



**ACT**  
Government

# Municipal Infrastructure Technical Specification

## 12 Public Lighting

January 2022



Transport Canberra and City Services

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# Acknowledgement of Country

Transport Canberra and City Services (TCCS) acknowledge that Aboriginal people are the Traditional Owners of Australia. We acknowledge and pay respect to the Ngunnawal peoples as the custodians of the land and waters that we live and thrive on today here in the ACT.

TCCS acknowledges that Canberra’s cultural and natural heritage was maintained by the Ngunnawal people for many generations before colonial settlement on Australian soil. Aboriginal people’s management of the land preserved the natural balance of local plants and animals. This knowledge of the environment in which we live is critical to the protection and restoration of our land today.

It is our responsibility to preserve and encourage Ngunnawal, Aboriginal and Torres Strait Islander cultural integrity. When using this document, consider opportunities to incorporate Ngunnawal, Aboriginal and Torres Strait Islander culture.



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# 1 Public Lighting

## 1.1 General

Transport Canberra and City Services (TCCS) manages over 83,000 streetlight columns, 4,100 km of underground cabling, 100 km of overhead cabling, 1,280 switched control points, 46 Smart City access points and 30,000 Smart Nodes.

This Specification outlines the technical requirements for public lighting including supply and installation of associated equipment.

Exclusions: This Specification does not include private lighting within the boundaries of a block.

### 1.1.1 Responsibilities

#### 1.1.1.1 Objectives

Provide public lighting in accordance with this specification. The final installation shall meet the following objectives:

- Facilitate the safe movement of people and vehicles;
- Satisfy the requirements of relevant Australian Standards, Industry Codes and the Territory Plan;
- Increase the safety of the general public and persons directly working on the assets;
- Contribute to a sustainable urban environment through environmentally sustainable design;
- Enhance the urban environment by providing assets of social, environmental and economic value;
- Increase security and amenity; and
- Consider the full life cycle of assets from safety in design to construction to ongoing maintenance and renewal.

#### 1.1.1.2 Compliance

The public lighting design objectives are achieved when:

- The planning, design, construction and modification of assets is adequate to service new and future developments.
- There is compatibility with existing assets, operational methods, and maintenance techniques; and
- The assets provide adequate environmental, community, and asset protection consistent with the accepted design and construction requirements set out in this document and with developments in technology as approved from time to time.

### **1.1.1.3 Requirements**

Requirements: The requirements for public lighting infrastructure in the ACT are set in the documents listed in **Cross references**.

### **1.1.1.4 Precedence**

Where any document (except legislation or the Territory Plan) issued in conjunction with this Specification includes technical requirements that conflict with this Specification, the requirements of this Specification take precedence.

## **1.1.2 Cross references**

### **1.1.2.1 ACT Legislation**

Roads and Public Places Act  
Public Roads Act  
Public Unleased Land Act  
Work Health and Safety Act  
Electrical Safety Act  
Environment Protection Act  
Planning and Development Act  
Utilities Act  
Dangerous Substances Act

### **1.1.2.2 Environment, Planning and Sustainable Development Directorate (EPSDD)**

Territory Plan and General Codes  
Group and Town Centre Master Plans  
National Capital Plan

### **1.1.2.3 Chief Minister, Treasury and Economic Development Directorate (CMTEDD)**

Electrical Fact Sheet – November 2019 – Street Light Systems for Public Streets, Roadways and Arterial Roads.

### **1.1.2.4 Electricity Utility (*Evoenergy*)**

Service and Installation Rules  
Electrical Safety Rules  
Civil Works Field Manual  
Streetlight Supply Connections Approval Procedure



### **1.1.2.5 Design Standards**

The following Design Standards are related to this specification:

- MIS 01 Street Planning and Design
- MIS 05 Active Travel Facilities design
- MIS 06 Verges
- MIS 07 Driveways
- MIS 12 Guide Signs
- MIS 13 Traffic Control Devices
- MIS 17 Shopping Centres and Commercial Areas

The full list of Design Standards can be accessed via the [TCCS website](#).

### **1.1.2.6 Technical Specifications**

The following Technical Specifications are related to this specification:

- MITS 00 Preliminaries
- MITS 01 Traffic Management
- MITS 02 Earthworks
- MITS 03 Underground Services
- MITS 06 Concrete Kerbs, Footpaths and Minor Works
- MITS 10 Concrete Works
- MITS 12 Public Lighting
- MITS 13 Traffic Signals

The full list of Technical Specifications can be accessed via the [TCCS website](#).

### **1.1.2.7 TCCS Reference Documents**

The following TCCS reference documents are related to this specification:

- Reference document 6 Requirements for design acceptance submissions
- Reference document 7 Requirements for operational acceptance submission for hard public infrastructure works
- Reference document 8 Requirements for work as executed records
- Reference document 9 Requirements for final acceptance submission for hard landscape assets and civil works
- Reference document 11 Drafting requirements for summary documents

The full list of Reference Documents can be accessed via [TCCS website](#).

### 1.1.2.8 Design Guidelines

The following design guides are related to this specification:

ACT Crime Prevention Through Environmental Design General Code (CPTED)

Canberra Central Design Manual Part B5

Canberra Central Design Manual Part C5

Civil Aviation Safety Authority (CASA) Manual of Standards Part 139 – Aerodromes

### 1.1.3 Referenced documents

The installation shall comply with the requirements and recommendations of the following standards, codes, regulations, and their successors:

#### 1.1.3.1 Australian Standards

AS/NZS 1158	Lighting for roads and public spaces
AS/NZS 1158.0	Part 0: Introduction
AS/NZS 1158.1.1	Part 1.1: Vehicular traffic (Category V) lighting – Performance and design requirements
AS/NZS 1158.2	Part 2: Computer procedures for the calculation of the light technical parameters for Category V and Category P lighting
AS/NZS 1158.3.1	Part 3.1: Pedestrian area (Category P) lighting – Performance and design requirements
AS/NZS 1158.4	Part 4: Lighting of pedestrian crossing
AS/NZS 1158.6	Part 6: Luminaires – Performance
AS/NZS 1170.2	Structural design actions, Part 2: Wind actions
AS/NZS 1214	Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series) (ISO 10684:2004, MOD)
AS 1379	Specification and supply of concrete
AS 1554.1	Structural steel welding Part 1: Welding of steel structures
AS 1627.1	Metal finishing – Preparation and pre-treatment of surfaces, Part 1: Removal of oil, grease and related contamination
AS 1627.4	Metal finishing – Preparation and pre-treatment of surfaces, Part 4: Abrasive blast cleaning of steel
AS 1798	Lighting poles and bracket arms – Recommended dimensions
AS 2053	Conduits and fittings for electrical installations – Set
AS 2339	Traffic signal posts, mast arms and attachments
AS/NZS 2700	Colour standards for general purposes
AS/NZS 3000	Electrical Installations (known as the Australian/New Zealand Wiring Rules)
AS 3600	Concrete structures
AS/NZS 3750	Paints for steel structures
AS 4100	Steel structures
AS/NZS 4282	Control of the obtrusive effects of outdoor lighting
AS/NZS 4600	Cold-formed steel structures
AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS 4741	Testing of connections to low voltage electricity networks
AS/NZS 4791	Hot-dip galvanized (zinc) coatings on ferrous open sections, applied by an in-line process

AS/NZS 4792	Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialized process
AS 4677	Steel utility services poles
AS 61386	Conduits systems for cable management – Series

### 1.1.3.2 Other publications

#### Austrroads

AGRDR Austrroads Guide to Road Design

### 1.1.4 Interpretation

#### 1.1.4.1 Abbreviations

For the purposes of this Specification the following abbreviations apply:

