

# Master Specification

## Part RD-EL-S1

### Supply of Luminaires and Lighting Components

September 2024



**Government of South Australia**  
Department for Infrastructure  
and Transport

**Build.**  
**Move.**  
**Connect.**

## Document Information

| Document Information |            |
|----------------------|------------|
| K Net Number:        | 12744818   |
| Document Version:    | 2          |
| Document Date:       | 30/09/2024 |

## Document Amendment Record

| Version | Change Description  | Date       |
|---------|---|------------|
| 0       | Initial issue   | 31/08/2023 |
| 1       | Update to amend terminology – change “Asset Data Collection Manual” to “Asset Data Collection Standard” | 31/01/2024 |
| 2       | Updated cover page  | 30/09/2024 |

## Document Management

This document is the property of the Department and contains information that is confidential to the Department. It must not be copied or reproduced in any way without the written consent of the Department. This is a controlled document and it will be updated and reissued as approved changes are made.

# Contents

|   |    |
|---|----|
| Contents  | 3  |
| RD-EL-S1 Supply of Luminaires and Lighting Components | 4  |
| 1 General   | 4  |
| 2 Documentation                                       | 6  |
| 3 Supply requirements                                 | 6  |
| 4 Verification requirements and records               | 15 |

---

## RD-EL-S1 Supply of Luminaires and Lighting Components

### 1 General

- a) This Master Specification Part sets out the requirements for the supply of luminaires and lighting components (excluding Tunnel lighting and underpass lighting), including:
  - i) the documentation requirements, as set out in section 2;
  - ii) the supply requirements, as set out in section 3, including:
    - A. requirements for the supply of electrical components, as set out in section 3.1;
    - B. requirements for the supply of light poles, as set out in section 3.2; and
    - C. requirements for the supply of luminaires, as set out in section 3.3; and
  - iii) the verification requirements and records, as set out in section 4.
- b) This Master Specification Part does not apply to the supply of:
  - i) Tunnel lighting systems or underpass lighting systems (which are otherwise addressed in TUN-ME-DC3 “Tunnel Carriageway and Underpass Lighting”);
  - ii) smart lighting control systems;
  - iii) electrical switchboards (which are otherwise addressed in RD-ITS-S2 “Roadside Electrical Switchboards” and TUN-ME-DC4 “Tunnel Equipment Cabinets”);
  - iv) pits and conduits (which are otherwise addressed in RD-EL-D3 “Conduit Design for Road Lighting, Traffic Signals and ITS” and RD-EL-C3 “Supply and Installation of Conduits and Pits”); or
  - v) the lighting of public transport interchanges, railway stations or railway infrastructure.
- c) The supply of luminaires and lighting components must comply with the Reference Documents, including:
  - i) AASHTO Manual for Assessing Safety Hardware (MASH);
  - ii) AEMO National Electricity Market Load Tables for Unmetered Connection Points;
  - iii) AGRD Part 6A: Paths for Walking and Cycling;
  - iv) AGRD Part 6B: Roadside Environment;
  - v) AS 1627 Metal finishing - Preparation and pretreatment of surfaces;
  - vi) AS 1798 Lighting poles and bracket arms - Recommended dimensions;
  - vii) AS 2339 Traffic signal posts, mast arms and attachments;
  - viii) AS 4100 Steel structures;
  - ix) AS/NZS ISO 9001 Quality management systems - Requirements;
  - x) AS/NZS 1158 Lighting for roads and public spaces;
  - xi) AS/NZS 1768 Lightning protection;
  - xii) AS/NZS 1170 Structural design actions;
  - xiii) AS/NZS 1214 Hot-dip galvanised coatings on threaded fasteners (ISO metric coarse thread series);
  - xiv) AS/NZS 1252 High-strength steel fastener assemblies for structural engineering - Bolts, nuts and washers;

