 – 70°C in increments of 1°C | 50°C | control unit / sign display / enclosure |
| Sign processor fault blank time (PFBT) | 0.5 – 3 seconds | 1 second | sign display |
| Contiguous Pixel Failure (CPF) | 0 – 10% | 2% | control unit / sign display |
| Multi LED failure (MLEDF) | 0 – 100% | 20% | control unit / sign display |
| Power recovery delay time (PRDT) | 1 – 600 seconds | 60 seconds | control unit / sign display |
| Minimum blank time (MBT) | 1 – 120 seconds | 30 seconds | control unit / sign display |
| LED brightness level transition time | 1 – 60 seconds | 15 seconds | control unit / sign display |
| Thermostat set Point (TSP) | 10 – 60°C in increments of 1°C | ON at 40°C, OFF at 35°C | control unit / sign display / enclosure |

Appendix C – Type approval compliance checklist
Table C – Type approval compliance checklist

| Item # | Sign type | Motorway ramp information signs product approval requirement | Reference document/s | MRTS217 2022 reference Clause | Verification method | | | | | Product compliance (Y, TBC, N, N/A) |
|-----------------|-----------|--|----------------------|-------------------------------|---------------------|---|---------------------------|-------------------|--|-------------------------------------|
| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 5 Design | | | | | | | | | | |
| 1 | ALL | The sign shall be designed in compliance with the requirements of AS 4852.1. The sign shall withstand the atmospheric and site conditions prevailing in the state of Queensland for the design life defined in this Technical Specification. | MRTS217, AS 4852.1 | 5.1 | | X | | | X | |
| 2 | ALL | The sign shall be designed to have an operating life as per the AS 4852.1 <i>Design life</i> . | MRTS217, AS 4852.1 | 5.2 | | X | | | X | |
| 3 | ALL | For the electrical system — not less than 15 years. | MRTS217, AS 4852.1 | 5.2 | | X | | | X | |
| 4 | ALL | For the sign enclosure — not less than 20 years. | MRTS217, AS 4852.1 | 5.2 | | X | | | X | |
| 5 | ALL | For roadside cabinet — not less than 20 years. | MRTS217, AS 4852.1 | 5.2 | | X | | | X | |
| 6 | ALL | For the sign mounting, support and access structures not less than 50 years. | MRTS217, AS 4852.1 | 5.2 | | X | | | X | |
| 7 | ALL | Markings and labels shall be provided as per AS 4852.1 <i>Markings and labels</i> . | MRTS217, AS 4852.1 | 5.3 | X | | | X | | |

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|--------|-----------|--|----------------------|-------------------------------|---------------------|---|---------------------------|-------------------|--|-------------------------------------|
| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 8 | ALL | The following information shall be marked on the sign controller in a prominent position: <ul style="list-style-type: none"> a) product / model name or brief description identifying the unit b) manufacturer's name c) manufacturer's type number d) a unique serial number e) description and rating of the primary power supply system, including nominal voltage, current and power consumption for operation, and f) relevant regulatory compliance marking (RCM). | MRTS217, AS 4852.1 | 5.3 | X | | | X | | |
| 9 | ALL | The following information shall be marked on the inside of the sign-controller housing, in a prominent position: <ul style="list-style-type: none"> a) description and rating of the reservoir battery, including battery type, voltage and capacity b) input ratings for the auxiliary 240 V a.c. battery charger, and c) relevantRCM. | MRTS217, AS 4852.1 | 5.3 | X | | | X | | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 10 | ALL | The following information shall be marked on the rear of the sign display housing: a) product / model name or brief description identifying the unit b) manufacturer's name c) manufacturer's type number, and d) a unique serial number. | MRTS217, AS 4852.1 | 5.3 | X | | | X | | |
| 6 Mechanical requirements | | | | | | | | | | |
| 11 | ALL | The sign enclosure shall be constructed with materials in compliance with the requirements of AS 4852.1. | MRTS217, AS 4852.1 | 6.1.1 | | X | | | X | |
| 12 | ALL | The sign and all mounting, support and access structures shall be constructed from durable materials treated to ensure optimum performance under prolonged exposure to atmospheric and site conditions prevalent in the geographical region in which they are intended to be used. | MRTS217, AS 4852.1 | 6.1.1 | | X | | | X | |
| 13 | ALL | The design and installation of the sign, sign support structure, and associated equipment shall be vandal-resistant to ensure that it can withstand attempted damage to equipment and attempted unauthorized access to interiors of housings and casings by brute force. | MRTS217, AS 4852.1 | 6.1.1 | | X | | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 14 | ALL | The sign enclosure shall be constructed from marine-grade aluminium alloy 5251 H32 to conform to AS/NZS 1734. The sign enclosure shall be reinforced and/or braced to facilitate the erection and continued operation of the unit in the intended application. | MRTS217, AS 4852.1, AS/NZS 1734 | 6.1.1 | | X | | X | X | |
| 15 | ALL | All external metal sections of the completed enclosure shall be suitably treated (for example, by a polyester powder coating). The surfaces shall be thoroughly cleaned and subject to the appropriate pre-treatment before the treatment is applied. The finish to the surface shall ensure that deterioration due to atmospheric and/or local environmental conditions has no detrimental effect on the structural integrity or appearance (including fading) of the finished enclosure for a period not less than 10 years. | MRTS217, AS 4852.1 | 6.1.1 | | X | | | X | |
| 16 | ALL | All sundry components used for connection and/or bracing of the sign onto the support structure shall be manufactured or constructed from suitably protected materials. All steel works shall be hot-dip galvanized in accordance with AS/NZS 4680. | MRTS217, AS 4852.1, AS/NZS 4680 | 6.1.1 | | X | | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 17 | ALL | The surface finishes shall be compliant to Section 3.1.2 of AS 4852.1 with the external front face of the sign being matt Black and other external surfaces matt Grey. Any interior surfaces that may be visible from outside the sign shall be matt Black. | MRTS217, AS 4852.1 | 6.1.2 | X | | | X | | |
| 18 | ALL | All internal and external surfaces shall be free from sharp edges or protrusions. | MRTS217, AS 4852.1 | 6.1.2 | X | | | | | |
| 19 | ALL | The viewing area shall comply with the requirements of AS 4852.1. | MRTS217, AS 4852.1 | 6.1.3 | | X | | | X | |
| 20 | ALL | The viewing area shall not be occluded, by any other part of the sign's construction from the half angles as defined in Table 5.1. | MRTS217, AS 4852.1 | 6.1.3 | | X | | | X | |
| 21 | RIS1, RIS2 | RIS1 and RIS2 signs shall not have any access doors. | MRTS217 | 6.1.4 | X | | | X | | |
