Master Specification
Part TUN-ITS-DC3

Over Height Vehicle Detection and Enforcement System

September 2024

Government of South Australia
Department for Infrastructure and Transport

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Document Information

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Contents

TUN-ITS-DC3 Over Height Vehicle Detection and Enforcement System

1 General

a) This Master Specification Part sets out the requirements for the design, supply, installation, testing and commissioning of over height vehicle detection systems (OHVDS) including:

i) the documentation requirements, as set out in section 2;

ii) the technical requirements, as set out in section 3;

iii) the control and monitoring requirements, as set out in section 4;

iv) the installation requirements, as set out in section 5;

v) the reliability, Design Life, and functionality safety requirements, as set out in section 6;

vi) the maintainability requirements, as set out in section 7;

vii) the Hold Point requirements, as set out in section 8; and

viii) the verification and testing requirements, as set out in section 9.

b) For the purposes of this Master Specification Part, OHVDS includes the following subsystems:

i) over height vehicle (OHV) detectors;

ii) OHV advanced warning signs;

iii) OHV static warning signs;

iv) OHV active warning signs; and

v) CCTV cameras.

c) This Master Specification Part does not apply to the:

i) sign faces of OHV static signs; or

ii) Tunnel closure system which is the subject of TUN-ITS-DC2 “Tunnel Closure Systems”.

d) The design and supply of the OHVDS must comply with the Reference Documents, including:

i) AS 1742 Manual of uniform traffic control devices; and

ii) AS 2144 Traffic signal lanterns.

e) The OHVDS includes 2 detection heights (enforcement detection height and critical detection height) and CCTV coverage at each OHV detection site and operates as follows:

i) detection of OHV at both detection heights;

ii) continuous CCTV coverage and recording;

iii) detection of an OHV at the OHV enforcement detection height will activate the advance active warning signs and OHV active signs; and

iv) detection of an OHV at the OHV critical detection height will activate the Tunnel closure response strategy for that site.

2 Documentation

2.1 Design Documentation

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

a) a layout plan of each OHVDS site detailing:

   i) list of all major OHVDS components, OHV detectors, and other OHVDS sub-components;

   ii) locations of detectors, controller and warning signs;

   iii) other static signs, proposed and existing; and

   iv) the distances between each item;

b) cross-section details of each OHVDS site detailing:

   i) the road pavement detailing any crossfall or camber; and

   ii) installation heights of the OHV detectors and the height of the detection across all points of the carriageway in the direction of travel;

c) a CCTV camera field-of-view analysis to demonstrate compliance with section 3.5b)ii);

d) a report detailing the OHVDS design and design compliance with all specified requirements including:

   i) all calculations for stopping sight distance, detection of an OHV and triggering active warning signs and time for reading of warning signs based on posted speeds; and

   ii) availability and reliability analysis;

e) complete schematic diagrams for each OHVDS site;

f) software and configuration parameters to enable maintenance;

g) design of the OHV sign faces, in accordance with section 3.12c)ii); and

h) a signage strategy report, in accordance with section 3.12d).

2.2 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 must include the following documents as required by section 9e):

a) records of all test activities;

b) records of all survey activities; and

c) certificates demonstrating currency of survey instrumentation calibration.

3 Technical requirements

3.1 General

a) OHVDS sites must be located in advance of height-restricted infrastructure, such as Tunnels, low bridges and underpasses and other overhead structures, to warn drivers of OHVs that their vehicle height exceeds the infrastructure height restriction.

b) To trigger warning signs and to enable enforcement of OHVs, the OHVDS must detect 2 heights at each detector site:

i) the OHV enforcement detection height, based on the posted clearance height; and

ii) the OHV critical detection height, based on the design clearance envelope which includes a buffer.

c) The OHV enforcement detection height and OHV critical detection height must be in accordance with the values specified in the Contract Documents.

d) The design of the OHV detectors, their mounting brackets and supporting structures must allow for height adjustments on site to accommodate site tolerances during installation and for ongoing operations.

e) Each OHVDS site must have an individual local controller.

f) The controller required by section 3.1e) must be housed in an enclosure in accordance with RD-ITS-S3 “ITS Enclosures”.

g) Where required, OHVDS support infrastructure must be provided with roadside safety barriers in accordance RD-BF-D1 “Design of Roadside Safety Barriers”.

