

TRUNK ROAD INFRASTRUCTURE TECHNICAL SPECIFICATION No. 12

STREET LIGHTING



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Territory and Municipal Services

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PREFACE

The Australian Capital Territory has adopted the Austroads Guides for provision and management of road and transport infrastructure. The Territory and Municipal Services Directorate has issued a revised series of documents to reflect this development in infrastructure standards and specifications for practice in the ACT.

This present document is part of the ACT Trunk Road Infrastructure Technical Specifications (TRITS) series spanning the broad scope of road infrastructure development and management in the ACT:

- TRITS 01 – Roadworks
- TRITS 02 – Earthworks
- TRITS 03 – Underground Services
- TRITS 04 – Flexible Pavements
- TRITS 05 – Rigid Pavements
- TRITS 06 – Kerbs and Footpaths
- TRITS 07 – Segmental Paving
- TRITS 08 – Incidental Works
- TRITS 09 – Landscape
- TRITS 10 – Bridges and Related Structures
- TRITS 11 – Pavement Marking
- TRITS 12 – Street Lighting
- TRITS 13 – Traffic Signals
- TRITS 14 – Road Signs
- TRITS 15 – Road Furniture

This ACT Trunk Road Infrastructure Technical Specification No. 12 – STREET LIGHTING prescribes the detailed street lighting requirements in the ACT. It is issued to clarify any exceptions or additional requirements for implementation in the ACT, and to identify relevant complementary documents.

In many areas of road infrastructure construction and management, the ACT has adopted the relevant specifications of the NSW Roads and Maritime Services (formerly RTA NSW). The relevant RMS documents are identified and referenced in these ACT Trunk Road Infrastructure Technical Specifications.

The works must be carried out according to the referenced RMS specifications with the exception of items detailed in the Technical Exception Clauses.

Where any differences in practice exist between the RMS Specifications and this Trunk Road Infrastructure Technical Specification, the latter will prevail.

The ACT Government replaces RMS where applicable as the Road Authority. ACT replaces NSW where applicable as the place where the work is conducted. Equivalent ACT authorised organisations and legislation replace NSW's where applicable. Roads ACT's authorised representative is equivalent to RMS's principal.

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I INTRODUCTION

The purpose of this specification is to provide the basis for the design and installation of streetlighting used in public spaces including roads, carparks, pedestrian areas and cycleways.

It is to be used in conjunction with the Australian Standards and other referenced ACT Government guidelines. Particular attention is drawn to the requirements outlined in the [Canberra Central Design Manual, Part 5B – Lighting](#).

These guidelines require that the streetlighting design be carried out by a person or persons with relevant qualifications, having experience in the design of streetlighting using [AS/NZS 1158](#) including all referenced standards, the application of compatible lighting design software and who have an understanding of the International Commission on Illumination (CIE) streetlighting design principles.

The design processes in the relevant Australian Standard should be followed and records of the process kept. Refer particularly to [Section 6 of AS/NZS 1158.1.3 Design Process](#) for design checklists. Clarification shall be sought from Territory and Municipal Services, (TAMS) should any discrepancy exist between these design standards and Australian Standards.

2 REFERENCE DOCUMENTS

2.1 LEGISLATIVE DOCUMENTS

2.2 GUIDELINES

Guide to Road Design – Part 6B: Roadside Environment. Austroads, 2009.

ACT Government Planning and Land Authority. *Electrical Note 2: Electrical Installation of Street Lights, Traffic Lights, Combination Street and Traffic Lights and Public Area Lighting.*
(www.actpla.act.gov.au/__data/assets/pdf_file/0012/2037/Electrical_note_2.pdf)

ACT Crime Prevention and Urban Design Resource Manual, ACTPLA, Guidelines register, Crime Prevention. Ref-08 - Requirements for Works As Executed Quality Records, 2006, Territory and Municipal Services. Ref-09 Requirements for operational Acceptance submissions

Territory and Municipal Services Lighting Masterplans.

Inner City Suburb Lighting Masterplan.

2.3 RELATED TECHNICAL SPECIFICATIONS

The Australian Standards provide most of the information required. Design and installation of streetlighting in the ACT shall meet the requirements and recommendations of these standards.

AS/NZS 1158.0	Road lighting. Part 0 : Introduction.
AS/NZS 1158.1.1	Road lighting. Part 1: Vehicular traffic (Category V) lighting. Part 1: Performance and installation design requirements.
AS/NZS 1158.1.3	Road Lighting. Part 1: (Category V) lighting. Part3: Guide to the design, installation, operation and maintenance.
AS 1158.2	Road lighting. Part 2: Computer procedures for the calculation of light technical parameters for category A lighting.
AS/NZ 1158.3.1	Road lighting. Part 3: Pedestrian area (Category P) lighting. Part 1: Performance and installation design requirements
AS 1158.4	Road lighting. Part 4: Supplementary lighting of pedestrian crossings.
AS 1158.6	Lighting for roads and public spaces. Luminaires
AS 1170.2	Minimum design loads on structures. Part 2: Wind loads
AS 1214	Hot dip galvanized coatings on threaded fasteners
AS 1379	The specification and manufacture of concrete
AS 1538	Cold formed steel structures code
AS 1554.1	Structural steel welding - Welding of steel structures
AS 1627.1	Metal finishing - Preparation and pretreatment of surfaces - Cleaning using liquid solvents and alkaline solutions

AS 1627.4	Metal finishing - Preparation and pretreatment of surfaces - Abrasive blast cleaning
AS 1650	Hot-dipped galvanized coatings on ferrous articles
AS 1798	Lighting poles and bracket arms
AS 2053	Non-metallic conduits and fittings
AS 2979	Traffic signal mast arms
AS 3000	Electrical Installations – Building, Structures and Premises (known as the SAA Wiring Rules)
AS 3600	Concrete structures
AS 4100	Steel structures
AS 4251.1	Electromagnetic compatibility – Generic Emission Standard – Part 1: Residential, commercial and light industry
AS/NZS 4676	Structural design requirements for utility service poles
AS/NZS 4677	Steel utility services poles
AS 4791	Hot-dip galvanised (zinc) coatings on ferrous open sections, applied by an inline process
AS 4792	Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or specialised process

3 LUMINAIRES AND LAMPS

3.1 EARTHING

Earthing shall be provided to meet the requirements of the Electricity Utility and ACT Planning and Land Authority (ACTPLA).

Earthing of lighting columns shall comply with [ACTPLA Electrical Note 2, Electrical Installation of Street Lights, Traffic Lights, Combination Street and Traffic Lights and Street Area Lighting](#).

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](#).

3.2 ELECTRICITY UTILITY POLES

Installation of streetlighting assets on electricity utility assets may not be undertaken without written permission of the electricity utility.