| 22 | RIS3 | RIS3 signs shall be provided with the access doors in compliance with AS 4852.1 <i>Access doors</i> . | MRTS217, AS 4852.1 | 6.1.4 | X | | | X | | |
| 23 | RIS3 | Door(s) shall be provided on the rear of the enclosure. The maximum horizontal width of each door opening shall be not greater than 1.2 m. | MRTS217, AS 4852.1 | 6.1.4 | X | | | X | | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 24 | RIS3 | Each door shall be provided with LTV stable closed-cell door seals and fitted with fastener(s) operated by means of a security key approved by the sign purchaser. Door stays shall be provided to secure the doors in the open position. | MRTS217, AS 4852.1 | 6.1.4 | X | | | X | | |
| 25 | ALL | Socket outlets shall not be provided unless specifically required by the contract. | MRTS217 | 6.1.5 | X | | | | X | |
| 26 | ALL | Mounting shall comply with the requirements of AS 4852.1 <i>Mounting</i> . | MRTS217, AS 4852.1 | 6.1.6 | X | | | | X | |
| 27 | ALL | The enclosure design shall facilitate adjusting the angle of the mounted sign during installation and commissioning. | MRTS217, AS 4852.1 | 6.1.6 | X | | | X | | |
| 28 | RIS1, RIS2 | RIS1 and RIS2 signs shall have a border with a minimum width of 175 mm. Conspicuity devices shall not be provided. | MRTS217 | 6.1.7 | | | | X | X | |
| 29 | RIS3 | The RIS3 border shall comply with the requirements of AS 4852.1 <i>Border</i> . Conspicuity devices shall not be provided. | MRTS217, AS 4852.1 | 6.1.7 | | X | | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 30 | RIS3 | The border shall surround the active display area. It shall not let light through at any point if the sign is backlit. The front face of the border shall be matt Black. The width of the border shall be at least 80% of the minimum character height. Conspicuity devices may be incorporated in the border. | MRTS217, AS 4852.1 | 6.1.7 | | X | | | X | |
| 31 | RIS1, RIS2 | RIS1 and RIS2 signs shall not have a facility switch. | MRTS217 | 6.2.1 | X | | | X | | |
| 32 | RIS3 | A facility switch complying with AS 4852.1 <i>Facility Switch</i> shall be provided for RIS3 signs. The facility switch shall be mounted inside the sign enclosure or field cabinet. | MRTS217, AS 4852.1 | 6.2.1 | | | X | | X | |
| 33 | RIS3 | The facility switch shall provide for the sign display to be switched to a minimum of four different display modes. The required four display modes are OFF, Auto, Message 1 and Message 2. | MRTS217, AS 4852.1 | 6.2.1 | | | X | | X | |
| 34 | RIS3 | The required four display modes are OFF, Auto, Message 1 and Message 2. | MRTS217, AS 4852.1 | 6.2.1 | | | X | | X | |
| 35 | RIS3 | Access to the switch shall be provided from the interior or exterior of the roadside cabinet as specified by the purchaser. | MRTS217, AS 4852.1 | 6.2.1 | X | | | X | | |
| 36 | RIS3 | The facility switch shall be an industrial-grade switch suitable for use in outdoor equipment. | MRTS217, AS 4852.1 | 6.2.1 | | X | | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 37 | RIS3 | The facility switch shall be rated to switch extra low voltage (ELV). | MRTS217, AS 4852.1 | 6.2.1 | | X | | | X | |
| 38 | RIS3 | Externally-mounted facility switches shall not be mounted on the rear side of the roadside cabinet or the housing door. | MRTS217, AS 4852.1 | 6.2.1 | X | | | X | | |
| 39 | RIS3 | The switch positions shall be indelibly and durably marked with the display mode designation. | MRTS217, AS 4852.1 | 6.2.1 | X | | | X | | |
| 7 Electrical requirements | | | | | | | | | | |
| 40 | ALL | The signs' electrical system shall conform to AS/NZS 3000 and AS/NZS 3100. \ | MRTS217, AS/NZS 3000, AS/NZS 3100 | 7.1 | | X | | | X | |
| 41 | ALL | The input supply of the sign shall comply with the requirements of AS 4852.1 <i>Operating voltage</i> . | MRTS217, AS 4852.1 | 7.2 | | X | | | X | |
| 42 | ALL | The input supply to the sign and sign controller shall be a mains supply. The sign shall convert this supply to extra-low voltage levels for supplying power to internal functional parts and modules other than socket-outlets. | MRTS217, AS 4852.1 | 7.2 | | | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 43 | ALL | The sign, including the sign controllers and associated communications equipment, shall operate correctly and reliably from a mains power supply with supply voltages over the range 205 V to 264 V r.m.s. and for any variations of frequency in the range 48 Hz to 52 Hz. The equipment shall be protected from damage if subjected to voltages and frequency outside these ranges. | MRTS217, AS 4852.1 | 7.2 | | | X | | X | |
| 44 | ALL | The battery backup system shall comply with AS 4852.1 <i>Battery backup</i> . | MRTS217, AS 4852.1 | 7.3 | | X | | | X | |
| 45 | ALL | A battery backup system shall be provided with each sign. This provision shall have the capacity to maintain normal sign operation except for sign pixel display and conspicuity devices for a period of 12 continuous hours, including any communication services. | MRTS217, AS 4852.1 | 7.3 | | X | | | X | |
| 46 | ALL | Batteries used in the backup system shall be of a leak-free low-maintenance type and shall be automatically charged from an internal system provided within the sign. | MRTS217, AS 4852.1 | 7.3 | | | | X | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 47 | ALL | In the event of battery failure, the sign shall include, as a minimum, automatic clearing of the display on power failure and onsite retention of all programming information in the sign controller achieved by the use of non-volatile memory or battery backup RAM. | MRTS217, AS 4852.1 | 7.3 | | | X | | X | |
| 48 | ALL | Lightning and surge protection shall comply with AS 4852.1 <i>Lightning protection</i> . | MRTS217, AS 4852.1 | 7.4 | | X | | | X | |
| 49 | ALL | The equipment shall provide surge protection to withstand the surges specified in AS/NZS 1768, Category B, with medium exposure peak amplitudes. | MRTS217, AS 4852.1, AS/NZS 1768 | 7.4 | | | | X | X | |
| 50 | ALL | Lightning protection in accordance with AS/NZS 1768 shall be provided to sign installations. Records of the lightning protection circuit and arrangement, and measured earth resistance shall be provided to the purchaser. | MRTS217, AS 4852.1, AS/NZS 1768 | 7.4 | | | | | X | |
| 51 | ALL | Immunity and electromagnetic emissions shall conform to AS/NZS 61000.6.1 and AS/NZS 61000.6.3. | MRTS217, AS/NZS 61000.6.1, AS/NZS 61000.6.3 | 7.5 | | X | | | X | |
| 8 Display and Optical requirements | | | | | | | | | | |
| 52 | ALL | RISs shall be LED display. | MRTS217 | 8.1.1.1 | | | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 53 | RIS1, RIS2 | RISs shall be LED display. RIS1 and RIS2 signs shall generate traffic control messages as per QGTM Part 9. The dimensions of the characters are shown in the respective TC sign. These signs shall have combination of messages as referred to in Table 8.1.1.1. The LEDs of RIS1 and RIS2 signs shall have a maximum spacing of two times the diameter of individual pixels. | MRTS217 | 8.1.1.1 | | | | X | X | |