3.2 OHVDS sites on arterial roads, freeways and motorways

a) Each OHVDS site on arterial roads, freeways and motorways must include:

i) OHV static signage in advance of the OHV detector site;

ii) an OHV detector site; and

iii) one or more OHV active signs in the form of advanced warning signs (AWS) appropriate for each OHVDS site.

b) The OHVDS sites on arterial roads, freeways and motorways must be located such that there is sufficient time for the following, based on the posted speed at the OHVDS site:

i) a driver to read and process the information between the OHV static sign and the OHV active signs and any other static signage on the approach or between these signs;

ii) the OHVDS to process the detection of an OHV and activate the OHV active signs;

iii) the driver of the OHV to read and process the information displayed on the OHV active signs before the downstream diversion point or stopping bay; and

iv) required stopping sight distance between the OHV active signs and the downstream diversion point or stopping bay.

c) The locations of OHV static signage required by section 3.2a)i) must:

i) form part of the Project’s static / directional signage strategy; and

ii) be developed in liaison with the Principal’s nominated traffic engineering team.

3.3 OHVDS sites at entry ramps

a) Where access to a freeway or motorway with height constraint infrastructure, such as a Tunnel or underpass with low clearance, is via an entry ramp the OHVDS sites must be provided on the entry ramps in addition to the OHVDS sites required by section 3.2.

b) Each entry ramp OHVDS site must include:

i) OHV detector site at the start of the entry ramp;

ii) lane use management system sign (LUMS sign) at the ramp entry to assist in indicating that the entry ramp is closed; and

iii) Tunnel closure system in accordance with TUN-ITS-DC2 “Tunnel Closure Systems” near the end of the ramp to prevent the OHV from entering the freeway or motorway.

3.4 OHVDS enforcement sites

Where required by the Contract Documents, OHVDS enforcement sites must include the following:

a) an OHV detector provided at the OHV enforcement detection height;

b) an interface to the enforcement camera system; and

c) lighting suitable for the enforcement system.

3.5 CCTV coverage

a) CCTV and associated equipment forming part of the OHVDS must be in accordance with RD-ITS-S5 “Imaging Equipment”.

b) CCTV cameras must be provided at each OHVDS site to:

   i) provide 100% CCTV coverage for tracking and monitoring of the OHV from the detection site to the height-restricted infrastructure; and

   ii) facilitate the image capture of the OHV and the OHV’s front or rear licence plate with a resolution and image clarity to enable the plate to be discernible and legible to an operator.

c) An OHV detection must result in the video images from the CCTV cameras required by section 3.5b) offering the best viewing angle for tracking and monitoring the OHV being automatically displayed to an operator.

d) The equipment providing CCTV coverage as described in this section 3.5 must not be part of the enforcement equipment required by section 3.4.

3.6 System performance requirements

a) The OHVDS must be able to operate as an autonomous system.

b) The OHVDS must be capable of detecting an object:

   i) that is a minimum 100 mm in cross-sectional width or diameter;

   ii) at any lane location across the entire width of the carriageway; and

   iii) travelling at speed between 5 km/h and 120 km/h.

c) The OHVDS must operate in all ambient lighting conditions, including direct sunlight on the OHV detectors.

d) The OHVDS must operate in all weather conditions including heavy rain and fog.

e) The OHVDS must include a vehicle detection system to ignore false positives such as debris or birds detected at the same OHV height as an OHV.

f) The OHVDS must determine the direction of travel of the OHV.

g) The OHVDS must determine the speed of the OHV.

h) The OHVDS must determine the lane in which the detected OHV is travelling.

i) The OHVDS must be able to synchronise its internal clock via NTP protocol.

j) The OHVDS must be able to detect when an OHV detector is degraded, obstructed or faulty.

k) The OHVDS must be able to discern between a degraded or faulty sensor and an OHV detection.

l) The OHVDS must provide the facility to operate in a degraded state using a reduced number of detectors or a reduced capability.

