

Master Specification

Part RD-EL-S3

Supply of LED Traffic Signal Lanterns

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Government of South Australia
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RD-EL-S3 Supply of LED Traffic Signal Lanterns

1 General

- a) This Master Specification Part sets out the requirements for the supply of LED traffic signal lanterns, including:
 - i) the documentation requirements, as set out in section 2;
 - ii) the technical requirements, as set out in section 3;
 - iii) the compliance and type approval requirements, as set out in section 4;
 - iv) the product support requirements, as set out in section 5;
 - v) the installation instructions for replacement parts, as set out in section 6;
 - vi) the requirements for compatibility with traffic signal controller, as set out in section 7;
 - vii) the environmental considerations, as set out in section 8;
 - viii) the safe handling considerations, as set out in section 9;
 - ix) the warranty requirements, as set out in section 10;
 - x) the requirements regarding certificate of sustainability, as set out in section 11; and
 - xi) the verification requirements and records, as set out in section 12.
- b) The supply of LED traffic signal lanterns must comply with the Reference Documents, including:
 - i) AS 2144 Traffic signal lanterns; and
 - ii) AS/NZS 3100 Approval and test specification - General requirements for electrical equipment.

2 Documentation

2.1 Construction Documentation

In addition to the requirements of PC-CN3 “Construction Management”, the Construction Documentation must include:

- a) evidence of compliance with AS 2144 Traffic signal lanterns, as required by sections 4.1 and 4.2; and
- b) evidence of compliance with the AEMO’s requirements with respect to national electricity market loads, as required by section 4.3b).

2.2 Quality Management Records

In addition to the requirements of PC-QA1 “Quality Management Requirements” or PC-QA2 “Quality Management Requirements for Major Projects” (as applicable), the Quality Management Records must include:

- a) a certificate of suitability for each variant of LED traffic signal lantern, certifying that the equipment meets the minimum electrical safety requirements issued by the Electrical Regulatory Authorities Council, as required by section 11 (EESS - electrical equipment safety scheme - “C-Tick” logo); and
- b) the verification requirements and records required by section 12.

2.3 Maintenance Plan

In addition to the requirements of PC-CN2 “Asset Handover”, the Maintenance Plan must include:

- a) a catalogue listing of all LED traffic signal lantern components supplied pursuant to this Master Specification Part, including part numbers and pricing for quantities of 1, 10 and 50 increments, as required by section 5c);
- b) details and installation methods of any LED traffic signal lantern spare parts, as required by section 6;
- c) details of the treatment of damaged or obsolete traffic signal lanterns as required by section 8; and
- d) details of all safe handling requirements and procedures associated with the installation and maintenance of LED traffic signal lanterns, as required by section 9.

3 Technical requirements

3.1 General

In relation to the supply of LED traffic signal lanterns, the Contractor must ensure that:

- a) all LED traffic signal lanterns comply with the requirements of AS 2144 Traffic signal lanterns;
- b) for the purposes of AS 2144 Traffic signal lanterns, LED traffic signal lantern mounting straps have the following dimensions:
 - i) for 200 mm diameter vehicle lanterns:
 - A. length = 120 mm; and
 - B. thickness = 5 mm; and
 - ii) for all other lanterns:
 - A. length = 250 mm; and
 - B. thickness = 5 mm;
- c) where a 3 aspect lantern is supplied with fewer than 3 active displays (e.g. the 3 aspect body houses a red arrow only) the unused aspects must be blanked out with a material that matches the lantern door finish; and
- d) sealing of the optical system of the unused aspect does not affect the performance of the LED traffic signal lantern in any way.

3.2 Arrow displays

The Contractor must ensure that all LED traffic signal lantern aspects with arrow displays formed by an adjustable mask over a disc display are:

- a) supplied as right turn aspects; and
- b) capable of field adjustment of the arrow orientation in 45° increments using simple hand tools, such that the resulting orientation of the arrow display allows for left, right, up, down, and intermediate directions.

3.3 Lens

The Contractor must ensure that all LED traffic signal lantern lenses are marked to identify the orientation necessary to achieve the intensity distributions required by AS 2144 Traffic signal lanterns.

3.4 Doors

- a) The Contractor must ensure that LED traffic signal lantern display doors:
 - i) are capable of being hinged both left and right without the need for tools;
 - ii) can be replaced as a simple field procedure, without the need to disturb the LED traffic signal lantern mountings;
 - iii) are keyed to prevent inadvertent rotation of any replaced doors and consequent disorientation of lenses; and
 - iv) are fitted with a removable locking device to prevent unauthorised or accidental opening of doors when in service.
- b) The Contractor must ensure that the locking device required in section 3.4a)iv) can only be removed with the use of a hand tool.
- c) Where the LED traffic signal lantern display is contained within the hinged door, the Contractor must provide an attachable, non-transparent cover to obscure the aspect display for maintenance purposes.

