TCS 032-3-2002

SPECIFICATION

FOR

LED “NO RIGHT TURN” AND LED “NO LEFT TURN” SIGNS

Issued
January 2002

Amendment 1; January 2004

Intelligent Transport Systems Group
Traffic and Transport Integration Department
60 Denmark Street Kew 3101

Phone: (03) 9854 2143 Fax: (03) 9854 2319

PREFACE

A. GENERAL

This specification has been developed by the VicRoads 'Traffic and Transport Integration Department' (herein called the "Department"). 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 covered by this specification shall hold current VicRoads 'Type Approval' certification. To obtain VicRoads 'Type Approval' the manufacturer/supplier must submit a written request, together with a sample product, to VicRoads for evaluation. Such requests shall include all relevant documentation demonstrating compliance with this specification

Type Approval issued in accordance with this specification does not constitute automatic approval against future versions of this specification. Where it is considered necessary, VicRoads may withdraw current Type Approval and request that the affected product be re-submitted for evaluation against future versions of this specification.

All equipment covered by this specification shall be manufactured 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 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' .

Amendment History		
Amendments	**Date Issued**	**Details**
No. 1	January 2004	Revised Cover New Preface Appendix - Requirements for Approval

Contents

1.0 SCOPE AND GENERAL

This document covers the requirements for the manufacture, supply and installation of symbolic display type, Illuminated Light Emitting Diode (LED) "NO RIGHT TURN" (NRT) signs for use within the State of Victoria. The manufacture, installation and operation of these LED NRT signs is the same as that required for the less common LED “NO LEFT TURN” (NLT) signs. The display layout for the latter option is also included in this specification.

1.1 GENERAL

NRT and NLT signs are utilised in conjunction with traffic signals to advise drivers entering an intersection that turning right or left through the intersection is banned. The sign is an alternative to the conventional static version, which consists of a red circle and slash over a black arrow on a white background.

Illuminated signs are generally installed where turns through an intersection are banned only at certain times.

A typical site layout for the LED NRT sign is shown in Figure 1.

1.2 RELATED SPECIFICATIONS AND DRAWINGS

The fabrication and supply of all components for LED No Right Turn Signs 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 related specifications and standard drawings are defined :

1.2.1 SPECIFICATIONS, STANDARDS AND DOCUMENTS

- Manual of uniform traffic control devices, Part 2: Traffic control devices for general use AS 1742.2
- Road signs – Specifications AS 1743 - 2001
- Degrees of protection provided by enclosures for electrical equipment (IP code) AS 1939
- SAA Wiring Rules ASNZ 3000-2000
- 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

- Traffic Signal Lanterns AS 2144.

2.0 APPROVAL

The signs supplied shall conform to a sample previously supplied to, and formally approved by, the VicRoads Intelligent Transport Systems (ITS) Group of the Traffic and Road Use Management Department. Such approval shall be subject to the issue of a Certificate of Type Approval or Notification of Acceptance by the ITS Section. Sample units for evaluation shall be provided by the supplier.

All testing required for Type Approval shall be carried out by the manufacturer at the manufacturer's expense.

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

The signs shall be manufactured and supplied under a VicRoads approved Quality Assurance System and shall be subject to all requirements of audit therein.

