

TCS 027-1-2004



SPECIFICATION
FOR
PUFFIN CROSSING
“WALK” DETECTORS

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PREFACE

A. GENERAL

This specification has been developed by the VicRoads 'Intelligent Transport Systems Group'. 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, and associated standard drawings, is intended for use in all relevant works undertaken by or on behalf of VicRoads.

B. APPROVED PRODUCTS

All equipment supplied under this specification shall conform to a sample previously supplied to, and formally accepted, or separately exempted, by the Department. Such acceptance shall be subject to the issue of a Certificate of Type Approval or Notification of Acceptance by VicRoads.

References to "approved" within this specification shall mean individual components or methods that have been previously accepted by VicRoads.

All equipment supplied under this specification shall be manufactured and supplied by an approved manufacturer under a VicRoads approved Quality Assurance System and shall be subject to all requirements of audit therein.

C. Electromagnetic Compatibility (EMC)

All equipment supplied under this specification shall comply with all relevant requirements of the Australian Communications Authority (ACA) for EMC.

All equipment supplied under this specification shall comply with the requirements of AS4251.1 Electromagnetic compatibility – Generic emission standard – Part 1: Residential, commercial and light industry.

For equipment complying with the ACA's 'Level 1' category a copy of a 'Declaration of Conformity' shall be supplied to VicRoads.

For equipment complying with the ACA's 'Levels 2 and 3' categories, a copy of a test report (from a NATA approved testing facility) showing compliance

shall be supplied to VicRoads. Equipment falling into either of these two categories shall be labelled with a conforming 'C-Tick'. 

D. Telecommunications Equipment

All telecommunications equipment shall comply with relevant requirements of the ACA. Such equipment shall be labelled with an ACA issued

'A-Tick' .

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1.0 SCOPE

This document details the functional requirements for 'walk' detectors for use at Puffin (Pedestrian user friendly intelligent) pedestrian operated signals within the State of Victoria.

A Puffin crossing is a signalised pedestrian crossing that uses "above ground" pedestrian 'walk' detectors to optimise the signal settings.

This specification outlines the zones of detection, the target size and speeds, reliability of operation, output conditions required to interface to the traffic signal controller, functional testing requirements and the regulations and standards that must be met by the equipment supplier.

2.0 GENERAL

The detector system defined in this specification forms a critical part of the Puffin crossing.

The purpose of a Puffin crossing 'walk' detector is to detect all pedestrians crossing the carriageway. The output from the detection system is used by the traffic signal controller to extend the walk and/or clearance times while a pedestrian is on the crossing. This, in turn, will help to improve crossing safety and efficiency for both pedestrian and vehicular traffic. It is expected that the detector system will typically comprise at least two pedestrian 'walk' detectors, one positioned on each side of the carriageway.

3.0 RELATED SPECIFICATIONS AND DRAWINGS

The fabrication and supply of all components for Puffin crossing 'walk' detectors 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.

3.1 SPECIFICATIONS, STANDARDS AND DOCUMENTS

The following related specifications and standard drawings are defined:

- AS 1939 - Degrees of protection provided by enclosures for electrical equipment (IP code)
- AS 2578 – Traffic Signal Controllers Part 1 – Physical and Electrical Compatibility

- AS/NZS 3000:2000 - Wiring Rules
- AS/NZS 4251 - Electromagnetic Compatibility - Generic Emission Standard.
- AS 3147 - Approval and test specification – Electric cables – Thermoplastic insulated for voltages up to and including 0.6 / 1 kV.
- AS 3100 - Approval and test specification – General requirements for electrical equipment.
- AS 60038-2000 – Standard Voltages
- TC-1005 - VicRoads Standard Drawing for Typical Layout for Puffin Pedestrian Operated Signals
- TC 1205 – VicRoads Standard Drawing for 13 and 29 Core Cable Connections for Pedestrian Operated Signals

4.0 PUFFIN CROSSING OPERATION

4.1 TYPICAL INSTALLATION

A Puffin crossing typically consists of two microwave 'walk' detectors, one mounted on each side of the pedestrian crossing on the tertiary pedestal. See Figure 1 below for the typical detector installation layout and detection zone "footprints". These detectors detect the presence of a moving pedestrian on the crossing.