3.7 Logging and reporting

a) The OHVDS must monitor the fault status of each controller and OHV detector.

b) OHV active signs must monitor and report their status.

c) The OHVDS must log all fault conditions with a date and time stamp and a minimum history of 90 days.

d) The OHVDS must log all OHV detections and AWS activation and deactivation activity with a date and time stamp and for a minimum history of 90 days.

e) The OHVDS must detect and indicate faults that cause a degradation of the operation of the OHVDS.

3.8 OHVDS outputs

a) The OHVDS must facilitate outputs to warning signs at each OHVDS site, including:

   i) 2 normally open volt free contacts that close upon detection of an OHV at the OHV enforcement detection height; and

   ii) a separate normally open volt free contact that closes upon detection of an OHV at the OHV critical detection height.

b) Each contact required by section 3.8a) for the detection of OHVs must have a user configurable duration for the time it stays closed.

c) The OHVDS must provide a normally open volt free contact that closes when a fault with a OHVDS detection sensor is identified.

d) The OHVDS must provide a normally closed volt free contact that opens when a system fault with a OHVDS is detected.

3.9 Electrical requirements

a) Electrical design and installation of the OHVDS must be in accordance with RD-ITS-C2 “Mains Power Supplies for Roadside Traffic Management Equipment”.

b) Solar power must not be used for the OHVDS.

c) OHVDS must be provided with back-up power supplies in accordance with RD-ITS-D1 “Design of Intelligent Transport Systems (ITS)”.

3.10 Environmental requirements

Components of the OHVDS that are installed at outdoor locations and exposed to weather must operate under the following environmental conditions:

a) operating in external air temperature in the range of -15°C to +55°C; and

b) have an IP rating of minimum IP55 in accordance with AS 60529 Degrees of protection provided by enclosures (IP Code).

3.11 Test facilities

a) The OHVDS must provide a test facility operable by the user at ground level to simulate the detection of an OHV at the OHV enforcement detection height.

b) The OHVDS must provide a test facility operable by the user at ground level to simulate the detection of an OHV at the OHV critical detection height.

c) The test facility must include secured access to prevent unauthorised use.

3.12 OHV signs

a) OHV signs must comply with AS 1742.2 Manual of uniform traffic control devices and RD-LM-S2 “Supply of Signs”.

b) OHV signs must be suitably sized and located for the posted approach speed.

c) The design of the OHV sign faces must:

   i) be undertaken with input from the Principal’s nominated traffic engineering team; and

   ii) be submitted with the Design Documentation.

d) A signage strategy report must be produced to describe the coordination of OHV signs with other static signs and road furniture and submitted as part of the Design Documentation.

e) Appendix 1: Over height vehicle sign examples provides an example to the Contractor of OHV sign designs.

4 Control and monitoring requirements

a) The OHVDS must include facilities to interface to STREAMS that includes the following information:

   i) detection of an OHV at the OHV enforcement detection height;

   ii) detection of an OHV at the OHV critical detection height;

   iii) direction of travel of OHV;

   iv) speed of travel of OHV;

   v) lane of OHV detection;

   vi) status of each detection sensor; and

   vii) any OHVDS status fault information.

b) The OHV active signs must be activated by the OHVDS independent of STREAMS.

c) The OHVDS must report faults to STREAMS within 3 seconds of the fault occurring.

5 Installation requirements

In addition to the requirements of RD-ITS-C1 “Installation and Integration of ITS Equipment”, the:

a) OHVDS must be installed to detect at the OHV enforcement detection height with a tolerance of +2 cm and -0 cm at all points across the carriageway in the direction of travel; and

b) OHV detector for the OHV critical detection height must be installed to measure an OHV at the specified height with a tolerance of +0 cm and -2 cm at all points across the carriageway in the direction of travel.

6 Reliability, Design Life, and functional safety requirements

a) The OHVDS must have a Design Life with the greater of:

   i) 10 years; or

   ii) as required in RD-ITS-D1 “Design of Intelligent Transport Systems (ITS)”.

b) The OHV detectors must have a MTBF for each Line Replaceable Unit of at least 100,000 hours.

