# BRISBANE INFRASTRUCTURE DIVISION

# REFERENCE SPECIFICATIONS FOR ENGINEERING WORK

# S710 SOLID STATE LIGHTING (SSL) LUMINAIRE INSTALLATION

## AMENDMENT REGISTER

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## GENERAL

### Scope

This specification applies to the selection, installation, and maintenance of Light Emitting Diode (LED) luminaires within Councils’ public lighting network. These LED luminaires may be installed as part of new construction projects or retrofitting of existing assets owned by Brisbane City Council. These occur on publicly accessible land within the road reserves or within other Council controlled land such as parks. This specification applies to Network Public Lighting (NPL) 3 and Metered tariffs. For NPL 1, NPL 2 and NPL 4 installations, Energex guidelines should be adhered to.

### Installation Techniques – Existing Council Assets

Council policy requires LED luminaires to be used whenever a luminaire is replaced due to failure or end of life. In some instances, the installation of an LED luminaire may not be possible as further testing needs to be performed on the pole or structure to ensure structural safety.

This may require engineering assessment or structural testing of the pole or structure prior to the LED luminaire installation to ensure structural safety.

An assessment of the illumination levels must comply with the relevant levels in the Australian Standards as detailed in City Plan 2014. Where previous lighting levels did not comply with an Australian Standard, advice should be sought, and direction should be provided by Council.

### Standards

|  |  |  |
| --- | --- | --- |
| Australian/New Zealand Standard | AS/NZS 1158.0 | Lighting for roads and public spaces – Introduction |
| Australian/New Zealand Standard | AS/NZS 1158.1.1 | Lighting for roads and public spaces – Vehicular Traffic (Category V) Lighting - Performance and design requirements |
| Australian/New Zealand Standard | AS/NZS 1158.1.2 | Lighting for roads and public spaces – Vehicular traffic (Category V) lighting – Guide to design, installation, operation and maintenance |
| Australian/New Zealand Standard | AS/NZS 1158.2 | Lighting for roads and public spaces – Computer procedures for the calculation of light technical parameters for Category V and Category P lighting |
| Australian/New Zealand Standard | AS/NZS 1158.3.1 | Lighting for roads and public spaces – Pedestrian area (Category P) lighting – Performance and design requirements |
| Australian/New Zealand Standard | AS/NZS 1158.4 | Lighting for roads and public spaces – Lighting of pedestrian crossings |
| Australian/New Zealand Standard | AS/NZS 1158.5 | Lighting for roads and public spaces – Tunnels and underpasses |
| Technical Specification Standards Australian/Standards New Zealand | SA/SNZ TS 1158.6 | Lighting for roads and public spaces – Luminaires – Performance |
| Australian Standard | AS 1798 | Lighting poles and brackets arms – Recommended dimensions |
| Australian/New Zealand Standard | AS/NZS 3000 | Electrical installations  (known As *The Australian/New Zealand Wiring Rules*) |
| Australian/New Zealand Standard | AS/NZS 4282 | Control of the obtrusive effects of outdoor lighting |
| Australian/New Zealand Standard | AS/NZS 60598.1 | Luminaires – General requirements and tests (IEC 60598-1, Ed. 8.0 (2014) MOD) |
| Australian/New Zealand Standard | AS/NZS 60598.2.3 | Luminaires – Particular requirements – Luminaires for road and street lighting (IEC 60598-2-3, Ed. 3.1 (2011) MOD) |
| Australian/New Zealand Standard | AS/NZS 60598.2.5 | Luminaires – Particular requirements – Floodlights (IEC 60598-2-5:2015 (ED. 3.0), MOD) |
| Australian/New Zealand Standard | AS/NZS 61000.3.2 | Electromagnetic compatibility (EMC) |
| American National Standard | ANSI C136.41 | For Roadway and Area Lighting Equipment – Dimming Control Between an External Locking Type – Photocontrol and Ballast or Driver |

Council’s Requirements align with LED Lighting requirements from Energex (Energy Queensland Group) and the Queensland Department of Transport and Main Roads (DTMR):