3.3 ENERGISING

Note that prior to energising the streetlighting system, Territory and Municipal Services, and the Electricity Power supply utility require Works As Executed (WAE) drawings in accordance with [TAMS document Ref-08 WAE Quality Records](#).

3.4 TERMINOLOGY

The [Austroads Glossary of Terms](#) is the source of definitions and meanings for the most commonly used terms in this specification.

The following terms apply specifically to lighting installations in ACT:

aeroscreen	Type of luminaire with flat glass lens. All light is controlled and directed downwards by an internal reflector without the assistance of a refractor lens. Particularly low glare output. Typically used near airports. Disadvantage is that lights need to be located at closer spacings than other types to achieve acceptable uniformity.
asset number	Each street light needs to be recorded as an asset of the Territory and Municipal Services 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 into the data base of the Territory and Municipal Services.
circuit breaker	A device included within each lighting column which will automatically trip and isolate one street light should there be an overload or short circuit caused by the installation within that lighting column.
base plate 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 base-plate is welded to the base of the column and the plate is bolted onto the mass concrete footing.
CORT	Refers to the ACT Government organisation Construction and Occupational Regulation Team.
Cad dwg	Refers to a computer aided drafting file storage format.
CASA	Refers to the Civil Aviation Safety Authority
conduit	Duct used for the enclosure of wiring. Shall be category A type rigid heavy duty orange PVC for streetlighting applications.
control gear	Refers to the auxiliary equipment such as ballast, capacitor and ignitor required to operate with the lamp.
control point	A device to isolate a sub-main 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.
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.
electricity utility	The licensed entity that manages the electricity distribution network, previously known as Electricity Supply Authority.
high pressure sodium lamp	A high intensity discharge lamp producing light with a yellowish bias.
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 group with minimum requirements defined in <i>AS/NZS 1158</i> .
lighting sub-main	Power supply conductors originating from the one single circuit breaker or fuse located at a switchboard. A number of lights will be connected to the same sub-main.
low pressure sodium lamp	A lamp type producing monochromatic light of amber colour.
luminaire	Light fitting

mercury vapour lamp	A high intensity discharge lamp producing white light (bluish), sometimes also referred to as high pressure mercury.
metal halide	A high intensity discharge lamp producing white light (bluish), containing metal halides.
NCA	National Capital Authority
photo-electric cell	A device which automatically switches on or off depending upon the ambient lighting levels.
point of supply	Or point of connection. Location in the power distribution where the electrical utility provides a connection point between the distribution network and the customers electrical installation.
overhead line conductor	Aerial conductor used for the distribution of electricity.
PVC	Polyvinyl chloride insulating plastic
service protection device	a device at the point of power supply but does NOT include apparatus up to the service protection device at the point of supply. Includes fuse.
slip base column	A frangible lighting column designed to come away near the base when hit by a vehicle.
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 place where a path passes underneath a roadway.
unmetered supply	An electricity supply provided by the electricity utility which does not have electricity consumption metered.
white light	A term used loosely to describe the light coming from light sources that appear to have a balanced mix of the primary colours of the visible spectrum.
XLPE	Cross linked polyethylene, a higher temperature rated insulating plastic than PVC.

4 QUALIFICATIONS OF PERSONNEL

The street light network is protected under the [ACT Utilities Act](#).

Only “Authorised Streetlighting Personnel” as defined in the Utilities Act shall carry out work on the electrical streetlighting network.

Where ACTPLA have set up a license category of Authorised Streetlighting Personnel then those persons within that category shall have obtained a license from ACTPLA.

Where ACTPLA have not set up a category of Authorised Streetlighting Personnel then those persons within that category shall hold a current Network Awareness Training certificate from ActewAGL plus certificates for working on or with relevant equipment.

5 COLUMN AND LUMINAIRE TYPES – SPECIFIC REQUIREMENTS

5.1 CATEGORY V LIGHTING (TRAFFIC ROUTES)

5.1.1 Rexel Optispan



Manufacturer

Luminaire: Rexel

As this luminaire has only a single action clip, which is susceptible to the covers being opened by some birds, the luminaire shall be fitted with a double action clip or clamp such as “Protex - Model 27-1570”

Column: Vicpole, Ingal EPS or equivalent.

Materials

Luminaire: Rexel Optispan Major. 150 – 400W Metal Halide or High Pressure Sodium Vapour

Column: Column heights are 9, 10.5, 12 and 15 metres. Outreach arms shall be 3, 3.5 or 4.5m single or double.

This type of luminaire may also be mounted directly off a distribution wood or concrete pole utilising pole mounting brackets of 1.5, 3 and 4.5m in outreach

Refer [Construction Dwg DS12 Category03 and 04](#)

5.1.2 Sylvania Roadster



Manufacturer

Luminaire: Sylvania

Column: Vicpole, Ingal EPS or equivalent.

Materials

Luminaire: Sylvania Roadster IP66 Optical Chamber. Integrated PE cell mounting. 150 – 400 Metal Halide or High Pressure Sodium Vapour

Column: Column heights are 9, 10.5, 12 and 15 metres. Outreach arms shall be 3 or 4.5m single or double.

This type of luminaire may also be mounted directly off a distribution wood or concrete pole utilising pole mounting brackets of 1.5, 3 and 4.5m in outreach.

Refer [Construction Dwg DS12 Category 03 and 04](#)

5.2 CATEGORY V & P MAJOR COLLECTOR (TRAFFIC ROUTES) DEC. (ADJACENT TO OR WITHIN PRECINCT AREAS)

5.2.1 Sylvania Clip 34 (Decorative)



Manufacturer

Luminaire: Sylvania

Column: Fyntrim Multipole.

Materials

Luminaire: Sylvania Clip 34 Category V shall be Metal Halide 150- 400W. Cat P shall be Metal Halide 70 - 150W. Complete with integrated D2 type PE cell. IP 66 rated. Colour Dulux Anotec XT Silver Grey Dulux Colour No 51272

Column: Decorative column. Fyntrim 'Canberra Prestige' or equivalent aluminium rag bolt base mounted column. Column heights 9m and 6.5m. Colour anodised aluminium. For use within the City and Suburban Precinct areas.

Refer [Construction Dwg DS12 Category03 and 04](#)

5.2.2 MV Technology Sky-Gen (Decorative)



Manufacturer

Luminaire: GE General Electric Company (Distributed by MV Technology Australia)

Note: This Luminaire is for Canberra CBD only.

Column: Fyntrim Multipole.

Materials

Luminaire: MV Technology Sky-Gen7001.

Category V shall be Metal Halide 150- 400W.

Category P shall be a MV Technology Sky-Gen Pro 7001 Metal Halide 70 - 150W.

MV Technology Sky Gen & Sky Gen Pro shall include IP 66 rated optical chambers and control gear to include thermal overload protection. Colour RAL7001 fitting to also include Canberra Central logo.