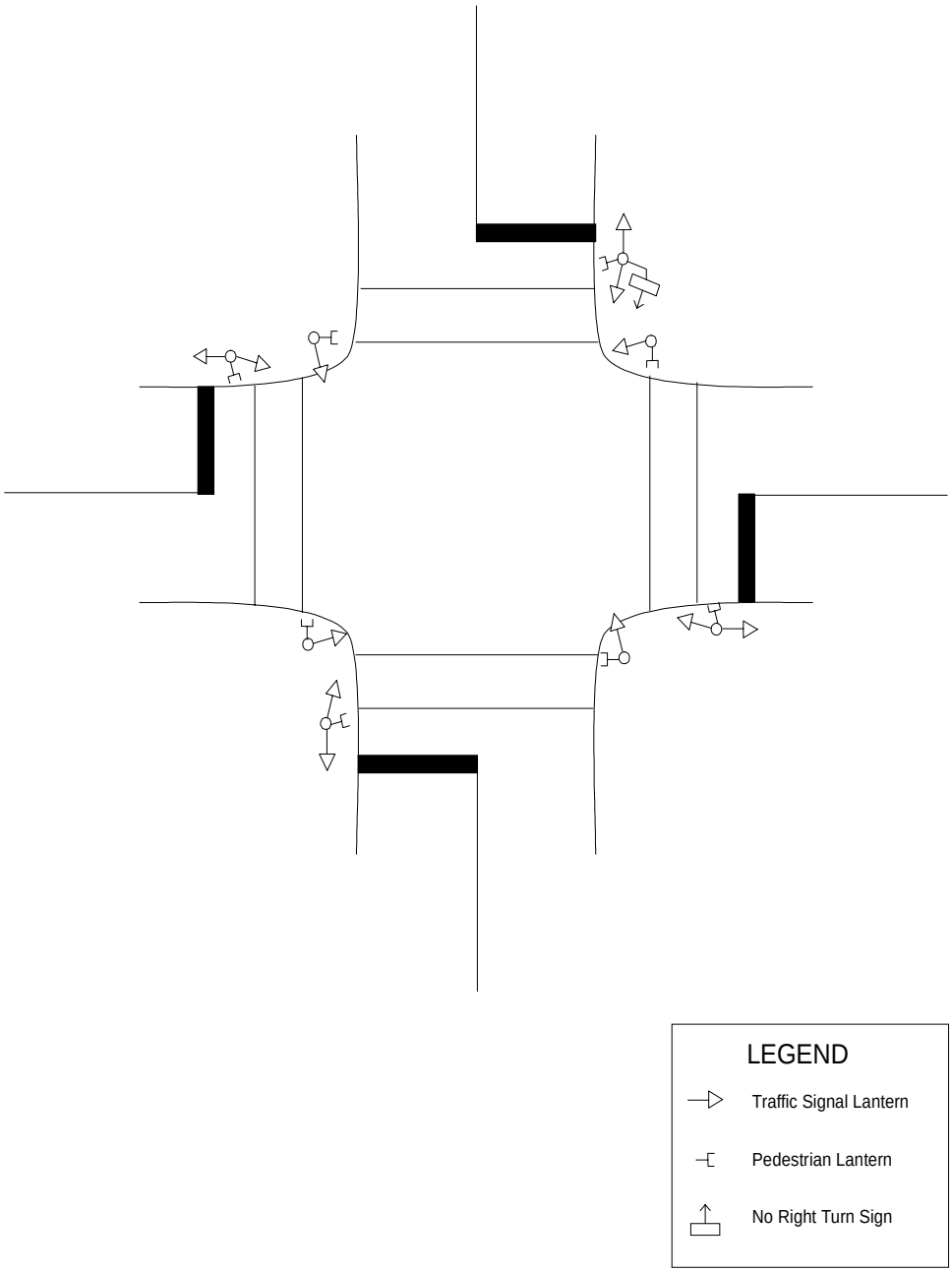


FIGURE 1 - "NO RIGHT TURN" SIGN - TYPICAL LAYOUT

3.0 HOUSING

3.1 MATERIALS

The enclosure shall be constructed from marine grade sheet aluminium and shall be suitably reinforced and/or braced to facilitate the erection and continued operation of the unit in the intended application. All external metal sections of the completed housing shall be of powder coat or baked enamel finish, low gloss black in colour. 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 housing for a period not less than ten years.

3.2 DESIGN AND FABRICATION

The sign housing and ancillary equipment shall be free from sharp corners, edges and protrusions which may cause injury to personnel or damage to components during installation and/or maintenance operations.

The sign housing shall incorporate the following features:

- Unless otherwise specified in individual tender documents, a door shall be located on the front of the sign housing, hinged on the left and lockable on the right (when viewed from the front). The locks shall be “Southco”, key lockable, Link Lock™, Rotary Action Latches (Code 801) or similar. All locks shall be keyed alike and shall ensure that the door is securely fastened. The door shall be used to provide access to all internal components of the sign for both installation and maintenance purposes.

- A suitable venting and air circulation system in accordance with the recommendations of the display matrix 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.

- A suitable moisture inhibitor.

The front viewing window shall incorporate the following features:

- It shall be manufactured from high impact, clear plastic (anti-glare) 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.

- The size of window area shall be such that, when installed, the sides and bottom edges of the display face shall be fully visible at viewing angles of 45° and 30° respectively to the 0°-0° axis of the display face.