7 Maintainability

The OHVDS devices must be Line Replaceable Units and require minimum site calibration.

8 Hold Points

Table TUN-ITS-DC3 8-1 details the review period or notification period, and type (documentation or construction quality) for each Hold Point referred to in this Master Specification Part.

Table TUN-ITS-DC3 8-1 Hold Points

Section reference	Hold Point	Documentation or construction quality	Review period or notification period
9c)	Verification of accuracy of the detection heights	Documentation	10 Business Days review

9 Verification and testing requirements

a) Testing and commissioning procedures and documentation for the OHVDS and its individual components must comply with the requirements of:

   i) RD-ITS-C1 “Installation and Integration of ITS Equipment”; and

   ii) PC-CN1 “Testing and Commissioning”.

b) The Contractor must conduct surveys in accordance with PC-SI1 “Site Surveys” to verify the accuracy of the detection heights at the OHV enforcement detection point and the OHV critical detection point of each OHVDS site.

c) The Contractor must submit to the Principal for approval all survey verification certificates in accordance with PC-SI1 “Site Surveys” for all OHVDS sites to verify the accuracy of the required detection heights for all points across the carriageway in the direction of travel have been complied with, which will constitute a **Hold Point**.

d) The Site Acceptance Testing activities for each OHVDS site must not commence until the Hold Point contemplated by section 9c) is released.

e) The Contractor must supply the following to the Principal as part of the Quality Management Records:

   i) records of all test activities;

   ii) records of all survey activities; and

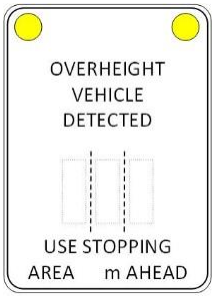
   iii) certificates demonstrating currency of survey instrumentation calibration.

10 Appendix 1: Over height vehicle sign examples

The following are examples of OHV static signs and OHV active warning signs. These sign examples are provided for guidance only. The actual size of the sign will be a function of the information to be shown and the posted speed limit of where the sign is to be installed.

TES19962 (static)

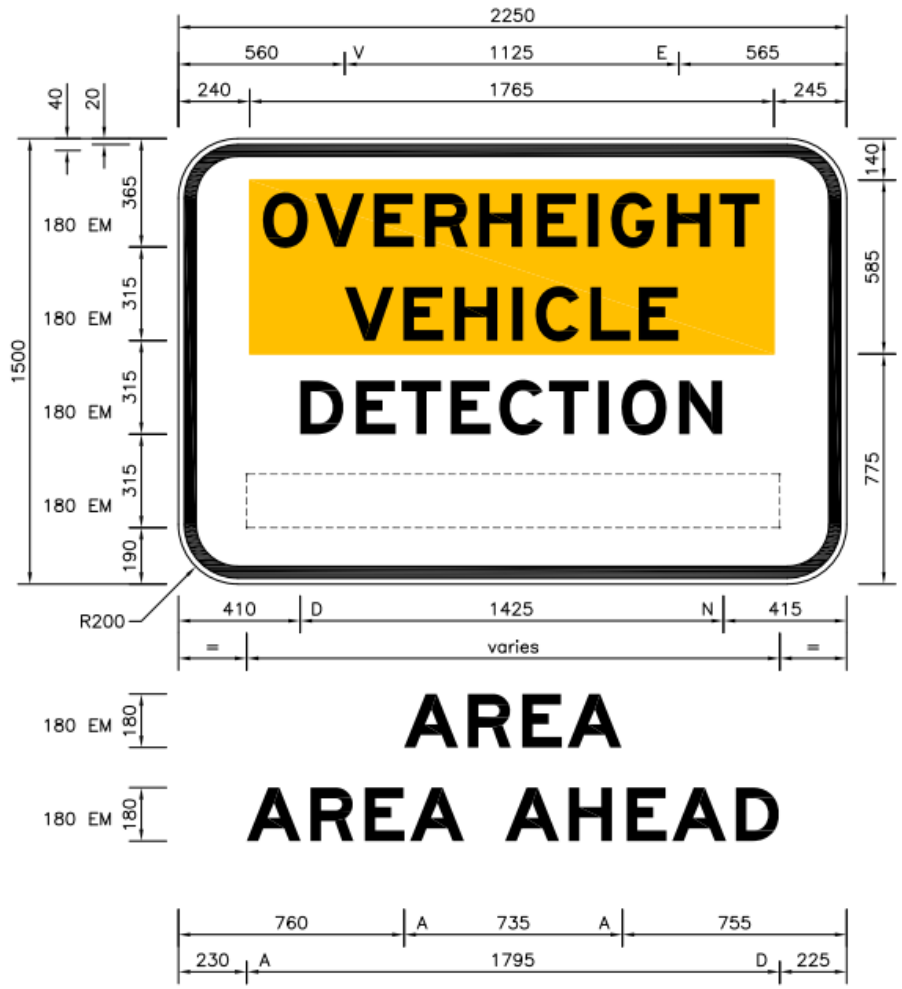
TES19964 (active)