ACMA	Australian Communications and Media Authority
AEMO	Australian Energy Market Operator
AGRDR	Austrroads Guide to Road Design
CAD	Computer-Aided Design
CASA	Civil Aviation Safety Authority
CES	Certificate of Electrical Safety
CCT	Correlated Colour Temperature
CMTEDD	Chief Minister, Treasury and Economic Development Directorate
CRI	Colour Rendering Index
DALI	Digital Addressable Lighting Interface
EMC	Electromagnetic compatibility
EPSDD	Environment, Planning and Sustainable Development Directorate, ACT Government, and its successors
ILAC	International Laboratory Accreditation Corporation
IPC	Insulation Piercing Connector
LED	Light Emitting Diode
MAC	Media Access Control
MEN	Multiple Earth Neutral
MIS	Municipal Infrastructure Standard
MITS	Municipal Infrastructure Technical Specification
MRA	Mutual Recognition Agreement
NEMA	National Electrical Manufacturers Association
OLED	Organic Light-Emitting Diodes
PE	Photo-electric
PLED	Polymer Light-Emitting Diodes
PVC	Polyvinyl Chloride
SLCC	Street Light Control Cubicle
TCCS	Transport Canberra and City Services, ACT Government, and its successors
UPVC	Un-plasticised Polyvinyl Chloride
UV	Ultraviolet

WAE	Works as Executed
XLPE	Cross-Linked Polyethylene

#### 1.1.4.2 Definitions

For the purpose of this specification, the definitions of terms used to define the components of the road reserve are in conformance with AS 1348, *Glossary of Austroads Terms* and AGRD03.

Other definitions that pertain to this specification are outlined below:

**Aeroscreen:** A luminaire where the intensity at or near the horizontal is restricted in accordance with the requirements of the aviation authorities and AS/NZS 1158.1.1. Typically used near airports and Mount Stromlo Observatory.

**Asset Number:** Each streetlight needs to be recorded as an asset of TCCS with relevant details of make, model, lamp type and wattage and full column details. A unique number is issued and fixed to the lighting column. The numbers are to be recorded on the as-installed drawings and entered in the TCCS database.

**Baseplate Foundation:** Term applies to a method of mounting lighting columns where there is a steel reinforced mass concrete footing with cast-in threaded fasteners. A steel baseplate is welded to the base of the column and the plate is bolted onto the mass concrete footing.

**Carriageway Width:** The portion (width) of the roadway that is devoted to the use of vehicles.

**Circuit Breaker:** A device/s included within each lighting column which will automatically trip and isolate one streetlight should there be an overload or short circuit caused by the installation within that lighting column.

**Co-located Asset:** A public lighting asset located on or within another asset other than a public lighting asset – e.g. public lighting on traffic signal columns, streetlight controllers location with Electricity Utility substation and public lighting outreach arm located on Electricity Utility distribution pole.

**Conduit:** Electrical enclosure or duct used for the installation and protection of streetlight wiring.

**Control Gear:** Refers to the auxiliary equipment required to operate lamps within luminaires.

**Control Point:** A device to isolate a sub-main cable at the point of supply. See also Service Protection Device.

**Cut-off:** Luminaires which are provided with a reflector that shields the lamp so that it is not visible from those directions of view where glare could be a problem, are said to provide a cut-off feature.

**Cycleway:** Path provided for cyclist and pedestrian use.

**DALI:** A digital intra-luminaire control protocol complying with IEC 62386 series, for two-way communication and control between the light emitting diode (LED) Power Supply (driver) and a lighting control system CMS. DALI-2 is an updated and enhanced version of DALI that is backwards compatible with DALI.

**Direct Buried:** Term applies to describe a column mounting method whereby part of the length of the column is buried in the ground in order to provide stability for the column.

**Distribution Network:** The system managed by the Electricity Utility responsible for the distribution network.

**Driveway:** The paved area between the road kerb and the property boundary where a vehicle can access a property.

**DWG:** A form of computer-aided design (CAD) drawing, specifically with the .dwg file format. This is the native file format to variety CAD software suites.

**Electricity Utility:** The licensed entity that manages the electricity distribution network, previously known as Electricity Supply Authority.

**Frangible Column:** A column designed to fail on vehicle impact in a controlled manner. Slip-Base and Impact Absorbing columns are both examples of Frangible Column types.

**Impact Absorbing Column:** A column designed to deform around a vehicle upon impact and gradually slow the vehicle.

**Integral Control Gear:** Control gear that is housed inside the luminaire.

**Lighting Category:** A lighting performance category with minimum requirements as defined in AS/NZS 1158.

**Light Point Controller:** The device that originates a command to execute a lighting action at the luminaire. Most commonly connected via a NEMA ANSI C136.41 5 or 7-pin photocell receptacle, or a Zhaga Book 18 receptacle. LPC receptacles are usually mounted on the luminaire body, either on upper or lower surfaces.

**Lighting Sub-Main:** Power supply conductors originating from the one single circuit breaker or fuse located at a switchboard. Several lights will be connected to the same sub-main.

**Luminaire:** A light fitting.

**MAC address:** Media Access Control address.

**Mounting Height:** The vertical distance from the roadway surface to the photometric centre of the luminaire.

**Nature Strip:** The area of the road reserve between the kerb and the property boundary.

**Overhang:** The horizontal distance from the edge of the kerb to the photometric centre of the luminaire.

**Outreach:** Outreach is measured horizontally from the centreline of the pole to the photometric centre of the luminaire.

**Outreach Arm:** Bracket extending out from lighting column on to which the luminaire is mounted.

**Overhead line conductor:** Aerial conductor used for the distribution of electricity.

**Photo-electric cell:** A device which automatically switches on or off depending upon the ambient lighting level.

**Point of supply:** Or point of connection. The point at which the electrical utilities distribution network ends and the customer's electrical installation begins.

**Pole setback:** The horizontal distance between the edge of the kerb (or edge of the traffic lane if no kerb) and the centreline of the lighting pole, measured normal to the direction of traffic.

**PVC Cable:** Polyvinyl chloride insulated cable.

**Road Reserve:** The section of land that includes the carriageway and nature strips on both sides of the carriageway, usually measured from property boundary to property boundary.

**Service protection device:** A protection device located at the point of supply.

**Slip base column:** A frangible lighting column designed to slip out of the base mount when hit by a vehicle.

**Solid State Lighting:** Lighting that uses light-emitting diodes (LED), organic light-emitting diodes (OLED), or polymer light-emitting diodes (PLED) as sources of illumination.

**Substation:** Location where a transformer steps down the voltage from high voltage to low voltage for distribution.

**Uncontrolled pedestrian crossing:** A pedestrian (zebra) crossing where there are no traffic signals to control the flow of traffic.

**Underpass:** A pathway which passes underneath a roadway.

**Unmetered supply:** An electricity supply provided by the Electricity Utility which does not have electricity consumption metered.

**Upcast (tilt angle):** The angle between the axis of the fixing spigot entry is tilted above the horizontal when the luminaire is installed.

**XLPE Cable:** Cross Linked Polyethylene insulated cable.

## 1.2 Pre-construction planning

### 1.2.1 General

#### 1.2.1.1 Traffic management

General: Take all necessary steps to avoid or minimise delays and inconvenience to all users of the road reserve or open space area during the course of the work but without compromise to the safety of the employees and the public or quality of the works.

Plan: Submit a Traffic Management Plan for approval in conformance with [MITS 01 Traffic Management](#).

#### 1.2.1.2 Hazardous Materials and Chemicals

General: Take all necessary steps to avoid or minimise contact and exposure to hazardous material and chemicals that may be found in public lighting infrastructure. Possible hazardous chemicals such as mercury in lamps, polychlorinated biphenyl (PCB) in capacitors and asbestos in panels, insulation, linings, fuse cartridges and conduits. Appropriate training, awareness, handling and disposal methods must be utilised.

Plan: Ensure Safe Work Method Statements are implemented for all high-risk work.