- xv) AS/NZS 1554 Structural steel welding;
  - xvi) AS/NZS 1594 Hot-rolled steel flat products;
  - xvii) AS/NZS 2053 Conduits and fittings for electrical installations;
  - xviii) AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules);
  - xix) AS/NZS 3008 Electrical installations - Selection of cables;
  - xx) AS/NZS 3678 Structural steel - Hot-rolled plates, floorplates and slabs;
  - xxi) AS/NZS 3679 Structural steel;
  - xxii) AS/NZS 3845 Road safety barrier systems and devices;
  - xxiii) AS/NZS 4282 Control of the obtrusive effects of outdoor lighting;
  - xxiv) AS/NZS 4600 Cold-formed steel structures;
  - xxv) AS/NZS 4676 Structural design requirements for utility service poles (as withdrawn);
  - xxvi) AS/NZS 4677 Steel utility service poles;
  - xxvii) AS/NZS 4680 Hot-dip galvanized (zinc) coatings on fabricated ferrous articles;
  - xxviii) AS 60529 Degrees of protection provided by enclosures (IP Code);
  - xxix) AS/NZS 60598 Luminaires;
  - xxx) AS/NZS 61000 Electromagnetic compatibility (EMC);
  - xxxi) ANSI/IES LM-79-19 Approved method - Optical And Electrical Measurements Of Solid-State Lighting Products;
  - xxxii) Air Services Australia - Developments at and around airports;
  - xxxiii) Department Asset Data Collection Standard (AM-PRC-005);
  - xxxiv) Department Operational Instruction 20.25 Energy Management for Electrical Assets (available from: [https://dit.sa.gov.au/standards/standards\\_and\\_guidelines](https://dit.sa.gov.au/standards/standards_and_guidelines));
  - xxxv) Department Electrical Services: Presentation & Technical Review Checklist (available from: [https://dit.sa.gov.au/standards/standards\\_and\\_guidelines](https://dit.sa.gov.au/standards/standards_and_guidelines));
  - xxxvi) Department Standard Drawing S-4055;
  - xxxvii) IEC 62262 Degrees of Protection Provided by Enclosures for Electrical Equipment Against External Mechanical Impacts (IK Code);
  - xxxviii) IES LM80-08 Approved method for measuring lumen maintenance of LED Light Sources;
  - xxxix) IES TM-21 Projecting long term lumen maintenance of LED Light sources; and
  - xl) SAPN Public Lighting Tariff Manual No. 21.
- d) For the avoidance of doubt, light pole structure design must comply with the requirements of AS/NZS 4676 Structural design requirements for utility service poles, even though the Reference Document has been withdrawn from Standards Australia.
- e) For the purposes of this Master Specification Part and related Reference Documents, the terms 'energy-absorbing' and 'impact-absorbing' have the same meaning when referring to light poles.

## 2 Documentation

### 2.1 Design Documentation

In addition to the requirements of PC-EDM1 “Design Management”, the Design Documentation must include:

- a) details of light poles not forming part of the Department Approved Products List (where applicable), as required by section 3.2.1b);
- b) details of luminaires not forming part of the Department Approved Products List (where applicable), as required by section 3.3b); and
- c) the luminaire information, as required by section 3.3c).

### 2.2 Construction Documentation

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

- a) evidence that the road lighting poles comply with the requirements of section 3.2.2a);
- b) the information regarding light poles, as required by section 3.2.2b);
- c) evidence of compliance with the requirements of section 3.2.2c), including structural design calculations; and
- d) the crash test report required by section 3.2.8g).

### 2.3 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) the verification records required by section 4; and
- b) road lighting asset data to be recorded in accordance with:
  - i) agreed asset management systems;
  - ii) Department Asset Data Collection Standard (AM-PRC-005); and
  - iii) PC-EDM5 “Digital Engineering”.

## 3 Supply requirements

### 3.1 Supply of electrical components

#### 3.1.1 General

The Contractor must ensure that the supply of electrical components used for the support of road lighting and signalling equipment complies with the requirements of this section 3.1.

