



**Transport  
for NSW**

## ***INTELLIGENT TRANSPORT SYSTEMS***

### ***TRAFFIC SYSTEMS***

**SPECIFICATION NO. TSI-SP-041**

**LUMINAIRES FOR ROAD LIGHTING**

Issue: 2.0  
Dated: 15/2/2021

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**RECORD OF AMENDMENTS**

Issue	Summary	Date	Approved by
1.0	First issue	3 Nov 15	Manager TSI
2.0	<p>Changes triggered by a Sydney Asset initiated review of IC-QA-R151 along with this specification (TSI-SP-041) so that their interdependencies were aligned with each other, and coordinated by way of a Specification Review Committee (SRC) for Road Lighting and Tunnel and Underpass Lighting to oversee the changes.</p> <p>Many changes and improvements were made, the main items of which were as follows:</p> <ul style="list-style-type: none"> <li>(a) Added Impact Resistance requirements.</li> <li>(b) Revised Temperature and Humidity requirement to align with that in SA/SNZ TS 1158.6.</li> <li>(c) Revised service life from initial considerations of 100,000 hours down to 70,000 hours to align with that in SA/SNZ TS 1158.6.</li> <li>(d) Updated existing Clause 9.6 on corrosion resistance by moving existing Clause R151/E1 Paragraph 2 to said clause.</li> <li>(e) Added/Updated 7-core cable receptacle requirement to be in accordance with NEMA/ANSI C136.41.</li> <li>(f) Revised Appendices.</li> </ul> <p>Made many other minor amendments for clarity.</p>	15 Feb 21	Manager TSI

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## 1 INTRODUCTION

### 1.1 Scope

This specification covers requirements for luminaires (complete with light source) for Category V road lighting.

This specification does not cover luminaires for tunnel and underpass lighting, or luminaires for other categories of lighting.

*NOTE: See Section 3 for definition for 'luminaire' and 'equipment'.*

This specification does not cover smart control.

This specification includes requirements for assessing light output from luminaires under this specification (see initial desktop assessment parameters in Appendix C).

## 2 REFERENCES AND APPLICABLE DOCUMENTS

### 2.1 Australian and International Standards

- |      |                  |  |
|------|------------------|--|
| [1]  | AS/NZS 1158.0    | Lighting for roads and public spaces, Part 0: Introduction   |
| [2]  | AS/NZS 1158.1.1  | Lighting for roads and public spaces, Part 1.1: Vehicular traffic (Category V) lighting – Performance and design requirements                              |
| [3]  | AS/NZS 1158.1.2  | Lighting for roads and public spaces, Part 1.2: Vehicular traffic (Category V) lighting—Guide to design, installation                                      |
| [4]  | AS/NZS 1158.2    | Lighting for roads and public spaces, Part 2: Computer procedures for the calculation of light technical parameters for Category V and Category P lighting |
| [5]  | SA/SNZ TS 1158.6 | Lighting for roads and public spaces, Part 6: Luminaires - Performance   |
| [6]  | AS/NZS 1170.2    | Structural design actions - Wind actions   |
| [7]  | AS/NZS 3000      | Electrical installations (known as the Australian/New Zealand Wiring Rules)  |
| [8]  | AS/NZS 3100      | Approval and test specification - General requirements for electrical equipment  |
| [9]  | AS/NZS 4417.2    | Regulatory compliance mark for electrical and electronic equipment - Specific requirements for particular regulatory requirements                          |
| [10] | AS/NZS ISO 9001  | Quality management systems - Requirements  |
| [11] | AS 60068.2.6     | Environmental testing - Tests - Test Fc: Vibration (sinusoidal)  |
| [12] | AS 60068.2.29    | Environmental testing - Tests - Test Eb and guidance: Bump   |
| [13] | AS/NZS 60598.1   | Luminaires - General requirements and tests (IEC 60598-1, Ed. 7.0 (2008) MOD)  |

- [14] AS/NZS 61000.6.1 Electromagnetic compatibility (EMC) - Generic standards - Immunity for residential, commercial and light-industrial environments