| 54 | RIS1, RIS2 | All other display characteristics of RIS1 and RIS2 signs shall comply with AS 4852.1 <i>Display characteristics</i> . | MRTS217, AS 4852.1 | 8.1.1.1 | | | X | | X | |
| 55 | RIS3 | Display characteristics of RIS3 signs shall comply with AS 4852.1 <i>Display characteristics</i> . | MRTS217, AS 4852.1 | 8.1.1.1 | | | X | | X | |
| 56 | ALL | The sign shall be capable of generating and displaying alphanumeric symbols, including all messages, texts and graphics specified in AS 4852.1. | MRTS217, AS 4852.1 | 8.1.1.1 | X | | | | X | |
| 57 | ALL | The symbols generated on the sign should conform to Qld MUTCD, AS 1743 and AS 1744. | MRTS217, AS 4852.1, AS 1742.1, AS 1743, AS 1744 | 8.1.1.1 | | | | X | X | |
| 58 | ALL | The message display shall be a full matrix LED display conforming to Table 5.1. | MRTS217, AS 4852.1 | 8.1.1.1 | | | | X | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 59 | RIS3 | RIS3's LEDs form a uniform matrix design, whilst RIS1 and RIS2 may not necessarily be of uniform matrix structure. | MRTS217 | 8.1.1.1 | | | | | X | |
| 60 | ALL | The luminance output shall comply with AS 4852.1 <i>Luminance output</i> . | MRTS217, AS 4852.1 | 8.1.1.2 | | X | | | X | |
| 61 | ALL | The luminance output of the message display shall be controlled by: a) a light output dimming system capable of adjusting light output, see Clause 5.1.9 (AS 4852.1), and b) both remote and local software command input, see Section 6 (AS 4852.1). | MRTS217, AS 4852.1 | 8.1.1.2 | | | X | | X | |
| 62 | ALL | The pixel arrangement shall comply with AS 4852.1 <i>Pixel arrangement</i> . | MRTS217, AS 4852.1 | 8.1.1.3 | | | X | | X | |
| 63 | ALL | Pixel pitches shall be equal vertically and horizontally across the display area. | MRTS217, AS 4852.1 | 8.1.1.3 | X | | | X | | |
| 64 | ALL | The pixel element service life shall comply with AS 4852.1 <i>Pixel Element Service Life</i> . | MRTS217, AS 4852.1 | 8.1.1.4 | | X | | X | X | |
| 65 | ALL | Each pixel element of the sign shall have a rated minimum service life of not less than 10 years of continuous switching and operation. | MRTS217, AS 4852.1 | 8.1.1.4 | | X | | | | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 66 | ALL | For the purpose of this requirement, the rated minimum service life of a pixel element shall be the minimum duration of operation which the pixel element can provide under: a) all combinations of operating and environmental conditions possible under this AS 4852.1; and b) those conditions designed for by the sign manufacturer. | MRTS217, AS 4852.1 | 8.1.1.4 | | X | | | | |
| 67 | ALL | Output luminance shall remain within the specified permitted range over the entire service life of operation, see Table 5.5. | MRTS217, AS 4852.1 | 8.1.1.4 | | X | | | | |
| 68 | RIS1, RIS2 | RIS1 and RIS2 signs shall have an easily detachable mounting mechanism with a quick disconnect from the power and communication connection for the ease of maintenance. | MRTS217 | 8.1.1.5 | | | X | | X | |
| 69 | RIS1, RIS2 | RIS1 and RIS2 signs shall have integrated sign controllers located within the sign enclosure. | MRTS217 | 8.1.1.5 | | | X | X | X | |
| 70 | RIS1, RIS2 | RIS1 and RIS2 signs shall be field replaceable units and shall only be serviced at the manufacturer's factory. | MRTS217 | 8.1.1.5 | | | X | | X | |
| 71 | RIS1, RIS2 | All other maintainability requirements of RIS3 signs shall comply with AS 4852.1 <i>Maintainability</i> . | MRTS217, AS 4852.1 | 8.1.1.5 | | | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 72 | RIS3 | RIS3 signs shall consist of modular replaceable subsystems such as display boards, power supplies, and sign controllers. These subsystems shall be field replaceable in a shorter duration not more than five minutes. | MRTS217 | 8.1.1.5 | | | X | X | X | |
| 73 | RIS3 | All other maintainability requirements of RIS3 signs shall comply with AS 4852.1 <i>Maintainability</i> . | MRTS217, AS 4852.1 | 8.1.1.5 | | | X | | X | |
| 74 | ALL | The pixels shall be arranged in modules of a size capable of being removed and reinstated insitu by hand by one person through the sign enclosure's rear access opening. The construction and layout of the sign enclosure, framework, and electronic driver networks shall facilitate the same. | MRTS217, AS 4852.1 | 8.1.1.5 | | | X | | X | |
| 75 | ALL | The manufacturer or supplier shall state the following to assist the purchaser in assessment of maintainability of the displays: a) mean time between failures (Display System) – MT BF, and b) mean time to repair (Display System) – MTTR. | MRTS217, AS 4852.1 | 8.1.1.5 | | | | X | X | |
| 76 | RIS1, RIS2 | The text and spacing requirements for RIS1 and RIS2 signs shall be in accordance with TC2290. | MRTS217, TC2290 | 8.1.2.1 | X | | X | | X | |
| 77 | RIS3 | The text and spacing requirements for RIS3 signs shall comply with AS 4852.1 <i>Text and spacing</i> . | MRTS217, AS 4852.1 | 8.1.2.1 | X | | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 78 | RIS3 | For alphanumeric characters, the parameters set out in Tables 5.2 and 5.3 shall apply. | MRTS217, AS 4852.1 | 8.1.2.1 | | X | | X | X | |
| 79 | RIS3 | Dimensional terminology and character proportions are given in Figure 5.1 and Table 5.2. | MRTS217, AS 4852.1 | 8.1.2.1 | | X | | X | X | |
| 80 | RIS3 | Minimum proportions shall be observed and scaled against the minimum character height (H) as defined in Table 5.3. | MRTS217, AS 4852.1 | 8.1.2.1 | | X | | X | X | |
| 81 | RIS3 | Signs shall have sufficient vertical pixels to permit lower case text to be shown concurrently on all three lines. The base of the lower case text body shall align with the base of upper case, so that descenders lie wholly below the base of upper case, see Figure 5.1. | MRTS217, AS 4852.1 | 8.1.2.1 | | X | | X | X | |
| 82 | RIS3 | Figure 5.2 shows how character heights are to be measured and the relationship between pixel width or diameter and pixel equivalent area. | MRTS217, AS 4852.1 | 8.1.2.1 | | X | | X | X | |
| 83 | ALL | The pixel lit area shall comply with AS 4852.1 <i>Pixel lit area</i> . | MRTS217, AS 4852.1 | 8.1.2.2 | | X | | | X | |
| 84 | ALL | For each colour, the lit width shall be a minimum of 60% of the stroke width and the lit height shall be a minimum of 60% of the stroke height, see Figure 5.3 | MRTS217, AS 4852.1 | 8.1.2.2 | | X | | X | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 85 | RIS1, RIS2 | RIS1 and RIS2 signs shall have a maximum light output in line with the mechanical axis of the sign display panel. | MRTS217 | 8.1.3 | | X | | | X | |
| 86 | RIS3 | RIS3 signs shall have a maximum light output complying with AS 4852.1 <i>Light axis</i> . | MRTS217, AS 4852.1 | 8.1.3 | | X | | | X | |
| 87 | RIS3 | The sign's maximum light output shall be at or below the mechanical axis of the sign display panel. | MRTS217, AS 4852.1 | 8.1.3 | | | X | | X | |