#### 3.1.2 Switchgear and switchboard lighting components

The Contractor must ensure that all switchgear and switchboard lighting components forming part of the road lighting system and associated electrical infrastructure comply with the following:

- a) switchgear and switchboard lighting components must be provided in accordance with the Design Documentation and the Department Standard Drawings; and
- b) for new installations, type C miniature circuit breakers must be used for distribution sub-circuits.



### 3.1.3 Electrical cables

The Contractor must ensure that all electrical cables forming part of the road lighting system and associated electrical infrastructure comply with the following:

- a) electric distribution cable must be sheathed multi-strand copper core with V-90 thermoplastic or X90 XLPE insulation;
- b) active and neutral distribution cables must be single, double-insulated and have a minimum cross sectional area of 6 mm<sup>2</sup>;
- c) earth cables which are not bundled must be single insulated, green/yellow and have a minimum cross sectional area of 6 mm<sup>2</sup>;
- d) bundled earth cables must comply with the requirements of AS/NZS 5000.1 Electric cables - Polymeric insulated - For working voltages up to and including 0.6/1 (1.2) kV;
- e) consumer main and sub-main supply cable must be sheathed multi-strand copper core with V-90 thermoplastic or X-90 XLPE insulation;
- f) supply cable conductor cross sectional area must be a minimum of 16 mm<sup>2</sup> and must comply with AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) and AS/NZS 3008 Electrical installations - Selection of cables requirements for distribution circuits; and
- g) electrical cables must be rated for use in underground conduits and comply with the requirements of:
  - i) AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules); and
  - ii) in relation to distribution circuits, AS/NZS 3008 Electrical installations - Selection of cables.

## 3.2 Supply of light poles

### 3.2.1 General

- a) The Contractor must ensure that the supply of light poles for the road lighting system complies with the requirements of this section 3.2.
- b) Lighting poles which are on the Department Approved Products List must be supplied. Where the Contractor proposes to supply lighting poles which are not on the Department Approved Products List, the Contractor must submit details of the proposed alternative light poles to the Principal as part of the Design Documentation, including details evidencing how the proposed light poles comply with the requirements of this Master Specification Part.

### 3.2.2 Light poles

The Contractor must ensure that:

- a) the supplied road lighting poles satisfy the following, and provide evidence of such compliance as part of the Construction Documentation:
  - i) the light poles must be perpendicular to the base plate within a tolerance of 0.25°;
  - ii) the requirements of AS/NZS 4676 Structural design requirements for utility service poles for strength and serviceability;
  - iii) the requirements of AS/NZS 1170.2 Structural design actions for terrain category 2 winds;
  - iv) loading from luminaire of up to the maximum mass limit in accordance with AS/NZS 1158.6 Lighting for roads and public spaces - Luminaires and a projected wind area of 0.2 m<sup>2</sup>; and
  - v) under serviceability limit state:

- A. the dynamic deflection of the pole from vertical position must not exceed 4% of vertical section height; and
  - B. the deflection of the outreach must not exceed 4% of the nominal horizontal outreach length;
- b) the Construction Documentation includes the following:
- i) evidence of compliance with section 3.2.2a);
  - ii) Shop Drawings including welding details for every type of road lighting pole;
  - iii) drawings detailing approved pile footing and the high strength anchor bolts;
  - iv) evidence of compliance with the crash testing requirements of:
    - A. AS/NZS 1158 Lighting for roads and public spaces;
    - B. AS/NZS 3845.2 Road safety barrier systems and devices - Road safety devices; and
    - C. section 3.2.8; and
  - v) road lighting pole design drawings with all associated equipment (door, panel mounting straps, brackets, bolts and washers); and
- c) all road lighting poles forming part of the road lighting system comply with the following:
- i) poles and associated components must be manufactured under a quality system certified to AS/NZS ISO 9001 Quality management systems - Requirements;
  - ii) all road lighting poles must comply with the requirements of:
    - A. AS/NZS 4676 Structural design requirements for utility service poles;
    - B. AS/NZS 1170.2 Structural design actions - Wind actions; and
    - C. this section 3.2.2,and the Contractor must provide evidence of such compliance to the Principal as part of the Construction Documentation, including structural design calculations (where not previously provided);
  - iii) all lighting components must be manufactured to comply with the requirements AS 1798 Lighting poles and bracket arms - Recommended dimensions;
  - iv) as part of the Construction Documentation, the Contractor must provide pole design drawings with all associated equipment (door, panel mounting straps, brackets, bolts and washers);
  - v) with the exception of combination mast arm poles, road lighting pole columns are supplied assembled as one section;
  - vi) for gooseneck poles:
    - A. the taper on the outreach is uniform from the tip to the lower extremity of the outreach;
    - B. the taper of the outreach is similar to that of the vertical portion of the column, so that the transition from the vertical to the curved outreach is smooth and continuous;
    - C. bends are free of kinks and ripples in excess of 2 mm in amplitude; and
    - D. the straight end section of the outreach is horizontal when a 10 kg luminaire is attached;
  - vii) for poles with square base plates, one side of the base plate is at right angles to the outreach;