|  |  |  |  |
| --- | --- | --- | --- |
| Energex (Energy Queensland Group) |  | EQTS 05-05-01 | PE Cells (or any amended version) |
| Energex (Energy Queensland Group) |  | EQTS 05-01-02 | SSL Luminaires (or any amended version) |
| Queensland Department of Transport and Main Roads | Technical Specification | MRTS91 | Conduits and Pits |
| Queensland Department of Transport and Main Roads | Technical Specification | MRTS92 | Traffic Signal and Road Lighting Footings |
| Queensland Department of Transport and Main Roads | Technical Specification | MRTS94 | Road Lighting (or any amended version) |
| Queensland Department of Transport and Main Roads | Technical Specification | MRTS210 | Provision of Mains Power |
| Queensland Department of Transport and Main Roads | Technical Specification | MRTS228 | Electrical Switchboards |
| Queensland Department of Transport and Main Roads | Technical Specification | MRTS256 | Power Cables |
| Queensland Department of Transport and Main Roads | Traffic and Road Use Management Manual | Volume 4, Part 3 | Electrical Design for Roadside Devices  (DTMR reticulate their infrastructure differently to Brisbane City Council) |
| Queensland Department of Transport and Main Roads | Technical Note | TN158 | Guide to the Use of LED Road Lighting Luminaire (or any amended version) |
| Queensland Department of Transport and Main Roads | Standard Drawings |  | DTMR Standard Drawings – Various (As Listed) |

### References

| Table of Technical Specification for Providing NPL 3 or Metered Lights | |
| --- | --- |
| Component | Reference specification |
| Point of Supply | * Energex Lighting Construction Manual. * DTMR Specification MRTS210 Provision of Mains Power. * DTMR Standard Drawing SD1327 – Traffic Signals/Road Lighting – Mains Connections. |
| Switchboard  Switch board protection  Fuses/Circuit breakers | * Standard Drawing BSD-4002 Mains connection to Energex equipment. * Standard Drawing BSD-11001 Pedestrian lighting main switchboard and control panel arrangement and schematic. * Standard Drawing BSD-11002 Pedestrian lighting control panel arrangement and schematic. * Standard Drawing BSD-11003 Pedestrian lighting M6 earthing stud detail and light sire component schedule. * Standard Drawing BSD-11101 Parks switchboard. * DTMR Specification MRTS210 Provision of Mains Power. * DTMR Specification MRTS228 Electrical Switchboards. |
| Cables | * DTMR Specification MRTS256 Power Cables (Refer to Table 3 in MRTS256). |
| Luminaires | * DTMR Specification MRTS94 Road Lighting. * DTMR Technical Note TN158 Guide to the Use of LED Road Lighting Luminaire.   (For major roads, not parks and bikeways) |
| General – Traffic and Road Use Management Manual | * DTMR Traffic and Road Use Management Manual (TRUM) Volume 4:   Part 2 Road Lighting Maintenance.  Part 3 Electrical Design for Roadside Devices.  Part 4 Road Lighting Dome Junction Box Assembly  Part 8 Electrical Verification Requirements for New or Altered Roadside Installations. |
| General – Road Planning Design Manual | * DTMR Road Planning and Design Manual (RPDM) 2nd Edition Volume 6: Lighting |
| Rag bolts | * Standard Drawing BSD-4154 Rag bolt assemblies mast arm. * Reference Specifications for Engineering Work S607 Traffic signals – Rag bolts. * DTMR Specification MRTS92 Traffic Signal and Road Lighting Footings. |
| Conduits  Pits  Lids | * BSD-1011 Cable pit rectangular type. * BSD-1012 Cable pit rectangular type lids. * BSD-1013 Public utility corridors and alignments (4.25m wide verge). * BSD-1014 Public utility conduit sections (4.25m wide verge). * BSD-1015 Public utility corridors and alignments (3.75m wide verge). * BSD-1016 Public utility conduit sections (3.75m wide verge) * Standard Drawing BSD-4001 Electrical cable clearances. * Standard Drawing BSD-4032 Circular cable jointing pit 600 diameter – Collar. * Standard Drawing BSD-4033 Circular Cable jointing pit 600 diameter – Cover. * Reference Specifications for Engineering Work S605 Traffic Signals Hardware Pits and Lids. * DTMR Specifications MRTS91 Conduits and Pits. * DTMR Standard Drawing SD1415 Traffic Signals/Road Lighting – Cable Jointing Pit Type 60. |
| Poles  Outreach  Bracket | * Standard Drawing BSD-11004 3m Pedestrian light-pole. * Standard Drawing BSD-11005 5m Pedestrian light-pole. * Standard Drawing BSD-11031 Typical requirements for lighting of off-road shared bicycle paths * Standard Drawing BSD-4123 to BSD- 4128 Joint use column details – Council type. * Reference Specifications for Engineering Work S606 Traffic signals – Poles. * Reference Specifications for Engineering Work S607 Traffic signals – Rag bolts. * DTMR Specification MRTS94 Road Lighting. |

