

# Roads

## Master Specification

### RD-EL-S3 Supply of LED Traffic Signal Lanterns

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## Document Amendment Record

Version	Change Description	Date	Endorsement record (KNet ref.)
1	Initial issue (formerly R54). Updated clauses for the evidence of compliance with AS 2144; added new requirements including Type Approval and AEMO load table; added list of Hold Points including response time; updated referencing.	2/7/19	

## Document Management

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## RD-EL-S3 Supply of LED Traffic Signal Lanterns

### 1 General

- 1.1 This Part details the requirements for the supply and delivery of LED traffic signal lanterns.
- 1.2 Documents referenced in this Part are listed below:
  - a) AS 2144 Traffic Signal Lanterns.
  - b) AS 2339 Traffic signal posts, mast arms and attachments.
  - c) AS/NZS 3100 Approval and Test Specification - General Requirements for Electrical Equipment.
  - d) AS/NZS 61000.6.1 Electromagnetic compatibility (EMC) - Generic standards - Immunity for residential, commercial and light-industrial environments.
- 1.3 Where this Part specifies a higher standard than that required by the above Australian Standards, the requirements of this Part will take precedence.

### 2 Technical Requirements

#### General

- 2.1 The technical requirements of the traffic signal lanterns shall be in accordance with AS 2144 or as stated otherwise in this Specification. Pedestrian lanterns shall be supplied fully assembled ready for installation.
- 2.2 The mounting straps referred to in AS 2144, Clause 4.1.2 shall have the following dimensions:
  - a) For 200 mm diameter vehicle lanterns: L = 120 mm, T = 5 mm.
  - b) For all other lanterns: L = 250 mm, T = 5 mm.

#### Arrow Displays

- 2.3 All aspects with arrow displays shall be supplied as "right turn" aspects and shall be capable of field adjustment of the arrow orientation in 45° increments using simple hand tools. The resulting orientation of the arrow display shall allow for LEFT, RIGHT, UP, DOWN and intermediate directions.

#### Lens

- 2.4 All lenses shall be marked to identify the orientation necessary to achieve the intensity distributions of AS 2144.

#### Doors

- 2.5 The doors shall be capable of being hinged both left and right without the need for tools. It shall also be possible, as a simple field procedure, to replace any door without the need to disturb the lantern mountings. Doors shall be keyed to prevent inadvertent rotation of any replaced doors and consequent disorientation of lenses.
- 2.6 Where lantern display is contained within the door, the Contractor shall make available an attachable non transparent cover to obscure the aspect display for maintenance purposes. This is to prevent the possible indication of conflicting displays when the lantern door is opened for maintenance. The doors shall be fitted with a removable locking device to prevent unauthorized or accidental opening of the doors when in service. For security purposes, removal of the locking device shall require the use of a hand tool.

## Built-In Transformers

- 2.7 Built-In Transformers shall comply with AS 2144 Clause 5.4. The efficiency of the transformer supplied for each type of lantern shall be stated.
- 2.8 The transformer connections and terminations shall be insulated and mechanically protected to provide safe working conditions for personnel engaged on lantern maintenance while lanterns are operating. Mounting facilities and electrical connections shall permit ready replacement of transformers in the field without the need to remove the lantern from its normal position.

## Segregation of Cabling

- 2.9 The cabling within the lanterns shall be arranged to provide full segregation between the low voltage and extra low voltage cables.

## Terminals for the Connection of supply Conductors

- 2.10 Terminals described in AS 2144 shall be provided and labelled as follows:
- a) Red signal active
  - b) Yellow signal active
  - c) Green signal active
  - d) Red signal neutral
  - e) Yellow signal neutral
  - f) Green signal neutral
  - g) Earth (if required)

## Visors

- 2.11 All necessary screws, pins, brackets, etc., necessary to attach the visors shall be provided by the Contractor.

# 3 Compliance and Type Approval

## Compliance With AS 2144

- 3.1 Submission of the evidence of compliance with AS 2144, including information to be provided in Table RD-EL-S3 3-1 shall constitute a **Hold Point**.