The dimensions of the housing shall be the minimum required to house the intended display and shall not exceed 520mm (h) x 520mm (w) x 120mm (d). Where fitted, a visor shall be no deeper than 220mm on the top and 45mm on the bottom.

The interior layout of the housing shall be such as to provide clear and ready access to all electrical and communication components for inspection, maintenance and replacement purposes.

The control equipment and electrical/electronic circuits shall be mounted on a suitable mounting panel located on the inside of the sign housing in an easily accessible location

3.3 WEATHER RESISTANCE

The complete housing 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.

3.4 MOUNTING

The housing shall be provided with all facilities to enable mounting of the finished sign using one of the following methods:

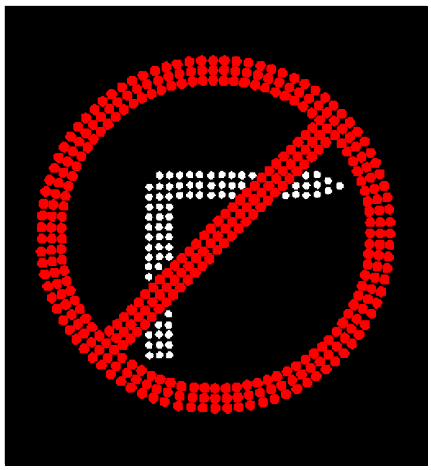
Method 1 Top/Bottom mounting.	Two (2) 40 mm x 300 mm x 5 mm standard traffic signal lantern mounting straps affixed to the top and bottom of the housing. The mounting arrangement shall be such as to enable the aiming and locking of the sign in the horizontal plane ± 45° in increments of not less than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

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

4.0 DISPLAY

Unless otherwise specified, the layout for the LED NRT and LED NLT signs shall comply with the requirements of Rule 91 of Road Rules Victoria and AS-1743-2001, for an R2-6A size sign with an outer radius of 220mm.

The display shall consist of a red circle and slash over a white arrow on a black background as shown in Figure 2 below.



"NO RIGHT TURN" SIGN LAYOUT

"NO LEFT TURN" SIGN LAYOUT

Figure 2
LED “NO RIGHT TURN and NO LEFT TURN SIGNS
TYPICAL LAYOUTS

5.0 ELECTRICAL SYSTEM

5.1 ELECTRICAL SAFETY

The signs shall comply with the relevant requirements of ASNZ 3000-2000. The signs are to operate from a 240 volt AC mains supply.

5.2 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.

5.3 ELECTRICAL FACILITIES

The electrical system shall incorporate the following facilities:

i. 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.

ii. a variable lamp dimming and activation circuit (Lumatrol ® or similar) preset to activate at 1100 lx, capable of dimming the LED's (to pre-determined values within the range 80% and 30% of normal high intensity) during times of low ambient light. The dimming circuit shall have a switching delay of 30 ±5 seconds.

The dimming facility should reflect the ambient light conditions immediately on "switch on" ie. If the display is switched on at night the lamps should be dim and if the display is switched on during daylight the lamps should be full brilliance without delay.

iii. all such operational facilities shall be mounted within a single control module or circuit board which will be affixed to the mounting panel on the inside rear of the cabinet housing. All connections to the control module/circuit board shall be via screw type terminals.

5.4 CONNECTION TO SUPPLY

The sign shall be supplied with connecting cables 2.5 metres in length enclosed in black flexible conduit 2.0 metres in length (both lengths being measured from the point of entry to the housing). The flexible conduit shall be 16 mm in diameter.

The connecting cables and internal wiring shall:

i. have stranded copper conductors

ii. be insulated with materials not inferior to V105 grade PVC: and
ii. comply with all relevant requirements of AS-3147.

The cable and hose shall enter the rear panel of the housing through a suitably sealed "goose neck" arrangement.

5.5 ACTIVATION MODE

The signs shall be activated via direct cable switching from a core of an adjacent traffic signal controller.

6.0 PHOTOMETRIC AND COLOURMETRIC REQUIREMENTS

All Light Emitting Diodes (LEDs) used to create the display for this sign shall conform to the following photometric and colourmetric requirements:

i. The total luminance of any symbolic display on axis shall be not less than 4000 cd/m^2.

ii. The colours of the display shall conform to the relevant chromaticity co-ordinates as detailed in AS 2144 Clause 2.2.

iv. the luminance and/or luminous intensity values for a dimmed display (where stipulated) shall be not more than 70% and not less than 30% of the undimmed output.

v. The resultant displays shall exhibit uniform light and colour distribution across the illuminated area. The illuminated legend should be legible up to 80m.