## **1.2.2 Activity plan**

### **1.2.2.1 Quality plan**

Requirements: Prepare and submit a quality plan for the public lighting construction consistent with the drawings and subject to direction from TCCS. Include the following:

- A program to conform to contract schedule, if required under the contract.
- Works as Executed (WAE) drawings.
- Allocation of plant and personnel for the contract period, if required under the contract.
- Supply plant maintenance records if required.
- The proposed installation technique for inground services and lighting columns.
- The proposed ground compaction details and finished levels.
- Inspection and Test Plan for mandatory testing.

### **1.2.3 Qualifications of Personnel**

The tradesperson supervising the electrical work shall hold an ACT Unrestricted Electrical License.

Other electrical workers shall be fully qualified or be a registered apprentice working under an electrical tradesperson.

All apprentices are to be fully supervised by qualified electricians as required by Access Canberra.

Work performed near or on the Electricity Utility network shall comply with their requirements including but not limited to:

- Service and Installation Rules
- Electrical Safety Rules
- Civil Works Field Manual
- Streetlight Supply Connections Approval Procedure

A large portion of the public lighting infrastructure are co-located and interdependent with the Electricity Utility electricity distribution network. Some streetlight controllers are located within substations and mounted on distribution poles or directly connected to the Electricity Utility overhead network and some outreach arms and luminaires are mounted on Electricity Utility distribution poles.

Contractor work must adhere to the strict requirements for any work near the Electricity Utility and TCCS asset interface.

# 2 Materials

## 2.1 General

### 2.1.1 Nominated materials

Submissions: Submit details, data sheets and/or shop drawings of all proposed materials, as outlined above.

Relocated materials: Relocated materials may be used, provided they meet all the criteria set out in this Specification and in suitable condition.

### 2.1.2 Marking

#### 2.1.2.1 Identification

General: Deliver materials to the site in the manufacturer's original sealed packaging, legibly marked to show the following:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.
- Handling and installation instructions.
- Material safety data sheets.

## 2.2 Luminaires

### 2.2.1 General

Luminaires shall comply with the requirements of AS 1158.6. Compliance with AS 1158.6 shall be substantiated by reference to appropriate test reports from a laboratory accredited by signatories to the International Laboratory Accreditation Corporation (ILAC) through their Mutual Recognition Agreement (MRA).

### 2.2.2 Pre-Approved Luminaires

TCCS prefers the use of pre-approved luminaires as listed on the Public Lighting Standard Drawings ACTSD-4201.

Should a designer propose to use an 'equivalent' luminaire from those listed on the Public Lighting Standard Drawings, the proposal requires a specific approval request by the designer to TCCS at the design stage. Note that proposals for 'equivalents' at construction stage may not be approved.



Where 'equivalent' proposals are made, TCCS requires the submission of comprehensive product data sheets, a Statement of Compliance and photometric data provided in a format required by AS/NZS 1158.2, IES LM-63-02 and LM-79-19.

Luminaires installed as an unmetered connection point must be listed on the Australian Energy Market Operator (AEMO) National Electricity Market Load Table for Unmetered Connection Points. See below:

[AEMO | Metrology Procedures and Unmetered Loads](#)

### **2.2.3 Body Material**

The luminaire body shall be constructed of cast or extruded aluminium alloy, unless otherwise approved.

### **2.2.4 Spigot Sizes and Maximum Mass of Luminaires**

The mass of the finished luminaire shall not exceed the applicable value as specified in Table 2 of AS 1158.6 or the maximum loading of the structural design of the footings, poles, outreach arm and brackets.

### **2.2.5 Service Life**

Luminaires should be capable of having an effective service life of at least 20 years under the environmental conditions as outlined in AS 1158.6.

### **2.2.6 Lamps**

In limited circumstances, TCCS maintains existing lamps by substitution on a 'like-for-like' basis, however for the most part, the preference is for existing lamps to be substituted with modern LED globes or completely substituted with modern solid-state lighting luminaires.

### **2.2.7 Mechanical and Physical Protection**

The required ingress protection and impact resistance shall be no less than required by AS 1158.6.

### **2.2.8 Power**

The luminaire shall be capable of starting and continuing to operate when connected to a 230/400 V +10%, -6%, 50Hz power supply in accordance with AS 60038.

Where a power factor correction capacitor is required, the luminaire shall incorporate a capacitor that operates at a nominal power of not less than 0.85pf lagging.

Luminaires shall be protected by a dedicated protective device internal to the column.

## 2.2.9 Control

Control gear shall comply with the appropriate requirements of AS/NZS 61347.2 series of Standards and IEC 61547. The control gear supply cabling termination compartment shall be of sufficient size to allow ease of supply cable termination and shall be clear of internal components and internal wiring from the luminaire cable entry to the supply termination block.

### 2.2.9.1 NEMA Base

The 7-pin NEMA base shall be wired as follows:

**Table 12-1 NEMA Base Connections**

Pin	Connector Name	Cabling	Cable Colour
1	Line	Connected to luminaire terminal block	Red
2	Neutral	Connected to luminaire terminal block and control gear	Black
3	Common	Connected to luminaire control gear	White
4	Dimming (Dim +)	Connected to luminaire control gear	Violet
5	DALI Dimming (Dim -)	Connected to luminaire control gear	Grey
6	Optional Signal	Spare	Orange
7	Optional Signal	Spare	Brown

### 2.2.9.2 Photo Electric Cells

As part of the Smart City network, a large portion of the public lighting asset has been installed with Smart Nodes. To expand the coverage of the Smart City network and expand remote monitoring all newly installed assets shall be compatible with the existing Smart City network.

Smart Nodes shall be integral with the luminaire via the NEMA base. Where the installation is an extension to the existing streetlight network and is centrally controlled, a bridging plug shall be provided in lieu of the PE-cell.

Smart Nodes shall have the following characteristics:

**Table 12-2 NEMA Based PE Cell**

<b>Characteristics</b>	<b>Value</b>
Equipment type or equal	External CMS Module
Networking Specification	Itron ACT Networking Specification Compatibility
Control	DALI 2.0
Maximum Load Current	10 A
Housing Material	UV Stabilised Polycarbonate (optional glare shield)
Metering Range	10A RMS, 105 – 305 V <sub>AC</sub>
Metering Accuracy	0.5% minimum
Operating Voltage	105 – 305 V <sub>AC</sub>
Rated Load	1800 VA 3 x 400W
Lux on Setting	15 Lux ± 20%
Lux off Setting	30 Lux ± 20%
Enclosure	IP66 minimum
Sensor	Filtered silicon photodiode
Sensor Drift	Zero over five years
Warranty Period	5 years minimum
Power Consumption	Less than 2 W average power

### **2.2.10 Electromagnetic Compatibility**

All new and replacement luminaires and control equipment covered by this specification shall comply with all relevant requirements of the Australian Communications and Media Authority (ACMA) for Electromagnetic capability (EMC) and the requirements of AS/NZS 61000-6-3 *Electromagnetic compatibility (EMC) – Generic Standards – Emission standard for residential, commercial and light industrial environments*.

### **2.2.11 Nominal Correlated Colour Temperature (CCT)**

Typically, luminaires shall have a value for nominal CCT no greater than 4,000 K. In areas where enhanced amenity is required, luminaires with a nominal CCT of 3,000 K may be acceptable provided this is clarified and approved in the early stages of design.

In areas where impact on wildlife is considered critical, luminaires with a nominal CCT of 2,700 K may be acceptable provided this is clarified and approved in the early stages of design.

## 2.2.12 Colour Rendering Index (CRI)

Luminaires shall have a minimum colour rendering index of 70.

## 2.3 Columns

### 2.3.1 General

Public lighting columns shall be the frangible direct buried energy absorbing type. Energy absorbing columns shall deform progressively when a vehicle makes impact with them. The columns shall be designed to deform progressively so as to decelerate an impacting vehicle in a controlled and uniform manner. Columns shall be demonstrated to fall or collapse in a safe fashion so as to be not likely to cause injury to occupants in the impacting vehicle or to other vehicles on the road. The base of an energy absorbing column shall remain attached to the footing after impact and the column shall collapse upon vehicle impact in a predictable and acceptable manner.

