

Master Specification

Part RD-ITS-D3

Ramp Metering Systems

September 2024



Government of South Australia
Department for Infrastructure
and Transport

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Document Information

Document Information

K Net Number:

Document Version: 1

Document Date: 30/09/2024

Document Amendment Record

Version	Change Description	Date
0	Initial issue	31/08/2023
1	Updated cover page	30/09/2024

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Contents

Contents	3
RD-ITS-D3 Ramp Metering Systems	4
1 General	4
2 Documentation	5
3 Design requirements	6
4 Installation requirements	8
5 Warranty and spare parts	9
6 Training	9
7 Testing and commissioning	9
8 Verification requirements and records	9

RD-ITS-D3 Ramp Metering Systems

1 General

- a) This Master Specification Part sets out the requirements for the design, installation and testing and commissioning of ramp metering systems including:
 - i) the documentation requirements, as set out in section 2;
 - ii) the design requirements, as set out in section 3;
 - iii) the installation requirements, as set out in section 4;
 - iv) the warranty and spare parts requirements, as set out in section 5;
 - v) the training requirements, as set out in section 6;
 - vi) the testing and commissioning requirements, as set out in section 7; and
 - vii) the verification requirements and records, as set out in section 8.
- b) For the purposes of this Master Specification Part, ramp metering systems includes the following components:
 - i) ramp signal lanterns;
 - ii) ramp signals controller;
 - iii) ramp control signs;
 - iv) vehicle detector systems; and
 - v) ramp metering static signage.
- c) This Master Specification Part does not apply to the following:
 - i) ramp capacity analysis;
 - ii) ramp storage design;
 - iii) design of stop line location;
 - iv) real time information signs;
 - v) static signage to manage traffic specific to the ramp geometry; or
 - vi) ramp metering control algorithms.
- d) The design, installation and testing and commissioning of ramp metering systems must comply with the Reference Documents, including:
 - i) AS 1100 Technical drawing;
 - ii) AS/NZS 1170.2 Structural design actions, Part 2: Wind actions;
 - iii) AS 1428 Design for access and mobility;
 - iv) AS 1742 Manual of uniform traffic control devices;
 - v) AS 2144 Traffic signal lanterns;
 - vi) AS 2312 Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings;
 - vii) AS 2700 Colour standards for general purposes;
 - viii) AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules);

- ix) AS/NZS 3008 Electrical installations - Selection of cables;
- x) AS/NZS 3845 Road safety barrier systems and devices;
- xi) AS/NZS ISO 9001 Quality management systems - Requirements;
- xii) VicRoads Managed Motorway Design Guide; and
- xiii) VicRoads Specification TCS 063 The Installation of Freeway Ramp Signal Control Equipment.

2 Documentation

2.1 Design Documentation

In addition to the requirements of PC-EDM1 “Design Management”, the Design Documentation must include:

- a) fully detailed location and layout documentation for all ramp metering equipment to be installed pursuant to this Master Specification Part;
- b) a ramp metering plan with a similar level of detail to the VicRoads “ramp metering signals layout” in accordance with the VicRoads Managed Motorway Design Guide;
- c) evidence of compliance with RD-ITS-D1 “Design of Intelligent Transport Systems (ITS)”;
- d) general layout, reduced levels, equipment position, coordinates or offsets, speed zones, conduit and pit locations, mounting structure positions and any protective barriers;
- e) details of any power or communications connections to any related ITS or traffic signals equipment; and
- f) details of equipment brackets and support connections.

2.2 Construction Documentation

In addition to the requirements of PC-CN3 “Construction Management”, the Construction Documentation must include:

- a) evidence of compliance with:
 - i) RD-ITS-S1 “General Requirements for the Supply of ITS Equipment”;
 - ii) RD-ITS-C1 “Installation and Integration of ITS Equipment”;
 - iii) RD-ITS-S4 “Supply of Electronic Signs”; and
 - iv) all other Master Specification Parts relevant to the supply and installation of the equipment forming part of the ramp metering systems;
- b) evidence of electrical licensing requirements;
- c) evidence of communications cabling licensing requirements; and
- d) evidence of STREAMS interoperability and compatibility for all ramp metering equipment to be operated by STREAMS.