Column: Decorative column. Fyntrim 'Canberra Prestige' or equivalent aluminium rag bolt base mounted column. Column heights 9m and 6.5m. Colour anodised aluminium. For use within the City and Suburban Precinct areas.

Refer [Construction Dwg DS12 Category 03 and 04](#)

5.3 CATEGORY V & P MAJOR COLLECTOR (TRAFFIC ROUTES) DECORATIVE

5.3.1 Sylvania Parkville 'Classical' Mod A



Manufacturer

Luminaire: Sylvania

Column: Vicpole, or equivalent.

Materials

Luminaire: Sylvania Parkville Classical Mod A.

Category V shall be Metal Halide or High Pressure Sodium Vapour 150- 400 W.

Cat P shall be Metal Halide 70 - 150W. Complete with integrated D2 type PE cell. IP 66 rated. Colour Heritage Green Dulux colour No 50068 (Aust std 2700 no G11).

Column: Vicpole 'Boulevard'. Colour Heritage Green Dulux colour No 50068 (Aus Std 2700 Colour No G11) two-pack acrylic. Column heights are 9, 10.5 metres. Outreach arms shall be 3m

Refer [Construction Dwg DS12 Category03 and 04](#)

5.3.2 Rexel Optisan Major



Manufacturer

Luminaire: Rexel

As this luminaire has only a single action clip, which is susceptible to the covers being opened by some birds, the luminaire shall be fitted with a double action clip or clamp such as "Protex - Model 27-1570"

Column: Vicpole, or equivalent.

Materials

Luminaire: Rexel Optisan Major Cat P Collector, Optispan minor. Complete with integrated D2 type PE cell.

Cat P. Major Collector shall be Metal Halide 150- 400W or High Pressure Sodium Vapour 150- 400 W.

Cat P residential shall be Metal Halide 70 - 150W (70W High Pressure Sodium permitted in existing LPS areas). Colour Charcoal Dulux Colour No 32999

Column: Vicpole 'Forde'. Colour Charcoal Dulux Colour No 32999 two-pack acrylic. Column heights are 9, 6.5, & 4.5 metres. Outreach arms shall be 3, 4.5m for roadside & 1.5 metres outreach on the pedestrian side.

Refer **Construction Dwg DS12 Category 03 and 04.**

5.4 CATEGORY P3, P4 (LOCAL ROADS)

5.4.1 Sylvania Urban



Manufacturer

Luminaire: Sylvania

Column: Vicpole, Ingal EPS or equivalent.

Materials

Luminaire: Sylvania Urban complete with integrated D2 type PE cell and optical chamber IP rating of IP64. Category P. Lamp type shall be 70 - 150W Metal Halide (70W High Pressure Sodium permitted in existing LPS areas).

Column: Octagonal tapered steel. Column height for residential category P is typically 6.5m with a 1.5m (0.15m for laneways) outreach arm.

This type of luminaire may also be mounted directly off a distribution wood or concrete pole utilising pole mounting brackets 1.5, 3 and 4.5m. Refer **Construction Dwg DS12 Category 03 and 04**.

Note: This is the preferred construction in areas where there is a history of high levels of vandalism. Wire guard cages are also recommended.

5.4.2 Rexel Optispan Minor



Manufacturer

Luminaire: Rexel

As this luminaire has only a single action clip, which is susceptible to the covers being opened by some birds, the luminaire shall be fitted with a double action clip or clamp such as "Protex - Model 27-1570"

Column: Vicpole, Ingal EPS or equivalent.

Materials

Luminaire: Rexel Optispan Minor Category P. Lamp type shall be 70 – 150W Metal Halide (70W High Pressure Sodium permitted in existing LPS areas).

Column: Octagonal tapered steel. Column height for residential category P is typically 6.5m with a 1.5m (0.15m for laneways) outreach arm.

Refer **Construction Dwg DS12 Category 03 and 04**.

Note: This is the preferred construction in areas where there is a history of high levels of vandalism. Wire guard cages are also recommended.

5.5 CATEGORY P3, P4 (LOCAL ROADS DECORATIVE)

5.5.1 Sylvania Burkehill 'Classical' Mod A



Classical Series - Mod A

Manufacturer

Luminaire: Sylvania

Column: Vicpole, or equivalent.

Materials

Luminaire: Sylvania Burkehill 'Classic' Category P shall be 70 - 150W Metal Halide (70W High Pressure Sodium permitted in existing LPS). Colour Heritage Green Dulux colour No 50068 (Aust std 2700 no GI I)

Column: Vicpole 'Boulevard' style columns. Colour Heritage Green Dulux colour No 50068 (Aust std 2700 no GI I) two-pack acrylic. Column height for residential Category P is typically 6.5m with a 1.5m outreach arm.

Refer [Construction Dwg DS12 Category 03 and 04](#).

5.5.2 Sylvania Clip 28



Manufacturer

Luminaire: Sylvania

Column: Fyntrim Multipole.

Materials

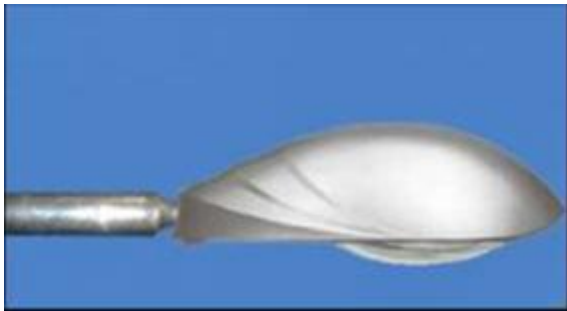
Luminaire: Sylvania Clip 28 complete with integrated D2 type PE cell. IP 66 rated. Category P shall be Metal Halide 70 - 150W. Colour Anotec XT Silver Grey Dulux Colour No 51272

Column: Decorative column. Fyntrim 6.5m. 'Canberra Prestige' or equivalent aluminium rag bolt base mounted column. Colour anodised aluminium. For use within the City and Suburban Precinct areas.

Refer **Construction Dwg DS12 Category03 and 04**.

Note: The use of these luminaire types shall be restricted to major shopping centre precincts where it is warranted to enhance the prestige of the area. Note Columns displayed show obsolete luminaires.

5.5.3 MV Technology Sky Gen Pro (Decorative)



Manufacturer

Luminaire: GE General Electric Company (Distributed by MV Technology Australia)

Note: This Luminaire is for Canberra CBD only.

Column: Fyntrim Multipole.

Materials

Luminaire: MV Technology Sky Gen Pro 7001. IP 66 rated. Category P shall be Metal Halide 70 - 150W. MV Technology Sky Gen Pro shall include IP 66 rated optical chamber and control gear to include thermal overload protection. Colour RAL7001 fitting to also include Canberra Central logo.

Column: Decorative column. Fyntrim 6.5m. 'Canberra Prestige' or equivalent aluminium rag bolt base mounted column. Colour anodised aluminium. For use within the City and Suburban Precinct areas.