The column supplier shall supply evidence of impact testing methods and data carried out by a National Association of Testing Authorities (NATA) accredited facility in accordance with testing procedures specified in AS/NZ 3845 unless otherwise approved.

TCCS reserves the right to accept or reject any column type.

Columns shall present a smooth overall appearance, with particular attention to the junction of the outreach and vertical sections. Bends shall be a true radius, smooth and free of kinks. The maximum deviation from the true shape at any point on the curve shall be checked by means of an internal template, which allows for the diametrical taper of the outreach. When placed against the inside of the outreach any gaps between the outreach and the template shall not exceed 1% of the radius and the rate of gap increase shall not exceed 1 in 50.

Any cross section of a column measured normal to the axis of the vertical component shall have a tolerance of  $\pm 2\%$  of outside dimension.

On the outreach this tolerance shall be  $\pm 5\%$  of the nominal outside diameter of the cross section at that point. Out-of-round in excess of this tolerance shall be grounds of rejection of the columns.

The methods of construction of the columns shall be such as to ensure that the vertical axis is perfectly straight and perpendicular to the base plate and the outreach is set in the plane of the vertical axis. One side of the square base plate shall be at right angles to the outreach. All burrs and blemishes shall be removed from the edges of the materials used. All sharp corners shall be removed from exposed edges, holes and openings provided for cables and for access to electrical equipment.

Welding shall be deposited in runs of sound, clean metal, free from slag inclusions, porosity and undercutting. Good fusion with parent material shall be obtained. Excess material shall be deposited and subsequently ground off flush to give a smooth surface and neat finish. All weld splatters shall be removed. All steel columns shall be galvanised to a minimum thickness of 600 g/m<sup>2</sup>.

Round off all rough welds, sharp edges and remove weld spatter. Clean surface in accordance with AS 1627.1.

Column material shall be galvanized light gauge sheet steel or aluminium. Allowance shall be made for use with luminaires of up to 12 kg weight with a projected windage area of 0.2 square metres.

All decorative steel columns shall be galvanised to a minimum thickness of 600 g/m<sup>2</sup> in accordance with the requirements of AS 4792 and then painted with a two-pack acrylic paint.

All galvanised direct buried columns are to be treated with Dulux Durebuild STE epoxy mastic paint, or equivalent, 300 mm from base of the column to 200 mm above ground level. The first 300 mm shall remain galvanised and is not to be painted or treated due to pole earthing requirements.

Surface preparation shall be by etching and priming the galvanising. Application shall be in a two-pack acrylic finish in accordance with AS 3750.10.

Columns and Outreach Arms shall be coloured as shown in the table below, unless otherwise approved.

**Table 12-3 Approved Colours for Columns and Outreach Arms**

<b>Dulux Application Purpose</b>	<b>Description</b>	<b>Dulux Number</b>
Decorative	Charcoal	32999
Decorative	Anotec XT Silver Grey	51272
Decorative	Heritage Green	50068
Decorative	Duratec "Eternity Bronze Pearl" Satin	90088393
Protective	Durebuild STE Epoxy Mastic	N/A

### 2.3.2 Outreach Arms

Outreach arms shall be secured to the column so that the outreach arm cannot be displaced from its intended position and shall be secured to the column in such a manner to prevent torsional movement of the outreach arm. Grub screws or similar are unacceptable. In plan the orientation of the outreach arm shall be at right angles to the traffic lane unless otherwise directed, or 90° to the tangent point of the curve.

### 2.3.3 Banner Mounting

Banner installation is to be provided only on columns that are 9 m or above where the requirement has been nominated. Banners shall have a quick release mechanism on the lower mounting that will be 'collapsible' should the wind load exceed the design parameters.

Banner serviceability loading is to be calculated using AS/NZS 4676 Appendix G using the following regional parameters:

**Table 12-4 Wind Loading Parameters**

Variable	Description	Value
P <sub>d</sub>	Design Horizontal Wind Pressure	1.0 kPa
P <sub>b</sub>	Regional Wind Pressure	0.9 kPa
K <sub>z</sub>	Terrain Category Height Factor	0.8
K <sub>t</sub>	Topographical factor	1.0
C <sub>D</sub>	Drag Factor	1.3

Each banner shall be attached top and bottom to prevent entanglement with the column, lighting luminaire, regulatory signs, guide signs etc. The total force of each banner shall not exceed 0.5 kN per banner and be restricted to a maximum of two banners per column. Banners shall be mounted at a minimum height of 2.4 m and at a maximum height of no greater than 6m. Banners shall have a quick release mechanism on the lower mounting that will 'break away' should the wind load exceed the design parameters.

### 2.3.4 Service Aperture

Provide an aperture in the base portion of each column for access to control gear. For maintenance personnel safety, column access hatches shall be placed either facing away from the road or to the side facing away from the oncoming traffic. The minimum clear dimensions of the aperture for Cat V poles shall be 670 mm x 150 mm for columns with a double outreach and 570 mm x 150 mm for columns with a single outreach, and Cat P poles shall be 250 mm x 100 mm. Mount terminals and luminaire circuit breaker protection behind the aperture. The lower end of the aperture shall be no less than 450 mm above ground level.

Provide adequate stiffening around the aperture. Provide a lift-out cover over each aperture and fix with tamper proof screws. Make the cover weatherproof to fit flush or semi-flush with the face of the column. Semi-flush covers shall not project more than 2 mm from the face of the column. Treat the surface of the steel prior to galvanising so that it is completely free from rust and mill scale and is suitable for hot-dip galvanising. Steel aperture covers shall have a minimum thickness of galvanising of 600 gm/m<sup>2</sup> and a finish surface free from white rust and stains.

No further coating shall be applied to the external surface of the galvanised steel unless the column is of a decorative nature.

Each lift off cover shall have an earth cable connected to the column. The earth cable shall have sufficient length to lower the cover to the ground.

### 2.3.5 Assembly

Where it is intended to assemble lighting columns on site, submit a detailed procedure for assembly at least three (3) working days prior to commencement of work. Allow to discontinue site assembly during adverse weather conditions that would be detrimental to the condition of the completed column. The transport and storage of galvanised steel lighting columns shall be in accordance with AS 4792 and AS 4680.

### 2.3.6 Asset Numbers

Asset numbers can be ordered from TCCS using the online portal:

<https://form.act.gov.au/smartforms/servlet/SmartForm.html?formCode=1416>

Mount asset numbers at 2.4 m above the finished surface facing the roadway, into the open area or towards the pathway when there is no roadway present. Attach asset numbers at two points on steel and aluminium columns with suitable pop rivets. Use screws or nails for wooden poles. Asset numbers on concrete columns shall be affixed with an adhesive fit for purpose. Decorative catenary lighting arrangements shall have the asset number placed on the first catenary column or on the optical driver control point access cover plate.

## 2.4 Reticulation

### 2.4.1 Conduits

Requirement: comply with [MITS 03G Service Conduits](#).

Conduits and conduit fittings shall be used for all cabling and shall be Class 12 orange heavy duty rigid Unplasticised Polyvinyl Chloride (UPVC) manufactured in accordance with AS 61386 with solvent welded joints. All the conduits shall be of the sizes shown on the approved Drawings.

### 2.4.2 Cabling

All cables shall be insulated and sheathed copper core cables and shall have stranded copper conductors. They shall be 10 mm<sup>2</sup> XLPE insulated HDPE/PVC sheathed for control point operated cabling and stranded copper 2 or 4 core 16 mm<sup>2</sup>, XLPE insulated HDPE/PVC sheathed for all other underground work.