TES 19963 (active)

proposed for entry ramps with single lane

Road and Marine Services
Network Management Services, Traffic Solutions Unit
Specific Road Signs - Specifications, South Australia



Yellow class 100
Black
White class 400

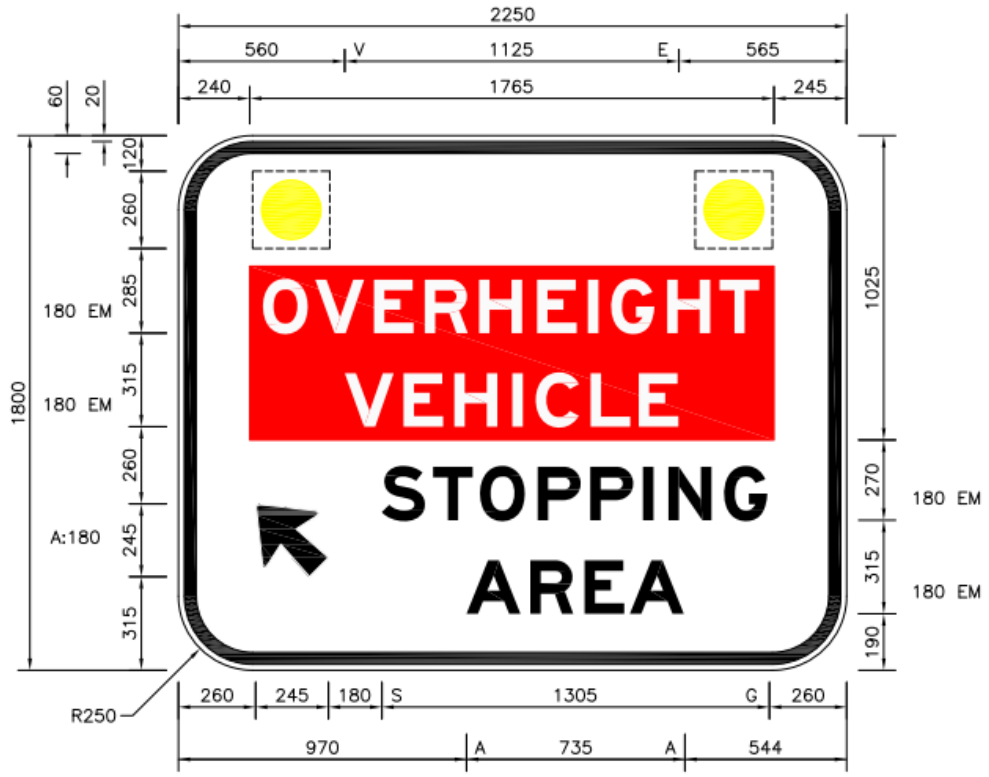
Scale 1:20
ALL DIMENSIONS ARE IN MILLIMETRES
Total Sign Area: 3.34 sqm
Sign Type: Warning
Location: RN4500 – South Eastern Freeway