Refer [Construction Dwg DS12 Category 03 and 04](#).

5.6 CARPARKS (AS FOR CATEGORY P11 AND P12)

5.6.1 Sylvania Roadster Aeroscreen



Manufacturer

Luminaire: Sylvania

Column: Vicpole, Ingal EPS or equivalent.

Materials

Luminaire: Sylvania Roadster aero screen. IP66 Optical Chamber. Integrated PE cell mounting. Pressure die cast aluminium body. Lamp type 150 – 400W Metal Halide or High Pressure Sodium Vapour

Column: Octagonal tapered steel. Column heights are 9, 10.5, 12 and 15 metres. Outreach arms shall be 3 or 4.5m single or double outreach.

Refer **Construction Dwg DS12 Category03 and 04**.

5.6.2 Sylvania Nightstar/ Nightstar Compact (Decorative)



Manufacturer

Luminaire: Sylvania

Column: Vicpole, Ingal EPS or equivalent.

Materials

Luminaire: Sylvania Nightstar and Nightstar compact full cut-off symmetrical and asymmetrical luminaire. Lamp type 70- 150W (compact) 250- 400W Metal Halide or High Pressure Sodium Vapour. Colour Charcoal Dulux Colour No 32999

Column: Minimum 6.5m column, Colour Charcoal Dulux Colour No 32999 two-pack acrylic. Post top mounting 76mm spigot.

Refer [Construction Dwg DS12 Category 03 and 04](#).

5.6.3 Kim Archetype



Manufacturer

Luminaire: Kim

Column: Vicpole, Ingal EPS or equivalent.

Materials

Luminaire: Kim Archetype full cut-off symmetrical or asymmetrical luminaire. Lamp type 70 -400W Metal Halide or High Pressure Sodium Vapour. Colour Charcoal Dulux Colour No 32999.

Column: Minimum 6.5m column. Colour Charcoal Dulux Colour No 32999 two-pack acrylic. Post top mounting 76mm spigot.

Refer [Construction Dwg DS12 Category 03 and 04](#).

5.7 CATEGORY P2, P6, P7 & P8 (PEDESTRIAN AND OPEN AREA LIGHTING)

Local street pathways, Town centres, shopping centre precincts, paths, cycleways as for Categories P2, P6 P7 P8:

5.7.1 Sylvania B2001 (ACT)



Manufacturer

Luminaire: Sylvania

Column: Vicpole, Ingal EPS or equivalent.

Materials

Luminaire: Sylvania B2001 (ACT) c/w house shield. Category P shall be 70W Metal Halide (70W High Pressure Sodium permitted in existing LPS areas). Colour Anotec XT Silver Grey Dulux Colour No 51272

Column: 4.5m NCC 2005 Post top, galvanised to 600gm/m².

Refer [Construction Dwg DS12 Category 03 and 04](#).

Note: Due to the known risk of vandalism this type of column and luminaire shall only be installed when used as infill lighting within suburbs that have similar column type i.e. post top luminaire.

5.8 CATEGORY P2, P6, P7 & P8 (PEDESTRIAN AND OPEN AREA LIGHTING) (HERITAGE LISTED AREAS)

5.8.1 Rexel Darwin (ACT)



Manufacturer

Luminaire: Rexel

Column: Vicpole, Ingal EPS or equivalent.

Materials

Luminaire: Rexel Darwin (ACT) c/w house shield. Category P shall be 70W Metal Halide (70W High Pressure Sodium permitted in existing LPS areas). Colour Anotec XT Silver Grey Dulux Colour No 51272

Column: NCC 2005 Post top, galvanised to 600gm/m².

Refer **Construction Dwg DS12 Category03 and 04**.

Note: Due to the known risk of vandalism this type of column and luminaire shall only be installed when used as infill lighting within suburbs that have similar column type i.e. post top luminaire.

5.8.2 Colonial Lighting ALN 440



Manufacturer

Luminaire: International Lighting

Column: Vicpole, or equivalent.

Materials

Luminaire: ALN 440 Coach luminaire. Category P shall be 70 - 150W Metal Halide (70W High Pressure Sodium permitted in existing LPS areas). Colour Anotec XT Silver Grey Dulux Colour No 51272

Column: 4.5m NCC 2005 Post top, galvanised to 600gm/m².

Refer **Construction Dwg DS12 Category03 and 04**.

Note: Due to the known risk of vandalism this type of column and luminaire shall only be installed when used as infill lighting within suburbs that have similar column type i.e. post top luminaire.

#The use of these luminaire types shall be restricted to major shopping centres or precincts where it is warranted to enhance the prestige of the area.

5.8.3 Bega 8081.5# & .7# & 8082.5# & .7#



Manufacturer

Luminaire: Bega

Column: Galvanised steel Vicpole, Ingal EPS or equivalent, Aluminium Fyntrim.

Materials

Luminaire: Bega 8081 and 8082 series symmetrical and asymmetrical post top luminaire c/w drop down reflector. Category P shall be 70 - 150W Metal Halide. Colour Charcoal Dulux Colour No 32999 or Anotec XT Silver Grey Dulux Colour No 51272

Column: Colour Charcoal Dulux Colour No 32999 or Anotec XT Silver Grey Dulux Colour No 51272 two-pack acrylic. 4.5m and 6.5m post top rag bolt base mounted. Rag bolts to remain below finished surface level. Refer Construction Dwg DS12 Category03 and 04

Alternative decorative column design Fyntrim 'Canberra Prestige' aluminium rag bolt base mounted column. Rag bolts to remain below finished surface level. Column height 4.5m Colour anodised aluminium. Kerb setback is 1.7m. Driveway and footpath setback is 1.2m. Refer **Construction Dwg DS12 Category 03 and 04.**

Note: The use of these luminaire types shall be restricted to major shopping centres or precincts where it is warranted to enhance the prestige of the area.

5.8.4 Shreder Allura



Manufacturer

Luminaire: Schreder

Column: Galvanised steel Vicpole, Ingal EPS or equivalent, Aluminium Fyntrim.

Materials

Luminaire: Allura symmetrical and asymmetrical post top luminaire. Category P shall be 70 - 150W Metal Halide. Colour Charcoal Dulux Colour No 32999 or Anotec XT Silver Grey Dulux Colour No 51272

Column: Galvanised to 600gm/m². Colour Charcoal Dulux Colour No 32999 or Anotec XT Silver Grey Dulux Colour No 51272 two-pack acrylic. 4.5m and 6.5m post top rag bolt base mounted. Rag bolts to remain below finished surface level.

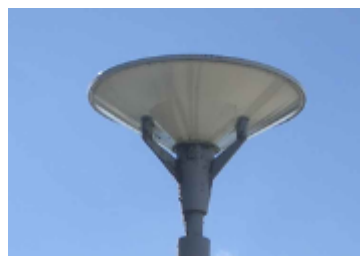
Refer **Construction Dwg DS12 Category03 and 04**.

