

ROADS AND MARITIME SERVICES (RMS)

QA SPECIFICATION TS104

ITS VEHICLE DETECTION SITE

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REVISION REGISTER

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Ed 1/Rev 2	4	Correct UPS arrangements, and specify operating temperatures for devices installed within outdoor cabinets.	A Mehaffey	11.07.14



ITS VEHICLE DETECTION SITE

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VERSION FOR: DATE:

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FOREWORD

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REVISIONS TO PREVIOUS VERSION

This document has been revised from Specification RMS TS104 Edition 1 Revision 1.

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:

- (a) Text which is additional to the base document and which is included in the Specification is shown in bold italics e.g. ***Additional Text***.
- (b) 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 TS104

ITS VEHICLE DETECTION SITE

1 GENERAL

1.1 SCOPE

This Specification sets out the requirements for supply, installation and commissioning of vehicle detection equipment at a field site. The Vehicle Detection Site (VDS) will comprise of all equipment and work required for the detection of road vehicles, the interfaces and physical connections to the local power supply point and communications backbone access point.

The scope includes all works required to fully integrate the VDS into the RMS host traffic control system.

The scope of this Specification covers the procurement of all hardware and performance of all site works required to commission the VDS including the following:

- VDS equipment, together with all associated components onsite;
- Controller Housing for equipment;
- Local communications link cabling and equipment up to the site access node;
- Electrical power link, up to the Point of Supply; and
- All site earthworks for equipment footings and underground cableways.

Items excluded from the scope of this Specification include:

- Communications system cabling and equipment beyond the site access node;
- Integration and configuration of the VDS into the RMS host system at the Control and Management Centre (CMC); and
- Vehicle detection equipment used for traffic light signal installations.

1.2 STRUCTURE OF THE SPECIFICATION

This Specification includes a series of annexures that detail additional requirements.

1.2.1 Project Specific Requirements

Project specific details of work are shown in Annexure TS104/A.

1.2.2 Measurement and Payment

The method of measurement and payment is detailed in Annexure TS104/B.

1.2.3 Schedules of HOLD POINTS, WITNESS POINTS and Identified Records

The schedules in Annexure TS104/C list the **HOLD POINTS** and **WITNESS POINTS** that must be observed. Refer to Specification RMS Q for definitions of **HOLD POINTS** and **WITNESS POINTS**.

The records listed in Annexure TS104/C are **Identified Records** for the purposes of RMS Q Annexure Q/E.

1.2.4 Planning Documents

The **PROJECT QUALITY PLAN** must include each of the documents and requirements listed in Annexure TS104/D and must be implemented.

In all cases where this Specification refers to the manufacturer's recommendations, these must be included in the **PROJECT QUALITY PLAN**.

1.2.5 (Not Used)

1.2.6 Referenced Documents

Unless otherwise specified the applicable issue of a referenced document, other than an RMS Specification, is the issue current at the date one week before the closing date for tenders, or where no issue is current at that date, the most recent issue.

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 2350). For convenience, the full titles are given in Annexure TS104/M.

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

1.3 DEFINITIONS AND ABBREVIATIONS

1.3.1 Definitions

The terms "you" and "your" mean "the Contractor" and "the Contractor's" respectively.

The following definitions are applicable to this Specification:

Equipment housing	Control housing as detailed in Specification RMS TSI-SP-012.
Induction loop vehicle sensor	Detection of a vehicle by it's producing a measurable current in a coiled copper loop (inductor) in the road surface by the metallic vehicle moving over the loop (magnetic induction).
Control and Management System	The central control system which is housed in the RMS control centre, also 'the host system'.
ITS Communications System	The communications backbone network for ITS equipment.
ITS Field Site	Roadside location for ITS equipment.
Point of Supply	Mains power connection point.

Principal	The RMS representative who is responsible for approvals over design documentations and site installations.
Site Access Node	The local site connection point for an ITS Field Site to enable access to the Communication Network.