## 2.2 TfNSW Documents

- [15] IC-QA-TS201 Approval of ITS Field Equipment

## 2.3 Other Documents

- [16] ANSI/IES LM-79-19 Approved Method: Optical And Electrical Measurements Of Solid-State Lighting Products
- [17] IES LM-79-08 Electrical and Photometric Measurements of Solid-State Lighting Products
- [18] IES LM-80-08 Measuring Lumen Maintenance of LED Light Sources
- [19] IES LM-84-14 Measuring Luminous Flux and Color Maintenance of LED Lamps, Light Engines, and Luminaires
- [20] IES TM-21-11 Projecting Long Term Lumen Maintenance of LED Light Sources
- [21] IES TM-28-14 Projecting Long-Term Luminous Flux Maintenance of LED Lamps and Luminaries
- [22] NEMA/ANSI C136.41 For Roadway and Area Lighting Equipment – Dimming Control Between an External Locking Type Photocontrol and Ballast or Driver

## 3 DEFINITIONS AND GLOSSARY OF TERMS

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

ACMA	Australian Communications and Media Authority (URL: <a href="http://www.acma.gov.au">http://www.acma.gov.au</a> )
CCT	Correlated colour temperature; see definition in AS/NZS 1158.0.
CRI	Colour rendering index; see definition in AS/NZS 1158.0.
Control gear	As used in SA/SNZ TS 1158.6, the electronics that drives, and if equipped with a microcontroller, controls, monitors and manages the road lighting equipment.
COTS	Commercial off-the-shelf
DoC	Declaration of Conformity; a signed document provided by a supplier for an equipment model declaring that that equipment and its replicas are compliant with applicable requirements listed therein.  For RCM DoC, see ACMA website for definition.
EMC	Electromagnetic compatibility;  EMC has two aspects: emission and immunity.

Equipment	Luminaire including control gear, dimming unit, power supply unit, as a minimum, and any associated parts and COTS equipment that may add to the functionality of the luminaire. <i>(NOTE: this term differs in definition from that of 'luminaire'.)</i>
ERAC	Electrical Regulatory Authorities Council (URL: <a href="http://www.erac.gov.au">http://www.erac.gov.au</a> )
HID	High Intensity Discharge (e.g. HPS or Metal Halide)
HPS	High Pressure Sodium
IES	Illuminating Engineering Society of North America
LED	Light emitting diode
Light source	As used in SA/SNZ TS 1158.6
LTP/s	Light technical parameter/s as defined in AS/NZS 1158.0
Luminaire	The enclosure for the light source as described by the term 'luminaire' as defined in AS/NZS 1158.0. <i>(NOTE: this term differs in definition from that of the 'equipment' in this specification. See definition above for the 'equipment').</i>
Manufacturer	Manufacturer of the equipment (see the term 'applicant' as defined in IC-QA-TS201)
OEM	Original Equipment Manufacturer
PHCS	Product host control system
RCM	Regulatory compliance mark (see AS/NZS 4417.2)
Smart controller	An electronic unit that monitors the equipment/luminaires linked to it in its region, and reports status to a designated PHCS.  <i>NOTE: Defined here for reference only. On what is covered in this document, see scope of this specification.</i>
SSL	Solid state lighting as defined in SA/SNZ TS 1158.6.
Submission for approval	A submission of equipment under this specification in an application for approval evaluation to ITSHelpDesk under IC-QA-TS201 by a manufacturer/supplier.
Supplier	Supplier of the equipment (see "Applicant" as defined in IC-QA-TS201)
TfNSW	Transport for New South Wales.

## 4 GENERAL REQUIREMENTS

### 4.1 Applicable standards and specifications

4.1.1 Where not otherwise specified, the equipment shall be in accordance with Australian Standards or Specifications, and in their absence, with relevant IEC or ISO Standards or Specifications.

### 4.2 General equipment

4.2.1 The equipment shall comprise all items necessary for the intended use. As a minimum, the following items shall be provided:

- (a) a luminaire (including light source, housings, covers, lenses, reflectors as required);
- (b) Control gear (including dimming unit and power supply unit);
- (c) Provisions for thermal management;
- (d) Provisions for smart control (see 7-pin NEMA or equivalent connector and 9-core cable receptacles requirement);
- (e) Other accessories such as connectors, cables and seals.

