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## RECORD OF AMENDMENTS

<table>
<thead>
<tr>
<th>Version</th>
<th>Summary</th>
<th>Date</th>
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<tr>
<td>1.0</td>
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SPECIFICATION No. TSI-SP-038

GENERAL REQUIREMENTS FOR VEHICLE LOOP DETECTOR EQUIPMENT

1 SCOPE

This specification covers requirements for the electronic equipment and loop cables used to form vehicle loop detectors. The requirements apply primarily to detector equipment of the permanently installed type.

This specification may be referenced by other Roads and Maritime Services (RMS) specifications or work documents, and shall always be read in conjunction with these referencing documents (known as Referencing Specifications).

This specification does not apply to vehicle loop detector equipment used for traffic light signal installations.
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2 REFERENCES AND APPLICABLE DOCUMENTS

2.1 Australian Standards

The following standards have been referred to in subsequent clauses of this Specification:

AS/NZS 2276.2 – Cables for traffic signal installations
    Part 2: Feeder cable for vehicle detectors
AS/NZS 2276.3 – Cables for traffic signal installations
    Part 3: Loop cable for vehicle detectors
AS 2703 – Vehicle loop detector sensors
AS/NZS 3000 – Electrical installations (known as the Australian/New Zealand Wiring Rules)
AS/NZS 3100 – Approval and test specification – General requirements for electrical equipment
AS/NZS ISO 9001 – Quality management system - Requirements

2.2 RMS Specifications and Documents

The following RMS specifications and documents have been referred to in subsequent clauses of this Specification:

TSI-SP-012 – General Requirements for Roadside Equipment Housings
TSI-SP-016 – General Requirements for Outdoor Electronic Equipment

2.3 Other Standards

The following standards have been referred to in subsequent clauses of this Specification:

ISO 9001 – Quality management systems - Requirements
ISO 9660 – Information processing; volume and file structure of CD-ROM for information interchange
2.4 Compliance with Specifications

All equipment and materials, where not otherwise specified, shall be in accordance with Australian Standards/Specifications where such exist, and in their absence, with appropriate IEC or ISO Standards/Specifications.

The equipment shall comply with the safety requirements of the National Electrical Codes AS/NZS 3000 and AS/NZS 3100.
3 DEFINITIONS AND GLOSSARY OF TERMS

For the purposes of this Specification, the following definitions and abbreviations shall apply:

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>ACMA</td>
<td>Australian Communications and Media Authority</td>
</tr>
<tr>
<td>the detector</td>
<td>Vehicle loop detector sensors covered by this Specification</td>
</tr>
<tr>
<td>equipment</td>
<td>Means vehicle loop detector equipment covered by this Specification unless the context dictates otherwise</td>
</tr>
<tr>
<td>IEC</td>
<td>International Electrotechnical Commission</td>
</tr>
<tr>
<td>ISO</td>
<td>International Standards Organisation</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>The manufacturer of the equipment covered by this Specification</td>
</tr>
<tr>
<td>NSW</td>
<td>New South Wales</td>
</tr>
<tr>
<td>Referencing Specification</td>
<td>A document or specification that stipulates or requires compliance with this Specification (TSI-SP-038) in full or in part</td>
</tr>
<tr>
<td>RMS</td>
<td>Means Roads and Maritime Services, which is a New South Wales Government agency</td>
</tr>
<tr>
<td>RMS Representative</td>
<td>The person appointed by Roads and Maritime Services to carry responsibilities on behalf of Roads and Maritime Services for the execution of the contract under which equipment covered by this Specification is supplied. A reference to the RMS Representative in this Specification shall be taken to include a reference to the representative(s) of the RMS Representative</td>
</tr>
<tr>
<td>this Specification</td>
<td>Means Specification TSI-SP-038</td>
</tr>
<tr>
<td>Supplier</td>
<td>Means the supplier of equipment covered by this Specification. Where the supply of equipment is under a contract, it means the contractor of the contract</td>
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</table>
4 TECHNICAL REQUIREMENTS

4.1 General

The vehicle loop detector shall comprise the following key equipment:

(a) Vehicle loop detector sensor;
(b) Feeder cable;
(c) Loop cable.

NOTE: Refer to Clause 5 for Supplier type tests, RMS verification tests and certification for detector sensors.