1.3.2 Abbreviations

The following abbreviations apply to this Specification:

ILVS	Inductive Loop Vehicle Sensor
CMC	Control and Management Centre
GPO	General Purpose Outlet
MTBF	Mean Time Between Failures
SMOF	Single Mode Optic Fibre
UPS	Uninterruptible Power Supply (DC/AC - Direct or Alternating Current)
VDS	Vehicle Detection Site

2 VEHICLE DETECTION SITES

2.1 OVERVIEW

A Vehicle Detection Site (VDS) provides data for vehicles passing over the inductive loop vehicle sensor (ILVS) to the RMS host traffic system. The vehicle data is used to assess the instantaneous traffic situation at the sensor and go on to provide information about the roadway for congestion, travel time, route performance and capacity planning.

While there are many vehicle detection technologies that may be appropriate for specific deployments, this Specification prescribes the use of inductive loop technology only.

A VDS will typically consist of the following equipment:

- (a) ILVS installed in the road surface;
- (b) vehicle detection field processors;
- (c) feeder cables from the ILVS to the field processors;
- (d) power and communications terminal equipment;
- (e) road-side enclosure housing the field processor, communications and power supply equipment;
- (f) conduits and cabling;
- (g) mounting accessories and miscellaneous hardware; and
- (h) materials for footings, underground cableways and earthworks.

3 DESIGN REQUIREMENTS

3.1 AVAILABILITY, RELIABILITY AND DESIGN LIFE

The VDS must be capable of continuous operation with an availability of greater than or equal to 99.8%.

The site equipment enclosure must be designed for a minimum operational life of 20 years.

All other electrical equipment must be designed to provide continuous operation for a service life of 15 years as a minimum.

Equipment must have an MTBF of 45,000 hours in operation as a minimum.

3.1.1 Environmental Protection

Environmental protection measures must be applied in accordance with Specification RMS TSI-SP-016 and Specification RMS R155.

3.1.2 Electromagnetic Compatibility

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

The equipment must comply with AS/NZS 61000.6.1 for immunity to surges and radiation.

The equipment must comply with AS/NZS 61000.6.3 for electromagnetic emissions.

3.1.3 Documentation

Documentation for the equipment must be provided in accordance with Specification RMS TSI-SP-038.

3.1.4 Warranty

Warranty for the equipment installed must be provided for 12 months after installation, or 24 months after equipment delivery to the Principal's store, whichever comes first.

3.1.5 Configuration

VDS equipment configuration to site purpose for presence detection or speed detection will be as specified in the applicable delineation drawings.

4 EQUIPMENT REQUIREMENTS

4.1 FUNCTIONAL REQUIREMENTS

The vehicle detection site must be capable of:

- (a) detecting a moving vehicle in a particular traffic lane at a fixed point;
- (b) detecting a stationary vehicle in a particular traffic lane at a fixed point;

- (c) indicate wrong way vehicle traffic;
- (d) collect vehicle volume, occupancy, speed, length and headway data;
- (e) transmit the collected data to the MCC via the communications backbone;
- (f) counting $\geq 99\%$ of all vehicles (excluding motorcycles);
- (g) counting $\geq 95\%$ of all vehicles (including motorcycles);
- (h) be capable of reporting vehicle speeds of up to 100 km/h to within ± 2 km/h accuracy relative to a calibrated radar speed gun;
- (i) vehicle presence must be provided on the output communications interface of the vehicle detection node within [20ms] of a vehicle passing the detection area;
- (j) operating as required to in all lighting conditions;
- (k) operating as required to in all weather conditions.

The Contractor must provide vehicle detection equipment (including field processor, loop and feeder cables) to comply with TSI-SP-038.

All discrete electrical equipment (including batteries) installed within standard RMS outdoor cabinets must be suitable for continuous operation at internal ambient temperatures between -10°C to $+70^{\circ}\text{C}$, and with a relative humidity up to 90%.

Further requirements for enclosures and housings are specified in TSI-SP-012 and TSI-SP-016.