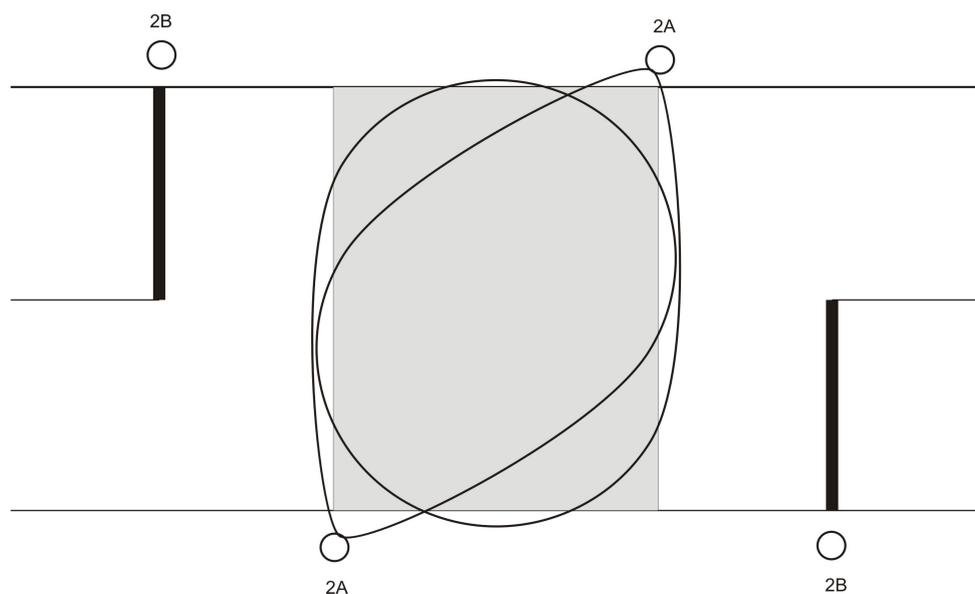


Figure 1
Typical Detector Installation and Detection Footprint

Walk detectors can be used to extend the 'walk' time, extend the 'clearance' time, or extend both times. These two time extensions are described in general terms in sections 4.2 and 4.3 below. The detailed Puffin operation for each site will be specified in individual 'Operations Sheets'.

4.2 WALK EXTENSION

The 'walk' detectors can be used to extend the 'walk' time.

If, at the end of the minimum walk time, the 'walk' detector continues to detect a pedestrian on the crossing, the extended walk time is called. Should the 'walk' detector stop detecting pedestrians for a predetermined time (typically two seconds) during the extended walk time, this time may be terminated prior to the maximum walk time being reached.

4.3 CLEARANCE EXTENSION

The 'walk' detectors can be used to extend the 'clearance' time.

If, at the end of the minimum clearance time, the 'walk' detector continues to detect a pedestrian on the crossing, the extended clearance time is called. Should the 'walk' detector stop detecting pedestrians for a predetermined time (typically two seconds) during the extended clearance time, this time may be terminated prior to the maximum clearance time being reached.

5.0 DETECTOR PERFORMANCE REQUIREMENTS

5.1 GENERAL

The function of the Puffin detection system is to detect the presence of a pedestrian crossing the carriageway.

The detection system shall cover the detection zones as detailed in Section 5.2 of this specification.

The detection system output shall meet the requirements detailed in Section 6 of this specification.

The pedestrian detection system shall respond correctly to pedestrians dressed in a worst case condition relevant to the detector technology used and in a manner appropriate to the typical range of Australian weather, including fog, and during the day or night.

5.2 DETECTION ZONES

Detection zones shall comply with VicRoads Standard Drawing TC-1005 and the following clauses. A diagram showing the typical detection zones on a crossing is shown in Figure 2.