**Table RD-EL-S3 3-1 Evidence of compliance with AS 2144**

AS 2144 Requirement	Information to be Provided
Clause 2.1	Written statement of compliance
Clause 3.2	Diagram showing the LED layout pattern (for discrete LED technology)
Clause 3.4	Written statement of compliance Diagram showing the LED layout pattern (for discrete LED technology)
Clause 4.1.3	Statement and / or diagram showing method of removal
Clause 4.1.5	Written statement of compliance
Clause 4.2	Written statement detailing the mass of each lantern for 1, 2 and 3 aspect lanterns
Clause 5.3.1	Table showing compliance

AS 2144 Requirement	Information to be Provided
Clause 5.5	Description of method used for compliance with Clause 5.5.4 Table showing power consumption for each aspect in normal mode and shutdown mode. Table to be provided for: 200 mm disc and arrow lanterns 300 mm disc and arrow lanterns 200 mm pedestrian lanterns Written statement of compliance with Clause 5.5.6.2
Clause 5.6	LED Manufacturer's documentation in support of compliance
Clause 7.4	Written statement of compliance

## Compliance with AS 2144 (NATA Certification)

- 3.2 The evidence shall attest that the lanterns being offered comply with the following requirements of AS 2144 (refer to Table RD-EL-S3 3-2). Submission of the evidence of compliance from a testing facility (endorsed by the National Association of Testing Authorities, NATA, for the appropriate tests) shall constitute a **Hold Point**.

**Table RD-EL-S3 3-2 Evidence of compliance with AS 2144 (NATA Certification)**

AS 2144 Requirement	Information to be Provided
Table 2.1 and Figure 2.1	Tables and Figures showing compliance
Clause 3.3.2.1	Written statement of compliance
Table 3.1, 3.2, 3.3, 3.4, 3.5, 3.6	Tables showing compliance
Clause 3.5.2 and Table 3.7	Written statement of compliance Tables showing compliance (for 5 mm LEDs)
Clause 3.6	Written statement of compliance
Clause 3.7 and Table 3.8	Written statement of compliance Tables showing compliance (for 5 mm LEDs)
Clause 3.8	Written statement of compliance Tables showing compliance
Clause 3.9.1	Written statement of compliance Tables showing compliance
Clause 3.9.2	Written statement of performance
Clause 4.3	Written statement of compliance
Clause 4.6	Written statement of compliance
Clause 4.7	Written statement of compliance
Clause 4.8	Written test report
Clause 5.2	Written statement of compliance
Clause 5.5	Written Statements of compliance with Clause 5.5.2. Waveform diagrams of steady state supply current and voltage (as a reference) showing compliance with Clause 5.5.3.1. Waveform to be provided for 2 cycles of supply current incorporating 5 zero crossings. Written statement of compliance with Clause 5.5.6.1.
Clause 5.6.2	Written test report and graph indicating the LED drive current used for red, yellow and green LEDs verifying compliance
Clause 6.2	Graph showing compliance with Figure 6.1 Note: Preference will be given to Lanterns with the "linear dimming characteristic". DPTI expects to operate LED Lanterns at 170 volts when dimmed.
Clause 6.3	Tables showing compliance for conditions of full brightness and dimmed. The voltage for each state shall be recorded.
Clause 6.5	Written statement of compliance with respect to the transition between dimmed and undimmed.

- 3.3 Where a Contractor has access to its own NATA testing facility, verification evidence from a third party testing facility shall be provided for the 200 mm 3-aspect general purpose lantern and the pedestrian lantern in support of its own data.

## Additional Compliance (NATA Certification)

- 3.4 Evidence from a testing facility (endorsed by the National Association of Testing Authorities, NATA, for the appropriate tests) shall be submitted with the tender. The evidence shall attest that the lanterns being offered comply with the following requirements.

**Table RD-EL-S3 3-3 Evidence of Additional Compliance (NATA Certification)**

Requirement	Information to be Provided
Effect of temperature on lantern supply current for a 3-aspect 200 mm lantern	Graph indicating Supply Current vs Ambient Temperature from 20°C up to 50°C in 5°C increments (NOTE for ambient temperature of 50°C it is anticipated the LED module will be tested at 70°C). Note: The purpose of this test is to determine any potential adverse effects on current monitoring performed by traffic signal controllers.

## Type Approval

- 3.5 Traffic signal lanterns supplied as part of this Contract shall be approved by DPTI. For a list of traffic signal lanterns approved by DPTI refer to [https://www.dpti.sa.gov.au/data/assets/pdf\\_file/0012/330105/DPTI\\_Approved\\_Products\\_Contract\\_Works.pdf](https://www.dpti.sa.gov.au/data/assets/pdf_file/0012/330105/DPTI_Approved_Products_Contract_Works.pdf).
- 3.6 If product type approval has been granted by other state road authority, the Contractor may submit a request to DPTI for the supply of traffic signal lanterns which are not currently on the DPTI Approved product list. The submission of the Type Approval Certificate issued by other state road authority shall constitute to a **Hold Point**.

## 4 Australian Energy Market Operator (AEMO) – NEM Load Table

- 4.1 Due to unmetered supply connection for traffic signals in South Australia, LED Traffic Signal Lanterns supplied shall be included in the NEM Load Tables. Refer to Australian Energy Market Operator (AEMO) approved load tables for unmetered connection point. [https://www.aemo.com.au/-/media/Files/Electricity/NEM/Retail\\_and\\_Metering/Metering-Procedures/NEM-Load-Tables-For-Unmetered-Connection-Points.pdf](https://www.aemo.com.au/-/media/Files/Electricity/NEM/Retail_and_Metering/Metering-Procedures/NEM-Load-Tables-For-Unmetered-Connection-Points.pdf). The submission of the evidence of AEMO load table shall constitute to a **Hold Point**.