| 88 | RIS1, RIS2 | RIS1 and RIS2 signs shall have character formats as per TC2290. | MRTS217, TC2290 | 8.1.4.1 | | | X | X | X | |
| 89 | RIS3 | RIS3 sign font types shall be comply with AS 4852.1 <i>Character formats</i> . | MRTS217, AS 4852.1 | 8.1.4.1 | | | X | X | X | |
| 90 | RIS3 | Standard operation of the signs shall permit the simultaneous generation of alphanumeric characters for the number of lines, characters, and character heights as defined in Table 5.1 and 5.2. The sign shall be capable of supporting at least five fonts including the following two: a) Font 1 — standard height fixed font characters, and b) Font 2 — standard height proportional font characters. | MRTS217, AS 4852.1 | 8.1.4.1 | | X | | X | X | |
| 91 | RIS1, RIS2 | RIS1 and RIS2 font shapes shall be according to TC2290. | MRTS217, TC2290 | 8.1.4.2 | | | X | X | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 92 | RIS3 | RIS3 sign font shapes shall comply with AS 4852.1. | MRTS217, AS 4852.1 | 8.1.4.2 | | | X | X | X | |
| 93 | RIS3 | The set of characters decimal 32–126 (20 h–7 Eh) shall be available for display. An example is shown In Figure 5.4. | MRTS217, AS 4852.1 | 8.1.4.2 | | | | X | X | |
| 94 | ALL | Signs shall be justified as per AS 4852. | MRTS217, AS 4852 | 8.1.4.3 | | | X | X | X | |
| 95 | ALL | Text messages shall be centre- and-middle-justified by default, unless otherwise formatted using the relevant communications protocol. | MRTS217, AS 4852 | 8.1.4.3 | | | X | X | | |
| 96 | ALL | Signs shall have the capability to display changes complying with AS 4852.1 <i>Display changes</i> . | MRTS217, AS 4852.1 | 8.1.5 | | | X | X | X | |
| 97 | ALL | Display changes shall be effected by complete blanking of one display followed by delivery of the next required display. The sign shall permit flexibility in the selection of time functions such as blanking times, message display alternating rates, and so on. These times shall be selectable via the control system, available locally and remotely from the specified host control centre. | MRTS217, AS 4852.1 | 8.1.5 | | | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 98 | ALL | The setting of a frame, message or plan shall only be performed on inactive frames, messages and plans. An active message or plan shall run to full completion before a new frame, message or plan is activated. Full completion is considered to have taken place when the last frame of a message has been displayed for 10 s. | MRTS217, AS 4852.1 | 8.1.5 | | | X | | X | |
| 99 | ALL | The sign shall: a) provide complete blank (that is, all pixel inactive) and complete full screen (that is, all pixel active) displays) b) successively flash the whole or any part of a display at a user-defined rate conforming with Table 5.4, and c) retain singular frames and/or messages in continuous display mode. | MRTS217, AS 4852.1 | 8.1.5 | | | X | | X | |
| 100 | ALL | The sign shall accept text commands (that is, set and display text frames) locally and remotely from the specified host control centre. | MRTS217, AS 4852.1 | 8.1.5 | | | X | | X | |
| 101 | RIS1, RIS2 | RIS1 and RIS2 signs shall not be provided with facility switches. | MRTS217 | 8.1.6 | X | | | X | X | |
| 102 | RIS3 | RIS3 signs shall comply with AS 4852.1 <i>Display changes</i> due to facility switch operations. | MRTS217, AS 4852.1 | 8.1.6 | | | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 103 | RIS3 | When the facility switch is in either the Message 1 or Message 2 position, the display shall show Message 1 or Message 2 accordingly. | MRTS217, AS 4852.1 | 8.1.6 | | | X | | X | |
| 104 | RIS3 | In the event that either Message 1 or 2 is undefined, the sign shall blank the display if activated via the facility switch (that is, the sign shall treat this the same as the OFF position); however, the sign shall still report the actual facility switch position (Message 1 or Message 2) but with a frame zero. | MRTS217, AS 4852.1 | 8.1.6 | | | X | | X | |
| 105 | RIS3 | Returning the facility switch to the Auto position (from any previous position) shall cause the previous active display to be removed (that is, the sign shall blank or revert to the current plan sequence). | MRTS217, AS 4852.1 | 8.1.6 | | | X | | X | |
| 106 | RIS3 | Facility switch display changes shall incorporate a time delay to prevent incorrect displays during operation of the switch: for example, if the facility switch is changed from Auto to Message 2 (passing through Message 1), Message 1 shall not be displayed and Message 2 shall only be displayed upon expiry of the time delay and completion of the previous sign display. The nominal value of this time delay shall be 1 s. | MRTS217, AS 4852.1 | 8.1.6 | | | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 107 | ALL | External inputs shall be provided and functioned complying with AS 4852.1 <i>Display changes</i> due to external inputs for RIS3 signs. | MRTS217, AS 4852.1 | 8.1.7 | | | X | | X | |
| 108 | ALL | The sign controller shall provide three voltage-free or ELV inputs for external inputs that can be connected to external devices (such as height detectors, speed cameras, weather stations and so on). These inputs shall activate (leading edge triggered) and log respectively predefined messages Message 3, Message 4 and Message 5. Where a facility switch is installed, it needs to be in the Auto position for this input activation and logging to occur. The sign controller shall not use the fault log for logging external switch-related messages. The sign controller shall provide a separate event log for such purposes. | MRTS217, AS 4852.1 | 8.1.7 | X | | X | X | | |
| 109 | ALL | In the event that an external input is activated and the respective Message 3, Message 4 or Message 5 is undefined, the sign shall not change its current display status. | MRTS217, AS 4852.1 | 8.1.7 | | | X | | X | |
| 110 | RIS3 | In the event that an external input is activated and a facility switch, if installed, is not in the Auto position, the sign shall not change its current display status. | MRTS217, AS 4852.1 | 8.1.7 | | | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 111 | ALL | The sign shall accept plans and command instructions (except display activation) as described in Section 6 regardless of the status and/or activation of the external switches. | MRTS217, AS 4852.1 | 8.1.7 | | | X | | X | |
| 112 | ALL | Any message due to an external input shall remain active for a predetermined configurable period of time (see Item (i) following) after the input signal was received. If a new signal input for that specific switch is received during that period, the timer shall be reset and the message display shall be extended. After the display time of the external switch message (Message 3, 4 or 5) expires, the sign shall display the previous display (or current plan setting if there was no previous display) or the next display (if it was received during switch activation). | MRTS217, AS 4852.1 | 8.1.7 | | | X | | X | |