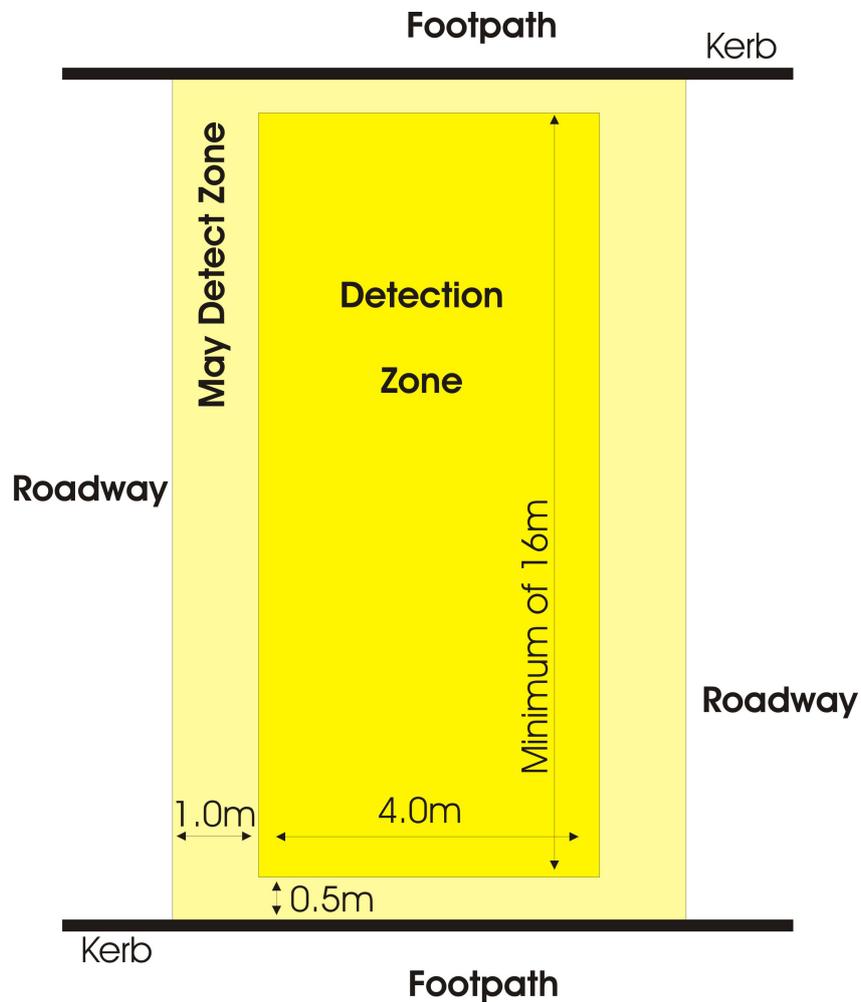


Figure 2
Detection Zones for a Typical Crossing

5.2.1 Detection Zone

The 'walk' detectors shall detect a pedestrian who is within the detection zone.

The detectors shall be capable of producing a detection zone not less than 16 metres in length and 4m in width. Detection zones less than 16 metres in length shall be achieved through configuration and/or adjustment of the detectors. This detection zone is typical for a two lane, two way carriage way (i.e. 4 lanes in total).

A continuous *detect condition* output, from the detection system, shall be maintained when a pedestrian is detected on the crossing.

The requirements of the above clause shall be met when a pedestrian is traversing the crossing at speeds greater than or equal to 0.5 metres per second.

Note: For the purpose of this specification a pedestrian is defined as having a minimum height of 1m, minimum width of 0.5m, minimum depth of 0.2m, and minimum mass of 20Kg and with the form and dynamic properties of a walking child with an average age of five years old. All pedestrians that meet or exceed this definition shall be detected in accordance with this specification. The requirements of the above clause must include a pedestrian seated in a wheel chair or pushchair.

5.2.2 May Detect Zones

Tolerances of detection zones have been allowed for by the inclusion of a 'may detect zone'. Pedestrians may or may not be detected in this zone.

The Puffin detectors shall not detect a pedestrian outside of the 'may detect' zone.

6.0 OUTPUT CONDITIONS

The output from the pedestrian detection system shall be isolated relay contacts or a solid state equivalent. The output conditions refer to the output terminal state of the relay contacts (i.e. open or closed contacts).

The relay contacts shall be connected between the allocated core of the traffic signal cable and the ELV detector return. See Appendix A for details.

6.1 OUTPUT TERMINAL STATES

The output terminal state shall be in accordance with Sections 6.2, 6.3 and 6.4 and Table 1 below.

Table 1
Output Terminal States

Condition	Output Condition
Power "On" – No Detect Condition	Open
Power On – Detect Condition	Closed
Power Off	Closed

6.2 DETECT CONDITION

When pedestrians are detected the output terminal state shall be closed relay contacts as indicated in Table 1 above.

6.3 NO DETECT CONDITION

When no pedestrians are detected the output terminal state shall be “open” as indicated in Table 1 above.

6.4 POWER SUPPLY INTERRUPTION

An interruption of the power supply to any detector shall automatically produce a '*detect condition*' as detailed in Clause 6.2 above.

The equipment shall regain its normal operational performance, as required by this specification, when the power supply is restored.

6.5 VISUAL INDICATORS

An external indicator shall be provided, visible from the footpath, to enable the operation of the detection system to be observed. This shall consist of a high brightness red light source which shall be illuminated for the duration of the *detect condition*.

7.0 ELECTRICAL SYSTEM

The mains supply voltage shall be deemed to be 230Vac +10%, -6% in accordance with Section 2 of AS 60038-2000 – Standard Voltages.

