

TCS 042-2-2005



---

GENERIC SPECIFICATION

FOR THE SUPPLY AND INSTALLATION OF

**INTERNALLY ILLUMINATED MESSAGE SIGNS**

---

Issued  
April 2005



Intelligent Transport Systems Group  
60 Denmark Street Kew 3101

Phone: (03) 9854 2111 Fax: (03) 9854 2319

Page Left Blank

# 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**

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 manufacturer/supplier 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 shall comply with all relevant requirements of the Australian Communications Authority (ACA) for EMC. Such equipment 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 (*i.e.* Level 2 and 3) shall be labelled with a conforming 'C-Tick'. 

#### **D. TELECOMMUNICATIONS EQUIPMENT**

All telecommunications equipment shall comply with relevant requirements of the Australian Communications Authority (ACA). Such equipment shall be labelled with an ACA issued

'A-Tick' .

#### **COPYRIGHT**

© Roads Corporation trading as VicRoads. All rights reserved.

This document remains the property of VicRoads. No part of this document may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of VicRoads.



## Introduction

This specification includes the requirements for the manufacture and operation of Internally Illuminated Message Signs (IIMS) for installation under VicRoads supervised works. This specification supercedes VicRoads specification TCS 042-1-2002.

A number of changes have been introduced in this edition with the objective of reflecting the current requirements and practices for these types of signs.

Below, is a summary of the main changes introduced in this edition.

- Requirement for a sign visor to prevent sun glare
- Inclusion of description of typical activation modes
- Inclusion of Appendix A, Guidelines for Purchasing and installation
- Inclusion of Appendix B, Requirements for approval of signs

Page Left Blank

# Contents

<b>SECTION 1 – SCOPE AND GENERAL.....</b>	<b>10</b>
1.1    SCOPE.....	10
1.2    GENERAL.....	10
1.3    RELATED SPECIFICATIONS AND DRAWINGS.....	10
<b>SECTION 2 – SIGN ENCLOSURE.....</b>	<b>12</b>
2.1    MATERIALS.....	12
2.2    DESIGN AND FABRICATION.....	12
2.2.1    General.....	12
2.2.2    Front Viewing Window.....	13
2.2.3    Door.....	13
2.2.4    Door Locks.....	13
2.2.5    Visor.....	13
2.2.6    IP Rating.....	14
2.3    MOUNTING.....	14
2.4    MARKING.....	14
<b>SECTION 3 - DISPLAY.....</b>	<b>16</b>
3.1    GENERAL REQUIREMENTS.....	16
3.2    MESSAGE.....	17
<b>SECTION 4 – PHOTOMETRIC PERFORMANCE.....</b>	<b>18</b>
4.1    COLORMETRIC AND PHOTOMETRIC REQUIREMENTS.....	18
4.2    REQUIREMENTS FOR LIGHT EMITTING DIODES (LED’S).....	18
4.2.1    General.....	18
4.2.2    White LED’s.....	18
4.2.3    Red LED’s.....	19
4.2.4    Yellow LED’s.....	19
4.3    DIMMING.....	19
<b>SECTION 5 – ELECTRICAL REQUIREMENTS.....</b>	<b>20</b>
5.1    MAINS SUPPLY.....	20
5.2    ELECTRICAL SAFETY.....	20
5.3    EMC COMPLIANCE.....	20
5.4    ELECTRICAL FACILITIES.....	20
5.5    CONNECTION TO SUPPLY.....	21
5.6    MANUAL OVERRIDE SWITCH.....	21
5.7    SOLAR OPERATION.....	21
<b>SECTION 6 - OPERATION.....</b>	<b>22</b>
6.1    ACTIVATION MODES.....	22
6.1.1    SCATS.....	22
6.1.1.1    SCATS Alarms.....	22
6.1.2    Time Clock Operation.....	22
<b>APPENDIX A.....</b>	<b>24</b>
GUIDELINES FOR PURCHASING AND INSTALLATION.....	24
<b>APPENDIX B.....</b>	<b>26</b>
REQUIREMENTS FOR APPROVAL.....	26

Page Left Blank

## SECTION 1 – SCOPE AND GENERAL

### 1.1 SCOPE

This document covers the requirements for the manufacture, supply and installation of Internally Illuminated Message Signs (IIMS) that are not covered by specific, individual, VicRoads Specifications. The technology covered by this specification is Light Emitting Diode (LED). Fibre optic technology may be used where specified in individual tender documents.