Alternative decorative column design Fyntrim 'Canberra Prestige' aluminium rag bolt base mounted column. Rag bolts to remain below finished surface level. Column height 4.5m. Colour anodised aluminium. Kerb setback is 1.7m. Driveway and footpath setback is 1.2m.

Refer **Construction Dwg DS12 Category 03 and 04**.

Note: The use of these luminaire types shall be restricted to major shopping centres or precincts where it is warranted to enhance the prestige of the area.

5.8.5 Louis Polsen Kipp#



Manufacturer

Luminaire: Louis Polsen

Column: Galvanised steel - Vicpole, Ingal EPS or equivalent, Aluminium - Fyntrim.

Materials

Luminaire: Kipp symmetrical and asymmetrical post top luminaire. Category P shall be 70 - 150W Metal Halide. Colour Charcoal Dulux Colour No 32999 or Anotec XT Silver Grey Dulux Colour No 51272

Column: Galvanised to 600gm/m². Colour Charcoal Dulux Colour No 32999 or Anotec XT Silver Grey Dulux Colour No 51272 two-pack acrylic. 4.5m and 6.5m post top rag bolt base mounted. Rag bolts to remain below finished surface level.

Refer **Construction Dwg DS12 Category03 and 04**.

Alternative decorative column design Fyntrim 'Canberra Prestige' aluminium rag bolt base mounted column. Rag bolts to remain below finished surface level. Column height 4.5m. Colour anodised aluminium. Kerb setback is 1.7m. Driveway and footpath setback is 1.2m.

Refer **Construction Dwg DS12 Category03 and 04**.

Note: The use of these luminaire types shall be restricted to major shopping centre precincts where it is warranted to enhance the prestige of the area.

5.9 PEDESTRIAN UNDER AWNING LIGHTING (HIGH MOUNT)

5.9.1 Sylvania Sylmaster/Sylmaster SM (surface mount)



Manufacturer

Luminaire: Sylvania

Column: N/A

Materials

Luminaire: Surface or recess mounted luminaire symmetrical high performance floodlight for heights up to 6m. Lamp type, 250 –400W Metal Halide. Colour Charcoal Dulux Colour No 32999.

Column: This type of luminaire is designed to be mounted under building awnings or building fly over structures to enable Territory and Municipal Services to service covered pedestrian and vehicle pavement areas. All buildings where this type of luminaire is mounted shall have the Territory lease title amended to ensure the luminaires, associated wiring and equipment are not interfered with and continued access is made available to the Territory and Municipal Services maintenance contractor.

5.9.2 Sylvania Condor S33306 (Recessed)



Manufacturer

Luminaire: Sylvania

Column: N/A

Materials

Luminaire: Recessed down light for mounting in pedestrian awnings. Lamp type 70W Metal Halide. Colour, Charcoal Dulux Colour No 32999.

Column: This type of luminaire is designed to be flush mounted under building awnings to enable Territory and Municipal Services to service covered pedestrian pavement areas. All buildings where this type of luminaire is mounted shall have the Territory lease title amended to ensure the luminaires, associated wiring and equipment are not interfered with and continued access is made available to the Territory and Municipal Services maintenance contractor.

5.10 PEDESTRIAN CROSSINGS

5.10.1 Rexel Sentry PX (Shield option also available)



Manufacturer

Luminaire: Rexel

Column: Vicpole, Ingal EPS or equivalent c/w spigot mounting adaptor.

Materials

Luminaire: This is an asymmetrical floodlight suitable for pedestrian crossing applications. Lamp type 250 – 400W Metal Halide. Obtrusive light shields available for residential applications.

Column: Octagonal tapered steel. Galvanised to 600gm/m². Column height is typically 6.5m – 9m with a 1.5m – 3m outreach arm.

Refer [Construction Dwg DS12 Category 03 and 04](#).

5.10.2 Sylvania Sylflood AS



Luminaire: Sylvania
Vicpole, Ingal EPS or equivalent c/w spigot mounting adaptor.

Materials

Luminaire: This is an asymmetrical floodlight suitable for pedestrian crossing applications. Lamp type 250 – 400W Metal Halide.

Column: Octagonal tapered steel. Galvanised to 600gm/m². Column height is typically 6.5m – 9m with a 1.5m – 3m outreach arm.

Refer [Construction Dwg DS12 Category03 and 04](#).

5.11 PEDESTRIAN UNDERPASSES

5.11.1 Sylvania Sylproof stainless



Manufacturer

Luminaire: Sylvania

Column: N/A.

Materials

Luminaire: Sylvania stainless construction with polycarbonate protection over fluorescent tubes. Lamp type, twin 24W T5 fluorescent tubes.

Column: This luminaire is designed to be mounted in pedestrian underpasses where there is a significant risk of vandalism. Attention shall be taken to the manner in which this type of luminaire is mounted to ensure both the luminaire and the mounting arrangement remain secure.

5.1.1.2 Versalight Rhino



Manufacturer

Luminaire: Versalux

Column: N/A

Materials

Luminaire: Vandal resistant polycarbonate construction with cast aluminium base. Lamp type, twin 24W T5 fluorescent.

Column: This luminaire is designed to be mounted in pedestrian underpasses where there is a significant risk of vandalism. Attention shall be taken to the manner in which this type of luminaire is mounted to ensure both the luminaire and the mounting arrangement remain secure.

5.12 ROUNDABOUTS CAT V

5.12.1 Sylvania Roadster Aeroscreened



Manufacturer

Luminaire: Sylvania

Column: Vicpole, Ingal EPS or equivalent.

Materials

Luminaire: Sylvania Roadster IP66 Optical Chamber. Integrated PE cell mounting. Pressure die cast aluminium body. Lamp type 150 – 400W Metal Halide or High Pressure Sodium Vapour (HPS lamps shall be used on non NCA designated Arterial). Aeroscreen option shall be used on roundabouts to minimise obtrusive light.

Column: Octagonal tapered steel. Column heights are 9, 10.5, 12 and 15 metres. Outreach arms shall be 1.5 or 2.0m. Where the column height is significant and the roundabout dimension size permits, hinged mounted columns shall be used.

Refer [Construction Dwg DS12 Category03 and 04](#).

5.12.2 Rexel Optispan Major Aeroscreened



Manufacturer

Luminaire: Rexel

As this luminaire has only a single action clip, which is susceptible to the covers being opened by some birds, the luminaire shall be fitted with a double action clip or clamp such as “Protex - Model 27-1570”

Column: Vicpole, Ingal EPS or equivalent.