| 113 | ALL | In the case where multiple external inputs are activated and their message display time overlaps, a decision based on a priority scheme as follows shall be implemented: Message 3 – priority 1 (highest). Message 4 – priority 2. Message 5 – priority 3. | MRTS217, AS 4852.1 | 8.1.7 | | | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 114 | ALL | <p>Additionally, for each individual external input the following local configurations shall be provided:</p> <ul style="list-style-type: none"> i. Message display time after activation. ii. Selection of time functions, for example, blanking times and message display alternating rates, as well as a compatibility check with the configuration time defined in Item (i). iii. A setting that allows Messages 3, 4 and 5 to not observe the general requirements in Clauses 5.1-6 and 6.1, requiring all frames, messages and plans that have been commenced to run to completion before a new message can be displayed. This setting shall be configured to either ON or OFF and shall apply to the external inputs only. iv. A setting that allows an existing message or a new message with flashing (that is, flashing of conspicuity devices activated) under either remote control (see Clause 6.3) or local control (see 6.2), to override the display of the pre-defined message for the external input. This setting shall be configured to either ON or OFF for the override function. | MRTS217, AS 4852.1 | 8.1.7 | | | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 115 | RIS1 | RIS1 signs shall display graphics NO RIGHT TURN, NO LEFT TURN and NO ENTRY as per AS 1743 R4-6 signs. | MRTS217, AS 1743 | 8.1.8 | | | X | | X | |
| 116 | ALL | Signs shall have two light sensors mounted in the front and back. | MRTS217 | 8.1.9.1 | X | | | | X | |
| 117 | ALL | The signs dimming shall be controlled by the higher value of the two light sensors. All other requirements of the sign dimming system shall comply with AS 4852.1. | MRTS217, AS 4852.1 | 8.1.9.1 | | | X | | X | |
| 118 | ALL | The sign shall provide the ability to dim the light output intensity of its message display and conspicuity devices to ensure maximum legibility distances are achieved and avoid glare under all external ambient lighting conditions in which each sign will operate. | MRTS217, AS 4852.1 | 8.1.9.1 | | | X | | X | |
| 119 | ALL | Automatic dimming control shall be achieved by a light-sensing device and light-dimming control algorithm representative of scene illuminance for the sign audience. | MRTS217, AS 4852.1 | 8.1.9.1 | | | X | | X | |
| 120 | ALL | If a dimming fault is activated, the sign shall select a luminance value based on the time of day or a fixed value in accordance with Clause 5.1.9.3 and Clause 5.1.9.4. | MRTS217, AS 4852.1 | 8.1.9.1 | | | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 121 | ALL | In addition, the sign shall provide the ability to adjust the relationship between the degree of dimming and external lighting conditions (that is, the light-dimming control algorithm) either locally or remotely. | MRTS217, AS 4852.1 | 8.1.9.1 | | | X | | X | |
| 122 | ALL | A total of 16 dimming levels shall be provided where dimming level 1 is minimum intensity output and dimming level 16 is maximum intensity output. The light-dimming control algorithm shall not permit sudden changes in the output intensity. The sign shall take a minimum of 5 s and a maximum of 15 s to transition from one dimming level to the next in either direction. The relationship between luminance level and dimming levels shall be as given in Table 5.5. | MRTS217, AS 4852.1 | 8.1.9.1 | | | X | | X | |
| 123 | ALL | The dimming level and dimming mode (automatic or manual) shall be reported when the sign has been instructed via an appropriate command. | MRTS217, AS 4852.1 | 8.1.9.1 | | | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 124 | ALL | <p>The monitoring system for the signs automatic dimming control shall comply with AS 4852.1 <i>Monitoring of automatic dimming control</i> with the following amendment of the subclause (a) (iii).</p> <p>(a) (iii) The reported sign illuminance of the light-sensing device does not have a variation greater than 600 lx over a period of 48 h.</p> <p>Additionally, the 1-minute and 15-minute average light sensor values shall be stored in the sign controller for a period of 12 months to be downloadable from the Product Host Control System (PHCS). Light levels and associated times shall be configurable parameters from the PHCS.</p> | MRTS217, AS 4852.1 | 8.1.9.2 | | | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 125 | ALL | <p>In addition to normal fault monitoring of the dimming system, the sign shall provide the following fault- monitoring functionality:</p> <p>a) Light-sensor fault logging except as provided in Item (c) below, the sign shall log a fault for the light-sensing device if any of the following conditions takes place, with a de-bouncing time of 15 min:</p> <p>i. During the period from 1100 h to 1500 h, the light-sensing device reports a sign illuminance lower than 50 lx.</p> <p>ii. During the period from 2300 h to 0300 h, the light-sensing device reports a sign illuminance higher than 400 lx.</p> <p>iii. (superseded) The reported sign illuminance of the light-sensing device does not have a variation greater than 600 lx over a period of 18 h.</p> | MRTS217, AS 4852.1 | 8.1.9.2 | | X | | | X | |
| 126 | ALL | <p>b) Light-sensor fault clearing except as provided in Item (c) below, the sign shall clear an active fault if the fault condition that originally generated the fault does not exist on a subsequent day (in the same time period).</p> | MRTS217, AS 4852.1 | 8.1.9.2 | | | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 127 | ALL | c) Real-time clock checking: The sign shall also check the operation of its real-time clock. If the sign detects a corruption in the clock or an incorrect date and/or time, it shall not log or clear faults using the time-based methods defined in Items (a) and (b) above. | MRTS217, AS 4852.1 | 8.1.9.2 | | | X | | X | |
| 128 | ALL | The sign dimming control system shall have time-based dimming controls complying with AS 4852.1 <i>Time-based dimming control</i> . | MRTS217, AS 4852.1 | 8.1.9.3 | | | X | | X | |
| 129 | ALL | Where the real-time clock is working with the correct date and time and a light-sensing device fault is active (that is, logged in accordance with Clause 5.1.9.2 (AS 4852.1)), the sign shall control its dimming levels, based on the time of day. | MRTS217, AS 4852.1 | 8.1.9.3 | | | X | | X | |