### 1.2 GENERAL

Internally illuminated message signs are generally installed where high visibility is required and/or the message is only required at certain times. Due to the increased use of this technology to treat specific traffic conditions, it has become necessary to develop a generic specification for any signs not covered by individual specifications.

### 1.3 RELATED SPECIFICATIONS AND DRAWINGS

The fabrication and supply of all components for IIMS shall conform with all relevant Australian Standards or, in the absence of same, the 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 related specifications and standard drawings are defined:

- Manual of uniform traffic control devices, Part 2: Traffic control devices for general use AS 1742.2
- Road signs – Specifications AS 1743
- 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

- 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.
- Road Rules - Victoria

## SECTION 2 – SIGN ENCLOSURE

### 2.1 MATERIALS

The exposed surfaces of the enclosure shall be constructed from marine grade sheet aluminium and shall be suitably reinforced and/or braced to facilitate the installation and continued operation of the unit in the intended application. All external metal sections of the completed enclosures shall be of powder coat or baked enamel finish. Such treatment shall ensure that deterioration due to atmospheric and/or local environmental conditions has no detrimental effect on the structural integrity or visual appearance (including colour fading) of the finished enclosure for a period not less than ten years.

The colour of the finish shall be matt black and the active display area of the sign shall be surrounded on all sides by a matt black border to enhance the conspicuity of the illuminated sign face.

### 2.2 DESIGN AND FABRICATION

#### 2.2.1 General

The interior and exterior of the enclosure shall be free from sharp edges or projections that might cause injury to personnel or damage to components during installation and/or maintenance operations.

The completed sign shall be rated to withstand wind forces defined in AS 1170, Part 2 - 1989.

The dimensions of the enclosure should be detailed in individual tender documents. However, the enclosure should be the minimum practical size that will house the intended display.

The sign enclosure shall include:

- A suitable venting and air circulation system in accordance with the recommendations of the individual component manufacturers. Air circulation shall include the means to keep dust and dirt from the internal areas of the sign enclosure. The use of air filters that require frequent servicing will not be accepted; and
- A suitable moisture inhibitor if required.

### 2.2.2 Front Viewing Window

In respect to the front viewing window, where installed, the following features shall be incorporated:

- The viewing window shall be made from high impact, clear plastic (anti-glare and U.V. stabilised) sheeting of a suitable casting grade acrylic copolymer or polycarbonate;
- The door and window shall be fitted with effective weatherproof seals of suitable materials (neoprene rubber or similar) to prevent the entry of dust and moisture. The design of the seals and fastening methods shall be such as to ensure sustained weather proofing of the sign for the life of the unit; and
- The size of window area shall be such that, when installed, the sides and bottom edges of the display face may be fully visible at viewing angles of 45° and 30° respectively to the 0°.0° axis of the display face (without the visor fitted).

### 2.2.3 Door

The sign enclosure shall incorporate a lockable door located on the front of the sign enclosure. The design and layout of the door, framing and/or connection structure shall be such as to enable full access to and extraction of any of the internal components (with the exception of fixed structural components) for installation, testing and/or maintenance purposes.

The door may hinge from either the left, the right, or the bottom. (The position of the hinges shall be defined in individual tender documents).

Where the door is hinged on the left or right, a suitable door stay shall be provided.

### 2.2.4 Door Locks

The door shall be locked in the closed position by the use of “Southco”, key lockable, Link Lock™, Rotary Action Latches or similar. All locks shall be keyed alike using an approved key.