Materials

Luminaire: Rexel Optispan Major. Lamp type, 150 – 400W Metal Halide or High Pressure Sodium Vapour (HPS lamps shall be used on non NCA designated Arterial Roads). Aeroscreen option shall be used on roundabouts to minimise obtrusive light.

Column: Octagonal tapered steel. Column heights are 9, 10.5, 12 and 15 metres. Outreach arms shall be 1.5m or 2.0m. Where the column height is significant and the roundabout dimension size permits, hinged mounted columns shall be used.

Refer [Construction Dwg DS12 Category03 and 04](#).

5.12.3 Sylvania Urban Aeroscreened



Manufacturer

Luminaire: Sylvania

Column: Vicpole, Ingal EPS or equivalent.

Materials

Luminaire: Sylvania Urban complete with integrated D2 type PE cell and optical chamber IP rating of IP64. Category P. Lamp type shall be 70 - 150W Metal Halide (70W High Pressure Sodium permitted in existing LPS areas). Aeroscreen option shall be used on roundabouts to minimise obtrusive light.

Column: Octagonal tapered steel. Column heights are 9, 10.5, 12 and 15 metres. Outreach arms shall be 1.5m or 2.0m. Where the column height is significant and the roundabout dimension size permits, hinged mounted columns shall be used.

Refer [Construction Dwg DS12 Category03 and 04](#).

5.12.4 Rexel Optispan Minor Aeroscreened



Manufacturer

Luminaire: Rexel

As this luminaire has only a single action clip, which is susceptible to the covers being opened by some birds, the luminaire shall be fitted with a double action clip or clamp such as “Protex - Model 27-1570”

Column: Vicpole, Ingal EPS or equivalent.

Materials

Luminaire: Rexel Optispan Minor Category P. Lamp type shall be 70 – 150W Metal Halide (70W High Pressure Sodium permitted in existing LPS areas). Aeroscreen option shall be used on roundabouts to minimise obtrusive light.

Column: Octagonal tapered steel. Column heights are 9, 10.5, 12 and 15 metres. Outreach arms shall be 1.5m or 2.0m. Where the column height is significant and the roundabout dimension size permits, hinged mounted columns shall be used. Colour Galvanised.

Refer **Construction Dwg DS12 Category03 and 04.**

5.13 HERITAGE LISTED AREAS

5.13.1 Colonial Lighting Waverly



Manufacturer

Luminaire: Colonial Lighting

Column: Koppers, (wood) Rocla (concrete) or equivalent.

Materials

Luminaire: This luminaire is designed to replicate the original incandescent luminaires that are present in the Heritage listed suburbs of Canberra. Lamp type 70W Metal Halide.

Column:

This luminaire is directly mounted off a streetlight or distribution wood/concrete pole utilising purpose designed pole mounting brackets.

6 MATERIALS

6.1 CONDUITS

Conduits and conduit fittings shall be used for all cabling and shall be Class 12 orange heavy duty rigid UPVC manufactured in accordance with AS 2053 with solvent welded joints. All the conduits shall be of the sizes shown on the Drawings.

6.2 CABLING

All cables shall be insulated and sheathed copper core cables, and shall have stranded copper conductors. They shall be 10mm² XLPE insulated HDPE/PVC sheathed for control point operated cabling and stranded copper 4 core 16mm², XLPE insulated HDPE/PVC sheathed for all other underground work.

Overhead conductors shall be hard drawn stranded 2 core 16mm² twisted service cable or aluminium 2 core 25mm² 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 UV stabilised neutral tag.

Decorative lighting cabling shall be suitable for extra low voltage applications (less than 50w DC) and be UV stabilised PVC or XLPE insulation suitable for catenary or tree branch mounting. LED and fibre optic cabling must be installed inside a weather proof enclosure (IP65 or better) or installed in Class 12 orange heavy duty rigid UPVC manufactured in accordance with AS 2053 with solvent welded joints of suitable dimension and terminated in a water proof enclosure. All cabling and conduit work shall be installed in accordance with AS/NZS 3000 as amended. Where shared trench arrangements are to be undertaken all streetlight cables shall be installed in conduit.

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

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

6.3 COLUMNS

The columns shall present a smooth appearance overall, 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 outreach arms shall be secured to the column in such a manner so as to prevent torsional movement of the outreach arm. Grub screws or similar are unacceptable.

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 splatter shall be removed. All steel columns shall be galvanising to a minimum thickness of 600g/m².

All decorative steel columns shall be galvanised to a minimum thickness of 600g/m² 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 Durabuild STE epoxy mastic paint, or equivalent, 300mm from base of the column to 200mm above ground level. The first 300mm shall remain galvanised and is not to be painted or treated due to pole earthing requirements.

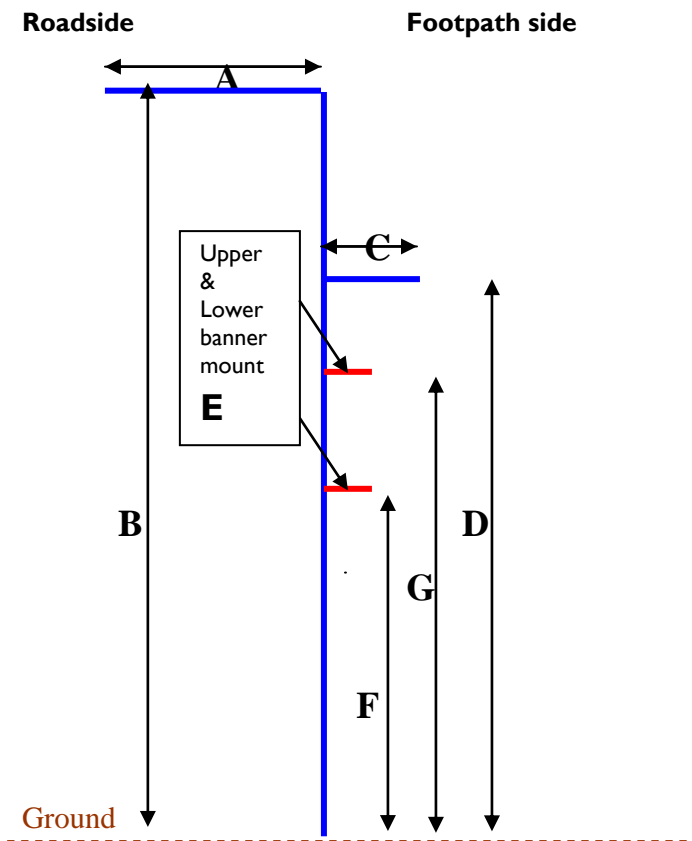
Colour types for columns and outreach arms either

Dulux application purpose	Description	Dulux Number
Decorative	Charcoal	32999
Decorative	Anotec XT Silver Grey	51272
Decorative	Heritage Green	50068
Protective	Durabuild STE epoxy mastic	

AS 2700 (G11)

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.