4.2 INTERFACE REQUIREMENTS

4.2.1 Communications Requirements

The VDS communications interface and protocol must comply with TSI-SP-038. This is a serial based protocol over copper cable within the equipment enclosure.

Communications wiring must comply with AS/CA S009.

Copper cabling must not be used for any communications section over 50 metres.

The Contractor must advise the Principal during detailed design where any copper cabling is to be used, including the use of any existing cabling infrastructure, and the surge suppression techniques that are included in the design.

Where copper cabling is used it must be protected against electrical transients and lightning strikes. Lightning/surge protection procedures must conform with the relevant provisions of AS 1768.

The VDS must be connected to the CMC via the ITS communications network. To provide communications access to the site from the CMC, the copper cable connection must be converted to run on the Single Mode Optic Fibre (SMOF) cable used within RMS communications infrastructure, presented to the site at the communications pit (by others).

The media converter – serial modem (from copper cable to SMOF) must be securely mounted, and powered from a battery backup power supply (UPS) within the equipment enclosure.

The SMOF cable of the RMS communications infrastructure from the pit (by others) must be extended via underground cableways into the equipment enclosure, terminating at the copper/SMOF

media converter- serial modem. Any spare SMOF cable must be neatly coiled and tied to the housing walls.

All SMOF splice-joints must be tested for return and insertion losses.

4.2.2 Power Requirements

The VDS must be powered by the local power Point Of Supply. Mains power reticulation from the Point of Supply to the VDS site must be provided by the Contractor through engaging the local power authority.

The Contractor must perform all works in connecting the site to the Point of Supply, including pits, conduits and underground cableways as required by the site layout.

The Contractor must provide underground cableways and associated earth works from the power connection point to the equipment housing as detailed in RMS R155.

All VDS equipment must be supplied with battery backup power supply (UPS) to support continued operation for a minimum of 12 hours in the event of mains power supply failure.

The site electrical installation must comply with applicable requirements in AS 3000.

Cabling for VDS installations must be provided in accordance with RMS Specification TSI-SP-016.

5 CONSTRUCTION AND INSTALLATION REQUIREMENTS

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

Specification RMS SI/TCS/8 may be used to provide an example of a typical installation.

5.1 GENERAL

5.1.1 Work Health and Safety

Work Health and Safety measures must be implemented, including preparation of Safe Work Method Statements, in accordance with Specification RMS G22.

5.1.2 Traffic Management

Traffic Management must be provided in accordance with Specification RMS G10.

Access must be maintained to private properties and commercial premises.

5.2 MOUNTING AND INSTALLATION

All civil and electrical works must comply with SI/TCS/8.

Installations must comply with AS 3000.

ILVS must be checked for basic correct operation using temporary means immediately after being installed, to determine that installation has not damaged the detector and that it will be possible to commission the VDS later without requiring removal and replacement of the detector unit.

5.2.1 Equipment Housing

The VDS must be supplied with a ground-mounted roadside equipment housing in accordance with TSI-SP-012.

The equipment housing holds the field processor in a rack-mount arrangement and provides mounting fixtures for ancillary power supply and communications terminal equipment.

All cable entries to the equipment housing must be constructed to preclude vermin ingress through sealed holes or cable glands.

5.3 ADDITIONAL SAFETY PRECAUTIONS

5.3.1 Protection of Completed Works and Existing Utilities

Completed works and existing utilities must be protected in accordance with RMS R155.

5.3.2 Installation of Conduits in High Voltage Areas

Where equipment is to be installed in proximity to high voltage earthed locations such as substations, written authorisation from the Principal must be obtained before commencing installation.

Existing high voltage earthing arrangements must not be disturbed under any circumstances.

5.4 ENVIRONMENTAL PROTECTION

Environmental protection measures must be provided in accordance with TSI-SP-016 and RMS R155

5.5 SETTING OUT

Setting out of the VDS site, and associated equipment must be as per the main project sign posting and delineation drawings (or equivalent) and performance of works in accordance with RMS R155.

5.5.1 Tolerances

Setting out of VDS sites, ILVS and associated equipment sites have a positioning tolerance on +/- **10 m** from the nominated plan position.