### Definitions

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| --- | --- |
| Major roads luminaires | Luminaires used to illuminate arterial roads, suburban roads, district roads, primary freight routes, primary freight accesses (Category V). |
| Minor roads luminaires | Luminaires used to illuminate neighbourhood roads lights for local streets and laneways and other pedestrian dominated areas (Category P). |
| AEMO | Australian Energy Market Operator. Responsible for the administration and operation of the National Electricity Market (NEM) |
| AER | Australian Energy Regulator |
| ANSI | American National Standards Institute (U.S.A) |
| BSI | British Standards Institution (U.K.) |
| Colour Rendering Index (CRI) | A measure of how well the light source renders colours. The index ranges from 0-100 with 100 being full and accurate colour rendition. |
| Correlated Colour Temperature (CCT) | Measures the colour temperature of light. Colour temperature is measured in Kelvins (K).  Lighting is described as warm (lower Kelvins) to cooler (higher Kelvins) |
| DTMR | Queensland Department of Transport and Main Roads |
| IEC | International Electrotechnical Commission (Switzerland)  (also known as Commission Électrotechnique Internationale) |
| ILAC | International Laboratory Accreditation Corporation |
| ISO | International Organization for Standardization |
| Lumens (lm) | Measure of the total amount of visible light (to the human eye) from a lamp or light source |
| Luminous efficacy | Energy efficiency of light sources is typically measured in lumens per watt (lm/W), meaning the amount of light produced for each watt of electricity consumed by the light source. |
| On pole warranty | A warranty shall be provided for either repair or replacement of the defective parts of the luminaire once installed in the operational location on a suitable pole.  The warranty is to include the total cost the repair of a luminaire during the warranty period, including the identification of the fault and the return of the luminaire to normal operations, including but not limited to replacement luminaire &/or parts, labour and traffic control, if required. |
| Public lighting | Lighting for any roadway, pathway or dedicated public thoroughfare, park or precinct (Lighting provided in accordance with the AS/NZS 1158 series) |
| Public Lighting can be divided into two broad categories: -   * Category V (Vehicle) lighting, lighting that is applicable to roads on which the visual requirements of motorists are dominant * Category P (Pedestrian) lighting, lighting that is applicable to roads and other outdoor public spaces on which the visual requirements of pedestrians are dominant. |
| NEMA | National Electrical Manufacturers Association (U.S.A) |
| NEMA 7 PIN receptacle | NEMA approved photoelectric control receptacle (base only) pre-wired into luminaire |
| Lighting tariffs | Types electricity tariffs for Public Lighting installations: |
| * NPL 1 | Unmetered Lighting (non-contributory) - Public lighting supplied, installed, owned and maintained by the Energex. Council pays a tariff that includes components supply, maintenance and amortisation of installation costs. |
| * NPL 2 | Unmetered Lighting (contributory) - Public lighting for which all supply and installation costs are funded by the Public Body or Developer and then ownership is vested in Energex on completion of the installation. Energex then assumes responsibility for maintenance of the installation. Council pays a tariff that includes components supply and maintenance. |
| * NPL 3 | Unmetered lights that are owned, operated and maintained by Brisbane City Council. Council is responsible for these lights and their ongoing maintenance. Installation costs are borne by Council or the developer. These lights include public lighting installed in parks, bikeways and Council roads.  Any light sources listed in the AEMO Public Lighting *National Electricity Market Load Tables for Unmetered Connection Points*’ Report (“Load Tables”) may be used (i.e. non-Energex standard lights) and may be installed by either Council or a private contractor. |
| * NPL 4 | Unmetered Lighting (non-contributory) – Public lighting originally supplied, installed, owned and maintained by the Energex (NPL 1) and the luminaire is converted to LED at Council’s cost. Council pays a tariff that includes components supply, maintenance and amortisation of installation costs. |
| * Metered Lighting | Electrical installation, where a Metering device, approved by AEMO, is installed for the measurement of electricity consumed. Equipment is installed, owned and maintained by Council. |
| * Tariff 91 (previously known as Tariff 81) | Unmetered electricity supply is available to other small loads, as approved by the Energex & Tier 1 Electricity Retailer. Equipment is installed, owned and maintained by Council. |
| * Watchman Service Lighting (Tariff 91) | Unmetered electricity supply for watchman security lights. Lighting supplied, installed, owned and maintained by Energex. |
| Warranty | The warranty shall provide for either repair or replacement of the defective parts. The warranty is void if a luminaire defect has resulted from improper installation, improper handling, vandalism or vehicular accident. Delivery costs associated with repair or replacement of the luminaire under this warranty shall be borne by the manufacturer/supplier. |
| Solar lighting | Lighting supplied, installed, owned and maintained by Council. Supply is created from photovoltaic panels and is generally standalone (not connected to the Electricity Network). |

### Traffic Control

General: Traffic control shall be undertaken in accordance with the approved Traffic Management Plans and Permits.