| 130 | ALL | As a default setting, during Day the sign luminance shall be set to dimming level 16 (that is, no dimming). During Night, the sign luminance shall be set to dimming level 1 (that is, maximum dimming). During Dawn and Dusk, the sign luminance shall be set to dimming level 8; however, dimming levels shall be user-configurable as required for site-specific conditions. | MRTS217, AS 4852.1 | 8.1.9.3 | | | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 131 | ALL | Although the time-based dimming control uses only three nominal levels of dimming, the requirement to avoid sudden changes in the sign luminance in Clause 5.1.9.1 (AS 4852.1) shall be followed at all times. | MRTS217, AS 4852.1 | 8.1.9.3 | | | X | | X | |
| 132 | ALL | The times for beginning of Dawn, end of Dawn, beginning of Dusk, and end of Dusk shall be locally configurable for the calendar dates 21 June and 21 December and shall be provided with factory default values for the geographical area specified by the purchaser. The Dawn and Dusk times for all other dates shall be linearly interpolated from those for 21 June and 21 December. | MRTS217, AS 4852.1 | 8.1.9.3 | | | X | | X | |
| 133 | ALL | The sign dimming control system shall have a fixed dimming control complying with AS 4852.1 <i>Fixed dimming control</i> . | MRTS217, AS 4852.1 | 8.1.9.4 | | | X | | X | |
| 134 | ALL | Where the real-time clock is not working or contains incorrect date and/or time, and a light-sensing device fault is active, the sign luminance shall be set to dimming level 6 unless otherwise configured by the user. | MRTS217, AS 4852.1 | 8.1.9.4 | | | X | | X | |
| 135 | ALL | Conspicuity devices shall not be provided. | MRTS217 | 8.1.10 | | | | X | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 136 | ALL | Display flicker shall be complied with AS 4852.1 <i>Display flicker</i> . | MRTS217, AS 4852.1 | 8.1.11 | | | X | | X | |
| 137 | ALL | There shall be no discernible flickering of the sign display. Where pixels are not energized continuously when required to be switched on, the frequency at which they are pulsed shall be not less than 100 Hz. Background checking of pixels (both ON and OFF pixels) shall not produce visible flickering of the pixels when observed from a distance greater than 10 m under all ambient lighting conditions. | MRTS217, AS 4852.1 | 8.1.11 | | | X | | X | |
| 138 | ALL | The signs luminance and luminance ratio shall comply with AS 4852.1 <i>Luminance and luminance ratio</i> . | MRTS217, AS 4852.1 | 8.2.1 | | X | | | X | |
| 139 | ALL | The sign's luminance and luminance ratio (LR) shall be in accordance with Table 5.5 for the pixel element service life, see Clause 5.1.1.4 Appendix C specifies test procedures for luminance ratio measurement. | MRTS217, AS 4852.1 | 8.2.1 | | X | | | X | |
| 140 | ALL | The signs luminance matching of colours shall comply with AS 4852.1 <i>Luminance matching of colours</i> . | MRTS217, AS 4852.1 | 8.2.2 | | X | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 141 | ALL | Where more than one colour is displayed simultaneously, the colours should appear with similar brightness. To achieve this, the following ratios are suggested: White: 1.6 Yellow: 1.0 Green; 0.5 Red: 0.4 | MRTS217, AS 4852.1 | 8.2.2 | | X | X | | X | |
| 142 | ALL | The luminous intensity uniformity shall comply with AS 4852.1 <i>Luminous intensity uniformity</i> . | MRTS217, AS 4852.1 | 8.2.3 | | X | | | X | |
| 143 | ALL | The following requirements for luminous intensity uniformity shall be separately met for each output colour: a) When measured on axis and at the combined horizontal/vertical down half-angle positions as specified in Table 5.1 the ratio of the average of the three highest pixel outputs to the average of the three lowest pixel outputs shall be not more than 2.5.1. | MRTS217, AS 4852.1 | 8.2.3 | | X | | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 144 | ALL | The following requirements for luminous intensity uniformity shall be separately met for each output colour: b) The ratio between the outputs of any two pixels shall be not more than 4:1. See AS 4852.1 Appendix C for test procedures. | MRTS217, AS 4852.1 | 8.2.3 | | X | | | X | |
| 145 | ALL | Colours shall comply with AS 4852.1. | MRTS217, AS 4852.1 | 8.2.4 | | X | X | | X | |
| 146 | ALL | The RIS display shall be able to display individual pixels in either Yellow, White, Red or Green colours, against a matt Black background. LEDs shall be used within pixels to generate output colours. The individual pixels may generate colour with either discrete LED/s for each of the 4 colours or via a colour mixing arrangement with RGB LEDs or equivalent technologies. In the event of the use of colour mixing or equivalent technology, any colours non-compliant with AS 4852.1 shall neither be configurable nor displayed under any circumstances. | MRTS217, AS 4852.1 | 8.2.4 | | | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 147 | ALL | The VMS display's colours shall remain within their corresponding chromaticity coordinates, as specified in Section 5.2.4 of AS 4852.1, for every configurable brightness level. The sign's display colours shall remain within their corresponding specified chromaticity coordinates for at least 10 years of pixel service life specified in Section 5.1.1.4 of AS 4852.1. It should be noted that this requirement is additional to the warranty requirements outlined in Clause 4.3 of this Technical Specification. | MRTS217, AS 4852.1 | 8.2.4 | | X | | | X | |
| 148 | ALL | When tested in accordance with Appendix D, each colour present in the message shall lie within one of the regions specified by the chromaticity coordinates in Table 5.6 and Figure 5.5. Monochrome displays are typically yellow. | MRTS217, AS 4852.1 | 8.2.4 | | X | | | X | |
| 9 Operation and control requirements | | | | | | | | | | |
| 149 | ALL | Signs shall be capable of connecting to STREAMS, principal's TMS. Signs shall be provided with PHCS complying with AS 4852.1. | MRTS217, AS 4852.1 | 9.1 | | | X | | X | |
| 150 | ALL | The PHCS shall also provide network diagnostics through looping back of the interfacing ports to isolate the faults to a specific system. | MRTS217 | 9.1 | | | | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 151 | ALL | The PHCS shall have the ability to be used standalone for diagnostic, maintenance, and control purposes. | MRTS217, AS 4852.1 | 9.1 | | | X | | X | |
| 152 | ALL | The sign's display shall be capable of being activated through any one of the following methods (see Clause 6.6 for requirements of the communications protocol): a) command instruction from a host control centre (host control system for remote control) b) command instruction from a remote site using the sign manufacturer's control system (that is, the PHCS) c) command instruction locally from a portable device, or d) external switch input. | MRTS217, AS 4852.1 | 9.1 | | | X | | X | |
| 153 | ALL | When a message is to be changed, the current message shall run to completion before the new message, frame or plan is displayed, except when external switches have been configured accordingly, see Clause 5.1.7 for details. | MRTS217, AS 4852.1 | 9.1 | | | X | | X | |