All underground wiring systems should be installed in accordance with AS/NZS 3000:2018 Clause 3.11. Where underground systems are in public areas a greater depth may be required or additional mechanical protection should be added.

Overhead conductors shall be hard drawn stranded 2 core 16 mm<sup>2</sup> twisted service cable or aluminium 2 core 25 mm<sup>2</sup> LV ABC. Active overhead cable conductors shall be identifiable by ribbing or other methods. No colour identification is permitted on overhead insulated cabling. Each individual neutral conductor shall be identified with a suitable ultraviolet (UV) stabilised neutral tag.

Decorative catenary lighting cabling shall be suitable for extra low voltage applications (less than 50 V DC or 120 V ripple-free DC) and be UV stabilised PVC or XLPE insulation suitable for catenary or tree branch mounting. Overhead catenary shall use lighting columns to accept the catenary loadings or alternatively free-standing columns with a minimum catenary mounting height of 4.5 m in pedestrian areas and 7 m

over roadways. Decorative lighting catenary and cabling shall not hinder the ability for tree trimming to occur.

LED and fibre optic cabling must be installed inside a weatherproof enclosure (IP65 or better) or installed in Class 12 orange heavy duty rigid UPVC manufactured in accordance with AS 61386 with solvent welded joints of suitable dimension and terminated in a waterproof enclosure.

All cabling and conduit work shall be installed in accordance with AS/NZS 3000. Where shared trench arrangements are to be undertaken all streetlight cables shall be installed in conduit.

All cables within the columns shall have a minimum of V90 insulation. The insulation of cables shall be coloured as shown in the table below:

**Table 12-5 Approved Cable Sheath Colours**

<b>Circuit</b>	<b>Object</b>	<b>Colour</b>
Three Phase Circuit	Active	Red, White, Blue
	Neutral	Black
Single Phase Circuit	Active	Red
	Neutral	Black
Earth Conductors	Earth	Green/Yellow

## 2.5 Power and Control

### 2.5.1 Control Cubicles

Free standing ground mounted control points shall be manufactured and installed in accordance with Drawing ACTSD-4015 and ACTSD-4016. A 200 mm wide concrete mowing strip shall be installed at finished ground level around the perimeter of the plinth.

Control Cubicles shall be provided for all new Public Lighting installations, unless approved otherwise.

Substantial modifications to existing Public Lighting installations will require new Control Cubicles to be provided where practicable. This should be assessed on a case-by-case basis and confirmed with TCCS during the early stages of the design process.

Streetlight control cubicle colour shall be Anotec Grey Dulux 512272.

It is common for TCCS public lighting assets to interface closely with Electricity Utility assets. It is important at the design stage that consideration (for safety in design) is given to the Electricity Utility requirements such as safe approach distances and other specific requirements for working near the electricity network.



Refer to requirements in the Evoenergy *Streetlight Supply Connections Approval Procedure*. Testing shall be conducted in accordance with AS 4741 *Testing of connections to low voltage electricity networks*.

At a minimum the following documentation shall be consulted:

- Service and Installation Rules
- Electrical Safety Rules
- Civil Works Field Manual
- Streetlight Supply Connections Approval Procedure.

## 2.6 Structural

### 2.6.1 Plinths for Light Columns

Excavation for plinths shall be neatly cut from solid material. Widen fill locally as necessary where light columns are located on fill to support the plinth. Solid material and fill shall comply with [MITS 02 Earthworks](#). The ground conditions are to be confirmed as adequate in accordance with the design by a structural engineer where necessary. Excavated material shall be disposed of at acceptable locations.

Construct plinths to the dimensions and with the embedment required. Design and construct forms true to line, braced in a substantial and unyielding manner so they can be removed without damaging the concrete. Forms shall be mortar tight. Where necessary, thoroughly soak timber forms with water to close cracks due to shrinkage. Lightly oil the interior surface to ensure non adhesion of the concrete. Take care not to stain the surface of the concrete which will be exposed. The material used for forms should give a smooth and even surface to the concrete. The anchor bolt assembly shall be accurately placed and firmly supported.

Concrete placed in plinths shall be normal class concrete with minimum strength grade N20 in accordance with AS 3600 with 20 mm maximum nominal aggregate size. If ready mixed concrete is used, the concrete shall be mixed and delivered in accordance with AS 1379.

The concrete shall be deposited in the forms, without segregation of the components. Concrete shall not be dropped freely from a height greater than 1 m or be deposited in large quantities at any point and moved or worked along the forms. Care shall be taken to fill every part of the forms. The freshly placed concrete shall be compacted by approved vibrator units. Vibrators shall not be permitted to rest on foundation bolt assemblies. Foundation bolt assemblies shall stop below the finished pavement level.

Exposed surfaces of the concrete shall be struck off and finished with a wooden float. All exposed edges shall be neatly rounded to a 5 mm radius. All conduits are to be capped at the time of pour to ensure conduits are free from grit.

The top of the concrete plinth shall be installed to suit the adjacent ground level, including all final landscaping works. The column base plate shall be mounted on the concrete plinth to minimise gaps.

## 2.6.2 Foundation Bolts

Foundation bolt assemblies for lighting columns shall be fabricated to the dimensions specified by the column manufacturer.

All welding shall be in accordance with the requirements of AS 1554.1 Category GP. Treat foundation bolt assemblies by the hot-dip galvanising process in accordance with AS/NZS 4792 to provide a minimum thickness of 800 gm/m<sup>2</sup> and a bright finished appearance free from all galvanising defects. Prior to galvanizing, treat the surface in accordance with AS 1627.1 and AS 1627.4 (Class 2½ Blast).

Galvanise bolts, nuts and washers in accordance with AS 1214. Installation shall be in accordance with the specific column manufacturer's requirements.

# 3 Execution

## 3.1 General

The whole of the work shall be carried out in accordance with AS/NZS 3000, [MITS 03 Underground Services](#), Access Canberra advice and the Service and Installation Rules of the local Supply Authority. The Contractor shall complete all necessary notices, pay all fees and charges and arrange for all inspections and tests required by the Supply Authority, Access Canberra, TCCS as required. Damage caused to columns, poles, luminaires or cabling during construction shall be made good by the Contractor at no cost to TCCS.

### 3.1.1 Site establishment

#### 3.1.1.1 Survey

Requirement: Confirm site surface and benchmarks. Conform to [MITS 00 Preliminaries](#).

### 3.1.2 Provision for traffic

#### 3.1.2.1 General

Requirement: Conform to [MITS 01 Traffic Management](#).

## 3.2 Luminaires

### 3.2.1 Internal Column Wiring

Use a minimum of 2.5 mm<sup>2</sup> twin and earth TPS cable through the column to connect the luminaire to the lamp control gear unit.

The luminaire, column and equipment shall be fully earthed as specified in Drawing ACTSD-4020, AS/NZS 3000 and Access Canberra requirements. Refer to section 3.5.1.

### 3.2.2 Mounting

The luminaire shall be end mounted onto the lighting spigot on the column, securely locked in position and weatherproofed at the point of entry of the spigot. The alignment of the outreach arm shall be normal (i.e., at right angles) to the traffic lane or tangent point of the curve in the roadway.

### 3.2.3 Supply Authority Utility Poles

Installation of luminaires on Supply Authority utility poles are to be avoided where practical. Where existing infrastructure requires luminaires to be mounted on utility assets it must be approved by TCCS and may not be undertaken without written permission from the Supply Authority.

## 3.3 Columns

### 3.3.1 Lighting Columns

Lighting columns shall be erected on concrete plinths or direct buried with electrical equipment installed and connected in accordance with the details shown on the drawings. The outreach and column shall be pulled together tightly as recommended by the pole manufacturer using a winch (e.g. Tirfor) to prevent rotation of the outreach under wind loads.