4.2 Vehicle Loop Detector Sensors

4.2.1 General

Vehicle loop detector sensors (the detector) shall comply with AS 2703.

The design, construction and manufacture of the detector shall comply with all relevant requirements in RMS Specification TSI-SP-016.

Unless otherwise specified in the Referencing Specification, the detector shall be supplied complete with a ground mounted roadside equipment housing complying with RMS Specification TSI-SP-012.

4.2.2 Configuration

The detector shall be multi-channel and rack-mounted.

4.2.3 Mode Switching

Each sensor unit shall provide manual selection of its operational mode, as either a passage detector or a limited presence detector. Visual indication shall be provided for the selected operational mode.

4.2.4 Presence Time

For the purpose of ‘presence time’ requirements in AS 2703 (clause 4.9 in AS 2703-2008), the requirements in this clause shall apply.
A sustained inductance change (actuation) shall be equivalent to a stationary vehicle.

In the case of slowly moving traffic (speed exceeding 4 km/hour) when the detector loop is not vacated between successive vehicles, the presence time of a limited presence detector shall be unlimited. In this context, slowly moving traffic shall be identified as inductance fluctuations ($\Delta L/L$) exceeding 2%. In such case, the detector shall provide either of the following:

(a) A continuous output; or

(b) An output of not less than 300 ms for each vehicle (which is identified by a reduction of not less than 2% in the instantaneous inductance). In addition, the total duration of the outputs in any one-minute interval shall be greater than 95% of the time.

4.3 Feeder Cable

Feeder cable for vehicle loop detectors shall comply with AS/NZS 2276.2.

Unless otherwise specified in the Referencing Specification, there is no requirement for the feeder cable to be provided with a polyamide jacket.

4.4 Loop Cable

Loop cable for vehicle loop detectors shall comply with AS/NZS 2276.3.

In reference to options available in AS/NZS 2276.3, the following requirements shall apply:

(a) The insulation material for the cable shall be X-90UV (cross-linked polyethylene);

(b) The conductor shall be tinned.

4.5 Special Marking for Cables

In addition to standard markings, each reel or drum of feeder cable and loop cable shall also be clearly marked with the date of manufacture and the purchaser's order number. This marking shall be applied to the flange(s) of the reel or drum in a readily visible position. All marking shall be resistant to damage by water and transportation.
5 TYPE TEST AND CERTIFICATION FOR DETECTOR SENSORS

5.1 General

Quotations for new detector sensors are not normally considered until after RMS verification type tests referred to under Clause 5.2 have been successfully completed.

It is accordingly desirable for prospective suppliers to submit their equipment, complete with results of all tests (including all suggested type tests) referred to in AS 2703 and documentation referred to in Clause 7, to the Manager, Traffic Equipment and Standards, for RMS testing as early as practicable, in order that such tests may be completed before quotations are sought.

NOTE: Vehicle loop detector sensors that have valid current type approval under RMS Specification LD/7 (or later version) are considered to have met the requirements for type test in this section (Clause 5).

5.2 Verification Type Tests

The sample equipment submitted for verification type tests shall be complete with all necessary ancillary equipment (such as wired rack assembly, power supply) ready for immediate operation.

The Manager, Traffic Equipment and Standards will arrange examination of the supplied documentation and inspection and testing of the sample equipment as necessary to ascertain the operation and compliance of the equipment in accordance with applicable requirements.

5.3 Certification

Upon successful completion of verification type tests, including resolution of outstanding issues, the Manager, Traffic Equipment and Standards will provide certification to that effect.

5.4 Revocation of Certification

The Supplier may be requested to show cause why certification should not be revoked where there is an adverse service history of the equipment in regard to equipment performance.

In addition, the certification will be automatically voided in the following circumstances:
(a) Modification to the equipment or the intended method of use which make it different from that for which the certification was issued previously;

(b) The Supplier or the manufacturer of the equipment has lost third-party certification for their quality management system (refer to Clause 6).
6 QUALITY ASSURANCE

6.1 General

The Supplier and the manufacturer of the equipment shall operate a quality management system complying with AS/NZS ISO 9001 or ISO 9001. This quality management system shall be certified by a quality management system certification body either accredited under the criteria laid down in the Joint Accreditation System of Australia and New Zealand (JAS-ANZ), or listed in the International Standards Organisation ISO Directory of ISO 9000 or ISO 14000 Accreditation and Certification Bodies.

