ROADS AND MARITIME SERVICES

TRAFFIC SYSTEMS

SPECIFICATION NO. TSI-SP-060

ILLUMINATED FLASHING ARROW SIGNS

Issue: 1.0
Dated: 27/9/2017
DISCLAIMER AND CONDITIONS FOR USE OF THIS SPECIFICATION

This Specification has been prepared by Roads and Maritime Services (referred to herein as RMS) for use, insofar as it is applicable, in the State of New South Wales for equipment supplied under an RMS order or contract, or under an order or a contract from another party that is required in writing by RMS to use this Specification.

The use of this RMS Specification other than by those parties stated above and in the manner stated above is not recommended or authorised by RMS. Any such use is entirely the decision of the user alone. RMS disclaims all responsibilities and liabilities arising whether directly or indirectly from any such use. RMS does not warrant that this Specification is error free, nor does RMS warrant the suitability, fitness or otherwise of this Specification for any stated or implied purposes expressed or implied in this Specification or other documents. By using this Specification, the user agrees to indemnify RMS against the full amount of all expenses, losses, damages and costs (on a full indemnity basis and whether or not incurred by or awarded against RMS) which may be suffered by any person or RMS in connection with or arising out of the use of this Specification in any manner.

RMS is not under any duty to inform you of any errors in or changes to this Specification.
## RECORD OF AMENDMENTS

<table>
<thead>
<tr>
<th>Issue</th>
<th>Summary</th>
<th>Date</th>
<th>Approved by</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>Specification FAS/5 (1991, RTA) converted into TSI-SP-000 Specification Template. Review and update obsolete items and references.</td>
<td>Nov 2015</td>
<td></td>
</tr>
<tr>
<td>0.2</td>
<td>Review and update obsolete items and references.</td>
<td>Apr 2017</td>
<td></td>
</tr>
<tr>
<td>0.3</td>
<td>Incorporate feedback form TES internal review, in particular Low Voltage Protection and Wind Loading.</td>
<td>May 2017</td>
<td></td>
</tr>
<tr>
<td>0.4</td>
<td>Review and consolidate feedback from version 0.3. Update description on the Fixed Signs and Adjustable sign in Clause 4.2.2 and 4.4.3, rewrite and restructure Low Voltage Protection in Clause 4.3, enhance the requirement on the Double-sided Sign in Clause 4.4.3.2 include an Appendix A, specify operator initiated action in Adjustable Signs Operation in Clause 4.4.3.3, and rewrite the Wind Loading in clause 4.6.4</td>
<td>Sept 2017</td>
<td></td>
</tr>
<tr>
<td>0.5</td>
<td>Additional clarification on the sign operation and control, and specified that all Type C trailer mounted signs are Single-signed Sign</td>
<td>18/9/17</td>
<td></td>
</tr>
<tr>
<td>0.6</td>
<td>Minor grammatical improvement</td>
<td>27/9/17</td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>Official release</td>
<td>27/9/17</td>
<td></td>
</tr>
</tbody>
</table>
CONTENTS

1 SCOPE ............................................................................................................................................. 5

2 REFERENCES AND APPLICABLE DOCUMENTS ............................................................................. 5
  2.1 AUSTRALIAN AND INTERNATIONAL STANDARDS ................................................................. 5
  2.2 RMS DOCUMENTS ...................................................................................................................... 5

3 DEFINITIONS AND GLOSSARY OF TERMS ..................................................................................... 5

4 REQUIREMENTS ................................................................................................................................. 5
  4.1 OVERALL COMPLIANCE .............................................................................................................. 5
  4.2 SIGN CLASSIFICATION ............................................................................................................... 5
    4.2.1 General ................................................................................................................................... 5
    4.2.2 Type A and Type B Signs ...................................................................................................... 5
    4.2.3 Type C Signs .......................................................................................................................... 5
  4.3 ELECTRICAL PROTECTION ......................................................................................................... 6
    4.3.1 Battery Protection .................................................................................................................. 6
    4.3.2 Reverse Polarity Protection .................................................................................................... 6
    4.3.3 Over Voltage Protection ......................................................................................................... 6
  4.4 SIGN OPERATION AND CONTROL .............................................................................................. 6
    4.4.1 Lamp Switching Sequences .................................................................................................... 6
    4.4.2 Provision for Fail-Safe Operation ............................................................................................ 6
    4.4.3 Operator Controls .................................................................................................................... 7
  4.5 PARTICULAR REQUIREMENT VEHICLE-MOUNTED SIGNS ......................................................... 7
    4.5.1 General ................................................................................................................................... 7
    4.5.2 Fixed Signs .............................................................................................................................. 7
    4.5.3 Adjustable Signs ..................................................................................................................... 7
  4.6 PARTICULAR REQUIREMENT TRAILER-MOUNTED SIGNS ......................................................... 8
    4.6.1 Solar Panels Combined with Batteries ..................................................................................... 8
    4.6.2 Single-Sided Sign .................................................................................................................... 8
  4.7 ADDITIONAL ENVIRONMENTAL REQUIREMENTS ..................................................................... 8
    4.7.1 General ................................................................................................................................... 8
    4.7.2 Anti-Shock & Vibration .......................................................................................................... 8
    4.7.3 Enclosure Protection for LED Aspect ...................................................................................... 8
    4.7.4 Wind Loading ......................................................................................................................... 8