Streetlight Pole - Dimension limits



Description	Dimension	Outreach Arm	Height	Condition	Design Std TRIS 02 Att A clause reference
Roadside column	A	1.5, 3, 4.5			1.3
“	B		4, 6.5, 9, 10.5, 12, 15		1.2
Pedestrian side column	C	0.5, 1.5			1.3
“	D		4, 6.5, 9, 10.5, 12, 15		1.2
Banner	E	0.5, 1.5		Only on poles > 9 metres in height & designed to withstand wind loadings	1.2, 1.4
“	F		2.4 minimum	“	1.2
“	G		6.0 maximum	“	1.2

Note Column Heights in Parks, Cycleways, Walkways, Adjacent Underpasses & Adjacent Shopping Centres shall be a minimum of 6.5 metres (See TRIS 02 Att A)

6.3.1 Heritage Listed Areas

Where columns are required in Heritage listed areas they shall comply with [TRIS 02 Road Design Attachment A – Street Lighting, Appendix A, 'Heritage ACT street lighting design and maintenance requirements'](#)).

6.3.2 Luminaire Outreach Arms

All outreach arms shall be secured to the column so that the outreach arm cannot be displaced from its intended position. 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.

6.3.3 Banner Mounting

Banner installation is to be provided only on columns that are 9m or above. Banners shall have a quick release mechanism on the lower mounting that will 'collapsible' should the wind load exceed the design parameters as specified in [TRIS 02 Attachment A, section 1.4](#).

6.3.4 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 670mm x 150mm for columns with a double outreach and 570mm x 150mm for columns with a single outreach, and for Cat P poles shall be 250mm x 100mm. Mount terminals and luminaire circuit breaker protection behind the aperture. The lower end of the aperture shall be no less than 450mm 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 2mm 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 600gm/m² 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.

6.3.5 Assembly

Where it is intended to assemble lighting columns on site, subject always to approval by the Superintendent, 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 in the opinion of the Superintendent would be detrimental to the condition of the completed column, or at such other times as the Superintendent may direct. The transport and storage of galvanised steel lighting columns shall be in accordance with [AS 4792](#) and [AS 4680](#).

6.4 LUMINAIRES

Luminaires shall comply with the requirements of [AS 1158.6](#). They shall be integral control gear type, power factor corrected to 0.9pf and have integral photo-electric cell control capabilities. Luminaires shall have individual circuit breaker protection inside the column. Control gear shall be of the reactive type and not constant wattage. Stepped switching and voltage regulation optioned luminaires are required in Cat V road luminaires for metal halide and high pressure sodium luminaries. Luminaires used for post-top installation may utilise external control equipment. As many luminaries have also been selected for their form as well as function, luminaire types are restricted to those listed.

Approved Luminaires

This schedule lists luminaires that may be used in accordance with locations & conditions as specified in [TRIS 02 Attachment A – Street Lighting](#).

Bega 8081
Bega 8082
Colonial Lighting ALN 440
Colonial Lighting Waverly
Kim Archetype
Louis Polsen Kipp
MV Technology Sky-Gen 7001
MV Technology Sky-Gen Pro
Rexel Darwin (ACT)
Rexel Optispan Major
Rexel Optispan Minor
Rexel Sentry PX
Shreder Alura
Sylvania Slyproof Stainless
Sylvania B2001 (ACT)
Sylvania Burkehill 'Classical' Mod A
Sylvania Clip 28
Sylvania Clip 34
Sylvania Condor S33306
Sylvania Nightstar Compact
Sylvania Parkville 'Classical' Mod A
Sylvania Roadster IP66 Optical Chamber
Sylvania Sylflood AS
Sylvania Sylmaster
Sylvania Urban
Versalight Rhino

6.5 ELECTROMAGNETIC COMPATIBILITY (EMC)

All new and replacement luminaires and control equipment covered by this specification shall comply with all relevant requirements of the Australian Communications Authority (ACA) for EMC and the requirements of [AS/NZS4251.1 Electromagnetic compatibility – Generic Emission Standard – Part 1: Residential, commercial and light industry](#).

6.6 LAMPS

Lamp types shall be as nominated on the drawings. The lamps shall be suitable for use in the type of luminaire installed and shall have a guaranteed minimum life as listed in the following table. Self igniting lamps shall not be used. 250W and 400W lamps shall be capable of being incorporated with voltage regulation and stepped switching devices.

LAMP TYPE	Wattage	Min Mean Lumen output (@100hrs)	Type	Base	Life #1 Expectancy	Colour Temperature	Survival at life expectancy	Lumen depreciation at life expectancy
High Pressure Sodium Vapour. For use within 5km of Mt Stromlo observatory. Twin Arc lamps shall be used in all Cat V lighting designs.	70	6,000	Elliptical Coated	E27	6 yrs	2000k	80%	80%
	150	17,000	Tubular clear	E40				
	250	32,000	Tubular clear	E40				
	400	55,000	Tubular clear	E40				
Metal Halide To be used in all Category P lighting schemes and all designated NCA areas including Cat V designs and Optical fibre decorative lighting driver units	70	5,500	Elliptical Coated	E27	4 yrs	4000k	70%	50%
	150	13,000	Tubular Clear	E27				
	250	21,000	Tubular Clear	E40				
	400	42,000	Tubular Clear	E40				
Post top luminaire lamps	70	6,000	Ceramic tubular	G12				
	150	13,000	Ceramic tubular	G12				
Fluorescent	24 - 42	20,000	Ceramic tubular	GX24q-4	4 yrs	4000k	70%	50%
Induction#2	23- 50		Elliptical Coated	E27	8yrs	4000k	70%	50%
24 volt LED Decorative lighting#2	0.72(typical)	20,000			10 yrs			

#1 The superintendent may require the contractor to provide a manufacturers certification that the Life Expectancy meets the required period.

#2 Lamps marked are for trial purpose only. Permission in writing must be granted by the Territory and Municipal Services before any of these types of lamps are installed.

Mercury vapour, low pressure sodium vapour, compact fluorescent, incandescent, quartz halogen, are not permitted to be installed in streetlighting or decorative lighting in the ACT. Where these types of lamps are currently installed they may be maintained until such time as the luminaire requires replacement. When this occurs only standard lamps from this table shall be used.

6.7 PHOTO ELECTRIC CELLS (PE CELLS)

PE cells shall be integral with the luminaire. 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.

