

ROADS AND MARITIME SERVICES (RMS)

QA SPECIFICATION TS105

ITS ELECTRONIC MESSAGE SIGN SITE

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Ed 2/Rev 2	Various	Remove references to AS4852.1. Align with TSI-SP-008. Added reference to TS200, TS201, and TS202 processes including associated hold-points. Add clarifications. Removed device requirements and other duplicate requirements.	Steven Shaw and Farzad Naziri	17.03.17



ITS ELECTRONIC MESSAGE SIGN SITE

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FOREWORD

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REVISIONS TO PREVIOUS VERSION

This document has been revised from Specification RMS TS105 Edition 1 Revision 3.

All revisions to the previous version (other than minor editorial and project specific changes) are indicated by a vertical line in the margin as shown here, except when it is a new edition and the text has been extensively rewritten.

PROJECT SPECIFIC CHANGES

Any project specific changes are indicated in the following manner:

- Text which is additional to the base document and which is included in the Specification is shown in bold italics e.g. Additional Text.
- Text which has been deleted from the base document and which is not included in the Specification is shown struck out e.g. Deleted Text.

RMS QA SPECIFICATION TS105

ITS ELECTRONIC MESSAGE SIGN SITE

1 GENERAL

1.1 SCOPE

This Specification sets out the requirements for the supply, installation and commissioning of the following types of Electronic Message Signs (EMS):

<u>EMS Type</u>	<u>EMS Type Description</u>
Standard Variable Message Sign (VMS)	Refers to VMS Type A, VMS Type B and VMS Type C. Capable of displaying text messages and/or graphics.
Specialised VMS	Refers to specialised VMS types like: <ul style="list-style-type: none">• Regulatory and Warning Signs - which are designed to replicate regulatory signage configurations electronically, and may be capable of displaying custom short text warnings; and• Tunnel Message Signs - single line VMSs only used in tunnels.
Other VMS	Reserved for use on future VMS types
Integrated Speed and Lane Use sign (ISLUS)	Refers to signs which display either the current enforceable speed limit, road conditions, or lane-based availability messages

The scope of this Specification covers the procurement of all hardware and performance of all site works required to commission the EMS Sites. An EMS Site includes:

- a) The EMS including all associated components onsite;
- b) The local communications link cabling and equipment up to the site access node cabinet;
- c) The electrical power link, from the point of supply to the site access node cabinet;
- d) All electrical earthworks for equipment footings and service/utility access cableways; and

Items excluded from the scope of this Specification include:

- Communications System cabling and equipment beyond the site access node; and
- Integration and configuration of the EMS into the host system at the ITS Control and Management Centre (CMC).

1.2 STRUCTURE OF THE SPECIFICATION

This Specification includes a series of annexures that detail additional requirements. These annexures are described below.

1.2.1 Project Specific Requirements (TS105/A)

If there are any Project specific details, these are described in Annexure TS105/A.

1.2.2 Measurement and Payment (TS105/B)

The method of measurement and payment is detailed in Annexure TS105/B.

Acceptance of materials and work shall be in accordance with Annexure TS105/B.

1.2.3 Schedules of HOLD POINTS, WITNESS POINTS and Identified Records (TS105/C)

The schedules in Annexure TS105/C list the **HOLD POINTS** and **WITNESS POINTS** that shall be observed. Refer to Specification RMS Q for definitions of **HOLD POINTS** and **WITNESS POINTS**.

The records listed in Annexure TS105/C are **Identified Records** for the purposes of RMS Q Annexure Q/E.

1.2.4 Planning Documents (TS105/D)

The Contractor shall provide a PROJECT QUALITY PLAN. The PROJECT QUALITY PLAN shall include each of the documents and requirements listed in Annexure TS105/D.

If the Contract does not require the Contractor to implement a PROJECT QUALITY PLAN, as a minimum the documents listed in Annexure TS105/D shall be submitted to the Principal for approval.

These documents shall be approved by the Principal prior to commencement of the EMS site works.

1.2.5 Referenced Documents

Unless otherwise specified, the latest issue of a referenced document shall apply.

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 2350). For convenience, the full titles are given in Annexure TS105/M.

In the event of a discrepancy between this document and a referenced document, this document shall take precedence.