- NOTE -
Series 2000 Font

Drawn: M. Douglas Authorisation:
Edition: A Rev: 0
Date: 18 July, 2022 Date:

TES 19962

Road and Marine Services
Network Management Services, Traffic Solutions Unit
Specific Road Signs - Specifications, South Australia



ADDITIONAL REFERENCE NOTES:
TES 12737(A Series) – Arrow detail sheet.
TES 18580 flashing light detail

Red class 100
Black
White class 400

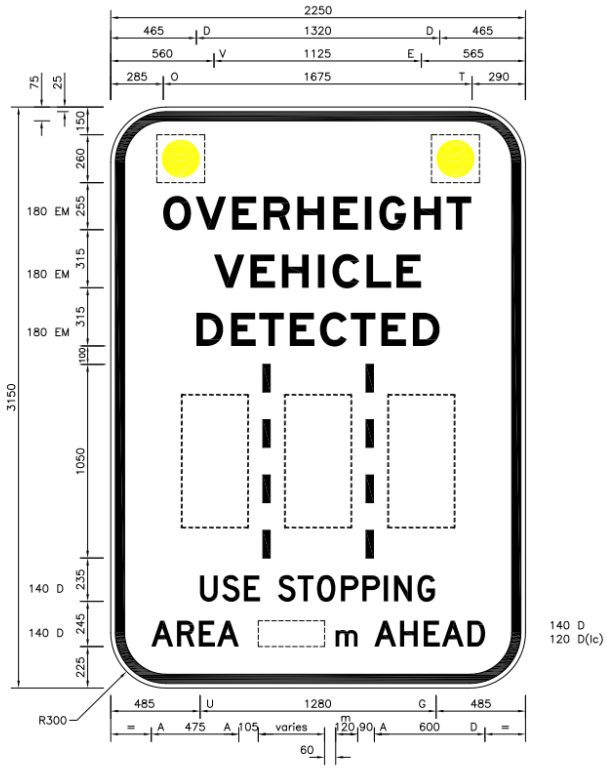
Scale 1:20
ALL DIMENSIONS ARE IN MILLIMETRES
Total Sign Area: 4.00 sqm
Sign Type: Regulatory
Location: RN4500 – South Eastern Freeway

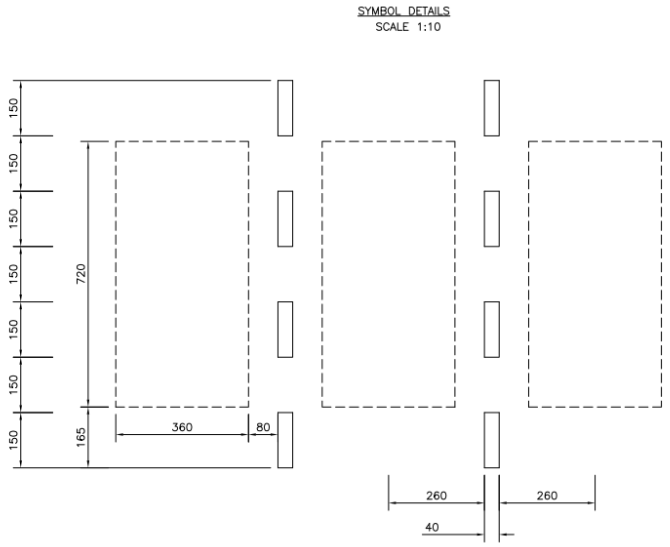
- NOTE -
Series 2000 Font

Drawn: M. Douglas Authorisation:
Edition: A Rev: 0
Date: 22 June, 2021 Date:

TES 19963

Road and Marine Services
Network Management Services, Traffic Solutions Unit
Specific Road Signs - Specifications, South Australia





Scale 1:20
ALL DIMENSIONS ARE IN MILLIMETRES
Total Sign Area: 7.01 sqm
Sign Type: Information – VMS
Location: RN4500 – South Eastern Freeway

Drawn: M. Douglas Authorisation:
Edition: A Rev: 0
Date: 20 September, 2021 Date:

- NOTE -
Series 2000 Font

TES 19964