| 154 | ALL | Signs shall have an Ethernet port for onsite control, operation and fault diagnostic functions. The control port shall also support the fault diagnostics using PHCS software when connected to a local computer. | MRTS217 | 9.2 | X | | | X | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 155 | RIS1, RIS2 | For RIS1 and RIS2 signs, the local control port shall be located outside of the sign enclosure or accessible via nearby cable termination infrastructure. The external port shall have a minimum ingress protection level of IP56. | MRTS217 | 9.2 | X | | | X | X | |
| 156 | RIS3 | Local control for RIS3 signs shall be accessible at the telecommunication field cabinet. | MRTS217 | 9.2 | | | | X | X | |
| 157 | ALL | Signs shall be connected to the Field Processor for remote operations through a RS422 interface. The communication parameters shall be configurable using the PHCS. All other requirements shall comply with AS 4852.1 <i>Remote control</i> . | MRTS217, AS 4852.1 | 9.3 | | | | X | X | |
| 158 | ALL | The sign shall support baud rates at speeds up to, and including, 115200 baud. | MRTS217, AS 4852.1 | 9.3 | | | | X | X | |
| 159 | ALL | Any communication equipment supplied under the purchasing contract shall be compatible with existing equipment currently used in the host control centre. This compatibility shall be demonstrated by the sign manufacturer or supplier prior to installation. | MRTS217, AS 4852.1 | 9.3 | | | | X | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 160 | RIS1, RIS2 | RIS1 and RIS2 signs shall have enough memory capacity to store messages and display all frames required for the operation of RIS1 and RIS2 signs. | MRTS217 | 9.4 | | X | | X | X | |
| 161 | RIS3 | RIS3 signs shall have memory capacity complying with AS 4852.1 <i>Non-volatile memory capacity</i> . | MRTS217, AS 4852.1 | 9.4 | | X | | X | X | |
| 162 | RIS3 | The sign shall be capable of storing a minimum of 255 separate messages, each with two frames and a minimum of 255 plans, each comprising from one to six messages. | MRTS217, AS 4852.1 | 9.4 | | X | | X | X | |
| 163 | ALL | In addition to requirements above, non-volatile memory shall be able to store the light sensor output data for a minimum 12-month period. | MRTS217 | 9.4 | | X | | | X | |
| 164 | ALL | Signs shall have the capability to program the frames or messages complying with AS 4852.1 <i>Programming</i> . | MRTS217, AS 4852.1 | 9.5 | | X | | | X | |
| 165 | ALL | The sign shall be capable of being programmed in its non-volatile memory either locally or remotely to display any stored frame or message. | MRTS217, AS 4852.1 | 9.5 | | | X | | X | |
| 166 | ALL | For multi-frame messages, the display duration for each frame shall be configurable from 0.5 s in 0.1 s increments individually. | MRTS217, AS 4852.1 | 9.5 | | | X | | | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 167 | ALL | The transition time between frames shall be configurable from 0.0 s to 1.0 s in maximum increments of 0.1 s. | MRTS217, AS 4852.1 | 9.5 | | | X | | | |
| 168 | ALL | The signs shall be able to interface with Principals TMS, STREAMS through the Field Processor. STREAMS use RMS protocol TSI-SP-003 with compatibility to operate with colours. | MRTS217, TSI-SP-003 | 9.6 | | | X | | X | |
| 169 | ALL | The sign shall have monitoring, fault logging and reporting complying with AS 4852.1 <i>Monitoring, fault logging and reporting.</i> | MRTS217, AS 4852.1 | 9.7 | | | X | | | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 170 | ALL | <p>The sign's control function shall be able to monitor sign operation and generate a distinguishable status messages series automatically or responding to host control system commands, with:</p> <ul style="list-style-type: none"> a) advice when sign communication is established b) advice when sign communication is discontinued c) current VMS time and date d) unique identity and revision level of the currently operating frame, message and/or plan e) current plan f) stored frames and messages list g) a list of stored plans h) status of individual pixels at the sign (ON, OFF or faulty) i) status of sign conspicuity devices (ON, OFF or faulty) (NOT NEEDED) j) status of the backup battery(s) supporting the controller k) status of mains power to the sign l) timestamp of any fault, alarm or status entry m) other required aspects of recordable/reportable status, and n) additional monitored functions as required by the protocol. | MRTS217, AS 4852.1 | 9.7 | | | X | | | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 171 | ALL | The control system shall monitor the operation of the sign and log any fault, alarm or event within 10 s of a trigger incident. | MRTS217, AS 4852.1 | 9.7 | | | X | | | |
| 172 | ALL | The VMS shall report to the Host Control System any information requested relating to the monitored functions as supported by the protocol. | MRTS217, AS 4852.1 | 9.7 | | | X | | | |
| 173 | ALL | Listed items not accessible by the Host Control System via the communications protocol shall be accessible by the Product Host Control System. | MRTS217, AS 4852.1 | 9.7 | | | X | | X | |
| 174 | ALL | The VMS shall report faults, alarms or events upon request by the Host Control System where these are supported by the protocol. | MRTS217, AS 4852.1 | 9.7 | | | X | | | |
| 175 | ALL | The sign shall provide a blanking capability with configurable threshold(s). The sign shall be blanked if the sum of all pixel failures exceeds the threshold. The default value of the threshold shall be set to 5% of the quantity of pixels of the main display matrix. | MRTS217, AS 4852.1 | 9.7 | | | X | | | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 176 | ALL | The sign shall only log the first occurrence of each fault type. Further occurrences of the same fault type shall not be logged until that fault type is cleared. Every clearance shall be associated with a fault and vice versa. The sign shall only log the last clearance of each fault type such that the fault no longer exists. | MRTS217, AS 4852.1 | 9.7 | | | X | | | |
| 177 | ALL | Faults that can be attributed to a primary fault shall not be logged. The primary fault shall be logged; for example, a power failure fault shall not cause the logging of a multi-LED fault, but the power failure shall be logged. | MRTS217, AS 4852.1 | 9.7 | | | X | | X | |
| 178 | ALL | Each of the fault, alarm, and event logs shall accommodate not less than 500 entries. Each log entry shall be date- and-time-stamped in years, months, day of month, hours, minutes and seconds. | MRTS217, AS 4852.1 | 9.7 | | | X | | X | |
| 179 | ALL | It shall not be possible to edit the logs. | MRTS217, AS 4852.1 | 9.7 | | | X | | | |
| 180 | ALL | Logs shall use a first-in-first-out method when storage space has been exceeded for each log. | MRTS217, AS 4852.1 | 9.7 | | | X | | | |
| 181 | ALL | The fall-back display shall be blank. | MRTS217 | 9.8 | | | X | | | |