3.5 Segregation of cabling

The Contractor must ensure that the cabling within the LED traffic signal lanterns is arranged to provide full segregation between any LV and ELV cables.

3.6 Terminals for the connection of supply conductors

The Contractor must ensure that terminals for the connection of supply conductors within the LED traffic signal lanterns, as described in AS 2144 Traffic signal lanterns, are 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; and
- g) earth (if required).

3.7 Visors

The Contractor must provide all necessary screws, pins, brackets and associated equipment as necessary to attach the visors to the LED traffic signal lanterns.

4 Compliance and type approval

4.1 Compliance with AS 2144 Traffic signal lanterns

The Contractor must submit evidence of compliance with AS 2144 Traffic signal lanterns, including information specified as needing to be provided in Table RD-EL-S3 4-1, as part of the Construction Documentation.

Table RD-EL-S3 4-1 Evidence of compliance with AS 2144 Traffic signal lanterns

AS 2144 Traffic signal lanterns reference	Information to be provided
Section 2.1	Written statement of compliance with light colour of each aspect to table 2.1.
Section 3.2	Diagram showing the LED layout pattern (for discrete LED technology).
Section 3.4	a) Written statement of compliance with clause 7.4 - Display of Symbols; and b) diagram showing the LED layout pattern for symbolic displays (for discrete LED technology).
Section 4.1.3	Statement or diagram showing method of access/removal of optical display
Section 4.1.5	Written statement of compliance with dimensions of lanterns.
Section 4.2	Written statement detailing the mass of each lantern for 1, 2 and 3 aspect lanterns.
Section 5.3.1	Table showing compliance of supply conductors.
Section 5.5	a) Description of method used for compliance with section 5.5.4 of AS 2144 Traffic signal lanterns; b) table showing power consumption for each aspect in normal mode and shutdown mode, to be provided for: i) 200 mm disc and arrow lanterns; ii) 300 mm disc and arrow lanterns; and iii) 200 mm pedestrian lanterns; and c) written statement of compliance with section 5.5.6.2 of AS 2144 Traffic signal lanterns.
Section 5.6	LED manufacturer's documentation in support of compliance with LED derating, drive current and design service life.
Section 7.4	Written statement of compliance with symbol display dimensions.

4.2 Compliance with AS 2144 Traffic signal lanterns (NATA certification)

- a) The Contractor must submit evidence of compliance from a NATA accredited testing facility that the LED traffic signal lanterns provided by the Contractor satisfy the requirements set out in Table RD-EL-S3 4-2 and Table RD-EL-S3 4-3, as part of the Construction Documentation.
- b) Where the Contractor has access to its own NATA accredited testing facility, verification evidence must be obtained from an independent NATA accredited testing facility for the 200 mm 3-aspect general purpose vehicle lantern and the 200 mm pedestrian lantern in support of the Contractor's own data.

Table RD-EL-S3 4-2 Evidence of compliance with AS 2144 Traffic signal lanterns (NATA certification)

AS 2144 Traffic signal lanterns reference	Certification to be provided
Table 2.1 and Figure 2.1	Tables and figures showing compliance with light colour of each aspect to table 2.1
Section 3.3.2.1	Written statement of compliance with the measurement of luminous intensities
Tables 3.1, 3.2, 3.3, 3.4, 3.5, 3.6	Tables showing compliance
Section 3.5.2 and Table 3.7	a) Written statement of compliance with display luminance; and b) tables showing compliance (for 5 mm LEDs).
Section 3.6	Written statement of compliance with symbolic pedestrian and bicycle aspects
Section 3.7 and Table 3.8	a) Written statement of compliance with luminance distribution of pedestrian and bicycle aspects; and b) tables showing compliance (for 5 mm LEDs).

AS 2144 Traffic signal lanterns reference	Certification to be provided
Section 3.8	a) Written statement of compliance with veiling reflection requirements; and b) tables showing compliance.
Section 3.9.1	a) Written statement of compliance with sun phantom requirements; and b) tables showing compliance with sun phantom requirements.
Section 3.9.2	Written statement of performance of removeable anti sun-phantom devices
Section 4.3	Written statement of compliance with sealing of the optical system
Section 4.6	Written statement of compliance with weather resistance requirements
Section 4.7	Written statement of compliance with operating temperature requirements
Section 4.8	Written test report of environmental test results
Section 5.2	Written statement of compliance with supply voltage requirements
Section 5.5	a) Written statements of compliance with section 5.5.2 of AS 2144 Traffic signal lanterns section reference; b) waveform diagrams of steady state supply current and voltage (as a reference) showing compliance with section 5.5.3.1 "current waveform" of AS 2144 Traffic signal lanterns section reference - waveform to be provided for 2 cycles of supply current incorporating 5 zero crossings; and c) written statement of compliance with section 5.5.6.1 electromagnetic immunity of AS 2144 Traffic signal lanterns section reference.
Section 5.6.2	Written test report and graph indicating the LED drive current used for red, yellow, and green LEDs verifying compliance
Section 6.2	Graph showing compliance with Figure 6.1 Light Output States of AS 2144 Traffic signal lanterns
Section 6.3	Tables showing compliance for conditions of full brightness and dimmed Signal switching response times. The voltage of each state must be recorded
Section 6.5	Written statement of compliance with respect to the transition between dimmed and undimmed - dimming of aspects