### 2.2.5 Visor

A visor shall be fitted to the front of the sign enclosure to reduce the effects of sun glare on the display face. The visor shall be approximately 200-250mm deep across the top of the sign and taper down the sides to 0-45mm at the

bottom. The exact size of the visor shall be determined by the size of the sign enclosure.

### 2.2.6 IP Rating

The complete enclosure when assembled 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.

## 2.3 MOUNTING

The enclosure shall be provided with all facilities to enable mounting of the finished sign using one of the methods detailed in Table 1 below.

**Table 1**  
**Approved Mounting Methods**

<p><b>Method 1</b></p> <p>Top/Bottom mounting.</p>	<p>Two (2) 40 mm x 300 mm x 5 mm standard traffic signal lantern mounting straps affixed to the top and bottom of the enclosure.</p> <p>The mounting arrangement shall be such as to enable the aiming and locking of the sign in the horizontal plane <math>\pm 45^\circ</math> in increments of not less than <math>7.5^\circ</math> and <math>+ 0^\circ</math> and <math>-15^\circ</math> in the vertical plane.</p>
<p><b>Method 2</b></p> <p>Rear Mounting</p>	<p>Using two full width lengths of mounting channel (unistrut® or similar) horizontally affixed to the rear of the enclosure.</p>

The method of mounting shall be detailed in individual tender documents.

## 2.4 MARKING

Each sign shall be legibly and durably marked on the interior surface of the enclosure 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.
- d. other information required under AS-3100.

## SECTION 3 - DISPLAY

### 3.1 GENERAL REQUIREMENTS

The layout of any IIMS shall comply with all relevant requirements of Road Rules Victoria, AS-1743-2001 and AS 1742.

The required display shall be detailed in individual tender documents. All proposed display layouts (i.e. pixel layouts) shall be supplied at time of tendering for approval.

Unless otherwise specified in individual tender documents, for text type signs all character heights and border widths shall comply with the guidelines detailed in Table 2.

Where specified in individual tender documents, the display characters shall comply with the appropriate font as defined in AS 1744.

*NOTE: It is accepted that due to the 'flaring' of illuminated displays, the widths of the characters may be slightly less than that required for a static sign.*

Each character shall be either single stroke width (single row of LED's) or double stroke width (two rows of LED's) as detailed in Table 2.

The display of an IIMS shall be surrounded by a matt black border as detailed in Table 2.

**Table 2**  
**Recommended Character Heights, Stroke Widths and Borders**

Speed Limit	Recommended Character Height	Recommended Stroke Width	Minimum Width of Border
40km/h	80mm	Single	75mm
60km/h	120 to 150mm	Single	100mm
80km/h	200 to 250mm	Single	150mm
100km/h	350 to 450mm	Single or Double	200mm
110km/h	450mm	Single or Double	250mm

NOTE: The character height to width ratio shall be 7:5

### 3.2 MESSAGE

An IIMS shall display a message as a single display (static or flashing) as shown in Figure 1, or as a combination of two alternating displays as shown in Figure 2.