The uniformity of display intensity shall be such that the ratio of the average luminous intensity of the total display (I_{Total}) to the average luminous intensity of any portion (not more than 10%) of the display (I_{Sample}) is not less than 0.75 and not greater than 1.25.

i.e. $0.75 < I_{Total} / I_{Sample} < 1.25$

7.0 MARKINGS

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

i. the name, trade name or trademark of the manufacturer or responsible supplier.

ii. catalogue number or marking which shall distinguish the particular sign from other similar items supplied and/or manufactured by the supplier.

iii. batch or serial number or other mark which will clearly identify the date of manufacture of the item.

iv. other information required under AS-3100.

8.0 DOCUMENTATION

The following items are to be supplied with the signs:

i. a schematic diagram or chart showing the, as supplied, electrical circuits contained within the sign.

ii. a list of all major electrical sub-components detailing their electrical characteristics and operations limits.

9.0 WARRANTY

The manufacturer shall provide the following minimum warranty provisions:

i. The signs supplied shall be subject to a warranty period against defects on the cabinet, control devices and labour of twelve (12) months from the date of installation into the field under authorised Vic Roads instructions.

ii. The LED's shall be subject to a warranty period against defect or failure of 3 years.

iii. LED symbolic displays which exhibit luminous intensities or luminances less than the relevant maintained minimum values specified in VicRoads 'Specification for the Supply of LED Traffic Signal Lanterns' throughout their specified 3 year operating life shall be replaced or repaired at no cost to VicRoads.

iv. LED displays which exhibit failure of 20% or more of the led arrays throughout their specified 5 year operating life shall be replaced or repaired at no cost to VicRoads.

Any item found to be defective during this warranty period will be returned to the manufacturer/supplier, who shall make good the defect or replace same within a period of thirty (30) days from receipt. Costs associated with transportation of defective items to and from the manufacturers/suppliers premises will be borne by the manufacturer/supplier.

10.0 PACKAGING

Each sign (including mounting hardware) shall be individually packed in a manner that will minimise damage to the sign during storage, handling and transport. Each packaged sign shall be marked on the outside with a clear indication of the contents, the manufacturer/suppliers name and any details regarding special handling and/or storage requirements.

11.0 SITE INSTALLATION

The NRT signs are installed to face traffic approaching the stop line of the signalised intersection. The sign(s) should be aligned such that they are clearly visible to traffic at approach distances up to 80m in advance of the relevant stop line.

The signs shall be mounted above ‘low mount’ secondary vehicle lanterns and immediately below ‘high mount’ secondary vehicle lanterns for the nominated approach for which the right turn is to be banned. The sign should not obscure any portion of any vehicle or pedestrian display on the mounting pedestal or on adjacent pedestals.

Note : in some cases the re-mounting of the 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 lanterns to ground level, are maintained at all times. No portion of the sign, pedestrian lantern and/or mounting facilities, is to be less than 2.2 m above ground level.

Compatible traffic signal crank-arm or riser unit may be used to raise the NRT 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 (including visor) 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 at the stop line of the relevant turn lanes.

The exact position of each sign on the pedestal shall be indicated in individual tender documents and shall be agreed to on site by the superintendent.

APPENDIX

REQUIREMENTS FOR TYPE APPROVAL
OF AN
LED “NO RIGHT TURN” AND “NO LEFT TURN” SIGN

A1. 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. A complete working sample of the sign.

b. An outline drawing showing the general presentation and overall dimensions of the complete sign.

c. Documentation to demonstrate that the sign has been manufactured and supplied under an approved quality assurance system.

d. Documentation to demonstrate that the sign 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.

A2. REQUIRED NATA ACCREDITED TESTING

Notwithstanding A1 above, the supplier shall submit test results from a NATA accredited testing organisation to demonstrate compliance with the following:

Clause 3.3	IP rating of IP55
Clause 5.2	EMC Compliance
Clause 6.0	Photometric and Colormetric Requirements

A3. OTHER REQUIRED TESTING

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

b. 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.

A4. ASSESSMENT PROCEDURE

The assessment procedure for a NLT or NRT sign will include, but not be limited to, the following:

a. Assessment of construction, workmanship and critical dimensions.
b. Evaluation of the submitted data against the requirements of the specification

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.