1.3 DEFINITIONS AND ABBREVIATIONS

1.3.1 Definitions

The terms “you” and “your” mean “the Contractor” and “the Contractor’s” respectively.

The terms “EMS” and “sign” are used interchangeably and have equal meaning in this Specification. These terms are used when a generic reference is required regardless the type of the EMS.

The following definitions are applicable to this Specification:

<u>Item</u>	<u>Definition</u>
EMS Controller	The microprocessor and communications electronics of the EMS, referenced and powered distinctly from the LED display electronics and enclosure.
ISLUS	Refers to all EMS’s used to display speed limits and lane use information.
ITS	An integrated technology solution using computer-based control systems which communicate with field devices to provide a functional outcome designed to improve journeys through the transport network.
ITS Control and Management System	The central control system which is housed in the RMS control centre. Also known as the host system.
ITS Communications System	The communications backbone network for ITS equipment.
Point of Supply	Mains power connection point.
Principal	RMS representative who is responsible for approvals over design documentations and site installations.
Site Access Node	The interfacing point for the ITS equipment on site to the ITS Communications System.
RWS	Electronic signs which are used to display regulatory graphics and warning text messages up to 6 characters wide.
VMS	Electronic signs which are used to display variable messages up to 18 characters wide.

1.3.2 Abbreviations

The following abbreviations apply to this Specification:

CMC	Control and Management Centre
CMS	Control and Management System
EMS	Electronic Message Sign
FAT	Factory Acceptance Test
GPO	General Purpose Outlet
ISLUS	Integrated Speed and Lane Use Sign
ITS	Intelligent Transport Systems
RMS	Roads and Maritime Services
SAT	Site Acceptance Test
SMOF	Single Mode Optical Fibre (cable)

UPS	Uninterruptible Power Supply (DC/AC - Direct or Alternating Current)
VMS	Variable Message Sign

2 EMS SITES

2.1 OVERVIEW

An EMS Site provides traffic-related information presented electronically to drivers via an illuminated sign display. EMS are mounted in permanent positions above or adjacent to the roadway for ease of visibility by road users.

An EMS site typically comprises of the following components:

- a) an EMS which contains an enclosure with illuminated display panels and a local EMS controller;
- b) an EMS cabinet which contains additional equipment required to support EMS operation;
- c) power and communications terminal equipment;
- d) conduits and cabling;
- e) mounting accessories and miscellaneous hardware;
- f) footings, underground cableways and earthworks (where not provided by the Principal); and
- g) EMS support structure (if applicable).

3 EMS REQUIREMENTS

3.1 EMS COMPLIANCE AND APPROVALS

A list of pre-evaluated EMS is maintained in RMS QA TS200. If the EMS proposed for supply is not listed in RMS QA TS200, then the project shall follow the process defined in RMS QA TS202 including the hold points defined in RMS QA TS202.

HOLD POINT

Process Held: Supply of EMS.

Submission Details: Notification of selection from TS200, or a submission as per requirements of RMS QA TS202.

Release of Hold Point: Approval from the Principal Manager ITS (for the submission)

Please contact ITS Helpdesk for any queries or further information on EMS compliance and approval via email to [ITS Helpdesk](#).

3.2 EMS GENERAL REQUIREMENTS

The Contractor shall ensure that supplied EMS is legible and functional in accordance with this Specification, relevant RMS specifications and the relevant Australian Standards.

Where this Specification differs from referenced RMS Specifications or external referenced specifications (such as Australian Standards), then the following order of precedence applies:

- a) this Specification;
- b) RMS specification; and
- c) Australian Standards.

3.2.1 Reliability and Design Life

All EMS site equipment and installation shall be designed for a minimum operational life across all environmental conditions:

- a) for the electrical system including EMS Controller, not less than 15 years;
- b) for the optoelectronic system, specified by RMS specifications and if not, then not less than 10 years ;
- c) for the sign enclosure, not less than 20 years;
- d) for the EMS Controller housing, not less than 20 years;
- e) for the fixed sign mounting, support and access structures, not less than 50 years.

3.2.2 Electromagnetic Compatibility and Emissions

The EMS Site equipment shall be certified to the applicable statutory requirements for electromagnetic compatibility and interference e.g. C-tick certification.