Method: Provide for traffic while undertaking the works in accordance with the requirements of the *Queensland Guide to Temporary Traffic Management (Harmonised)*.

## TECHNICAL SPECIFICATION OF SOLID STATE LIGHTING (SSL) LUMINAIRES

* All equipment and material, where not otherwise specified, shall be in accordance with the appropriate Australian Standard specifications, where such exist, and in their absence, with BSI, IEC or ISO Specifications.
* *AS 1798 Lighting poles and brackets arms – Recommended dimensions.*
* *SA/SNZ TS* *1158.6 Lighting for roads and public spaces Luminaires – Performance.*
* *AS/NZS 60598.1 Luminaires – General requirements and tests.*
* *AS/NZS 60598.2.3 Luminaires – Particular requirements – Luminaires for road and street lighting.*
* *AS/NZS 60598.2.5 Luminaires – Particular requirements – Floodlights.*
* *AS/NZS 61000.3.2 Electromagnetic compatibility (EMC).*
* All photometric data provided must be supported by an independent test report from a laboratory which is endorsed by an accreditation body which is a signatory to the International Laboratory Accreditation Corporation (ILAC) through the Mutual Recognition Agreement (MRA).
* Luminaires shall comply with the relevant spigot fixing sizes detailed in Clause 4.1 of *AS 1798*. The depth of the spigot entry shall be as specified in Clause 2.9 of *SA/SNZ TS 1158.6*.
* Side-entry Luminaires shall have a sail area no greater than 0.17 m2 (Major Road) and 0.1 m2 (Minor Road) and a mass in accordance with *Clause 2.9* of *SA/SNZ TS 1158*.
* The luminaire on-board circuitry shall include surge protection devices to withstand high repetition transients as a result of line switching, nearby lighting strikes and other interference. The luminaire as a minimum shall be fitted with Metal Oxide Varistor (MOV) type surge suppressor with a minimum energy absorption capacity of 320 joules or greater.
* The luminaire shall be provided with at least the following degrees of protection when tested in accordance with *AS/NZS 60598.1*:
* LED Chamber – IP65; and
* Control Gear Chamber – IP65 or where the LED driver unit has an IP65 rating the control gear chamber may be IP24.
* The luminaire must be capable of being monitored and controlled remotely. If only a proprietary product to the offered luminaire can be used for monitoring and control, then Council shall be made aware of this at the time of tendering.
* Luminaire to be fitted with a “NEMA” 7 contact pattern photocell socket complying with *ANSI C136.41* and a matching shorting plug.
* Electronic control gear shall comply with *SA/SNZ TS 1158.6; Clause 3.2.4* except that the power factor shall be not less than 0.9
* Manufacturer/supplier shall detail mechanism for arresting any flicker mode for individual LED units. This must take into account dimming levels of 25%, 50%, 75% as well as 100% operating power.
* Nominal correlated colour temperature (CCT) shall be 4000 K, unless authorised in writing by Council. There shall be no variation between individual LED units comprising a complete luminaire. Chromaticity tolerance shall be, CCT tolerance 3985 ± 275 K and Duv 0.0009 ± 0.0006.
* The colour rendering index (CRI) of luminaires shall be the maximum available, but not less than 70.
* Cooling system for the LED luminaires shall consist of a heat sink only with no fans, pumps or liquids and shall be resistant to debris build up to maintain the heat dissipation performance.
* Standard lighting outreach spigot has a 5-degree upcast. The luminaire spigot entry shall have the option of an integral system in place for the luminaire to have a final upcast of 0 degrees.
* A warranty must be provided for the full replacement of the luminaire, due to any failure, for a minimum of 10 years. This includes the LED light engine and power supply/drivers.
* On pole warranty for P Category LED luminaires is encouraged.

## NEW ITEMS

Load Table for Unmetered Loads

High Intensity Discharge (HID) Lamps (such as Mercury Vapour, High Pressure Sodium, Metal Halide, etc) are a light source that have been typically used in conventional luminaires. These lights sources are non-proprietary and have been tested and approved by AEMO.

However, LED Luminaires have a different level of complexity & assembly. To be connected to an Unmetered Load (NPL 1, 2, 3 or 4) the individual LED luminaire (Make & Model) must first be approved for use by [AEMO](https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Retail-and-metering/Metrology-Procedures-and-Unmetered-Loads). The list of luminaires is published in the ‘*National Electricity Market Load Tables for Unmetered Connection Points*’ Report (commonly known as the “Load Tables”). The Load Tables are available on the AEMO website and is regularly updated.

<https://www.aemo.com.au/-/media/Files/Electricity/NEM/Retail_and_Metering/Metering-Procedures/NEM-Load-Tables-For-Unmetered-Connection-Points.pdf>