4.2.2 The equipment shall meet all relevant requirements for Category V SSL (e.g. LED) in SA/SNZ TS 1158.6, and AS/NZS 1158.1.1, and this specification.

4.2.3 Light technical parameters calculations shall be in accordance with AS/NZS 1158.2.

4.2.4 The equipment construction shall be modular, to allow for maintainability.

*NOTE: For example, if a component fails that the entire luminaire or equipment should not be replaced; only that component needs to be replaced;*

4.2.5 The luminaire shall have a 7-pin NEMA/ANSI C136.41 or equivalent receptacle, to allow for prospective smart controller connectivity.

4.2.6 All parts of the equipment, apart from the luminaire, shall be capable of being mounted on the control gear tray at the base of the light pole (i.e. remote mounting).

4.2.7 A 9-core cable terminal strip shall be provided within the luminaire for remotely mounted control gear installations.

4.2.8 The equipment shall have provisions for dimming.

4.2.9 In the event the fitting is a HID (e.g. HPS) lamps, the luminaire shall be equipped with one or more fast acting pressure release safety valves.

### 4.3 Design life

4.3.1 For the purpose of this specification, design life shall be the same as service life.

### 4.4 Service life

4.4.1 The service life of the equipment shall be at least 70,000 hours of continuously lit operation or as stated in SA/SNZ TS 1158.6, whichever is greater.

4.4.2 Where a part or component of the equipment (e.g. control gear) has a service life other than that specified in Clause 4.4.1 of this specification, that information shall be declared by the supplier.

## 5 REGULATORY REQUIREMENTS

### 5.1 Work health and safety

The equipment and its recommended installation method shall comply with the requirements of the NSW Work Health and Safety Act.

### 5.2 RCM and EMC Emission

#### 5.2.1 Regulatory Compliance Mark (RCM)

5.2.1.1 For RCM and EMC emission (intentional and unintentional) as per ACMA, the equipment shall comply with AS/NZS 4417.2 requirements for compliance level 2/medium-risk device or higher, whichever is applicable to the equipment.

5.2.1.2 If RCM is used on the equipment to indicate electrical safety, that usage shall comply with AS/NZS 4417.2.

5.2.1.3 The equipment's compliance/risk level (for RCM and EMC) and equipment level (if RCM used to indicate electrical safety) shall be stated in the declaration of conformity of submission contents for this requirement.

5.2.1.4 In addition to the information required by AS/NZS 4417.2, the supplier shall also include the information required in RCM and EMC related submission contents.

*NOTE: See Appendix A for guidance.*

5.2.1.5 Following compliance, the RCM number issued by ACMA shall be shown on the marking labels of the equipment as required in accordance with SA/SNZ TS 1158.6.

#### 5.2.2 EMC Emission: Unintentional

5.2.2.1 The equipment, with all its intentional emitters set to non-emitting mode, shall comply with EMC emission in accordance with AS/NZS 61000.6.3.

#### 5.2.3 EMC Emission: Intentional

5.2.3.1 If any component of the equipment (e.g. control gear) has the capability for intentional electromagnetic emissions (e.g. radiocommunications via an air interface or telecommunications via a wired interface), the following requirement shall apply.

5.2.3.2 The equipment, with all its intentional emitters set to emitting mode, shall comply with EMC emission in accordance with their corresponding regulatory arrangements and requirements (for radiated and conducted electromagnetic emissions).

*NOTE: See requirements by ACMA and NSW Fair Trading for details.*

### 5.3 Electrical Safety

#### 5.3.1 General

5.3.1.1 The equipment shall comply with AS/NZS 3820 and relevant electrical safety requirements.

5.3.1.2 The equipment shall comply with the safety requirements of the National Electrical Codes AS/NZS 3000, AS/NZS 3100 and AS/NZS 60950.1.

5.3.1.3 The supplier shall provide a certificate of suitability from NSW Fair Trading for the equipment, for this requirement.

### 5.3.2 Certificate of Suitability

- 5.3.2.1 If the design of the equipment is changed since the issue of a Certificate of Suitability, the supplier shall have the Certificate of Suitability endorsed accordingly.
- 5.3.2.2 Where a Certificate of Suitability or an equivalent document is issued by another state or territory of Australia, the supplier shall provide written evidence from NSW Fair Trading that such a certificate or document is regarded as fully equivalent to a Certificate of Suitability issued by NSW Fair Trading.
- 5.3.2.3 The approval number shown on the Certificate of Suitability shall be shown on the marking labels of the equipment as required in accordance with SA/SNZ TS 1158.6.