The EMS Site equipment shall comply with AS/NZS 61000.6.1 for immunity to surges and radiation.

The EMS site equipment shall comply with AS/NZS 61000.6.3 for electromagnetic emissions.

3.2.3 Communications Requirements

The Contractor shall perform all works in connecting the EMS site to the point of communications interconnect, including pits, conduits and underground cableways as required by the site layout to the control housing and from the control housing to the support structure in accordance with Specification RMS R155.

Where the ITS strategy is to connect the VMS to discrete communications, the nominated carrier will identify the point of interconnect, and where communications is via RMS optical fibre networks the point of interconnect will usually be the Site Access Pit.

The Contractor shall confirm with RMS the required communications interface and the required communications protocol to be implemented for the EMS.

The EMS communications interface shall be either RS232 serial data over copper cable or IP over Ethernet.

The EMS communications protocol shall be either RMS communications protocol OR NTCIP 1203.

RMS Principal Manager ITS (reachable via [ITS Helpdesk](#)) shall approve any RMS communications design (regardless proposed protocol's or connection technology's capabilities) where other protocols are proposed or where copper cables over fifty (50) metres is utilised for any communications link.

Where communications cabling is proposed beyond the EMS Site, the Contractor shall advise the Principal during detailed design of the cabling proposed, including the use of any existing cabling infrastructure.

If the communications access to the site is provided over the RMS optical Ethernet IP communications infrastructure then:

- a) the copper cable connection shall be converted at the EMS cabinet to operate on Single Mode Optic Fibre (SMOF) cable;
- b) the media converter – serial modem (from copper cable to IP Ethernet over SMOF) shall be securely mounted, and powered from a battery backup power supply (UPS) within the equipment enclosure;
- c) the SMOF cable in the RMS communications infrastructure provided to the Site pit (by others) shall be extended via underground cableways into the control housing, terminating at the copper/SMOF media converter- serial modem; and
- d) Any excess SMOF cable shall be neatly coiled and tied to the housing walls.

3.2.4 Electrical Requirements

For all EMS types, suitable power supply arrangements shall be included in the detailed design based on the manufacturer's specifications.

The Contractor shall engage the local power authority in order to provide mains power from the point of supply to the EMS, unless mains power is made available by the principal.

The Contractor shall perform all works in connecting the EMS site to the point of electrical supply, including pits, conduits and underground cableways as required by the site layout.

The Contractor shall provide underground cableways and associated earth works from the power connection point to the control housing and from the control housing to the support structure in accordance with Specification RMS R155.

3.3 STANDARD VMS SPECIFIC REQUIREMENTS

The Contractor shall provide VMS (including enclosures and control housings) in compliance with any project specific requirement, this Specification and RMS VMS specification TSI-SP-008. Compliance to TSI-SP-008 will either be via use of a pre-evaluated and approved device (see Clause 3.1) or via project specific approval of the Principal Manager ITS (see TS202).

3.4 SPECIALISED VMS SPECIFIC REQUIREMENTS

If RMS requires the supply of specialised VMS then the requirements will be presented in Annexure TS105/A.

3.5 OTHER VMS SPECIFIC REQUIREMENTS

If RMS requires the supply of other uncategorised VMS, then the requirements will be presented in Annexure TS105/A.

3.6 ISLUS SPECIFIC REQUIREMENTS

The Contractor shall provide ISLUS (including enclosures and control housings) in compliance with any project specific requirement, this Specification and RMS ISLUS specification, TSI-SP-011. Compliance to TSI-SP-011 will either be via use of a pre-evaluated and approved device (see Clause 3.1) or via project specific approval of the Principal Manager ITS (see TS202).

3.7 WARRANTY

If no warranty requirements are defined in the Contract then the following warranty requirements shall apply:

- a) The Contractor shall provide, for each item of equipment supplied, a warranty period of 12 months after equipment installation or 24 months after equipment delivery to the RMS's store, whichever occurs first.
- b) Any equipment failed in service or found to be defective within the warranty period, will be delivered to the Contractor, who shall then make good the defect or arrange to have the defect made good, and subsequently return the good unit to the RMS at no charge to RMS. Unless otherwise agreed, defective goods shall be processed and returned within 30 calendar days from the date the defective item is delivered to the Contractor.
- c) It is understood that any equipment damaged as a result of a traffic accident, abuse or act of vandalism after delivery to the RMS will not be covered by warranty provisions.
- d) Notwithstanding the warranty obligation stated above, the Contractor shall rectify any latent defects at the Contractor's own cost when such a defect is detected and reported to the Contractor within 5 years of the equipment delivery.