All lighting columns shall be mounted for true vertical alignment (+/- 0.5 degree). Columns mounted on concrete plinths may be straightened by means of levelling nuts under the mounting base and then secured tightly in place by means of the nuts on top of the mounting base. The Contractor shall also supply and install a 20 mm diameter plastic drainage tube under the mounting base. The gap under the mounting base shall be completely filled with cement mortar and exposed edges neatly chamfered.

With slip base columns the plug and flex assembly shall be clamped to the bottom of the control gear tray and installed so that there is no slack present in the lead. The use of cable ties is not an acceptable clamp. Slip base columns shall be installed for correct operation. Particular attention shall be drawn to the height of the slip-base baseplate from the finished surface level and the correct tensioning of the hold down bolts.

For maintenance personnel safety column access hatches shall be placed either facing away from the road or to the side facing away from the oncoming traffic.

## 3.4 Reticulation

### 3.4.1 Laying of Conduit

Requirement: Conform to [MITS 03G Service Conduits](#).

Conduits shall be installed in accordance with AS/NZS 3000 and Access Canberra requirements.

#### 3.4.1.1 Minimum Invert Levels

Conduits shall be installed in accordance with AS/NZS 3000 to a minimum cover of 600 mm from the finished surface. Where this is impracticable, and otherwise approved, a minimum depth of 300 mm may be employed in conjunction with a continuous pour of concrete having a minimum strength of 5 MPa. Electrical warning tape shall be installed 200 mm above all conduit runs and for shallow conduit placement directly on top of the continuous concrete pour. Any laying of conduit that does not meet minimum depth requires approval and are to be marked on the WAE drawings.

#### 3.4.1.2 Conduits Under Roadways

Conduits under roadways shall project at least 1,000 mm beyond the kerb or edge of shoulder and obstructions. Obstructions include but are not limited to gas mains, telecommunications equipment, water mains, stormwater mains, pedestrian crossings and footpaths.

### 3.4.1.3 Conduit Marking

Where conduits are laid under existing kerbed roads, their location shall be marked by means of Ramset nail driven into the kerb face directly above the centre of the conduit(s) with a disc or plate with “E” stamped on it.

Conduits laid under new roads shall have their location marked by means of a 100 mm high “E” stamped into the kerb face directly above the centre of the conduit(s).

Conduits laid that terminate at a property line or in open spaces, shall have a marker peg provided to indicate the end of the conduit. This peg shall be labelled clearly with the letter “E”. Prior to the installation of underground cables, the Contractor may be required to expose the conduit ends.

### 3.4.1.4 Conduit Inspection

The Contractor shall be responsible for the installation of conduits in accordance with the drawings and shall not backfill the conduit trenches until they have been inspected.

Backfilling of trenches for conduits shall be in accordance with the requirements for shared services trenches detailed in [MITS 03 Underground Services](#).

The Contractor shall be responsible for all necessary permits and fees associated with completion of the works. The existing road or path pavement shall be matched, i.e. each layer of pavement material shall be replaced with identical materials, including asphalt layers where present. Pavement shall be stepped at the edges, work to be as per [MITS 04 Flexible Pavement Construction](#) and [MITS 06 Concrete Kerbs, Footpaths and Minor Works](#) as applicable. Where concrete is removed it shall be taken back to the next weakened plane joint or expansion joint.

## 3.4.2 Cable Pits

Cable pits shall be installed wherever there is more than one 90 degree or greater change in direction in any single conduit run which is not occurring at a street light column. Cable pits shall be installed on long straight runs exceeding 95 metres and at other locations shown on the drawings.

All cable pits shall be installed firmly in the ground with the top flush with the finished surface away from paths and driveways on a drainage bed of 5 mm nominal size screened aggregate of minimum thickness 150 mm. All pits shall be of sufficient size to accommodate the minimum bending radius of the installed cable. All conduit connections to cable pits shall be made waterproof by bitumastic sealant or other approved method. All cable pits shall have their lids marked with the word “ELECTRICAL”.

## 3.4.3 Cabling

Cabling shall be installed in one single run from the control point or mini-pillar to column, column to column, column to pit without inline joints. Do not install cables where undue physical stress is placed on the electrical connections. Cable entering or leaving columns or other assets shall be guarded from sharp protrusions. Cables mounted on the exterior of poles or columns shall exit on the pathway side or off traffic side of columns and shall be protected from damage by metallic cable guards from 200 mm below ground

to a minimum height of 2.4 m above the finished ground level. The Contractor shall supply and install cabling as specified in Section 2.4.2.

In all cases the supply of the service protection equipment (circuit breaker or service fuse) and final connection to the distribution network shall be the responsibility of the Electricity Utility. All costs for this work will be the responsibility of the Contractor.

For Category V and non-residential Category P installations, main conductors shall loop in and out of large (suitable for 4 core 16 mm<sup>2</sup> conductors minimum) terminal links provided in the base of each column. Connection of such networks will be via a common control point arrangement.

When slip base columns are used provision shall be made for disconnect plugs and flex assemblies in the base of each column in accordance with Drawing ACTSD-4005.

Where proposed Category P lighting is to be installed in an existing overhead supply area the public lighting shall be connected directly to the distribution network utilising PE cells for individual luminaire control. Final connection shall be the responsibility of the Electricity Utility or approved Contractors. Cost for this work will be the responsibility of the Contractor.

Connections made in cable pits shall be designed for full submersion. All connectors used for aluminium cable shall be the fully sealed insulation piercing connector (IPC) type. Where insulated cables terminate in an outdoor open-air environment (e.g. pole top) weather loops shall be adopted to prevent water ingress.

## 3.5 Power and Control

### 3.5.1 Earthing

Earthing shall be provided to meet the requirements of the AS/NZS 3000.

Earthing of lighting columns shall comply with *Electrical Fact Sheet – November 2019 – Street Light Systems for Public Streets, Roadways and Arterial Roads*. This can be downloaded from the Access Canberra website.

Earth electrodes shall be installed in accordance with AS/NZS 3000.

All exposed conductive parts, including metallic parts of all fittings, shall be earthed in accordance with AS/NZS 3000. Any exposed metal of columns and equipment should be earthed by means of an earthing conductor originating from the main switchboard. There should be no interconnection, at any column, between neutral and earth.

The method of installing the earth electrode depends on the type of column installed:

#### 3.5.1.1 Direct Buried

Provided the column is direct buried to a depth of 1.2 m, the buried metal of the column may be regarded as the earth electrode. For slip base columns the main earth connection should be the part of the column buried in the ground.

## **Rag Bolt Assembly and Concrete Columns**

An earth electrode needs to comply with AS/NZS 3008:2018 clause 5.3.6 and needs to be installed for each column and/or street light controller. Earth electrodes are to consist of one of the following:

- An approved earth electrode driven to a depth of 1.2 m into the ground
- Copper Strap 25 mm x 1.6 mm x 3,000 mm buried at a depth of at least 500 mm
- Bare Copper Cable 25 mm x 3,000 mm buried at a depth of 500 mm

A green and yellow insulated copper main earthing conductor is to be installed between the electrode and the main neutral link. The main earth conductor should be sized appropriately to the largest active conductor. The minimum size of the main earthing conductor is to be 6 mm.

The electrode must be labelled as required by AS/NZS 3000:2018 Clause 5.5.1.3 and should have mechanical protection in accordance with AS/NZS 3000:2018 Clause 5.5.1.2 (c). Where the earth electrode has been buried below the ground level then further compliance for inspection and testing as per AS/NZS 3000:2018 Clause 5.5.1.2 (a) and NOTE 1 and the requirements of Clause 5.5.1.2 (b) to (d) must be achieved.

The joint or termination installed in an under-ground or damp location must be sealed to prevent the entry of moisture and to comply with AS/NZS 3000:2018 Clause 5.5.5.3 (a).

### **3.5.2 Access Covers**

Earthing of the column access cover shall be with an appropriately sized earthing conductor to an earth stud. If the earth stud is not present, drill and tap a hole to suit a brass bolt with double nuts.