- viii) road lighting columns and the outreaches must have a minimum wall thickness of 3 mm;
- ix) all frangible poles must comply with the requirements of:
  - A. AS/NZS 1158 Lighting for roads and public spaces;
  - B. AS/NZS 3845.2 Road safety barrier systems and devices - Road safety devices; and
  - C. for energy-absorbing poles, section 3.2.8;and the Contractor must provide evidence of such compliance to the Principal as part of the Construction Documentation;
- x) for slip-base poles:
  - A. crash testing is not required; and
  - B. evidence of compliance with the requirements of Department Standard Drawing S-4055, sheet 39 must be provided to the Principal as part of the Construction Documentation;
- xi) energy-absorbing poles must be crash tested in accordance with the requirements of:
  - A. AS/NZS 1158 Lighting for Roads and Public Spaces;
  - B. AS/NZS 3845.2 Road safety barrier systems and devices - Road safety devices; and
  - C. section 3.2.8,and the Contractor must provide crash test documentation and calculations as part of the Construction Documentation;
- xii) with respect to service access openings:
  - A. service access openings must have a suitable lift out cover (door) which must be made weatherproof and must fit flush with the face of the column;
  - B. a built-in locking device must be incorporated, using an M8 allen dome-head stainless steel bolt;
  - C. all opening covers must be interchangeable for poles of the same type;
  - D. for combination poles with mast arm, the access opening must be opposite to the traffic signal outreach; and
  - E. for slip base poles, the orientation of the access openings must be in accordance with the Department Standard Drawing S-4055, sheet 39;
- xiii) all road lighting columns must be permanently and legibly marked with an identification plate securely fixed to the column in accordance with AS/NZS 4677 Steel utility service poles; and
- xiv) the plate, required in section 3.2.2c)xiii), must include manufacture date, model type and manufacturer.

### 3.2.3 Mast arm

The Contractor must ensure that mast arms comply with the following requirements:

- a) outreaches and columns must be separate units with no section exceeding 10 m in length;
- b) the columns and outreaches must be such that for a specific road lighting pole type, any outreach can be assembled onto any column to form a pole; and
- c) traffic signal outreaches for combination mast arms must be:
  - i) separate from the column; and

- ii) able to be assembled onto any combination mast arm of the same type.

### 3.2.4 Spigot

The Contractor must ensure that spigots comply with the following requirements:

- a) the luminaire fixing spigot must:
  - i) be straight, unthreaded grade C250 circular hollow section with an outside diameter of 32 mm; and
  - ii) project 125 mm from the tip of the outreach in line with the axis of the outreach; and
- b) spigot upcast angle (loaded at 10 kg) must be 0°.

### 3.2.5 Materials

The Contractor must ensure that:

- a) materials used in the structural components of light poles comply with the requirements of AS/NZS 4677 Steel utility service poles;
- b) steel used in mounting plates and base plates complies with the requirements of AS/NZS 3678 Structural steel - Hot-rolled plates, floorplates and slabs, grade 250 or grade 350;
- c) the columns and outreach arms are fabricated from steel coil conforming to AS/NZS 1594 Hot-rolled steel flat products, grade HA300; and
- d) phosphorous and silicon content of the steel used in poles and pole bases must comply with the formula: %Silicon + (2.5 x %Phosphorous) < 0.09% by weight.