5 QUALITY ASSURANCE AND CONTROL ......................................................................................... 8
  5.1 QUALITY SYSTEM .......................................................................................................................... 8
  5.2 QUALITY PLAN ............................................................................................................................... 8
  5.3 QUALITY AUDITS .......................................................................................................................... 9

6 WARRANTY .......................................................................................................................................... 9

7 APPROVAL ......................................................................................................................................... 10
  7.1 APPROVAL PROCESS ..................................................................................................................... 10
  7.2 TYPE APPROVAL MARKING ....................................................................................................... 10

APPENDIX A: ALLOWABLE SIGNAGE FOR DOUBLE-SIDED SIGN ..................................................... 11
1 SCOPE

This Specification covers the requirements of flashing arrow signs for the temporary
diversion of vehicular traffic on roads.

Note: This Specification supersedes Specification FAS/5.

2 REFERENCES AND APPLICABLE DOCUMENTS

2.1 Australian and International Standards

[2] AS 4192 Illuminated Flashing Arrow Signs

2.2 RMS Documents

[5] TS201 Approval of ITS Field Equipment

3 DEFINITIONS AND GLOSSARY OF TERMS

For the purposes of this Specification, the following definitions and abbreviations shall apply:

RMS – Roads and Maritime Services, a New South Wales government agency
FAS - Illuminated Flashing Arrow Sign

4 REQUIREMENTS

4.1 Overall Compliance

The Illuminated Flashing Arrow Signs (FAS) shall meet the requirements of AS 4192 [2]
unless specified otherwise in this specification.

4.2 Sign Classification

4.2.1 General

FAS are classified as per AS 4192:2006 Table 1.1 [2].

4.2.2 Type A and Type B Signs

Type A and Type B signs shall be for mounting on road vehicles, or on the cab of vehicles,
without the need for major structural alterations to the standard vehicle.

4.2.3 Type C Signs

The Type C sign shall be trailer-mounted with back-up battery supply powered by solar
panels or an integral generator. The units are suitable for unattended operation.
An option shall be provided for mounting the Type C signs on special-purpose vehicles without the trailer.

4.3 Electrical Protection

In addition to the requirements in AS 4192 [2], the additional requirements are listed in the following clauses.

4.3.1 Battery Protection

The FAS shall incorporate an additional low voltage cut-off point to ensure that the attached battery supply is not over discharged. When this low voltage cut-off point is reached the FAS shall turn off and the supply from the battery disconnected from the FAS. This protection is required to eliminate possible damage to the battery supply.

*Note: The supplier shall specify the voltage of this cut-off point, and the associated recovery voltage hysteresis.*

4.3.2 Reverse Polarity Protection

The FAS shall incorporate reverse polarity protection on its supply input to prevent damage to the FAS if a battery is incorrectly connected.

Under reverse polarity conditions the FAS is not expected to operate.

4.3.3 Over Voltage Protection

The FAS shall incorporate over voltage protection on its supply input to prevent damage to the FAS if an incorrect DC voltage supply is connected.

*Note: The supplier shall specify the over voltage level, and the associated recovery voltage hysteresis.*

Under over voltage conditions the operation of the FAS is expected to be in one of the following states:

- Not operational with, ideally, an overvoltage alarm indication,
- Operate normally with, ideally, an overvoltage alarm indication, this assumes the over voltage protection incorporates a DC voltage clamp.

4.4 Sign Operation and Control

The requirements in clause 3 of AS 4192 [2] apply for all signs, the following requirements for double-sided signs are in addition.

4.4.1 Lamp Switching Sequences

Clause 3.1 of AS 4192 [2] applies to both sides of the double-sided sign.

4.4.2 Provision for Fail-Safe Operation

In addition to clause 3.2 of AS 4192 [2] the front and rear signage shall be interlocked to prevent the signage from providing conflicting traffic direction, allowable displays as per Appendix A.
4.4.3 Operator Controls

Clause 3.1 of AS 4192 [2] applies to both sides of the double-sided sign. For clarity, the display for each side shall be independently controlled. In addition clause 4.4.2 of this specification applies.

4.5 Particular Requirement Vehicle-Mounted Signs

4.5.1 General

Vehicle mounted signs may be supplied as fixed or adjustable form.

4.5.2 Fixed Signs

Fixed signs are permanently mounted to the specific vehicle.

4.5.3 Adjustable Signs

Adjustable signs are for mounting on the cab of a vehicle. The sign shall be held firmly in either vertical or horizontal position.