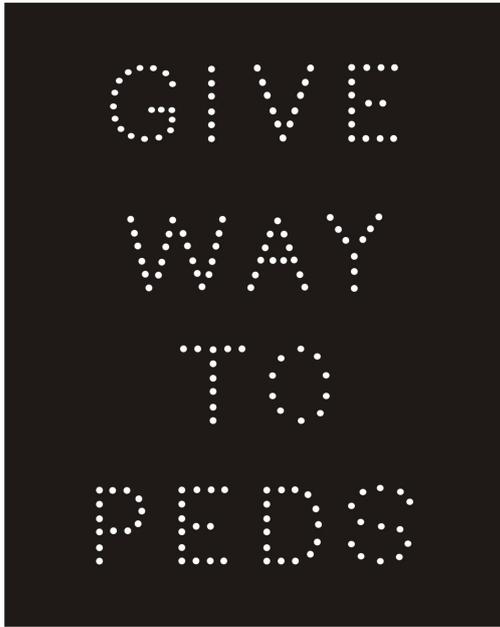


Figure 1  
Typical Single Display Sign



Figure 2  
Typical Two Display Sign

**NOTE: The maximum displays used for a single message shall not exceed two.**

## SECTION 4 – PHOTOMETRIC PERFORMANCE

### 4.1 COLORMETRIC AND PHOTOMETRIC REQUIREMENTS

All IIMS displays shall conform to the following general requirements:

- a. The colour of the displays shall be in accordance with Section 2 of AS 2144; and
- b. The photometric performance of the displays shall conform to the relevant requirements of this specification.

All displays shall be clear and legible.

### 4.2 REQUIREMENTS FOR LIGHT EMITTING DIODES (LED'S)

#### 4.2.1 General

All LED's used in a sign shall be designed for a life of 10 years. The manufacturer shall guarantee a minimum life of not less than 5 years. The manufacturer shall provide full documentation detailing the operation and maintenance regime required to ensure this life.

Individual LED's shall be wired such that a failure of any one LED will result in the loss of not more than 6% of the sign displays total LED's.

The LED display shall automatically shut down in the event that less than 80% of the total numbers of LED's in a display are illuminated.

#### 4.2.2 White LED's

All white LED's shall:

- a. Be 5mm nominal diameter;
- b. Have a minimum luminous intensity of 7,000mcd; and
- c. Comply with the chromaticity requirements for "white" as detailed in Section 2 of AS 2144.

### 4.2.3 Red LED's

All red LED's shall:

- a. Be 5mm nominal diameter;
- b. Have a minimum luminous intensity of 2,000mcd; and
- c. Comply with the chromaticity requirements for "red" as detailed in Section 2 of AS 2144.

### 4.2.4 Yellow LED's

All yellow LED's shall:

- a. Be 5mm nominal diameter;
- b. Have a minimum luminous intensity of 1,800mcd; and
- c. Comply with the chromaticity requirements for "yellow" as detailed in Section 2 of AS 2144.

## 4.3 DIMMING

The sign shall incorporate a variable dimming and activation circuit capable of dimming the display during times of low ambient light. The dimming circuit shall be preset to activate at 1100 lx. The dimming circuit shall have a switching delay of 30 ±5 seconds;

When in the dimmed state, the luminous intensity of the display, measured when new, shall fall within the following range:

$$1\% \leq \text{luminous intensity} \leq 75\%$$

The dimming and activation circuit shall be capable of dimming the display to pre-determined values with a minimum of 20 steps.

The dimming facility should reflect the ambient light conditions immediately on "switch on" *i.e.* if the sign is switched on at night the display should be dimmed and if the sign is switched on during bright daylight the display should be optimum brilliance without delay.

At all times, signs installed in pairs (*i.e.* one on either side of a roadway) shall display the same brightness level.

*NOTE: Where a sign is in close proximity to artificial lighting the ambient light level local to that sign may be artificially high. This may result in the dimming system setting the light output of the sign too high. Therefore, each sign and/or dimming circuit shall be capable of adjusting the dimmed light levels to compensate for local artificial light levels.*

## SECTION 5 – ELECTRICAL REQUIREMENTS

### 5.1 MAINS SUPPLY

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

### 5.2 ELECTRICAL SAFETY

The signs shall comply with the relevant requirements of AS/NZS 3000:2000 (Wiring Rules). The signs shall be capable of operating from either a mains supply or solar power as specified in individual tender documents.

### 5.3 EMC COMPLIANCE

The sign and all integral control and/or communication components shall comply with the requirements of AS4251.1 Electromagnetic compatibility – Generic emission standard – Part 1: Residential, commercial and light industry.