| 182 | ALL | The sign fall-back system shall comply with AS4852.1 <i>Fall-back system</i> . | MRTS217, AS 4852.1 | 9.8 | | | X | | | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 183 | ALL | The sign shall incorporate the ability to automatically fall-back to a predefined operation under the following conditions and with the associated responses: a) When mains power is lost, normal sign operation shall be maintained (except for pixel lighting and conspicuity devices) on battery backup. On power restoration, the sign shall resume the current plan sequence and/or frame or message display commanded prior to or during the mains failure. b) When communication is lost or adversely affected, normal sign operation shall be maintained, continuing to operate from local control and current plan sequence. | MRTS217, AS 4852.1 | 9.8 | | | X | | | |
| 184 | ALL | Where communication is lost after expiry of a predefined time, the sign shall end the session (that is, go offline). The communications time-out fault shall be cleared on the next successful communications message. The predefined time-out shall be configurable, ranging from 0.0 s (infinite: that is, no time-out) to 600 s with a default of 300 s. | MRTS217, AS 4852.1 | 9.8 | | | X | | | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 185 | ALL | Where communication has not been received within a predefined time, the sign shall blank if configured to do so and log a display time-out. The predefined time for display time-out shall be configurable, ranging from 0 s (infinite: that is, no blank) to 7 days, and depend on the type of communications link. Where a facility switch is installed, the display time-out function shall apply only when the facility switch is in the Auto position and the sign display is not blank. Notwithstanding, a display time-out fault shall be cleared on the next successful communications message. | MRTS217, AS 4852.1 | 9.8 | | | X | | | |
| 186 | ALL | Any software for signs and PHCS shall be developed to comply with AS 4852.1 <i>Software development</i> . | MRTS217, AS 4852.1 | 9.9 | | | | | X | |
| 187 | ALL | The development and subsequent revisions of any software and firmware used in or for the sign system should be carried out in accordance with industry standards and known processes. The following standards or their equivalent are relevant to the development and revision processes: AS/NZS ISO 9001, HB 90.9., AS/NZS ISO/IEC 12207, AS 4009, AS 4042, AS 4043. | MRTS217, AS 4852.1 | 9.9 | | | | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 188 | ALL | The sign shall be provided with an operation and maintenance manual complying with AS 4852.1 <i>Operation and maintenance manual</i> . | MRTS217, AS 4852.1 | 9.10 | | | | | X | |
| 189 | ALL | Signs shall have a real-time clock with an accuracy within ± 5 s within a week. Real-time clock shall periodically synchronize with the Field Processor through the communication protocol. | MRTS217 | 9.11 | | | | | X | |
| 190 | ALL | Real-time clock shall have backup battery system for uninterrupted operation. | MRTS217 | 9.11 | | | | | X | |
| 191 | ALL | Parameters in Appendix B shall be configurable using the PHCS | MRTS217 | 9.12, Appendix B | | | | | X | |
| 10 Environmental requirements | | | | | | | | | | |
| 192 | ALL | Sign and supporting hardware shall comply with environmental conditions as per MRTS201 <i>General Equipment Requirements</i> . | MRTS217, MRTS201 | 10.1 | | X | | | | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 193 | ALL | The equipment shall be capable of continuous, normal operation in the conditions described below: <ul style="list-style-type: none"> a) installed directly in sunlight b) ambient air temperature range between -5°C and 50°C c) enclosure air temperature: refer Clause 13.2 and Appendix B Clause 5 d) ambient ground temperature not exceeding 40°C e) a range of temperature and humidity prescribed in AS 2578 (withdrawn) f) maximum wind conditions likely to occur at the installation Site g) Queensland coastal environment with salt deposit densities in the range of 2.0 to 3.0 g/m² h) varied light intensity due to shadows i) a humidity of up to 95% non-condensing j) conditions, both permanent and temporary, that may be unique to the specified location, for example instances of thick smoke and electromagnetic interference, and k) vibrations reasonably expected in the installed location. | MRTS217, MRTS201 | 10.1 | | X | | | | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 194 | ALL | The equipment performance shall be unaffected by a humidity of 90% combined with an ambient air temperature of 40°C followed by a sudden drop in temperature of up to 10°C. | MRTS217, MRTS201 | 10.1 | | X | | | | |
| 195 | ALL | Equipment operation shall cause no adverse effect on the surrounding environment in which it is installed. Likewise, equipment shall not be affected by adverse environmental conditions expected at the intended installation location. | MRTS217, MRTS201 | 10.1 | | X | | | | |
| 196 | ALL | The ingress protection of the sign and control enclosures shall comply with AS 4852.1 <i>Enclosure protection</i> . | MRTS217, AS 4852.1 | 10.2 | | X | | | | |
| 197 | ALL | The following levels of ingress protection in accordance with AS 60529 shall be provided: a) IP65 for the complete sign enclosure (see Clause 3.1). b) IP45 for the complete roadside cabinet (see Clause 3.2). | MRTS217, AS 4852.1, AS 60529 | 10.2 | | X | | | | |
| 12 Telecommunication requirements | | | | | | | | | | |
| 198 | ALL | The telecommunications requirements defined in MRTS201 <i>General Equipment Requirements</i> and MRTS245 <i>ITS Telecommunications Network (ITS TN)</i> apply to work provided under this Technical Specification. | MRTS217, MRTS201, MRTS245 | 12 | | | X | | X | |

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| | | | | | Visual inspection | NATA approved certificate (or equivalent) | Field / bench test / demo | Detailed drawings | Manufacturer conducted tests records / other documents | |
| 13 Testing and commissioning | | | | | | | | | | |
| 199 | ALL | FAT shall include all the testing that can be conducted at the factory to ensure the equipment functioning to according to the performance measures in this Technical Specification. | MRTS217 | 13.2 | | X | | | | |
| 200 | ALL | Photometric test reports issued by a NATA-accredited laboratory or NATA-endorsed by Mutual Recognition shall be submitted for the verification by the representative of the Principal. | MRTS217 | 13.2 | | X | | | | |
| 201 | ALL | Ingress protection test reports issued by a NATA-accredited laboratory or NATA-endorsed by Mutual Recognition shall be submitted for verification | MRTS217 | 13.2 | | X | | | | |
| 202 | ALL | STREAMS acceptance certificate issued by Transmax for the current firmware of the sign / site controller shall be submitted to the Principal. | MRTS217 | 13.2 | | X | | X | | |