Table RD-EL-S3 4-3 Evidence of additional compliance (NATA certification)

Requirement	Information to be provided
Effect of temperature on lantern supply current for a 3-aspect 200 mm traffic signal lantern	A graph and associated data table for each aspect indicating load current versus ambient temperature from 20°C up to 70°C in 5°C increments.

4.3 Type approval

- a) The Contractor must ensure that all supplied LED traffic signal lanterns are listed on the Department Approved Products List.
- b) The Contractor must:
 - i) ensure that the brand and model number or version of LED traffic signal lanterns supplied are included in the AEMO National Electricity Market Load Table;

- ii) comply with all AEMO requirements, including approved load tables for unmetered connection points; and
- iii) submit evidence of compliance with this section as part of the Construction Documentation.

5 Product support

In relation to LED traffic signal lantern product support, the Contractor must provide from the lantern supplier:

- a) assurance that spare parts will be available from the supplier for at least 10 years following Completion, which must include written assurance from the supplier that the lantern types will be supported over this period;
- b) assurance that any updated or redesigned spare parts for the LED traffic signal lanterns are compatible with the originally supplied LED traffic signal lanterns; and
- c) as part of the Maintenance Plan, a comprehensive catalogue listing of all LED traffic signal lantern components supplied pursuant to this Master Specification Part, including:
 - i) part numbers; and
 - ii) price for quantities of 1, 10 and 50 increments.

6 Installation instructions for replacement parts

The Contractor must submit details and installation methods for the installation of replacement parts for LED traffic signal lanterns, as part of the Maintenance Plan.

7 Compatibility with traffic signal controller

The supplied LED traffic signal lanterns must comply with the following:

- a) lanterns must be compatible with TfNSW Specification TSI-SP-069 compliant traffic signal controllers, including installed software and firmware which may be specific to South Australia;
- b) there must be no adverse effect of mixing LED traffic signal lanterns from different suppliers on the same circuit; and
- c) lanterns must be compatible with all approved traffic signal controllers listed on the Department Approved Products List.

8 Environmental considerations

The Contractor must provide details of the proposed recycling methods (including any environmental impacts resulting from these methods) for dealing with damaged or obsolete LED traffic signal lanterns removed from service (or otherwise at their end of life), as part of the Maintenance Plan.

9 Safe handling considerations

The Contractor must provide details of all safe handling requirements and procedures associated with the installation and maintenance of the supplied LED traffic signal lanterns, as part of the Maintenance Plan.

10 Warranty

For the purposes of PC-CN3 "Construction Management", the Contractor must:

- a) provide the following warranties for all LED traffic signal lanterns, commencing on the date of commissioning:

- i) 5 years for electrical and optical components; and
- ii) 10 years for lantern bodies and mechanical components;
- b) ensure that the warranty of the LED traffic signal lantern electrical and optical components required by section 10a)i) includes:
 - i) catastrophic failure of any lantern aspect;
 - ii) any failure of a lantern aspect, which enters the shutdown mode as described in AS 2144 Traffic signal lanterns; and
 - iii) any degradation in the luminous intensity within a 5-year period of operation that exceeds the degradation limits outlined in AS 2144 Traffic signal lanterns, including Appendix E; and
- c) ensure that:
 - i) LED traffic signal lanterns are stamped or marked to show the date of manufacture; and
 - ii) LED traffic signal lantern aspects are stamped or marked to show the serial number and date of manufacture of the LED assembly.

11 Certificate of suitability

The Contractor must:

- a) obtain a certificate of EESS suitability for the complete LED traffic signal lantern certifying that the LED traffic signal lantern meets the minimum electrical safety requirements;
- b) ensure the certificate of EESS suitability is issued by the Electrical Regulatory Authorities Council and provide the certificate as part of the Quality Management Records; and
- c) ensure that the approval number shown on the certificate of suitability is shown on the marking plate of the relevant LED traffic signal lantern in accordance with AS/NZS 3100 Approval and test specification - General requirements for electrical equipment.

12 Verification requirements and records

The Contractor must supply written verification as part of the Quality Management Records that the requirements listed in Table RD-EL-S3 12-1 have been complied with.

Table RD-EL-S3 12-1 Verification requirements

Subject	Property	Record
LED traffic lantern compliance	NATA testing certificate	Evidence from a NATA accredited testing facility that the LED traffic signal lanterns provided by the Contractor satisfy the requirements of this Master Specification Part.