

TCS 055-1-2005



SPECIFICATION

FOR

**EMERGENCY VEHICLE PRE-EMPTION
SYSTEM**

Issued
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PREFACE

A. GENERAL

This specification has been developed by VicRoads. It is one of a number of technical specifications, and associated standard drawings, which set out the requirements for “on-road” ITS devices, traffic signal equipment and other electrical equipment and associated devices and control systems.

This specification is intended for use in all relevant works undertaken by or on behalf of VicRoads.

B. APPROVED PRODUCTS

Items covered by this specification are not required to hold formal VicRoads ‘Type Approval’ certification. Rather, they are required to obtain VicRoads acceptance in accordance with Appendix B of this specification and the requirements of individual tender documents.

To obtain VicRoads acceptance the Contractor must submit evidence of compliance in accordance with Appendix B of this specification and the requirements of individual tender documents.

Acceptance issued in accordance with individual tender documents does not constitute automatic acceptance for future works.

C. ELECTROMAGNETIC COMPATIBILITY (EMC)

All equipment covered by this specification is required to comply with all relevant requirements of the Australian Communications Authority (ACA) for EMC as detailed in this specification.

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SECTION 1 – SCOPE AND GENERAL

1.1 SCOPE

This document covers the requirements for the supply, operation and installation of Emergency Vehicle Pre-Emption systems for use within the State of Victoria.

1.2 GENERAL

Emergency Vehicle Pre-Emption (EVP) systems are used to provide priority at traffic signals for emergency services vehicles.

The system is activated by an approaching emergency vehicle sending a priority request to the traffic signal controller. When the traffic signal controller receives a priority request it activates a special emergency vehicle phase.

At the time of this specification, an existing EVP system is operational in Melbourne's south eastern suburbs. It will be a requirement for all EVP systems to be compatible with this existing system.

1.3 RELATED SPECIFICATIONS

The fabrication and supply of all components for Emergency Vehicle Pre-emption systems shall conform with all relevant Australian Standards or, in the absence of same, with appropriate international standards.

All installation works shall conform to the relevant VicRoads specifications and related specifications and standards as indicated throughout this document.

The following specifications and documents are referred to or relevant to this specification:

- Degrees of protection provided by enclosures for electrical equipment (IP code) AS 1939.
- SAA Wiring Rules AS 3000.
- Electromagnetic Compatibility - Generic Emission Standard AS/NZS 4251.1.

- Approval and test specification – Electric cables – Thermoplastic insulated for voltages up to and including 0.6 / 1 kV AS 3147.
- Approval and test specification–General requirements for electrical equipment AS 3100.

1.4 DEFINITIONS

For the purpose of this specification, the following definitions shall apply.

Emitter – emits an infrared, strobing, optical signal from the emergency vehicle.

Detector – detects the optical signal from the emitter and is typically mounted on a traffic signal pole.

Signal Processor – interprets the signal received by the detector and places a priority request to the traffic signal controller.

Traffic Signal Controller – a roadside device that regulates the timing and sequence of the traffic signals

1.5 OPERATION OF SYSTEM

A typical traffic signal intersection with an EVP system installed would operate as follows:

- a. The driver of an emergency vehicle on 'urgent duty driving' activates the EVP system emitter (which is typically mounted on the roof of the vehicle). The activation may be by its own switch, via the activation of the lights and/or sirens of the emergency vehicle, or some other automated method;
- b. The EVP emitter sends out a signal by means of an optical, infrared "strobing" light;
- c. The EVP system detector (mounted on a traffic signal pole) detects the emitter's signal, converts it to an electrical signal and passes it to the EVP signal processor;
- d. The EVP signal processor then interprets the received signal, arbitrates the level of priority, and places a request for priority to the traffic signal controller;
- e. The traffic signal controller then activates the special emergency vehicle phase.

1.6 TYPICAL INSTALLATION

A typical EVP system at a traffic signal intersection would include:

- One detector per approach, mounted on a traffic signal pole; and
- One signal processor, installed within the traffic signal controller cabinet.

As well as the above, each emergency vehicle requires a single emitter mounted on the roof of the vehicle. See Figure 1 for the typical site installation of an EVP system.