6.2 Traceability

Each item of equipment shall be marked with a batch code, serial number, or other marking to provide traceability under the equipment manufacturer’s quality management system to all key manufacturing, inspection and test processes.
7 DOCUMENTATION

The Supplier shall supply the following documentation for the detector:

(a) Certificate of Suitability issued by the NSW Office of Fair Trading;

(b) Documentary evidence of compliance with statutory EMC (electromagnetic compatibility) regulatory arrangements (C-tick compliance);

(c) Documentary evidence of compliance with statutory requirements for telecommunications equipment (A-tick compliance), where applicable;

NOTE: It should be noted that the Regulatory Compliance Mark (RCM) will be the only available compliance mark for ACMA and electrical safety purposes after 1 March 2016. Refer to ACMA for transitional arrangements for A-Tick, C-Tick and RCM under the previous arrangements.

(d) Documentary evidence of compliance with statutory requirements for radiocommunications equipment, where applicable;

(e) Other applicable certification for the equipment;

(f) Applicable test reports for the equipment;

(g) A detailed technical manual for the detector. The technical manual shall contain the following information as the minimum:

   (i) Overview of the equipment architecture;
   
   (ii) Detailed specification of the detector;
   
   (iii) Detailed description of detector operation, functions and parameters;
   
   (iv) Detailed description of available parametric settings, including range of values and recommended value for each setting under various environmental conditions;
   
   (v) Installation procedures;
   
   (vi) Maintenance procedures;
   
   (vii) A copy of the certificates, documents and reports referred to in paragraphs (a) to (f).

NOTE: The technical manual may be bundled into separate volumes respectively for field and workshop use.

Refer to the supply contract for the quantity of technical manuals to be supplied to RMS. Where the supply contract does not contain specific requirements for the supply of manuals, the following shall be supplied:
(a) A copy of the technical manual shall be provided with each of the first five (5) units of equipment supplied to RMS; and

(b) An electronic copy of the technical manual on an ISO 9660 compliant CD-ROM, or on a storage media otherwise directed by the RMS Representative. The electronic copy shall be in the portable document file format (PDF) or other file format(s) acceptable to the RMS Representative.
8 PRE-DELIVERY INSPECTION

All equipment supplied under this Specification shall be subjected to a pre-delivery inspection at the Manufacturer’s Works or Supplier’s premises in the Sydney area prior to delivery.

The Manufacturer shall provide a Compliance Certificate to cover the batch of equipment to be delivered, and access to all quality records related to the batch. The Compliance Certificate shall be a formal document stating that the equipment has been fully tested in accordance with the Inspection and Test Plan approved by the RMS Representative and meets all specified requirements. The Compliance Certificate shall clearly identify the equipment, the batch information and the purchaser’s order number. The Compliance Certificate shall be personally signed and dated by a designated representative of the Manufacturer.

The pre-delivery inspection shall include an examination of the goods and a check of the Manufacturer’s Compliance Certificate and quality records. Before leaving the Supplier’s premises the RMS Inspector will issue the Supplier with documentation to confirm that the goods …

(a) have been accepted and are cleared for delivery; or

(b) have been rejected for stated reasons; or

(c) are subject to further verification for stated reasons.

The Supplier shall give the RMS Inspectors at least two working days’ notice of the availability of the goods for pre-delivery inspection.

Requests for pre-delivery inspection are to be directed to the Quality Assurance Manager, Traffic Equipment & Standards Group, on telephone No. (02) 8837 0123 or fax (02) 8837 0056.

NOTE: The contact details for arranging pre-delivery inspections may change from time to time due to operational or other reason. If the Supplier is unable to make contact for arranging a pre-delivery inspection, the Supplier shall notify the RMS office that issued the purchase order and request for updated contact details.
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9 PACKAGING

The equipment and any spare parts, tools and ancillary equipment shall be packed to protect them from damage during transport and handling. All fittings liable to damage during shipment shall be protected, or removed and packed separately. Where necessary, reusable transit bars or other forms of additional support shall be provided with the equipment.

Equipment must not be damaged and preset adjustments must not be affected when subjected to the shock and vibration of transport between the Supplier’s premises and the nominated delivery point. Unless otherwise directed, the Supplier shall select the means of transport and pack the equipment to ensure compliance with this clause.