3.8 SPARES

The Contractor shall maintain a supply of spare parts and modules to allow the equipment to be maintained in service for a minimum period of ten (10) years.

The Contractor shall give notice to RMS prior to the last manufacturing run before cessation of manufacture for the particular spares type.

The Contractor shall maintain spares for a minimum period of five (5) years after cessation of manufacture for the particular spares type.

Spare parts and modules for maintenance purposes shall include the following as applicable:

- a) Mechanical assemblies;
- b) Electrical assemblies;
- c) Electronic assemblies;
- d) Optical assemblies; and
- e) Electrical and electronic components.

4 CONSTRUCTION AND INSTALLATION REQUIREMENTS

4.1 GENERAL

The Contractor shall carry out a detailed site survey to determine the location of any underground services, in accordance to relevant RMS Policy (such as Roads and Maritime Supplement to Austroads Guide to Traffic Management Part 10) on the basis of the strategic location identified by the Principal.

The final location of the new EMS site shall be provided to RMS as a “General Site Layout” drawing which shall be submitted to the Principal for approval, to ensure that the required sight-distance and visibility angles (for example) have been achieved at the EMS location.

Before commencing any work, the Contractor shall make all such enquires and inspections necessary to make themselves fully aware of the type and location of surface and underground utility services at each site.

The Contractor shall follow the installation requirements in the Specification RMS SI/TCS/8.

4.1.1 Work Health and Safety

The Contractor shall undertake all activities in accordance with the appropriate Work Health and Safety specifications/requirements specified in the Contract.

4.1.2 Traffic Management

Traffic Management plan shall be created and implemented in accordance with the relevant specifications/requirements specified in the Contract.

4.2 MOUNTING AND INSTALLATION

The location, positioning, design and installation of VMS must consider Austroads Guide to Traffic Management (Part 10) and the relevant RMS supplement to determine the correct position of the VMS panel with respect to approaching vehicles, as this will determine the type of structure and level of outreach required.

The proposed EMS mounting arrangement and structural drawings shall be submitted to the Principal for RMS evaluation and comment. These mounting and structural drawings may use RMS Model Drawings (where available) or Structural Design Drawings supplied by others as an informative reference to the project’s requirements.

The project is accountable for ensuring the delivery of suitable structures.

The Contractor shall install the following:

- a) all EMS (in EMS enclosures), control housings and associated modules, drivers and control equipment;
- b) any mounting, connecting and/or bracing to the support structures required for the supplied display panels (as identified by the manufacturer);
- c) any housing footings, ducts, pits and accessories at the site (including interconnection to RMS ITS Cableways, where available); and
- d) the site communications equipment including software, modems, media converters, auxiliary power supplies connecting to the power and communications access points;

Installations shall be performed in accordance with AS 3000.

Communications and power wiring for EMS installation shall comply with AS/CA S009.

All cable entries to the control housing and the EMS shall be constructed to preclude vermin ingress through sealed holes or cable glands.

4.3 SAFETY PRECAUTIONS

4.3.1 Completed Works and Existing Utilities

The Contractor shall ensure that Completed works and existing utilities shall be in accordance with item 4.2.1 of RMS R155.

4.3.2 Installation of Conduits in High Voltage Areas

Where EMS is to be installed near high voltage earthed locations such as substations, the Contractor shall obtain written authorisation from the Principal before commencing installation.

The Contractor shall ensure appropriate safe-work procedures and precautions are undertaken when undertaking working near existing high voltage earthing.

4.4 ENVIRONMENTAL PROTECTION

The Contractor shall implement and monitor appropriate environmental protection measures during construction in accordance with specifications/requirements specified in the Contract.

4.5 SETTING OUT

Setting out of EMS Sites and associated equipment shall be as per the nominated site layout, signposting and delineation drawings.

4.5.1 Tolerances

Setting out of EMS Sites and associated equipment shall have a positioning tolerance of +/- **10 m** from the nominated plan position. Setting out of sites at locations outside this range shall be approved by the Principal.