### 5.4 ELECTRICAL FACILITIES

The electrical system shall incorporate the following facilities:

- a circuit breaker board comprising appropriately rated mains isolation switch and circuit breaker;
- where required, a variable flasher unit suitable for use with LED's and capable of varying both the "on", "off" and space times of the light source from 0.5 seconds to 3.0 seconds in increments of 0.2 seconds;

All equipment shall be internally protected against damage resulting from:

- lightning strikes at or near the sign/gantry
- electrical transients on power cabling
- electrical transients on signal wiring
- radio frequency interference
- static electrical discharge

## 5.5 CONNECTION TO SUPPLY

The sign shall include connecting cables enclosed in 16mm<sup>2</sup>, black flexible conduit or other method approved by VicRoads.

The connecting cables and internal wiring shall:

- a. have stranded copper conductors;
- b. be insulated with materials not inferior to V90HT grade PVC; and
- c. comply with all relevant requirements of AS-3147 – Approval and test specification – Electric cables - Thermoplastic insulated - For working voltages up to and including 0.6 / 1 kV.

The cable and hose shall enter the rear panel of the enclosure (in an upper corner) through a suitably sealed "goose neck" arrangement or other approved method.

## 5.6 MANUAL OVERRIDE SWITCH

Each sign shall incorporate a manual override switch, located on the outside of the enclosure, which can be operated via a standard VicRoads facility key. The switch shall include the positions as detailed in Table 1 below.

**Table 3**  
**Manual Override Switch Configuration for IIM Signs**

Switch Position	Function
Auto	This position shall allow the sign to operate normally
Off	This position shall switch the sign off
On	This position shall switch on the display

## 5.7 SOLAR OPERATION

If solar power is to be used, the contractor shall design a suitable 'solar system', which shall be proof engineered by a VicRoads approved consultant.

Care must be taken in the design to ensure that the solar panel is installed in a position that minimises the possibility of vandalism and theft. Typically, the pedestal that the solar panel is installed on shall be a 5.1m 'extended' 2B pedestal.

## SECTION 6 - OPERATION

### 6.1 ACTIVATION MODES

The method of controlling IIMS shall be detailed in individual tender documents and shall generally be one of the methods detailed below.

*NOTE: The methods listed below are the most common activation modes used and do not preclude other technologies being considered.*

#### 6.1.1 SCATS

This method of control operates the signs from an existing traffic signal controller. Signs operated in this manner shall be capable of being isolated at the traffic signal controller through a separate circuit breaker or isolation switch or other approved method.

The signs are typically supplied with a 'switch wire' used to switch the signs on and off. The switch wire is generally activated through a relay contact. The relay is typically switched using a Special Purpose Output (SPO) or a 'wait state' output.

##### 6.1.1.1 SCATS Alarms

Where specified in individual tender documents, signs operated from a traffic signal controller via SCATS shall be capable of confirming (via detector inputs) that the signs are operating.

Each sign shall be capable of providing a separate 'no voltage' contact closure which shall provide a detector input to the controller.

When the display is switched off, or is off due to failure, the 'monitoring relay(s)' contacts shall remain "open".

#### 6.1.2 Time Clock Operation

Time Clock Operation shall use a time clock, located within the sign enclosure, to activate the sign at specified times of the day.

Time clocks shall:

- Be 365 day, fully programmable time clock that enables the sign to remain inactive on specified days (i.e. weekends, public holidays etc.)
- Automatically update for daylight savings;

- Incorporate a battery back-up; and
- Maintain synchronised time between multiple sign's at a single installation or treatment via the Global Positioning System (GPS) time function, or other "failsafe" method.