### **3.5.3 Neutral Link**

The incoming and outgoing main neutral conductors at each column should not depend upon a terminal of the neutral link for continuity. The neutrals are to be connected with a take-off tail to the neutral link of the lighting column. Where applicable, the multiple earth neutral (MEN) point is to be made at a neutral link located behind the access cover. This can be achieved by a line clamp or large connector at the base of the streetlight column tying all incoming and outgoing neutral conductors together. This will avoid inadvertently opening the neutral conductor to downstream columns and preventing a rise in potential to the exposed metal of the columns.

### **3.5.4 Protection**

Provide circuit protection accordance with AS/NZS 3000 and specifically clause 2.6.3.2.3.3 *Requirements for additional protection*.

Where fixed electrical equipment such as CCTV, Wi-Fi and Small Cell electrical connections are inside a public lighting column, they are deemed to be final sub-circuits and must be protected accordingly. Fixed electrical equipment can be protected by a circuit breaker/main switch installed within the column behind the access cover.

If the electrical equipment is supplied by an alternate power source other than public lighting and/or traffic light supply, a permanent label “CAUTION: DUAL SUPPLY” must be attached inside and outside of the column.

### **3.5.5 Energisation**

Prior to energising the public lighting system, TCCS requires WAE drawings in accordance with TCCS document [\*Reference Document 8 – Requirements for works as executed records\*](#).

### **3.5.6 Commissioning and Testing**

On completion of each section of public lighting the Contractor shall test and commission the lighting circuits and associated control equipment in accordance with AS/NZS 3000 and AS 3017.

Evidence of the submission of a Certificate of Electrical Safety (CES) to Access Canberra is to be provided with the WAE information on completion of the commissioning and testing.

Commissioning includes verification of Smart Node connectivity and functionality.

### **3.5.7 Access Prior to Practical Completion**

Where road network or public area access lighting is required prior to practical completion the Contractor shall employ one of the options below. The choice of option will be the responsibility of the Contractor and will include meeting all associated costs including connection, disconnection and plant hire.

#### **3.5.7.1 Provide Temporary Power Source**

Provide compliant temporary lighting until the WAE information is submitted (e.g. generator).

#### **3.5.7.2 Provide Temporary Metering**

Where necessary, arrange with the Electricity Utility to install a temporary metered point of supply until compliant WAE information is submitted.



# 4 Completion

## 4.1 Works as Executed Drawings

WAE Records: Conform to [MITS 00B Quality Requirements](#).

The Contractor shall supply the WAE documents and shall certify that the WAE information is correct and that all works have been completed in accordance with the relevant specifications. The Contractor shall review and certify the drawings and documentation in accordance with TCCS reference documents [Reference Document 7 – Requirements for operational acceptance submission for hard public infrastructure works](#) and [Reference Document 8 – Requirements for works as executed records](#) and lodge them for acceptance.

The WAE drawings are to show, with dimensioned set out, all columns and underground cabling together with total circuit loading. Drawings shall be prepared in accordance with TCCS document [Reference Document 8 – Requirements for works as executed records](#).

All relocated or removed columns shall be recorded on a WAE drawing and submitted to enable the spatial mapping to be updated and the energy billing to be adjusted where necessary. Where the removal is temporary, suitable alternative lighting shall be installed to compensate.

Smart Nodes installed on public lighting infrastructure shall have the Media Access Control (MAC) address for each public lighting asset number within a schedule.

In combined public lighting and traffic signal columns the full extent of the public lighting power and control circuits to the luminaire shall be shown in the WAE drawings.

A schedule of 'normally open points' created shall be provided in the WAE drawings.

## 4.2 Request for Isolation and Energisation

Energisation shall not occur until compliant WAE drawings have been received and accepted.

The Contractor shall pay all costs associated with the energisation of the public lighting circuits through TCCS and the Electricity Utility as applicable.

When making an isolation/energisation booking for permanent works, one of the following options is required:

Option 1:

- a copy of acceptance of design (e.g. Certificate of Design Acceptance/Approval, or a copy of email from Territory/TCCS project manager or project officer); and
- associated drawings showing public lighting element of works; and
- a copy of approved WAE drawings.

Option 2:

- Letter of Design Review, and associated design drawings.

When making an isolation/energisation booking for temporary or staged works (during construction phase), a copy of acceptance of design is required:

- Letter of Design Review; or
- Certificate of Design – Acceptance/Approval, or email from Territory/TCCS project manager or project officer confirming endorsement of the proposed temporary works; and
- associated drawings showing proposed arrangement.

WAE drawings are not required for temporary or staged projects before completion of construction works.

# 5 Measurement and payment

## 5.1 Measurement

### 5.1.1 General

Payments made to the Bill of Quantities: To [MITS OOB Preliminaries](#), this Specification, the drawings and Table 12-6 Pay Items table.

### 5.1.2 Methodology

The following methodology will be applied for measurement and payment:

- Allow for all work, materials, testing and quality assurance requirements in each Pay Item.

## 5.2 Pay Items

Table 12-6 Pay Items table

Item No	Pay Items	Unit of Measurement	Schedule of Rates Scope
12.1.1	< 6 m Column	Per Column	This pay item shall include all installation and material costs required for each column, including outreach arm, cable termination and electrical components
12.1.2	6.5 m Column	Per Column	As per above
12.1.3	9.0 m Column	Per Column	As per above
12.1.4	10.5 m Column	Per Column	As per above
12.1.5	12 m Column	Per Column	As per above
12.1.6	> 12 m Column	Per Column	As per above
12.2.1	< 50 W Luminaire	Per Luminaire	This pay item shall include all installation and material costs required for each luminaire, including cable termination, electrical components including control equipment
12.2.2	50-99 W Luminaire	Per Luminaire	As per above
12.2.3	100-149 W Luminaire	Per Luminaire	As per above
12.2.4	150-199 W Luminaire	Per Luminaire	As per above
12.2.5	> 200 W Luminaire	Per Luminaire	As per above
12.2.6	Smart Node	Per Node	As per above

<b>Item No</b>	<b>Pay Items</b>	<b>Unit of Measurement</b>	<b>Schedule of Rates Scope</b>
12.3	Relocation of Existing Columns	Per Column	This pay item shall include all installation and material costs required for each relocated column, including removal, reinstallation, cable termination and electrical components
12.4	Demolition and Disposal of Columns	Per Column	This pay item shall include all demolition and disposal costs required for each column, including any fees to disconnect, removal of footings and buried cable
12.5	Supply and Lay Conduit	Per Lineal Metre	This pay item shall include all installation and material costs required for conduits, required bends, trenching, disposal of soil, laying of conduit in trench or structure, backfilling and the provision of a draw wire
12.6	Supply and Lay Cable	Per Lineal Metre	This pay item shall include all installation and material costs required for cabling and installation of cable in conduits i.e. from power source to column base
12.7	Cable Pits	Per Pit	This pay item shall include all installation and material costs required for cable pits, excavation, disposal of soil and backfilling
12.8	Concrete Plinth for Lighting Column	Per Plinth	This pay item shall include all installation and material costs required for plinths, excavation, concrete, anchor bolts assembly and cast in conduits
12.9	Control Cubicles	Per Item	Supply of Street Light Control Cubicle (SLCC) as per Public Lighting Standard Drawing
12.10	Control Cubicle Plinth	Per Plinth	Supply of plinth for street light control as per Public Lighting Standard Drawing
12.11	TCCS, Electricity Utility, Access Canberra Fees and Charges	Per Instance	This pay item shall include all fees and administrative charges as required by TCCS, Electricity Utility and Access Canberra

## 5.2.1 Submissions

### 5.2.1.1 General

Requirement: Conform to Hold and Witness points.

Drawings: Prepare drawings or other documentation to record extent and constitution of final works in accordance with [\*Reference Document 8 – Requirements for works as executed records\*](#).