## 6 OPTICAL REQUIREMENTS

### 6.1 For Luminaire

- 6.1.1 Unless otherwise specified in the supplies contract, the following optical requirements shall apply to the luminaire.

*NOTE: The optical characteristics of the light source, elements or modules whichever is applicable, that form the light emitting part of the luminaire, may need to be controlled accordingly to meet these requirements for the luminaire.*

- 6.1.2 The luminous flux output shall be not less than 8,000 lm.
- 6.1.3 The nominal CCT shall be in accordance with the 4000 K photometric test requirements for SSL luminaires in SA/SNZ TS 1158.6.
- 6.1.4 The minimum CRI shall be 70 Ra or in accordance with SA/SNZ TS 1158.6, whichever is greater.
- 6.1.5 Photometric, colorimetric and electrical measurements shall be in accordance with ANSI/IES LM-79-19, or as specified in SA/SNZ TS 1158.6, whichever is latest. This requirement shall replace the requirement for IES LM-79-08 in SA/SNZ TS 1158.6. The test reports shall show the ambient temperature(s) measured during these tests.

*NOTE: For these measurements, the ambient temperature recommended for these tests in SA/SNZ TS 1158.6 should be applicable. To ensure conformal operation within the temperature and humidity ranges required in this specification, see thermal management within environmental requirements of this specification.*

- 6.1.6 The lumen depreciation shall not exceed 30% of its initial value (i.e. L70) during its service life, when operated under the environmental requirements in this document, or as specified in SA/SNZ TS 1158.6, whichever is greater.
- 6.1.7 Lumen depreciation measurements shall be in accordance with IES LM-84-14 and IES TM-28-14, or as specified in SA/SNZ TS 1158.6, whichever is superior. The test reports shall show the ambient temperature(s) measured during these tests.

*NOTE: For these measurements, the ambient temperature recommended for these tests in SA/SNZ TS 1158.6 should be applicable. To ensure conformal operation within the temperature and humidity ranges required in this specification, see thermal management within environmental requirements of this specification.*

- 6.1.8 The luminous efficacy (or normalised efficiency) shall be not less than 120 lm/W, in accordance with the following equation:

6.1.9 All optical components of the luminaire, excluding the light source, shall be manufactured of materials that do not exhibit noticeable change to their optical properties during the service life of the luminaire specified in this document.

## 6.2 For Light Source

6.2.1 The light source shall be of SSL technology (e.g. LED) or equivalent in construction.

*NOTE: See general requirements in this specification.*

6.2.2 If photometric, colorimetric, electrical measurement and lumen depreciation measurement test reports for the luminaire are not available at submission (see Submission for Approval requirements), at least the following for the light source shall be provided to TfNSW while those for the luminaire are being obtained by the supplier:

- (a) Photometric, colorimetric and electrical tests to IES LM-79-08; and
- (b) Lumen depreciation tests to IES LM-80-08 and IES TM-21-11.

*NOTE: These are applicable to the light source only hence not to be substitutes for luminaire measurement test reports as required in this document.*

## 7 ELECTRICAL REQUIREMENTS

### 7.1 Operating voltage and frequency rating

7.1.1 In addition to the voltage and frequency rating requirements of luminaire for Australia in SA/SNZ TS 1158.6, the following requirements shall apply to the equipment.

7.1.2 The tolerance for the frequency rating of 50 Hz in SA/SNZ TS 1158.6 shall be  $\pm 4\%$ .

### 7.2 Surge protection

The equipment shall have sufficient built-in surge protection to withstand lightning surges in accordance with impulse voltage test requirements in SA/SNZ TS 1158.6.

### 7.3 Electrical design/wiring standards

7.3.1 See electrical safety requirements in Regulatory Requirements clause of this specification.

7.3.2 The supplier shall provide a detailed electrical wiring and schematic diagrams for the equipment.

### 7.4 EMC Immunity

7.4.1 The equipment shall comply with EMC immunity in accordance with AS/NZS 61000.6.1.

7.4.2 The supplier shall provide an EMC immunity test report for the equipment to this requirement.

### 7.5 EMC Emission

See EMC emission requirements in Regulatory Requirements clause of this specification.