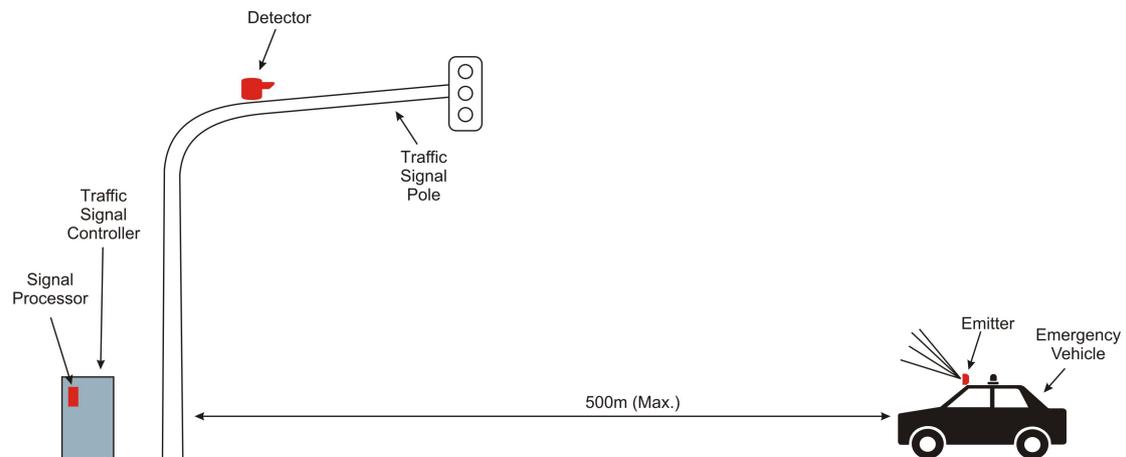


Figure 1
Typical EVP System Installation

1.7 COMPATIBILITY

All components supplied to VicRoads under this specification shall be Tomar® Strobecom II, Optical Preemption and Communications System equipment or similar, fully compatible, system.

SECTION 2 – SYSTEM REQUIREMENTS

2.1 SYSTEM COMPONENTS

2.1.1 Emitter

The emitter shall:

- be a Tomar® 3060 Strobecom II Preemption Emitter or similar, fully compatible, emitter;
- have an optical, infrared output that is invisible to the human eye (this may be achieved by use of a suitable filter over the emitter's lens);
- be designed to operate from the vehicles 12Vdc power supply (a suitable over current protection device such as an in-line fuse shall be included);
- have a minimum range of 500m; and
- have a maximum weight of 1.2kg.

2.1.2 Detector

The detector shall:

- be a Tomar® Strobecom II 2091 Optical Preemption Detector or similar, fully compatible, detector;
- be designed to operate on 'line of site' only;
- have a field of view not inferior to 60 degrees;
- only detect emitters on a single approach
- have a minimum range of 500m;
- continue to detect an emitter until the vehicle reaches the 'stop line';
- have a maximum weight of 0.5kg; and
- be designed to operate from an ELV power supply, typically supplied from the signal processor.

2.1.3 Signal Processor

The signal processor shall:

- be a Tomar® 2140 Optical Signal Processor or similar, fully compatible, processor;
- be capable of receiving up to 10 input signals simultaneously;
- have an adjustable detection range down to ≈60m;
- provide a minimum of 4 separate, no voltage, normally open, contact outputs. These outputs shall provide detector inputs to the traffic signal controller;

- hold a pre-emption signal input to the controller for a pre-set period of time (typically 3 seconds) after losing the emitters signal; and
- be designed to operate from the traffic signal controller's 240Vac power supply (this supply shall typically be taken from the controllers 'detector' active).

2.2 SYSTEM SECURITY

The EVP system shall be a secure system that prevents false activations, unauthorised activations and 'hacking'.

2.3 LOGGING OF EVENT DATA

The system shall be capable of logging all events or activations. The 'event log' shall be capable of being downloaded on site or from a remote location.

Preference will be given to a system that is capable of downloading the 'event log' over existing SCATS lines.

2.4 ELECTRICAL SAFETY

All EVP system equipment shall comply with the relevant requirements of AS-3000 (SAA Wiring Rules).

SECTION 3 - ENVIRONMENTAL REQUIREMENTS

3.1 ELECTROMAGNETIC COMPATIBILITY

3.1.1 General

All equipment covered by this specification shall comply with all relevant requirements of the Australian Communications Authority (ACA) for EMC and shall be labelled with a conforming 'C-Tick'. .

3.1.2 Generic Emission

The EVP system, including all integral control and/or communication components, shall comply with the requirements of AS 4251.1 Electromagnetic Compatibility – Generic Emission Standard – Part 1: Residential, Commercial and Light Industry.

Evidence of compliance with AS 4251.1 shall be provided in accordance with Appendix B.

3.1.3 Noise Immunity

The EVP system shall include protection against transients and surges present on the 230Vac mains supply, electrostatic discharge and radiated or conducted radio frequencies to comply with the requirements of AS 4252.1 Electromagnetic Compatibility – Generic Immunity Standard Part 1: Residential, commercial and light industry.

Evidence of compliance with AS 4252.1 shall be provided in accordance with Appendix B.

3.2 AMBIENT CONDITIONS

All equipment and components associated with the EVP system shall be capable of continuous operation at any ambient with free air temperature in the range -10°C to +50°C, with up to 90% relative humidity.