2.3 Quality Management Records

In addition to the requirements of PC-QA1 “Quality Management Requirements” or PC-QA2 “Quality Management Requirements for Major Projects” (as applicable), the Quality Management Records required by section 8.

3 Design requirements

3.1 General

- a) Ramp metering systems must be provided in accordance with the VicRoads Managed Motorway Design Guide.
- b) Where the requirements of this Master Specification Part conflict with the VicRoads Managed Motorway Design Guide, the requirements of this Master Specification Part must take precedence.
- c) Ramp metering supporting infrastructure, including conduit networks and pits, must be provided in accordance with:
 - i) VicRoads Managed Motorway Design Guide, to connect the ramp metering devices; and
 - ii) relevant Master Specification Parts, including:
 - A. RD-ITS-D1 “Design of Intelligent Transport Systems (ITS)”; and
 - B. RD-EL-D3 “Conduit Design for Road Lighting, Traffic Signals and ITS”.
- d) Where the design of the ramp metering systems includes other elements of ITS near the location of the ramp metering system, the design can co-locate equipment within a single ITS cabinet provided that:
 - i) all of the requirements for each ITS element are fully complied with; and
 - ii) there is no resultant impairment of the operation of any ITS equipment.

3.2 Ramp signals controller

- a) Ramp signals controllers must be provided in accordance with the VicRoads Managed Motorway Design Guide.
- b) Ramp signals controllers must be housed within ITS enclosures in accordance with RD-ITS-S3 “ITS Enclosures”.
- c) The ITS enclosure required by section 3.2b) must be provided with safe and easy access for maintenance, including parking for maintenance vehicles, in accordance with RD-ITS-C1 “Installation and Integration of ITS Equipment”.

3.3 Facility switch

- a) A facility switch must be provided on the ITS enclosure required by section 3.2b) in accordance with VicRoads Specification TCS 063 Installations for Freeway Ramp Signals Control Equipment.
- b) The key for the facility switch required by section 3.3a) must be as specified in the Contract Documents.
- c) The type of facility switch required by section 3.3a), that is the number of switched positions, must be as specified in the Contract Documents.

3.4 Ramp signal lanterns

- a) Ramp signal lanterns must be provided in accordance with the VicRoads Managed Motorway Design Guide.
- b) The ramp signal lanterns required by section 3.4a) must:
 - i) be 3-aspect (red / amber / green);
 - ii) be in accordance with AS 2144 Traffic signal lanterns;

- iii) have 300 mm diameter aspects;
 - iv) be housed in a single mounting enclosure;
 - v) include visors; and
 - vi) include a target board around each set of lanterns.
- c) The following signs must be provided in accordance with AS 1742 Manual of uniform traffic control devices, and VicRoads Managed Motorway Design Guide:
- i) “Stop here on red signal” (R6-6) signs; and
 - ii) “One vehicle per green each lane” signs.

3.5 Entry ramp vehicle detectors

- a) The following entry ramp vehicle detectors must be provided at locations in accordance with the VicRoads Managed Motorway Design Guide:
- i) stop line detectors;
 - ii) middle of ramp queue detectors; and
 - iii) ramp entrance detectors.
- b) The entry ramp vehicle detectors required by section 3.5a) must be in accordance with RD-ITS-S7 “Supply and Installation of Motorway Vehicle Detection Systems”.
- c) The technology used for the entry ramp vehicle detectors must achieve the performance required to enable the ramp metering control algorithm to function optimally, including:
- i) detection accuracy; and
 - ii) detection speed.
- d) Where applicable, queue overflow detectors and collector-distributor road entry ramp detectors must be provided in in accordance with the VicRoads Managed Motorway Design Guide.

3.6 Ramp control signs

- a) The following ramp control signs must be provided at locations in accordance with the VicRoads Managed Motorway Design Guide:
- i) RC1 ramp control warning and regulatory signs (RC1 signs);
 - ii) RC2 ramp control warning signs (RC2 signs); and
 - iii) RC3 ramp control warning and information signs (RC3 signs).
- b) Ramp control signs must be in accordance with RD-ITS-S4 “Supply of Electronic Signs”.
- c) Ramp control signs must have the communications with the ramp signals controller hard-wired.
- d) Wireless communications between the ramp control signs and the ramp signals controller must not be used.