### 3.2.6 Manufacture

The Contractor must ensure that:

- a) all supplied road lighting poles are manufactured in accordance with:
  - i) AS 2339 Traffic signal posts, mast arms and attachments;
  - ii) AS/NZS 3678 Structural steel - Hot-rolled plates, floorplates and slabs;
  - iii) AS/NZS 3679 Structural steel; and
  - iv) AS/NZS 4677 Steel utility service poles;
- b) for combination mast arms, the traffic signal mounting pipe is vertical under fully loaded conditions (approximately 15 kg);
- c) the following road lighting system components are manufactured within the following tolerances:
  - i) mounting plates and base plates: 2.0 mm; and
  - ii) slotted holes for base plate anchor bolts: 1.0 mm;
- d) all welding complies with AS 4677 Steel utility service poles and are category 'SP';
- e) intermittent fillet welds such as those used to attach reinforcement at door/plate openings have gaps between welds no larger than 35 mm; and
- f) the column to base plate weld is flush with the lower face of the base plate.

### 3.2.7 Protective treatment

The Contractor must ensure that the supply of the road lighting system complies with the protective treatment requirements set out below:

- a) in relation to cleaning:

- i) prior to galvanizing, all sharp edges and burrs resulting from cutting and drilling are removed; and
- ii) the columns, outreaches and footing units are chemically cleaned and fluxed so that the surface of the steel is completely free from rust and mill scale and is suitable for hot-dip galvanizing;
- b) in relation to cleaning and hot-dip galvanizing:
  - i) columns, outreaches, mounting plates and footing units are hot-dip galvanized after fabrication in accordance with the requirements of AS/NZS 4680 Hot-dip galvanized (zinc) coatings on fabricated ferrous articles;
  - ii) threads of bolts and nuts are cleaned by centrifuging, brushing or similar process after galvanising in accordance with the requirements of AS/NZS 1214 Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series);
  - iii) the M8 dome-head bolt for aperture cover is stainless steel; and
  - iv) galvanized components have a bright zinc appearance and not show evidence of white rust;
- c) in relation to the repair of galvanized components:
  - i) areas of galvanized components damaged during transport, handling or storage or left bare by cutting or welding subsequent to galvanizing are cleaned of any weld slag, heavy wire brushed and painted with 2 coats of an organic zinc rich paint, as approved under APAS 29/16, which must be applied before rusting occurs; and
  - ii) damage to components galvanized after fabrication has been completed is repaired by using methods permitted by AS/NZS 4680 Hot-dip galvanized (zinc) coatings on fabricated ferrous articles; and
- d) in relation to the transportation and storage of galvanised components, all galvanized components are transported and stored in accordance with the recommendations of AS/NZS 4680 Hot-dip galvanized (zinc) coatings on fabricated ferrous articles.

### 3.2.8 Energy-absorbing pole crash test requirements

The Contractor must ensure that all energy-absorbing poles supplied as part of the road lighting system comply with the following crash test requirements:

- a) crash testing must comply with the requirements of:
  - i) AS/NZS 3845.2 Road safety barrier systems and devices - Road safety devices; and
  - ii) AASHTO Manual for Assessing Safety Hardware (MASH);
- b) test pole configuration and installation must be representative of in-service pole installations and be installed in accordance with Department Standard Drawings S-4055, sheets 30 or 37, as applicable to the type of pole;
- c) tests must be conducted by a MASH/AASHTO testing facility accredited by NATA or ILAC;
- d) the crash test for energy-absorbing poles must include:
  - i) a vehicle weighing 1,100 kg travelling at 50 km/h; and
  - ii) the same evaluation criteria MASH 1-40 in accordance with AS/NZS 3845.2 Road safety barrier systems and devices - Road safety devices;
- e) all crash tests must be conducted with typical luminaires attached;
- f) evaluation factors, based on the factors detailed in Table 5-1 of AASHTO Manual for Assessing Safety Hardware (MASH), must include the following:

- i) the test article must collapse in a predictable manner as per AS/NZS 1158.1.2 Lighting for roads and public spaces - Vehicular traffic (Category V) lighting - Guide to design, installation, operation and maintenance;
  - ii) acceptable test article performance;
  - iii) the pole must remain attached to the base structure and absorb any impact energy by progressively deforming and entrapping the impacting vehicle, as illustrated in AS/NZS 1158.1.2 Lighting for roads and public spaces - Vehicular traffic (Category V) lighting - Guide to design, installation, operation and maintenance. The final resting position of the pole must be in the direction of travel of the impacting vehicle;
  - iv) occupant risk from detached elements or intrusions;
  - v) no part of the pole or luminaire can penetrate the occupant compartment of the impacting vehicle;
  - vi) there must be limited deformation of the occupant compartment as required by AASHTO Manual for Assessing Safety Hardware (MASH);
  - vii) pole elements that could present a hazard to other traffic or pedestrians (including luminaires, access doors and electrical components) must remain attached to the pole;
  - viii) the impacting vehicle must remain upright;
  - ix) roll and pitch must not exceed 75°;
  - x) the occupant impact velocities must not exceed 12 m/s; and
  - xi) the occupant ride down acceleration must not exceed 20 G and preferably be less than 15 G; and
- g) a report detailing the crash tests must be supplied as part of the Design Documentation must include:
- i) a description of the tested pole installation, including drawings;
  - ii) details of the test conditions, including type and mass of vehicle;
  - iii) details of the tests, testing procedure and test equipment, including:
    - A. vehicle type;
    - B. vehicle speed;
    - C. pole and vehicle deformation and trajectory; and
    - D. videos, sequential photographs and detailed photographs including before and after pictures of the base mounting, door and door reinforcing, impact zone and the front of impacting vehicle;
  - iv) calibration test certification of all measuring equipment;
  - v) an assessment of the performance compared with the evaluation factors listed in section 3.2.8f); and
  - vi) a conclusion and recommendation about the acceptability of the pole, including where test requirements have been:
    - A. entirely met (i.e. an unqualified test pass);
    - B. substantially met (i.e. a qualified test pass, subject to approval by the Principal); and
    - C. not met (i.e. a test fail).

### 3.3 Supply of luminaires

- a) The Contractor must ensure that all luminaires supplied as part of the road lighting system comply with the requirements of this section 3.3.
- b) Luminaires which are on the Department Approved Products List must be supplied. Where the Contractor proposes to supply luminaires which are not on the Department Approved Products List, the Contractor must submit details of the proposed alternative luminaires to the Principal as part of the Design Documentation, including details evidencing how the proposed luminaires comply with the requirements of this Master Specification Part.
- c) The Contractor must provide the following, as part of the Design Documentation:
  - i) the luminaire data sheets, including rated operating voltage, frequency, power factor, THD and operating temperature;
  - ii) the luminaire photometric files in both .ies and .cie file format applicable to the design;
  - iii) the submission of an isolux plot for the luminaire mounted at a height of 12 m, showing luminaire position, all dimensions, 7.5 lux and 3.5 lux levels;
  - iv) for unmetered lighting connections, evidence that the luminaires are included in AEMO's approved load tables;
  - v) an IES LM-79-19 Approved Method - Optical And Electrical Measurements of Solid State Lighting Products test report for the luminaires, including the following test parameters (as a minimum):
    - A. total luminous flux in absolute measurement;
    - B. luminous efficacy (lm/W);
    - C. luminous intensity distribution polar diagram;
    - D. zonal lumens distribution and backlight, uplight and glare rating;
    - E. correlated colour temperature;
    - F. colour rendering index; and
    - G. chromaticity coordinates;
  - vi) an IES LM80-08 Approved method for measuring lumen maintenance of LED Light Sources test report;
  - vii) an IES TM-21 Projecting long term lumen maintenance of LED Light sources test report;
  - viii) an in situ temperature measurement test report for the luminaires;
  - ix) confirmation of compatibility with a smart lighting interface; and
  - x) a checklist confirming the Contractor's compliance with the requirements set out in this Master Specification Part relating to luminaires.
- d) The Contractor must ensure that the luminaires:
  - i) have shields or optical devices available as accessories to reduce back-spill;
  - ii) have a 10 year on-pole warranty available (which otherwise satisfies the requirements of PC-CN3 "Construction Management" and which includes all costs associated with the removal and replacement of the luminaire, materials, equipment and labour);
  - iii) meet the following optical requirements:
    - A. full cut-off (i.e. aeroscreen) optic;
    - B. have a correlated colour temperature of 4,000 K unless the design specifies an alternative colour temperature to meet project or site-specific requirements; and