3.3 ENVIRONMENTAL PROTECTION

The complete detector and emitter, including all cable connections, shall be subject to all tests prescribed for the degree of protection IP55 in AS-1939

and shall comply with the appropriate requirements therein. A certificate or letter of compliance from a NATA approved testing facility shall be made available to VicRoads upon request.

SECTION 4 - MARKINGS

Each major component shall be legibly and durably marked with the following information:

- the name, trade name or trademark of the manufacturer or responsible supplier.
- catalogue number or marking which shall distinguish the particular sign from other similar items supplied and/or manufactured by the supplier.
- batch or serial number or other mark which will clearly identify the date of manufacture of the item.
- other information required under AS-3100 (Approval and test specification -general requirements for electrical equipment).

APPENDIX A

GUIDELINES FOR PURCHASING AND INSTALLATION

INFORMATIVE

A1. DETAILS TO BE CONSIDERED AND/OR INCLUDED WHEN TENDERING

When tendering, the following details should be considered and included in the tender document as required:

- The total number of intersections to be included in the system;
- The total number of approaches at each intersection to be included in the system;
- The total number and type of emergency vehicles to be fitted with emitters;
- The type of traffic signal controller at each intersection; and
- Reprogramming of PROMS for each traffic signal intersection.

A2. DOCUMENTATION

The contractor shall be required to provide, as a minimum, the following documentation with the tender submission:

- Details of the proposed equipment;
- Evidence of compliance with the requirements of this specification.

The contractor shall be required to provide, as a minimum, the following documentation at the completion of works:

- a schematic diagram or chart showing the, as supplied, electrical circuits contained within the EVP system; and
- any and all operational and maintenance requirements to ensure the optimal operation of the EVP system.

A3. INSTALLATION

A3.1 EVP Signal Processor

The processor shall be installed in the traffic signal controller and interfaced with the controller as required.

A3.2 EVP Detector

The detector unit must be installed on an appropriate traffic signal pole such that it provides clear line of sight for the approach being treated.

Cabling between the detector and processor should be run through existing conduits wherever possible. All such cabling must have 240 volt rated insulation.

A3.3 EVP Emitter

The installation of emitters into emergency vehicles shall be carried out by the relevant emergency service. Emitters should be supplied to the emergency service pre-coded with all cabling and components. All required instructions for installation and maintenance should also be provided.

APPENDIX B

REQUIREMENTS FOR APPROVAL

B1. GENERAL

EVP systems shall not be subject to standard evaluation procedures associated with formal Type Approval. Rather, EVP systems shall be subject to Product Acceptance. That is, the Contractor must demonstrate to VicRoads' satisfaction that the components of the EVP system comply with this specification. Upon confirmation that the EVP system complies with this specification, VicRoads may issue a letter of Product Acceptance.

To enable assessment for the purpose of granting Product Acceptance, the Contractor is to submit the following to VicRoads:

- a. A complete working sample of an EVP system including processor, detector and emitter;
- b. An outline drawing showing the general presentation and overall dimensions of each of the above components;
- c. Documentation to demonstrate that the EVP components have been manufactured and supplied under an approved quality assurance system.
- d. Documentation to demonstrate that the EVP system conforms to the requirements of VicRoads Specification. This may be by means of submitting test results from approved and appropriately qualified independent testing organisations, or providing the manufacturer's assurance that the product complies with each paragraph of the specification.

Alternatively, the supplier may submit evidence of approval of the same product by another Australian State Road Authority, together with details of volume and period of usage by other jurisdictions;

- e. A schematic diagram or chart showing the electrical circuits contained within the system.

B2. REQUIRED NATA ACCREDITED TESTING

Notwithstanding B1 above, the supplier shall submit test results from a NATA accredited testing organisation to demonstrate compliance with the following:

Clause 2.3.2	EMC Compliance
Clause 2.3.3	IP rating of IP55

B3. OTHER REQUIRED TESTING

Each of the main components of the EVP system (i.e. the emitter, the detector and the signal processor) shall be required to be demonstrated to be fully compatible with the existing Tomar® Strobecom II, Optical Preemption and Communications System equipment.

VicRoads may require additional information or testing to be carried out as part of its evaluation of the product.

B4. ASSESSMENT PROCEDURE

The assessment procedure for an EVP system will include, but not be limited to, the following:

- a. Assessment of construction and workmanship;
- b. Evaluation of the submitted data against the requirements of this specification; and
- c. Any required testing to demonstrate full compatibility with VicRoads existing system.

Where some of these procedures have been completed prior to formal submission, the results will be considered in the evaluation, provided there is no relevant change in the design. The supplier is to state whether tests carried out prior to formal submission were carried out on an identical sample.