3.7 CCTV coverage

- a) CCTV cameras must be provided at all ramp metering sites.
- b) CCTV cameras must be in accordance with RD-ITS-S5 “Imaging Equipment”.
- c) The locations of the CCTV cameras must be in accordance with the VicRoads Managed Motorway Design Guide to provide visibility:
- i) along the entire length of the ramp being metered;

- ii) at the ramp metering stop line;
- iii) on the approach roads to the ramp, i.e. the left and right lanes in case of queue overflow; and
- iv) at the motorway entry, up to and including the end of the ramp merge taper, or for a similar distance if the entry ramp has added lanes.

3.8 Integration with managed motorways

- a) The requirements of this section 3.8 apply where ramp metering is to be provided on an entry ramp that merges with a motorway with managed motorways in operation, or as required by the Contract Documents.
- b) Variable speed limit signs (VSLS) or lane use management system signs (LUMS signs) must be provided at the end of the ramp prior to the merge to provide speed equalisation.
- c) The VSLS or LUMS signs must be provided in accordance with the requirements of:
 - i) RD-ITS-D1 “Design of Intelligent Transport Systems (ITS)”;
 - ii) RD-ITS-S4 “Supply of Electronic Signs”; and
 - iii) RD-ITS-C1 “Installation and Integration of ITS Equipment”.
- d) The VSLS and LUMS signs must not be co-located with the ramp signal lanterns.

3.9 Integration with Tunnel closure systems

- a) The requirements of this section 3.9 apply where ramp metering is to be provided on the same ramps as Tunnel closure systems, or as required by the Contract Documents.
- b) The ramp metering stop line can be used for the Tunnel closure system stop line.
- c) The ramp signal lanterns can be used for the Tunnel closure traffic signal lanterns.
- d) The Tunnel closure system controller must be used as the ramp signals controller.

4 Installation requirements

4.1 General

The installation of ramp metering equipment must comply with:

- a) the Contract Documents; and
- b) RD-ITS-C1 “Installation and Integration of ITS Equipment”.

4.2 Ramp signal lanterns

- a) The ramp signal lanterns required by section 3.4a) must be mounted with the lanterns in a vertical alignment.
- b) For ramps with a single lane at the stop line, the ramp signal lanterns required by section 3.4a) must be provided on a traffic signal post on the left side verge.
- c) For ramps with 2 or more lanes at the stop line, the ramp signal lanterns required by section 3.4a) must be:
 - i) mounted on gantries in accordance with the VicRoads Managed Motorway Design Guide;
 - ii) provided on each gantry leg; and
 - iii) provided over each lane centre.

4.3 Vehicle detectors

The entry ramp vehicle detectors required by section 3.5 must be installed in accordance with RD-ITS-S7 “Supply and Installation of Motorway Vehicle Detection Systems”.

4.4 Ramp control signs

If RC1, RC2 and RC3 signs are to be mounted on pedestals, the pedestals must be traffic signal posts in accordance with RD-EL-C2 “Installation of Traffic Signals”.

4.5 Pits and conduits

Conduit networks and pits must be provided in accordance with RD-EL-C3 “Supply and Installation of Conduits and Pits”.

5 Warranty and spare parts

Warranty and spare parts must comply with RD-ITS-S1 “General Requirements for the Supply of ITS Equipment”.

6 Training

The Contractor must provide training with respect to the ramp metering systems and associated equipment in accordance with the requirements of RD-ITS-C1 “Installation and Integration of ITS Equipment”.

7 Testing and commissioning

Testing and commissioning procedures and records must comply with the requirements of:

- a) RD-ITS-S1 “General Requirements for the Supply of ITS Equipment”;
- b) RD-ITS-C1 “Installation and Integration of ITS Equipment”; and
- c) PC-CN1 “Testing and Commissioning”.

8 Verification requirements and records

The Contractor must supply written verification as part of the Quality Management Records that the requirements listed in Table RD-ITS-D3 8-1 have been complied with.

Table RD-ITS-D3 8-1 Verification requirements

Master Specification reference	Subject	Record to be provided
RD-ITS-C1 “Installation and Integration of ITS Equipment”	Testing and commissioning	Test records as required by RD-ITS-C1 “Installation and Integration of ITS Equipment”
PC-CN1 “Testing and Commissioning”	Testing and commissioning	Test procedures and records as required by PC-CN1 “Testing and Commissioning”