7.1 ELECTRICAL SAFETY

The detector shall comply with the relevant requirements of AS/NZ 3000:2000 Wiring Rules. The detectors shall be designed to operate from a mains supply voltage.

The output relay contacts shall be designed to operate with voltages up to 48Vac.

7.2 EMC COMPLIANCE

The detector and all integral control and/or communication components shall comply with the relevant requirements of AS4251.1 Electromagnetic

compatibility – Generic emission standard – Part 1: Residential, commercial and light industry.

8.0 ENVIRONMENTAL REQUIREMENTS

8.1 WEATHER RESISTANCE

The complete detector housing when assembled shall be subject to all tests prescribed for the degree of protection IP65 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.

8.2 OPERATING TEMPERATURES

The detector shall be capable of operating continuously under a range of temperatures and humidity as detailed in clause 1.4 of AS 2578 for Traffic Signal Controllers - Part 1.

9.0 MARKINGS

Each detector shall be legibly and durably marked on the exterior surface of the housing with the following information:

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

10.0 DOCUMENTATION

The following items are to be supplied with the detector equipment:

- a) A schematic diagram or chart showing the electrical connections; and,
- b) Any installation/set up notes required to assist those installing the detectors.

APPENDIX A

INSTALLATION NOTES (INFORMATIVE)

A1. INTERFACE WITH TRAFFIC SIGNAL CONTROLLER

The Pedestrian Detector output shall be connected to the traffic signal cable in accordance with VicRoads standard drawing TC-1205. The controller input connections shall be in accordance with the relevant Operation (Op.) Sheet.

Generally the connections shall be in accordance with Table A1 below.

**Table A1
Puffin 'Walk' Detector Connections**

PEDESTRIAN DETECTOR OUTPUT	TRAFFIC SIGNAL CABLE	CONTROLLER INPUT
Pedestrian Detector 1		
Relay Common	ELV Return	ELV Return
Relay Contact	Walk 1	External Detector Input as detailed in relevant Op. Sheet
Pedestrian Detector 2		
Relay Common	ELV Return	ELV Return
Relay Contact	Walk 2	External Detector Input as detailed in relevant Op. Sheet

A2. DETECTORS

Care must be taken when ordering and installing 'WALK' detectors. These detectors are used in an opposing pair configuration. If opposing pair detectors are not used, the result may be that one or both of the detectors cause interference with the opposite detector. To overcome this problem, some manufacturers specify that the opposed pair should comprise one odd serial numbered detector and one even numbered detector (this ensures that the two detectors operate on a slightly different frequency). It is advisable to check the manufacturer's requirements before purchasing or installing detectors.

A3. DETECTOR INSTALLATION

Walk detectors shall be installed in accordance with VicRoads Standard Drawing TC-1005. When installing the detectors on site, care must be taken to ensure that the detectors are

- Installed at the correct height
- Aimed correctly
- 'Paired' in accordance with A2 above (if required)
- Fully checked for correct operation

APPENDIX B

REQUIREMENTS FOR TYPE APPROVAL

B1 GENERAL

To enable assessment for the purpose of granting Type Approval, the supplier is to submit a formal request for Type Approval accompanied by the following:

- a. An outline drawing showing the general presentation and overall dimensions of the complete detector;
- b. Documentation to demonstrate that the detector has been manufactured and supplied under an approved quality assurance system;
- c. Documentation to demonstrate that the detector 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; and
- d. Evidence of compliance with any international standards.

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 specific clauses of this specification:

- (a) Clause 4.2 EMC Compliance
- (b) Clause 5.1 Weather Resistance

B3 OTHER REQUIRED TESTING

- a. Evidence that the product will operate in the range of temperatures as detailed in Clause 5.2, and
- b. The supplier shall provide VicRoads (at no cost to VicRoads) with not less than two (2) complete working detectors for installation in the field. The detectors shall operate in the field for a period of up to four months.

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 a PUFFIN 'On Crossing' detector will include, but not be limited to, the following:

- a. Assessment of construction and workmanship;
- b. Preliminary assessment of the detector's operation and 'footprint' in a test installation;
- c. Evaluation of the submitted data against the requirements of the specification; and
- d. An on-road trial for a period of up to six months;

B5 TYPE APPROVAL

If the product is approved, a Certificate of Type Approval will be provided to the supplier. Until such time as this Certificate is issued, the product is not to be used in the State of Victoria.

APPENDIX C

ASSOCIATED STANDARD DRAWINGS

Drawing Number	Title
TC-1005	Typical Layout For Puffin Pedestrian Operated Signals
TC-1205	Multicore Cable Connections For Pedestrian Operated Signals