HOLD POINT

Process Held:	Finalisation of schedule for construction.
Submission Details:	Detailed site layout and site equipment configuration drawings.
Release of Hold Point:	The Principal will review the detailed site drawings prior to authorising the release of the Hold Point.

5 TESTING AND COMMISSIONING

5.1 EMS FACTORY ACCEPTANCE

Note: The EMS is a major component of an EMS site, and is subject to approval from Principal Manager – ITS prior to procurement. See section 3.1.

The Contractor shall advise the Principal of pending FAT at least 3 weeks before the test date.

HOLD POINT

Process Held: Commencement of EMS installation at site.

Submission Details: FAT Reports in accordance with the contractor’s quality plan.

Release of Hold Point: The Principal will release a site for EMS installation after successful FAT.

5.2 PHYSICAL SITE INSPECTION

For each EMS type, at least the first EMS site shall be completed for inspection, and acceptance obtained from the Principal before continuing installation on any other sites. The EMS site chosen for this preliminary fit out shall be mutually agreed between the two parties.

The RMS Principal Manager ITS (or his nominated representative) may attend to validate technical aspects of the installation.

Any deficiency to the installation shall be rectified by the Contractor where it is evident the installation does not meet with this Specification.

WITNESS POINT

Process Witnessed: First EMS site installation of the project.

Submission Details: EMS installation inspection by the Principal

5.3 COMMISSIONING AND SITE ACCEPTANCE

The new EMS site cannot be commissioned without operational communications with the host control system.

The ITS Site Access Communications connection must be established by the Principal, and the Principal will advise the Contractor once the ITS Site Access link has been established and tested.

Note : The lead time required for the Principal to establish the ITS Site Access Communications link can vary. Any schedule for Site Acceptance should be based on a verified activation date for the ITS Site Access Communications connection provided by the Principal.

The Contractor is responsible for the EMS Site commissioning which includes:

- a) Coordination of Commissioning Date with key Stakeholders (in particular the Principal’s nominated EMS System Integrator);
- b) Correct operation of the EMS and associated local control equipment;
- c) Communications to and operation via the remote host control system;
- d) Access for local programming, configuration, operation and maintenance purposes;
- e) Testing the integrity of signs and communications system; and
- f) Provision of electrical, communications, and duct configuration drawings within the EMS cabinet

During commissioning, all message functions and operation shall be checked, and interconnection and operation with ITS Control and Management System (CMS) shall be proven.

The Contractor shall advise the Principal at least 3 weeks before the proposed commissioning date.

The RMS Principal Manager ITS (or his nominated representative) may attend to validate technical aspects of commissioning, and RMS Asset Management may attend to validate maintainability and to accept the EMS Asset for maintenance. Please contact [ITS Helpdesk](#) to facilitate attendance by RMS witnesses.

WITNESS POINT

Process Witnessed: EMS Site commissioning and Site acceptance test

Submission Details: Commissioning test witnessed by the Principal and RMS Principal Manager ITS (or his nominated representative)

Acceptance of the installation, testing and commissioning of each EMS will be issued by the Principal two weeks after satisfactory operation of the EMS at site.

5.4 COMPLETION REPORT AND EQUIPMENT INVENTORY

5.4.1 Completion Report

A completion report shall be provided. The completion report shall include as a minimum:

- a) Colour photograph of each EMS installation including showing the following views:
 - i. front views;
 - ii. side views;
 - iii. back views;
 - iv. inside control cabinet; and

- v. wiring.
- b) Photographs of VMS viewed from the minimum legibility distance;
- c) Photographs of ISLUS clearly showing the number of required annulus;
- d) All commissioning and test results;
- e) Work-as-executed drawings;
- f) User manuals shall be provided in accordance with requirements of TSI-SP-062.

5.4.2 Equipment Inventory

The Contractor shall provide equipment inventory, hardware and software configuration management details for each EMS installation.

HOLD POINT

Process Held: Final Payment.

Submission Details: Completion Report including equipment inventory, product configuration, product documentation and work-as-executed drawings.

Release of Hold Point: The Principal will release the hold point once the completion package is received.