Setting out of ILVS **less than 50 m** longitudinally from any signal stopping position i.e. stop line must have a tolerance of +/- **0.5 m**.

Setting out of ILVS **more than 50 m** longitudinally from any signal stopping position i.e. stop line must have a tolerance of +/- **5 m**.

Relative positions of ILVS laterally within the station must be maintained to within **0.5 m**.

Setting out of VDS at locations outside this range must be approved by the Principal.

HOLD POINT

Process Held:	Commencement of Civil Works.
Submission Details:	Detailed site layout and equipment drawings.
Release of Hold Point:	The Principal will review the detailed site drawings prior to authorising the release of the Hold Point.

5.6 CIVIL WORKS

Civil Works include underground cableways, pits and junction boxes and footings for controller housings and ILVS installation in the roadway.

Inductive loop vehicle detectors operation and maintenance are sensitive to their initial installation method. As a priority, the contractor must cut loop detector into sub base pavement layer before application of surface layers. The contractor must apply for permission from the Principal where this may not be achieved.

Where conceded, the alternative construction methods for ILVS installation in priority order are:

- (a) Install prefabricated or pre-formed ILVS into sub base pavement layer before application of surface layers;
- (b) Install prefabricated or pre-formed ILVS into milled pavement surface before application of surface layers;
- (c) Install prefabricated or pre-formed ILVS before application of final surface layer; and
- (d) Cut ILVS into final surface layer of pavement.

The Contractor will perform any required Civil Works for each VDS prior to installation of any electronic equipment. Once the pre-requisite Civil Works have been completed, the Contractor may completely install the first VDS.

HOLD POINT

Process Held:	First VDS equipment installation.
Submission Details:	First off site Civil Works type approval.
Release of Hold Point:	The Principal will approve site type inspection and test and authorise installation of first site prior to authorising the release of the Hold Point.

6 TESTING AND COMMISSIONING

6.1 PHYSICAL INSPECTION

Site inspection and acceptance must be completed for at least one site by the Principal before continuing installation on any other sites. The site chosen for this preliminary fit out will be mutually agreed between the Contractor and the Principal.

Deficiencies to the mechanical and electrical installation must be rectified where it is evident the installation does not meet this Specification.

HOLD POINT

Process Held: Vehicle detection equipment installation at other sites after the first site.

Submission Details: Documentation to verify that the first VDS installation complies with RMS TS104.

Release of Hold Point: The Principal will inspect the VDS installation and consider the submitted documentation prior to authorising the release of the Hold Point.

6.2 COMMISSIONING AND FINAL ACCEPTANCE

All VDS equipment must be tested to confirm compliance with the requirements in this Specification.

Integration testing must be performed with other systems to which the VDS is connected at the CMC. Integration testing must be in accordance with Annexure TS104/E.

WITNESS POINT

Process Witnessed: VDS commissioning at CMC.

Submission Details: Notification of trial at least 3 working days prior to commencement.

6.3 COMPLETION REPORT AND WORK-AS-EXECUTED DRAWINGS

6.3.1 Completion Report

A completion report must be provided. The completion report must include a close-up colour photograph of each VDS installation and/or equipment housing, and a photo of the site set against the surrounding background to allow for easy identification of the site location.

The completion report must include the commissioning test results from testing performed in accordance with Annexure TS104/E.

6.3.2 Work-As-Executed (WAE) Drawings and Documentation

Drawings must be provided in accordance with requirements of TSI-SP-016.

An equipment inventory must be provided with hardware and software configuration management details for each VDS installation.

A manual must be provided by the VDS installer describing installation procedure, operation and maintenance of a generic site for this project.

ANNEXURE TS104/A – PROJECT SPECIFIC REQUIREMENTS

A1 PROJECT LOCATION

VDS ID	VDS Site	VDS Type	Power Source	Communications Link Type	Telecommunications Line Arranged By
001					
002					
003					
004					
005					

ANNEXURE TS104/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.