## 5 Product Support

- 5.1 The Contractor shall maintain a sufficient stock of all custom-made components and all of those which are not readily available from commercial sources. Availability of spare parts shall be maintained for at least 10 years following the last purchase date.
- 5.2 A comprehensive “catalogue” listing of all lantern components shall be provided inclusive of part numbers and price for quantities of 1, 10 and 50.

## 6 Installation of Spare Parts

- 6.1 The Contractor shall submit details and installation methods of any lantern spare parts.

## 7 Compatibility with Traffic Signal Controller

- 7.1 The lanterns shall be compatible with traffic signal controllers used in South Australia. In addition there shall be no adverse effect of mixing lanterns from different contractors on the same circuit.
- 7.2 Compatibility shall be required for the following makes of Traffic Signal Controller:
- ATC ATSC4 Controller.
  - Tyco Eclipse Controller.

- c) Tyco PSC Controller.
  - d) QTC Advanced Traffic Controller.
- 7.3 All Lanterns shall be capable of satisfactory operation when used with any brand of Controller.
- 7.4 Non-complying lanterns will not be approved for use.
- 7.5 The Contractor shall ensure ongoing compatibility of lanterns installed in field conditions irrespective of the findings of these tests.

## 8 Environmental Considerations

### Lanterns Removed From Service

- 8.1 The Contractor shall provide details of proposed recycling methods for dealing with obsolete lanterns removed from service. Environmental impact of such work shall be provided. Proposed methods of disposal shall be detailed in the attached Schedule for Disposal of Obsolete Traffic Signal Lanterns.

### LED Lanterns

- 8.2 The Contractor shall provide details of proposed recycling methods for dealing with end of life LED lanterns. Hazardous substances and any disposal precautions shall be provided.

## 9 Safe Handling Considerations

- 9.1 The Contractor shall provide details of all safe handling requirements and or procedures associated with installation and maintenance of LED lanterns. This shall be made available in electronic format for reproduction by DPTI in a single A4 sheet format suitable for laminating and use in the field.

## 10 Modifications to Lanterns

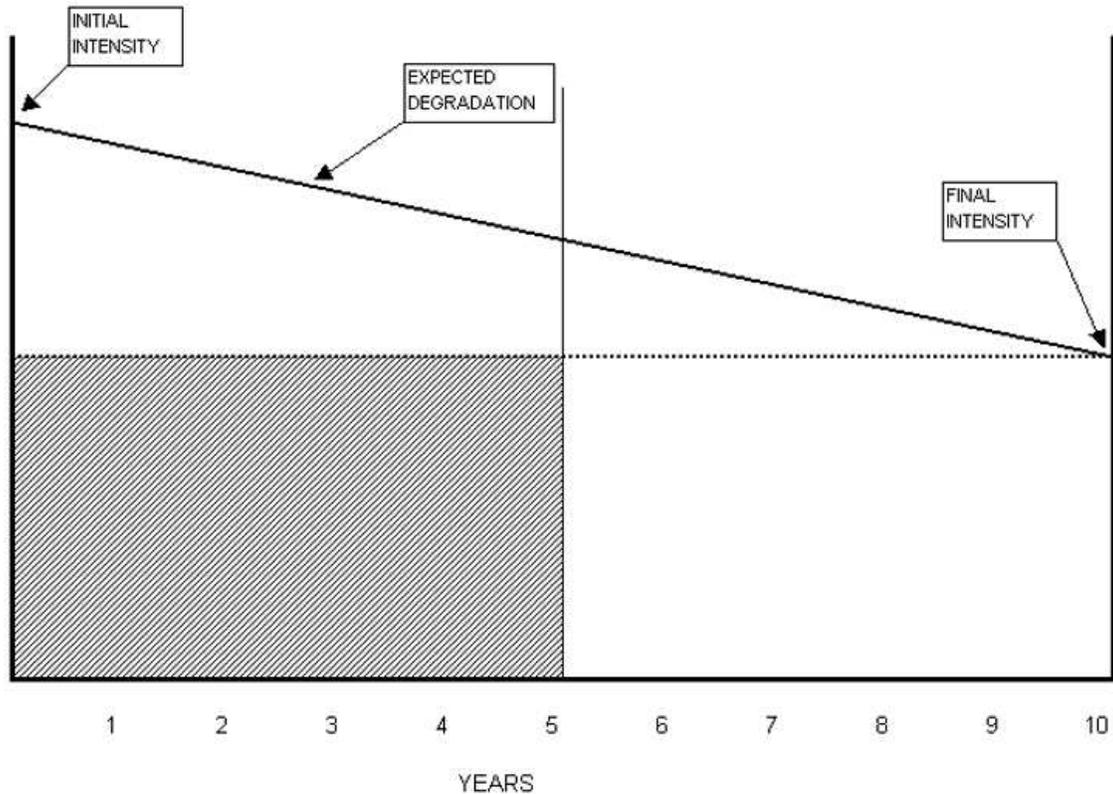
- 10.1 If the Contractor makes any changes to the design of manufacture of lanterns, the Contractor shall submit the new lanterns with appropriate certification for the Principal to perform compatibility testing as detailed in Clause 7.
- 10.2 300 mm Extended Range Discs and arrows shall be supplied in 3-aspect lantern housings with the door of the unused aspect(s) blanked out with a material that matches the lantern door finish. Sealing of the optical system of the unused aspect shall not affect the performance in any way.