- C. have a colour rendering index greater than 70;
- iv) meet the following requirements:
  - A. have a luminous efficacy of greater than 120 lm/W;
  - B. retain at least 90% of initial lumen level over 90% of the luminaire population after 100,000 hours of operation (i.e. L90B10 at 100,000 hours);
  - C. be fitted with a 7-pin NEMA socket on the underside of the luminaire;
  - D. be provided with a lighting control interface; and
  - E. demonstrate electromagnetic compatibility compliance with AS/NZS 61000 Electromagnetic compatibility (EMC); and
- v) the luminaires must meet the following physical construction requirements:
  - A. include an integral stepped, adjustable upcast angle between 5° and -20° with increments of 5°;
  - B. be fitted with a bubble level, mounted in the wiring chamber, in a parallel plane to the visor, for assisting with levelling the luminaire;
  - C. include a control gear/wiring chamber which is accessible without the use of tools and is resistant to damage or access by birds;
  - D. all wiring must be enclosed within the luminaire;
  - E. include provision for clamping the cable in the control gear/wiring chamber which is sufficient to support the weight of the cable suspended in the pole;
  - F. an ingress protection rating of IP65 or higher for the optical chamber, in accordance with AS 60529 Degrees of protection provided by enclosure (IP Code);
  - G. an impact rating of IK06 or higher with a minimum impact rating of IK08 for Category P, in accordance with IEC 62262 IK code;
  - H. are light grey in colour; and
  - I. have different optic distributions available to suit varying road geometries.

## 4 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-S1 4-1 have been complied with.

**Table RD-EL-S1 4-1 Verification requirements**

| Section reference | Record   |
|-------------------|--|
| 3.2.2b)           | <p>A copy of the Construction Documentation which includes the following:</p> <ul style="list-style-type: none"> <li>a) evidence of compliance with section 3.2.2a);</li> <li>b) shop drawings including welding details for every type of road lighting pole;</li> <li>c) drawings detailing a suitable pile footing and the high strength anchor bolts;</li> <li>d) evidence of compliance with the crash testing requirements of:               <ul style="list-style-type: none"> <li>i) AS/NZS 1158 Lighting for roads and public spaces;</li> <li>ii) AS/NZS 3845.2 Road safety barrier systems and devices - Road safety devices; and</li> <li>iii) section 3.2.8; and</li> <li>iv) road lighting pole design drawings with all associated equipment (door, panel mounting straps, brackets, bolts and washers).</li> </ul> </li> </ul> |
| 3.3c)iii)         | The submission of an isolux plot for the luminaire mounted at a height of 12 m, showing luminaire position, all dimensions, 7.5 lux and 3.5 lux levels.  |
| 3.3c)iv)          | For unmetered lighting connections, evidence that the luminaires are included in the Australian Energy Market Operator's approved load tables.   |
| 3.3c)v)           | Proof of testing as detailed in section 3.3c)v) conducted by a NATA accredited or Principal approved testing facility.   |
| 3.3c)ix)          | Confirmation of compatibility with a smart lighting interface.   |
| 3.3c)x)           | A checklist confirming the Contractor's compliance with the requirements set out in this Master Specification Part relating to luminaires.   |