ANNEXURE TS105/A – PROJECT SPECIFIC REQUIREMENTS

A1 PROJECT LOCATION

EMS ID	001	002	003
Site ID			
EMS Type			
Support Structure Type			
Control Housing			
Power Source			
Communications Link Type			
Telecommunication Line arranged by			

A2 PROJECT SPECIFIC REQUIREMENTS

ANNEXURE TS105/B – MEASUREMENT AND PAYMENT

B1 MEASUREMENT AND PAYMENT

Payment will be made for all costs associated with completing the work detailed in this Specification in accordance with the following Pay Items.

Where no specific pay items are provided for a particular item of work, the costs associated with that item of work are deemed to be included in the rates and prices generally for the Work Under the Contract.

Unless otherwise specified, a lump sum price for any of these items will not be accepted.

Pay Item P1 - Infrastructure, Cabling and Equipment Installation

This includes all the trenching and installations for the underground cableway, conduits, pits, the installations of EMS enclosures and all the cabling. All cables shall be patched or terminated. The system shall be ready for testing and commissioning at the end of this phase.

Pay Item P2 - EMS Testing and Commissioning

This includes all the relevant testing, commissioning and arrangements of inspections and the submission of all necessary documentations.

Pay Item P3 - EMS Completion Documentation

This is a lump sum item for each EMS site.

The schedule rate shall include submission of all EMS Completion Report in accordance with Clause 5.4.

ANNEXURE TS105/C – SCHEDULES OF HOLD POINTS, WITNESS POINTS AND IDENTIFIED RECORDS

Refer to Clause 1.2.3.

C1 SCHEDULE OF HOLD POINTS AND WITNESS POINTS

Note: The Site Civil Works and electronics works may happen in parallel.

Clause	Type	Description
3.1	Hold	Contractor's EMS type is on RMS QA TS200 or RMS QA TS202 process is followed.
4.5.1	Hold	Commencement of Civil Works
5.1	Hold	EMS Factory Acceptance
5.4.2	Hold	Final Payment
5.2	Witness	First EMS type site installation.
5.3	Witness	EMS Site commissioning and Site acceptance test

C2 SCHEDULE OF IDENTIFIED RECORDS

The records listed below are Identified Records for the purposes of RMS Q Annexure Q/E.

Clause	Description of Identified Record
3.1	Submission as per requirements of RMS QA TS202 (where EMS is not listed as "type approved" or "compliant" in RMS QA TS200)
4.1.1	Safe Work Method Statements
4.1.2	Traffic Management Plan
4.5.1	Detailed site layout and equipment drawings
5.1	EMS FAT Procedure and test report
5.3	Commissioning and site acceptance procedure and test report
5.4.1	Completion Report (including work-as-executed drawings)
5.4.2	Equipment Inventory, hardware and software configuration management details for each EMS installation

ANNEXURE TS105/D – PLANNING DOCUMENTS

Refer to Clause 1.2.4. The following documents are a summary of documents that shall be included as a minimum in the PROJECT QUALITY PLAN. The requirements of this Specification and others included in the Contract shall be reviewed to determine additional documentation requirements.

Clause	Description of Document
1.2.4	Evaluation Plan

As part of the Evaluation Plan, as a minimum the Contractor shall outline the plan for the following evaluations and tests:

- a) 'Fitness-for-purpose' evaluation in accordance with RMS QA TS202, if the EMS to be supplied is not listed in RMS QA TS200 or is listed under 'Provisional' approval;
- b) Contractor's quality inspection(s);
- c) Factory Acceptance Test (FAT);
- d) System Integration Test (SIT); and
- e) Site Acceptance Test (SAT).

ANNEXURE TS105/E – COMMISSIONING TESTING

E1 PRE-CONDITIONS

Prior to commencement of testing the following conditions shall be met:

- a) the communications system has been installed;
- b) all equipment is assembled and connected as per the accepted design and power applied;
- c) a full EMS test has been conducted locally using a laptop computer;
- d) the EMS site is connected to the ITS communications system via the Site Access Node.
- e) the ITS CMS is configured and able to communicate with the EMS; and
- f) a CMS operator is available to issue test commands for the commissioning testing.

E2 COMMISSIONING TESTING

As a minimum, the following commissioning test procedure shall be followed.