## **8 MECHANICAL REQUIREMENTS**

### **8.1 General**

- 8.1.1 The fixing spigot entry requirements in SA/SNZ TS 1158.6 for the specified aperture size in this specification and spigot entry type applicable to the luminaire of the equipment under this specification shall apply to this requirement.
- 8.1.2 The spigot size and maximum mass of luminaire requirements in SA/SNZ TS 1158.6 for the specified aperture size in this specification shall apply to this requirement.
- 8.1.3 All the other mechanical and physical requirements and recommendations in SA/SNZ TS 1158.6 shall apply to this requirement.

### **8.2 Lighting Pole Mounting Brackets and Mounting Points**

- 8.2.1 The lighting pole mounting brackets and mounting points of the luminaire shall meet the static/mechanical loading and wind loading requirements of this specification.
- 8.2.2 For retrofitting existing luminaires, the load maxima for light pole outreach arm length versus luminaire wind sail area (long-side profile) shown in Appendix B shall apply.

### **8.3 Aperture Size**

- 8.3.1 The aperture size shall allow for two points of contact with 42 mm diameter spigots.

### **8.4 Nameplate**

- 8.4.1 A nameplate shall be affixed to the exterior of the luminaire and control gear enclosures of the equipment. The nameplate shall remain attached to the equipment and legible for at the service life of "all other parts of the equipment".
- 8.4.2 The nameplate shall provide the following information about the equipment:
  - (a) Product/model number and name;
  - (b) Manufacturer's name;
  - (c) Manufacturer's type number;
  - (d) RCM approval number;
  - (e) A unique serial number.

### **8.5 Vandal Resistance**

- 8.5.1 The equipment shall be vandal resistant.
- 8.5.2 The supplier shall provide information on how the equipment complies with this requirement.

### **8.6 Vibration Testing and Impact Resistance**

- 8.6.1 The vibration testing requirements as specified in SA/SNZ TS 1158.6 shall apply to the equipment.
- 8.6.2 The impact resistance rating of the equipment shall be no less than IK08 when tested in accordance with AS 60598.2.3, or as specified in SA/SNZ TS 1158.6, whichever is higher. Impact test reports shall show the compliance status and IK-rating measured.

## **9 ENVIRONMENTAL REQUIREMENTS**

### **9.1 General**

In addition to the environmental conditions requirements as specified in SA/SNZ TS 1158.6, the following environment requirements shall apply to the equipment.

### **9.2 Temperature and Humidity**

9.2.1 The equipment shall operate without failure within the environmental conditions for Australia as specified in SA/SNZ TS 1158.6.

9.2.2 The supplier shall provide supporting evidence to demonstrate how the equipment meets this requirement (e.g. evidence such as laboratory test reports or field data extrapolations, and associated design calculations explanations/rationale).

### **9.3 Thermal Management**

9.3.1 In order to ensure that the equipment withstands the environmental and particularly temperature and humidity requirements in this specification, and maintain its operational performance conformity within this specification particularly to the optical requirements, sufficient thermal management shall be designed into the equipment.

9.3.2 The equipment shall incorporate adequate and effective heat removal capability on the luminaire, control gear and power supply unit. For the purpose of this requirement, electro-mechanical parts such as ventilation fans shall not be used.

9.3.3 The equipment shall comply with thermal endurance and thermal testing requirements for Australia as specified in SA/SNZ TS 1158.6.

### **9.4 Enclosure Protection**

9.4.1 The enclosure ingress protection for the equipment shall be IP65 when tested in accordance with AS 60529, or as specified for SSL luminaires in SA/SNZ TS 1158.6, whichever is more ingress protective while allowing for any particulates to egress.

9.4.2 The supplier shall demonstrate how the electrical parts are protected from moisture such that the equipment functions are not affected.

9.4.3 The supplier shall provide an enclosure protection test report for the equipment, when making a submission for approval. The test report shall show the test results and overall compliance verdict for the equipment submitted for approval.