4.5.3.1 Single-sided Sign

Single sided signs shall be pivoted and locked into any one of two orientations:

a) Vertical position either facing forward or to the rear;

b) Travelling position (horizontal, lamps facing down).

4.5.3.2 Double-sided Sign

The double-sided sign shall have signage on both front and rear. These front and rear signage shall be interlocked to prevent the signage from providing conflict traffic direction, with only allowable signage as per Appendix A.

Double sided signs shall be pivoted and locked into any one of two orientations:

a) Vertical Position;

b) Travelling position (horizontal, sign panel down).

4.5.3.3 Adjustable Signs Operation

The operation of the adjustable signs between the positions shall be an operator initiated automatic facility, to raise and lower the sign as required.

External cables shall be located and/or clamped so as to facilitate pivoting of the sign without placing undue strain on those cables.
4.6 Particular Requirement Trailer-Mounted Signs

4.6.1 Solar Panels Combined with Batteries

In addition to the requirements in AS 4192 [2], the Type C trailer mounted signs with solar panels shall be able to power the signs in conjunction with batteries for at least 72 hours. The solar panels shall have enough capacity to power the sign and charge the fully flat batteries in the same amount of time. The output charging current of solar panels shall be controlled by a regulator to avoid overcharging the batteries.

4.6.2 Single-Sided Sign

All Type C trailer mounted signs are single-sided signs.

4.7 Additional Environmental Requirements

4.7.1 General

In addition to the requirements in AS 4192 [2], the additional requirements are listed in the following clauses.

4.7.2 Anti-Shock & Vibration

The aspects and the LED optical modules shall withstand shock and vibration during transport and operation, including remaining aligned.

4.7.3 Enclosure Protection for LED Aspect

The LED aspect shall comply with the requirement to a protection degree of IP65 in accordance with AS 60529 [3].

4.7.4 Wind Loading

The FAS shall have adequate strength and rigidity for the wind loading conditions set down in AS/NZS 1170.2 for Terrain Category 1.5, Region B [1], with full consideration in the field and on vehicle.

5 QUALITY ASSURANCE AND CONTROL

5.1 Quality System

The Supplier and the manufacturer shall operate a quality management system complying with ISO 9001 [4], certified by an accredited quality management system certification body.

5.2 Quality Plan

The manufacturer shall document and provide a quality plan including details of quality control tests, sampling, and records to be made by the manufacturer during manufacture and release. A copy of this quality plan shall be provided to RMS as part of the approval process. Acceptance of this quality plan by RMS is a prerequisite to gaining overall approval.
5.3 Quality Audits

RMS reserves the right to examine the Manufacturer's quality records pertaining to an order that is on behalf or RMS. RMS also reserves the right to arrange for an independent quality audit concerning items in contract.

6 WARRANTY

Purchase of any items under this Specification shall be subject to a warranty period, to be confirmed by the Supplier. The length of warranty period after the despatch of products are:

a) Five years for each LED aspect. The light emitting of the LED module shall not fail or degrade from its initial specified value as specific in Section 2.1.3 and 2.1.5 of AS4192:2006 [2] by more than 25 percent after five years of operation in the field;

b) Two years for all other electro-mechanical components.

In order to facilitate checking of warranty claims, each sign shall be stamped or marked to show the date of despatch.
7 APPROVAL

7.1 Approval Process

To gain approval the Supplier shall follow the process defined in TS201 [5]. The Supplier shall submit the following documentation, as a minimum, in support of a submission for product approval via email to the ITS Help Desk: (ITSHelpDesk@rms.nsw.gov.au).

a) A clause-by-clause statement of compliance, and associated evidence, referenced to each compliance item, with this Specification and applicable sections of referenced standards;

b) Results of tests required in relevant Australian standards;

c) Datasheet(s) of the equipment, which shall include parameters of physical characteristics;

d) Wind loading calculation

e) A copy of the Manufacturer’s quality plan for the equipment. Evidence of third party certification of the Supplier and Manufacturer’s quality systems;

f) Any other documentation requested by RMS under the processes defined in TS201 [5];

g) A full description of techniques employed to achieve fail-safe operation;

h) Evidence of compliance with EMC statutory requirements (RCM);

i) A detailed description of all departures from the requirements of this specification;

j) If subsequently requested by RMS, the Supplier shall provide samples of equipment for evaluation as part of the approval process.

7.2 Type Approval Marking

After type approval has been issued, the Manufacturer or Selling Agent shall affix a durable marking plate in the following format:

```
This equipment conforms to
RMS - NSW TYPE APPROVAL
No. ..............................
Software version................
```

to each sign sold or to be used in the State of New South Wales. The number to be displayed would be the RMS Type Approval Certificate, with software version of the FAS.
Appendix A: Allowable Signage for Double-Sided Sign

Possible Valid FAS Displays

Lane

1  2  3  4  5  6

Note: Orientation of vehicle displays are appropriate for roads with less lanes