Characteristic Tested	Test Method	Acceptance Criteria
Power supply	Power up the EMS onsite.	The EMS is able to successfully power up and ready to function
Connectivity to CMC	Observe the communications status of the powered up EMS from the ITS CMC.	The EMS is indicated as online from the CMC
Connectivity to a local technician	Connect a portable laptop to the EMS.	The EMS is able to connect locally to a technician onsite with a laptop
Display activation	Activate the EMS using the following methods: (a) CMC (b) Locally from a laptop (c) Local sign controller (d) Hardwire and external switch input	The EMS is activated correctly and does not have corrupted displays. Corrupt displays are deemed to be any display that is illegible, unintelligible or misleading to the observer
Display quality	Send a command to the EMS to display a message.	The EMS is capable of displaying information clearly from the minimum legibility distance. The image display is not corrupted.

Characteristic Tested	Test Method	Acceptance Criteria
Display Switching	Send a command to change the EMS display using the following methods: (a) From the ITS CMC (b) Locally from a laptop (c) Local sign controller (d) Hardwire and external switch input	The EMS is capable of switching displaying information clearly from the minimum legibility distance. The image display is not corrupted.
Switching to configuration mode	Switch the EMS into configuration mode	The EMS is able to switch to configuration mode where changes to configuration values and settings are allowed. The normal operation of the display is not affected while in configuration mode.
Display attributes	Send a command to the EMS to display a message	Observe that the display colour, fonts, sizes of the displayed information and other display attributes comply with this Specification
Display changes due to facility switch operation	Change the display message of the VMS with the facility switch using the key provided	The messages that are displayable by the facility switch operation comply with TSI-SP-008
Display changes due to facility switch operation	Change the display message of the VMS with the facility switch using the key provided	The messages that are displayable by the facility switch operation comply with TSI-SP-011
Simultaneous Display Changes	Change the display of the ISLUS in the same locations, facing the same directions and observe the displays	The ISLUS in the same locations, facing the same direction capable of changing their displays simultaneously. This applies to the display matrix, annulus and conspicuity devices
Fall Back Operations	Simulate a critical fault scenario by performing the following: (a) Unplug the communications connections to the ISLUS (b) Unplug the power supply to the ISLUS (c) Remove the processor from the ISLUS (d) Remove the display drivers (e) Blank a sign in the same group	The ISLUS is capable of automatic response to each of the scenarios in accordance with TSI-SP-011 Clause 7.7

ANNEXURE TS105/F – SUPPORT STRUCTURE MODEL DRAWINGS

To be provided when available

ANNEXURES TS105/G TO TS105/L – (NOT USED)

ANNEXURE TS105/M – REFERENCED DOCUMENTS

Refer to Clause 1.2.5.

RMS Documents

RMS Q	Quality Management System
RMS R155	Design and Construction of Underground Cableways
RMS TS 200	Register of ITS Field Equipment
RMS TS 201	Approval of ITS Field Equipment
RMS TS 202	Approval of ITS Solutions for Projects
RMS SI/TCS/8	Installation and Reconstruction of Traffic Light Signals
RMS TSI-SP-062	User manual requirements for ITS equipment
RMS Guideline	RMS Supplement to Austroads Guide to Traffic Management Part 10: Traffic Control and Communication Devices

Australian Standards

AS 3000	Electrical Installations (known as the Australian/New Zealand wiring rules)
AS/CA S009	Installation Requirements for Customer Cabling (Wiring Rules)
AS 61000.6.1	Electromagnetic Compatibility (EMC) – Generic standards – Immunity for residential, commercial and light industrial environments
AS 61000.6.3	Electromagnetic Compatibility (EMC) – Generic standards – Emission standard for residential, commercial and light industrial environments

Austroads Guidelines

Austroads Guide	Austroads guide to Traffic Management Part 10: Traffic Control and Communication Devices
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ANNEXURE TS105/N – INFORMATIVE REFERENCES

The reference to these documents is provided for information only. Compliance against these specifications should be undertaken either via supply a pre-evaluated and approved device (see Clause 3.1 and TS200) or via project specific device approval by the Principal Manager ITS (see TS202).

RMS TSI-SP-008 General Requirements for Variable Message Signs

RMS TSI-SP-011 Integrated Speed and Lane Use Signs