9.4.4 In the event COTS equipment or components are used as parts of the equipment, the test report shall demonstrate how the equipment, all those COTS equipment parts used and their conjoining contacts and interfaces with the equipment, meet this requirement.

### **9.5 Wind Loading**

9.5.1 The equipment, mounting brackets and mounting points and declared post shall withstand at least the wind loading conditions of Region B, Terrain Category 2 in accordance with AS/NZS 1170.2.

9.5.2 Wind loading certification by a qualified structural engineer shall be provided to demonstrate how the equipment meets this requirement.

### **9.6 Corrosion Resistance**

9.6.1 The equipment shall provide corrosion resistance to last the specified service life.

- 9.6.2 In the event COTS equipment are used as parts of this equipment, the supplier shall provide evidence to demonstrate how those COTS equipment and the conjoining contacts and interfaces with this equipment, meet this requirement.
- 9.6.3 The equipment shall withstand the severely corrosive effects of salt spray in marine environments and airborne chemicals in industrially contaminated environments.
- NOTE: For example, one method may be the equipment to be constructed of marine grade aluminium alloy 5251 H32 to AS/NZS 1734 and treated with powder coating to a suitable thickness (typically 50 microns), and all steel works, fittings and fasteners hot-dip galvanized as per AS/NZS 4680, or equivalent.*
- 9.6.4 The supplier shall provide details of the construction and materials used, and the expected effect on service life to enable assessment of corrosion resistance.

## 10 MANUALS

- 10.1.1 Manuals shall be provided to cover operation and maintenance of the equipment, at an appropriate level of detail.
- 10.1.2 A copy in PDF format is expected at approval stage.
- 10.1.3 All manuals shall be in accordance with TSI-SP-062.
- 10.1.4 Each manual shall be provided with a compliance statement to that effect, if in a submission for approval.

## 11 QUALITY ASSURANCE

### 11.1 Quality Management System

- 11.1.1 The supplier and the manufacturer of the equipment shall operate a quality management system complying with AS/NZS ISO 9001.
- 11.1.2 This quality management system shall be certified by a quality management system certification body accredited for such purposes under the criteria defined in the Joint Accreditation System of Australia and New Zealand (JAS-ANZ).
- 11.1.3 The supplier shall provide evidence of their quality certification by an accredited body, in a submission for approval.

### 11.2 Quality Plan

- 11.2.1 The supplier shall provide a quality plan for the equipment, in a submission for approval.
- 11.2.2 Each batch of equipment shall be marked with a model number, batch code, serial number, and/or other marking to provide traceability under the equipment manufacturer's quality management system to all key manufacturing, inspection and test processes, including batch identifications of key components (e.g. luminaire, control gear, power supply unit, other parts, smart controller interfaces if any, etc.).

### 11.3 Inspection and Test Plan

The supplier shall submit an inspection and test plan for each batch of equipment as part of the quality assurance requirements in this specification.

## 12 SUBMISSION FOR APPROVAL

### 12.1 Submission process for equipment approval

12.1.1 For submissions for approval of equipment, the supplier shall follow IC-QA-TS201.

12.1.2 This shall include the

- (a) submission contents listed in Clause 13.2 and
- (b) all relevant supporting evidence.

12.1.3 In the event any contents are pending at the time of submission this shall be indicated in the compliance statement with an intended follow-on date where available, by the supplier.

12.1.4 Other approvals for an overall installation may apply, such as those that may be included in policy, but are excluded from the scope of this document.

### 12.2 Submission contents

When making a submission for approval of the equipment (see definition), in addition to the submission evidence required in the relevant clauses of this specification and those required in SA/SNZ TS 1158.6, the following shall be provided:

- (a) The equipment model number under submission (i.e. collective unique model number as it is noted that the luminaire, control gear, power supply unit, other parts, and components such as smart controller interfaces if included might have their own unique model number) and serial number as a minimum clearly declared in all relevant submission contents documentation and supporting evidence.