Pay Item TS104P1 - Cabling

This is a lump sum item for each VDS site.

The schedule rate must include excavation for and supply/installation of electrical and communications cables and pits from the power source and telecommunications connection point to the VDS, including any connection fees.

Pay Item TS104P2 - VDS Installation and Commissioning

This is a lump sum item for each VDS site.

The schedule rate must include supply and installation of VDS equipment at each site, including ILVS, field processor and housing.

Pay Item TS104P3 - VDS Completion Documentation

This is a lump sum item for each VDS site.

The schedule rate must include submission of all VDS documentation in accordance with Clause 5.3.

ANNEXURE TS104/C – SCHEDULES OF HOLD POINTS, WITNESS POINTS AND IDENTIFIED RECORDS

Refer to Clause 1.2.3.

C1 SCHEDULE OF HOLD POINTS AND WITNESS POINTS

Clause	Type	Description
5.5.1	Hold	Commencement of Civil Works
5.6	Hold	First VDS site type approval
6.1	Hold	First installation at other sites after the first site
6.2	Witness	VDS commissioning 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 Records
3.1.3	Manufacturers installation, operation and maintenance manuals for each item of equipment
5.1.1	Safe Work Method Statements
5.1.2	Traffic Management Plan
6.3.1	Completion Report
6.3.2	Equipment Inventory
6.3.2	Work-as-executed general arrangement and schematic drawings for each site
6.3.2	Manual provided by the VDS installer describing installation procedure, operation and maintenance of a site

ANNEXURE TS104/D – PLANNING DOCUMENTS

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

Clause	Description of Document
1.2	Site Inspection and Test Plan

ANNEXURE TS104/E – COMMISSIONING TESTING**E1 PRE-CONDITIONS**

- (a) Assemble and connect all equipment as per the accepted design and power applied.
- (b) VDS equipment has been connected to commissioned communications backbone.
- (c) CMC host system is operating.

E2 COMMISSIONING TESTING

Clause	Characteristic Tested	Test Method	Acceptance Criteria
4.1(a)	Detecting a moving vehicle		Detects moving vehicle within lane. Does not detect moving vehicle in adjacent lane(s)
4.1(b)	Detecting a stationary vehicle		Detects stationary vehicle within lane. Does not detect stationary vehicle in adjacent lanes.
4.1(c)	Indicate wrong way vehicle traffic		Indication of wrong way vehicle traffic. Does not indicate wrong way vehicle traffic in adjacent lane(s)
4.1(d)	Collection of vehicle occupancy data		Correct data is displayed on CMC host system.
4.1(d)	Collection of vehicle volume data		Correct data is displayed on CMC host system.
4.1(d)	Collection of vehicle speed data		Correct data is displayed on CMC host system.
4.1(d)	Collection of vehicle length data		Correct data is displayed on CMC host system.
4.1(d)	Collection of vehicle headway data		Correct data is displayed on CMC host system.
4.1(h)	Reporting of vehicle speeds		Reported speed is within parameters of 4.1(h)

ANNEXURES TS104/F TO TS104/L – (NOT USED)

ANNEXURE TS104/M – REFERENCED DOCUMENTS

Refer to Clause 1.2.6.

RMS Specifications

RMS Q	Quality Management System
RMS G10	Traffic Management
RMS G22	Work Health and Safety (Construction and Maintenance Works)
RMS R155	Design and Construction of Underground Cableways
RMS SI/TCS/8	Installation and Reconstruction of Traffic Light Signals
RMS TSI-SP-012	General Requirements for Roadside Equipment Housing
RMS TSI-SP-016	General Requirements for Outdoor Electronic Equipment
RMS TSI-SP-038	Vehicle Loop Detection Equipment

RMS Drawings

RMS VC005-33	Installation of Loop Detectors at traffic detector stations
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Australian Standards

AS 2703-2008	Vehicle Loop Detector Sensors
AS 3000	Electrical Installations (known as the Australian/New Zealand wiring rules)
AS/CA S009	Installation Requirements for Customer Cabling (Wiring Rules)