Design Deviations: If it appears that minor variations in column locations are required, submit a proposal and obtain approval.

### 5.2.1.2 Materials

Samples:

Submit technical data sheets for each luminaire type provided on the project. The data sheets shall clearly identify all options selected and shall not be a generic data sheet for the product range.

Submit technical data sheets for all luminaire accessories provided as part of the project.

Submit shop drawings for each column type provided on the project. Provide column footing details for all base mount column arrangements, including identification of soil type and burial depth.

All technical information shall be reviewed and approved prior to ordering and installation of material.

Inspection type: **HOLD POINT**.

## 5.2.2 Hold points and Witness points

### 5.2.2.1 Notice

General: Give written notice to the Authorised Person so that the documented inspection and submissions may be made to the **Hold point table** and the **Witness point table**.

**Table 12-7 Hold point table**

<b>Item</b>	<b>Clause Title</b>	<b>Requirement</b>	<b>Notice for Inspection</b>	<b>Release By</b>
<b>General</b>				
12.1	Ordering of Materials	Confirm that all materials to be used in the installation of public lighting meet the requirements of TCCS design and technical specification standards	5 working days before ordering	Authorised Person
<b>Pre-construction planning</b>				
12.2	Quality plan	Prepare and submit Quality plan including Inspection and Test Plan	2 weeks before commencing site work	Authorised Person
12.3	Temporary Traffic Management Plan	Prepare and submit a temporary traffic management plan	2 weeks before commencing site work	Authorised Person
12.4	Temporary Lighting Plan	Prepare and submit a temporary lighting plan	2 weeks before commencing site work	Authorised Person
<b>Execution</b>				
12.5	Placement of concrete lighting columns plinth construction	A copy of the drawing(s) in each case certifying the plinth locations, reference levels, dimensions and ground conditions are in accordance with the design and adequate for the installation	2 working days before commencing placement of concrete	Authorised Person
12.6	Backfilling of conduit trenches	Opportunity shall be given to inspect the conduits prior to backfilling and document the findings prior to releasing this hold point. WAE information shall be updated at this point	2 working days before commencement of backfilling	Authorised Person
12.7	Installation of columns, cable pits, wiring, control points, luminaires etc.	Ensure compliance with TCCS relevant design and specification requirements	WAE information shall be updated at this point	Authorised Person
12.8	Commissioning, Verification and Testing	Conduct commissioning, verification and testing activities in accordance with AS/NZS 3000 and AS 3017. Including verification of Smart Node connectivity and functionality	2 working days before commissioning, verification and testing	Authorised Person

Item	Clause Title	Requirement	Notice for Inspection	Release By
12.9	Connection of Power	Provision of WAE drawings, <i>RD4 Asset Description</i> form and Certificate of Electrical Safety (CES)	N/A	Authorised Person

**Table 12-8 Witness point table**

Item	Clause title	Requirement	Notice for inspection
<b>Execution</b>			
12.1	Operation of the installation in accordance with the design requirement	Opportunity shall be given to Witness operation of the installation prior to Practical Completion	2 working days

# 6 Standard drawings

## 6.1 Public Lighting

### 6.1.1 Wiring, Cables and Information

Drawing Name	Drawing No.
Blank Panels for Streetlight Columns	ACTSD-4001
Minor Streetlight Panel for Integral Luminaires on Concrete Post Top Columns	ACTSD-4002
Slip Base Panel Layout Wiring Diagram	ACTSD-4003
Slip Base Column Base Wiring	ACTSD-4005
Single Line Diagram for Ground Mounted Streetlight Control Cubicle	ACTSD-4015
Streetlight Control Cubicle	ACTSD-4016
Streetlight Control Cubicle Evoenergy Service Connection Arrangement	ACTSD-4017
MEN Earthing of Streetlight Columns	ACTSD-4020
Streetlighting 1Ø Neutral Screen Straight Through Joint	ACTSD-4021
Streetlighting 3Ø Neutral Screen Straight Through Joint	ACTSD-4022
Streetlight Column Identification Plate	ACTSD-4023

### 6.1.2 Footings

Drawing Name	Drawing No.
Streetlighting Column Installation	ACTSD 4051
Concrete Footing Details and Streetlight Control Cubicle	ACTSD 4052



### 6.1.3 Columns

<b>Drawing Name</b>	<b>Drawing No.</b>
Complap Concrete Streetlight Column	ACTSD-4101
4.5 m Post Top Tapered Streetlight Column Bas Mounted	ACTSD-4103
6.5 m Tapered Streetlight Column with Ladder Rest Direct Buried	ACTSD-4104
6.5 m Single Tapered Octagonal Direct Buried	ACTSD-4105
9.0 m Impact Absorbing Column Direct Buried	ACTSD-4107
10.5 m Impact Absorbing Column Direct Buried	ACTSD-4109
12.0 m Impact Absorbing Column Base Plate Mounted	ACTSD-4110
12.0 m Impact Absorbing Column Direct Buried	ACTSD-4111
6.5 m Dual Tapered Octagonal Direct Buried	ACTSD-4115
6.5 m Decorative Column Direct Buried	ACTSD-4116
4.5 m Single Forde Decorative Column Direct Buried	ACTSD-4117
4.5 m Post Top Forde Decorative Column Direct Buried	ACTSD-4118
6.5 m Dual Multi Height Forde Decorative Column Direct Buried	ACTSD-4119
6.5 m Single Forde Decorative Column Direct Buried	ACTSD-4120
9.0 m Single 4.5m Forde Decorative Column Direct Buried	ACTSD-4121
9.0 m Single 3.0m Forde Decorative Column Direct Buried	ACTSD-4122
Canberra Multipole Streetlight	ACTSD-4123
12.0 m Tapered Octagonal Column Base Plate Mounted	ACTSD-4124

## 6.1.4 Outreach Arms and Brackets

<b>Drawing Name</b>	<b>Drawing No.</b>
Electrical Pole Bracket	ACTSD-4151
Streetlight Bracket Arm for Wood Poles	ACTSD-4152
0.5 m Outreach Pole Mounted Bracket	ACTSD-4155
1.5 m 4-way Pipe Outreach Arm	ACTSD-4156
Decorative Hook Outreach	ACTSD-4157
1.5 m Single Outreach Arm	ACTSD-4159
3.0 m Dual Outreach Arm	ACTSD-4160
3.0 m Single Outreach Arm	ACTSD-4161
VPACTORW3.7D Dual 3.5 m Outreach	ACTSD-4162
VPACTORW3.7D-90 Dual 3.5 m Outreach 90 Degree	ACTSD-4163
VPACTORW3.75S 3.5 m Single Outreach	ACTSD-4164
4.5 m Dual Outreach Arm	ACTSD-4165
4.5 m Single Outreach Arm	ACTSD-4166
4.5 m Dual 90 Degree Outreach Arm	ACTSD-4167
Galvanised Steel Spigot Adaptor to Suit 3.5 m Post Top Column	ACTSD-4168

## 6.1.5 Luminaires

<b>Drawing Name</b>	<b>Drawing No.</b>
Pre-Approved Luminaire Table	ACTSD-4201

## 6.1.6 Road Classification

<b>Drawing Name</b>	<b>Drawing No.</b>
Road Classification Sheet 1	ACTSD-4210
Road Classification Sheet 2	ACTSD-4211

## 6.1.7 Column Setbacks and Clearances

<b>Drawing Name</b>	<b>Drawing No.</b>
V Category Lighting Streetlight Column Offsets Sheet 1	ACTSD-4251
V Category Lighting Streetlight Column Offsets Sheet 2	ACTSD-4252
P Category Lighting Streetlight Column Offsets Sheet 1	ACTSD-4261
P Category Lighting Streetlight Column Offsets Sheet 2	ACTSD-4262
P & V Category Lighting Services and Barrier Clearances	ACTSD-4271