*NOTE: Equipment model number provides a means to limit the range of items and constituent parts associated with the equipment under submission for approval;*

- (b) Clause-by-clause compliance statement(s) to this specification (TSI-SP-041);
- (c) Clause-by-clause compliance statement(s) to SA/SNZ TS 1158.6 including showing where those requirements are associated with this specification;
- (d) Detailed analyses and calculations of service life for Clause 4.4;
- (e) For RCM and EMC requirements for Clauses 5.2.1, 5.2.2 and 5.2.3:
  - (i) RCM declaration of conformity for the equipment as per AS/NZS 4417.2, showing
    - i. equipment model number,
    - ii. regulatory arrangements that apply to each EM radiating part of the equipment (see EMC Emission: Unintentional and EMC Emission: Intentional, and Electrical Safety requirements of this specification),
    - iii. identified standards applicable to each regulatory arrangement that the equipment needs to be tested to, for demonstration of compliance,
    - iv. test report number for each identified standard,
    - v. compliance verdict from each test report, and
  - (ii) Dated evidence of listing of the equipment on the ACMA/ERAC website.
- (f) EMC emission (unintentional) test report for Clause 5.2.2;
- (g) Certificate of suitability for the equipment, for Clause 5.3 (and 7.3);

- (h) IES/CIE files for luminaire model with LTPs for Clause 6;
- (i) Photometric, colorimetric and electrical measurement test reports for Clause 6;
- (j) Luminaire lumen depreciation measurement and extrapolation report for Clause 6;
- (k) If luminaire report is pending, while that is being obtained by the supplier, light source lumen depreciation measurement and extrapolation report for Clause 6;
- (l) Electrical wiring and schematic diagrams (detailed) for Clause 7.3;
- (m) EMC immunity test report for Clause 7.4;
- (n) Nameplate sample or image for Clause 8.4;
- (o) Vandal resistance information for the equipment for Clause 8.5;
- (p) Vibration test report for Clause 8.6;
- (q) Impact resistance test report and IK-rating for Clause 8.6;
- (r) Temperature and humidity supporting evidence for Clause 9.2;
- (s) Detailed analyses and calculations of thermal management for Clause 9.3;
- (t) Enclosure protection test report for Clause 9.4;
- (u) Wind loading certification by a qualified structural engineer for Clause 9.5;
- (v) Corrosion resistance construction and treatment details for Clause 9.6;
- (w) Manuals for the equipment, for Clause 10

*NOTE: The locations in the manuals where O&M details can be found should be declared in the compliance statement to this specification for relevant requirement (e.g. luminaire, control gear, power supply unit, LTPs, etc.);*

- (x) For each manual, compliance statement to TSI-SP-062 for Clause 10;
- (y) Quality management system certification each by an accredited body, for the equipment's (i) manufacturer and (ii) supplier, for Clause 11.1;
- (z) Quality plan for Clause 11.2;
- (aa) Inspection and test plan for Clause 11.3;
- (bb) In the event any supporting evidence (e.g. test reports, certifications, declarations of conformity, and so on) refer to requirements other than Australian standards and TfNSW specification (e.g. EN, IEC, etc.), a compliance traceability map showing rationale as to how those supporting evidences demonstrate how the equipment meets the requirements in this specification, shall be provided by the supplier.

See Appendix A guidance step 2;

- (cc) Technical design drawings for the equipment including the following:
  - (i) Block diagrams of electronic and power/electrical system of the equipment;
  - (ii) Any terminal block and electrical wiring layouts;
  - (iii) Mechanical drawings containing dimensions, components and assemblies;
- (dd) Relevant reliability, availability, maintainability and safety (RAMS) technical information for the individual items of the equipment (see definition);
- (ee) Photographs and/or video of the equipment demonstrating the operation of the display.

### **12.3 Changes**

If a design, material or manufacturing method change is made to an approved equipment, the supplier shall notify the ITS help desk (ITSHelpDesk@rms.nsw.gov.au) and the requirements of IC-QA-TS201 regarding changes shall be followed.