## APPENDIX A

### GUIDELINES FOR PURCHASING AND INSTALLATION

#### INFORMATIVE

#### A1. DETAILS TO BE INCLUDED WHEN TENDERING

When tendering, the following details shall be provided:

- The required display of the proposed signs
- The size of the display characters;
- The location of the hinges for each sign (i.e. left, right or bottom)
- The proposed power supply *i.e.* 240vac or solar power;
- The proposed activation mode;
- Whether the cables connecting the sign to the field wiring should be terminated in an 'upper mounting assembly' or an isolation switch located on the pedestal behind the sign (*Where an 'Upper Mounting Assembly' is not used, a suitable 'cap' shall be installed on the top of the pedestal to prevent the ingress of water*);
- Whether the signs are to be mounted on standard 2A or 2B pedestals or other type of pole;
- Whether 600mm cable pits must be used or whether 300mm electrical pits are acceptable;
- The requirement to supply and install stickers on each pedestal, in accordance with standard drawing TC-2105, displaying the site number.

#### A2. INSTALLATION

The sign should not obscure any portion of any traffic signal vehicle lantern or pedestrian lantern or any other traffic sign. (Note: In some cases the re-mounting of vehicle or pedestrian lanterns on extended mounting straps may be required.)

Care should be taken to ensure that the minimum clearances from the bottom of any of the signs to ground level is maintained at all times. No portion of the sign or associated mounting facilities should be less than 2.2 m above ground level.

Compatible traffic signal crank-arm or riser unit may be used to raise the sign to a clear viewing position if necessary.

A minimum lateral clearance of 500 mm between the back of kerb and the nearest portion of the sign shall be maintained at all times.

The signs when mounted shall be capable of adjustment in both the vertical and horizontal alignments. The signs shall be aimed such that the active displays are clearly visible to approaching traffic.

### A3. DOCUMENTATION

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

- Details of the proposed sign including the manufacturer, the proposed technology and confirmation that the manufacturer has similar types of signs Type Approved by VicRoads; and
- Details of the proposed technology to be used for activating the signs.

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 sign;
- a schematic diagram showing the 'As Built' cabling between the traffic signal controller (if SCATS activation is being used) and the signs. A copy of this diagram should be included within the controller cabinet;
- a list of all major electrical sub-components detailing their electrical characteristics and operational limits; and
- any and all operational and maintenance requirements to ensure the LED's operate for the minimum required life.

## APPENDIX B

### REQUIREMENTS FOR APPROVAL

#### B1 GENERAL

Internally Illuminated Message Signs shall not be subject to VicRoads formal Type Approval process.

Rather, IIMS shall be subject to 'acceptance' in accordance with the requirements of individual tender documents. This acceptance process shall generally require the contractor to demonstrate compliance with this specification and the relevant contract specific clauses of individual tender documents.

To enable assessment for the purpose of granting acceptance, the manufacturer/supplier should submit to VicRoads the following:

- a. Evidence of compliance with the requirements of individual tender documents.
- b. An outline drawing showing the general presentation and overall dimensions of the complete sign.
- c. Evidence that the manufacturer/supplier holds current VicRoads Type Approval for a similar type of internally illuminated sign.
- d. Documentation to demonstrate that the sign conforms to the requirements of this 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.

Test results from similar types of 'Type Approved' signs, that use the same power supply and control equipment, may be considered.

#### B2 REQUIRED COMPLIANCE

As a minimum, Contractors must demonstrate compliance with the following:

- IP55 rating in accordance with clause 2.2.7 (Test report or certificate from a NATA approved facility);
- Evidence that the LED's comply with relevant sections of clause 4.3 (Manufacturers specification data sheet); and

- EMC certification in accordance with clause 5.3 (Test report or certificate from a NATA approved facility).

Evidence of compliance with the above may be in the form of test results from other similar signs, using the same power supply and control equipment, that hold current VicRoads Type Approval. Test results for other, similar types of sign, should be accompanied with a written statement that the test results can be applied to the submitted sign.

### B3. OTHER REQUIRED TESTING

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 IIMS will typically include, but not be limited to, the following:

- Evaluation of the submitted data against the requirements of this specification and individual tender documents;
- Assessment of construction, workmanship and critical dimensions;
- Factory acceptance in accordance with the requirements of individual tender documents.