## 11 Warranty

- 11.1 The Contractor shall provide a warranty period of 5 years for the lantern electrical and optical components and 10 years for the lantern body and all mechanical components following the date of installation.
- 11.2 Warranty of the optical system shall cover:
- a) catastrophic failure of any lantern aspect; and
  - b) any failure of a lantern aspect, which enters the shutdown mode as described in AS 2144, Clause 5.5.4.
- 11.3 The Contractor shall provide a Warranty against the degradation of the light output over the expected life of the various lantern aspects supplied under this Contract.
- 11.4 Warranty against degradation shall be as follows:
- a) any lantern aspect falling below the final expected intensity prior to the 5 year period shall be replaced; and
  - b) any lantern aspect falling between the Expected Degradation and the Final Intensity period shall result in pro-rata cost recovery from the Contractor.

11.5 This Warranty is show in Figure RD-EL-S3 11-1.

**Figure RD-EL-S3 11-1 Warranty against Intensity Loss**



- 11.6 Any equipment failing In Service, or found to be defective within the warranty period, will be returned to the Contractor who shall make good the defect or arrange to have the defect made good, and have the equipment returned to the Principal.
- 11.7 During the warrant period, no more than 5% out of total number of lanterns procured shall fail in any given 30 day period. Failure rates in excess of this shall require the Contractor to undertake all associated field works until the problem is rectified.
- 11.8 Defective equipment shall be processed and returned within 30 calendar days from the date of receipt.
- 11.9 All costs associated with warranty claims shall be at no charge to the Principal, unless otherwise agreed.
- 11.10 Any equipment failing as a result of a traffic accident, abuse or act of vandalism after delivery shall not be covered by the warranty provisions.
- 11.11 In order to facilitate checking of warranty claims, each lantern shall be stamped or marked to show the date of manufacture. Each lantern aspect shall be stamped or marked to show the serial number and date of manufacture of the transformer and LED assembly including power supply.

## 12 Certificate of Suitability

- 12.1 The Contractor shall obtain a "Certificate of Suitability" for the complete signal lantern to ensure that the equipment meets minimum electrical safety requirements. The Certificate shall be issued by Electrical Regulatory Authorities Council (ERAC). Submission of the Certificate shall constitute a Hold Point.
- 12.2 Once a "Certificate of Suitability" is issued, it shall be the Contractor's responsibility to ensure that the lantern complies with any subsequent amendments to State Regulations and Australian Standard

Specifications relative to electrical safety. If the design of the equipment is changed, the Contractor shall have the "Certificate of Suitability" endorsed accordingly and a copy forwarded immediately to the Superintendent.

- 12.3 The approval number shown on the "Certificate of Suitability" shall be shown on the marking plate required by AS 3100, Section 7 "Approval and Test Specification – General Requirements for Electrical Equipment".

## 13 Immunity to Electromagnetic Interference

- 13.1 Test specified in Clause 5.5.6.1 of AS 2144 shall be performed and all applicable performance criteria met.

## 14 Hold Points

- 14.1 The following is a summary of Hold Points referenced in this Part:

Document Ref.	Hold Point	Response Time
3.1	The evidence of compliance with AS 2144, including information to be provided in Table RD-EL-S3 3-1.	5 Working days
3.2	NATA test facility report showing the evidence that the lanterns being offered comply with the requirements of AS 2144 (refer to Table RD-EL-S3 3-2).	5 working days
3.6	Type Approval Certificate issued by other state road authority. This Hold Point is applicable only if the lanterns to be supplied are not already in DPTI Approved Product list	5 working days
4.1	The evidence of lanterns to be supplied are included in the AEMO load table	5 working days
12.1	Submission of the Certificate of Suitability for electrical safety requirements	5 working days