## APPENDIX A – GUIDANCE

For regulatory requirements, the supplier may choose to follow the following checklist, which may also be applicable to other requirements in this specification that need similar supporting tests or empirical evidence for demonstration of compliance of the equipment:

- (1) Determine if the equipment (with all its constituent parts including speed detector radar and 3G/4G/5G/other wireless modem) is subject to regulatory compliance requirements. This might include RCM, EMC (intentional and unintentional) emission and electrical safety requirements;
- (2) Identify which regulatory arrangements and standards are applicable as listed by the relevant regulatory bodies (e.g. see ACMA, ERAC, NSW Fair Trading, etc.), For any COTS or equipment certified external to Australia and NSW, determine how those map to applicable Australian standards and NSW requirements. List those mappings in declarations of conformity documents;
- (3) Test the equipment for compliance in accordance with the identified standards in (2) by accredited test laboratories. If any parts of the equipment is COTS (e.g. speed detector radar, 3G/4G/5G/other modem, etc.), identify which applicable EMC and electrical safety standards those have been tested to by their respective OEMs; then obtain the test reports and certifications for those from the relevant OEMs or test providers;
- (4) Provide a declaration of conformity document confirming that the equipment complies with each standard identified in (2), by way of the following information:
  - a. part of the equipment is subject to regulatory compliance (if entire equipment then this could be indicated as 'equipment' insofar as all intentionally emitting parts are shown as included with the 'equipment'),
  - b. regulatory arrangement/s applicable to each part in a.,
  - c. standard/s applicable to each part in a.,
  - d. regulatory body listing regulatory arrangement in b. and standard/s in c.,
  - e. test report number/s demonstrating compliance with standard/s in d.,
  - f. compliance verdict as extracted from the test report/s in e.
  - g. where there is more than one test report in f., the overall compliance verdict.

### NOTES:

- (1) *Albeit the equipment is non-radiating, the attachment of intentionally EM emitting parts such as smart controller and 3G/4G/5G/other wireless modem (whether COTS or not) could render the equipment at compliance level 2/medium risk device or higher.*
- (2) *For guidance, following are some reference websites relevant to this requirement:*
  - a. <https://www.acma.gov.au/5-steps-suppliers>
  - b. <https://www.acma.gov.au/Industry/Suppliers/Regulatory-arrangements/EMC-Electromagnetic-compatibility/emc-standards-list>
  - c. <https://www.acma.gov.au/consultations/2019-08/remaking-telco-standards-and-changes-labelling-notice-consultation-242018#proposed-acma-technical-standards>
  - d. [http://www.erac.gov.au/index.php?option=com\\_content&view=article&id=99:implementation-of-the-erac-equipment-certification-system&catid=82&Itemid=541](http://www.erac.gov.au/index.php?option=com_content&view=article&id=99:implementation-of-the-erac-equipment-certification-system&catid=82&Itemid=541)
  - e. [https://www.fairtrading.nsw.gov.au/\\_data/assets/pdf\\_file/0009/400041/Explanatory-notes-for-the-approval-and-sale-of-electrical-articles.May-2018.pdf](https://www.fairtrading.nsw.gov.au/_data/assets/pdf_file/0009/400041/Explanatory-notes-for-the-approval-and-sale-of-electrical-articles.May-2018.pdf)

## APPENDIX B – OUTREACH ARM LOAD MAXIMA FOR RETROFITTING TO EXISTING POLES

For retrofitting to existing poles, the luminaire mass dead “load” maxima based on light pole outreach arm length versus luminaire wind sail area (long-side profile) are shown Table B.1.

**Table B.1 – Luminaire mass “dead” load maxima based on light pole outreach arm length (top row) versus luminaire wind sail area (long-side profile) (left column)**

		Light pole outreach arm length			
		2.5 m	3.0 m	4.5 m	6.0 m
Luminaire wind sail area (long-side profile)	Up to 0.080 m <sup>2</sup>	14 kg	14 kg	13 kg	13 kg
	Larger than 0.080 m <sup>2</sup> and up to 0.132 m <sup>2</sup>	14 kg	14 kg	10 kg	None

## APPENDIX C – LIGHT OUTPUT CALCULATIONS/DESKTOP ASSESSMENT PARAMETERS

For initial desktop analysis, the following parameters for light output calculations are used by TfNSW:

**Table C.1 Initial desktop Assessment parameters**

PARAMETERS USED FOR ASSESSMENT	
Single Sided Arrangement	5 Degree Up-Tilt
12m Mounting Height	One Way Traffic Flow
4.5m Outreach	-1.5m Overhang
0.7 Maintenance Factor – HID (e.g. HPS)	0.8 Maintenance Factor – SSL (e.g. LED)
CIE R3	