PE cells shall have the following characteristics:

NEMA Based

Rated voltage	220 – 270 Vac
Rated load	2 x 400W HPS
Lux on setting	15 Lux ± 20%
Lux off setting	30 Lux ± 20%
Enclosure	IP65 minimum
Sensor	Filtered silicon photodiode
Sensor drift	Zero over five years
Guarantee Period	6 years minimum
Power consumption	Less than 0.5 Watt

D2 based

Rated voltage	220 – 270 Vac
Rated load	2 x 400W HPS
Lux on setting	15 Lux ± 20%
Lux off setting	30 Lux ± 20%
Enclosure	IP65 minimum
Sensor	Filtered silicon photodiode
Sensor drift	Zero over five years
Guarantee Period	6 years minimum
Power consumption	Less than 0.5 Watt

6.8 ASSET NUMBERS

Asset numbers in accordance with [AS/NZS 4677](#) shall be supplied to the superintendent, at the contractor's expense, by the power supply utility upon their connection point approval. Mount asset numbers at 2.4m 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 lighting arrangements shall have the asset number placed on the first catenary column or on the optical driver control point access cover plate.

6.9 CONNECTIONS

In all cases the supply of the initial protection equipment (circuit breaker or service fuse) and final connection to the distribution network shall be the responsibility of the Power Supply Authority. All costs for this work will be the responsibility of the contractor. **The ACT Government is not responsible for this cost.**

For Category V and non-residential Category P installations, main conductors shall loop in and out of large (suitable for 4 core 16mm² 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 DS12 Category 01](#).

When high speed impact absorbing columns are used electrical installation shall incorporate a service pit adjacent to the base of each column in accordance with [Drawing DS12 Category 01](#).

For Category P residential lighting columns are to be supplied from the closest power supply point e.g. mini-pillar.

Where proposed category P streetlighting is to be installed in an existing overhead supply area the streetlights shall be connected directly to the distribution network utilising PE cells for individual luminaire control. Final connection shall be the responsibility of the supply authority or supply authority 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.

6.10 CONTROL POINTS

Free standing ground mounted control points shall be installed in accordance with **Drawing DS12 Category 01**. Control points shall be used on all Category V lighting installations, major collector roads and where there is large open area lighting. Luminaire control shall be via individual PE cell control.

6.11 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 1650 to provide a minimum thickness of 800gm/m² 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. The **Standard Drawings DS12-02 (see Section 10)** provide a guide to foundation bolt installation.

Hold Point 14.1

Process Held: Placement of material orders.

Submission Detail: **Confirmation that all materials to be used in the installation of street or decorative lighting meet the requirements of the Territory and Municipal Services Design Standards.**

Release of Hold Point: The Superintendent will consider the submitted evidence and document approval prior to releasing of the Hold Point.

7 PLINTHS FOR LIGHT COLUMNS

The Contractor shall construct concrete plinths at the locations for light columns shown on the Drawings.

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 **TRITS 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 locations acceptable to the Superintendent.

Construct plinths to the dimensions and with the embedment required. Design and construct forms true to line, braced in a substantial and unyielding manner and 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 concrete which will be exposed. The material used for forms shall be such as to give a smooth and even surface to the concrete. The anchor bolt assembly shall be accurately placed and firmly supported.

Hold Point 14.2

Process Held:	Placement of concrete for lighting columns plinth construction.
Submission Detail:	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.
Release of Hold Point:	The Superintendent will consider the submitted drawings and certification prior to releasing of the Hold Point.

Concrete placed in plinths shall be normal class concrete with strength grade N20 in accordance with **AS 3600** with 20mm 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 metre 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 5mm radius. All conduits are to be capped at the time of pour to ensure conduits are free from grit.

8 ERECTION AND INSTALLATION

8.1 GENERAL

The whole of the work shall be carried out in accordance with **AS 3000 SAA Wiring Rules** 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, streetlight maintenance contractor, ACTPLA, Territory and Municipal Services, Parks and Places, and NCA as required. Damage caused to the columns, poles, fittings or cabling during relocation shall be made good by the Contractor at no cost to the Principal.

8.2 EARTHING

Earthing shall be provided to meet the requirements of the Electricity Supply Authority, ACTPLA and **TRIS 02 Attachment A – Street Lighting**.

8.3 LAYING OF CONDUIT

Conduits shall be installed in accordance with **AS 3000** and ACTPLA requirements.

8.3.1 Minimum Invert Levels

Conduits shall be installed in accordance with **AS/NZS 3000** to a minimum cover of 600mm from the finished surface. Where this is impracticable, as approved by the superintendent, a minimum depth of 300mm may be employed in conjunction with a continuous pour of concrete having a minimum strength of 5MPa. Electrical warning tape shall be installed 200mm above all conduit runs and for shallow conduit placement directly on top of the continuous concrete pour. Any conduits laid to minimum depth need approval from the superintendent, and are to be marked on the WAE drawings.

8.3.2 Conduits Under Roadways

Conduits under roadways shall project at least 1000mm beyond the kerb or edge of shoulder and / or obstructions. Obstructions include but are not limited to all gas lines, Telstra plant, water-mains, stormwater mains, pram crossings and footpaths.

8.3.3 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 100mm 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.

8.3.4 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 the Superintendent has inspected the conduit in the trenches.

Hold Point 14.3

Process Held:	Backfilling of conduit trenches
Submission Details:	Provide at least one working days notice of readiness for inspection of conduit trenches
Release of Hold Point:	The Superintendent shall inspect the conduits prior to backfilling and document the findings prior to releasing this hold point. WAE information shall be updated at this point.

Backfilling of trenches for conduits in areas that do not require a Road Opening Permit shall be general fill compacted as per **TRITS 02 – Earthworks**. Backfilling shall be carried out in layers not exceeding 150 mm maximum thickness after compaction.

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 edges. Where concrete is removed it shall be taken back to the next weakened plane joint or expansion joint. Work to be as per **TRITS 03 – Underground Services**.

8.4 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 method authorised by the superintendent. All cable pits shall have their lids marked with the word “ELECTRICAL”.

8.5 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 200mm below ground to a minimum height of 2.4m above the finished ground level. The Contractor shall supply and install cabling as specified in **Section 6.2**.

8.6 Installation of Lighting Columns

Columns shall be of the make and type as described in **TRIS 02 Attachment A – Streetlighting**. Lighting columns shall be erected on the concrete plinths or direct buried and the 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 maybe 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 20mm 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. See drawing **DSI2 Category 02**.

Use a minimum of 2.5mm² twin and earth TPS cable through the column to connect the luminaire to the lamp control gear unit. 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. The specified lamp shall be fitted into the luminaire.

The luminaire column and equipment shall be fully earthed as specified in **Drawing DSI2 Category 01, AS 3000** and ACTPLA requirements.

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.

Hold Point 14.4

Process Held: Installation of columns, cables, pits, wiring, control points, luminaires etc.

Submission Detail: **The Superintendent shall ensure compliance with Territory and Municipal Services relevant design and specification requirements.**

Release of Hold Point: WAE information shall be updated at this point.

8.7 Commissioning and Testing

On completion of each section of streetlighting the Contractor shall test and commission the streetlighting circuits and associated control equipment.

Evidence of submission of a Notice of Electrical Work to ACTPLA is to be provided with the WAE information on completion of the commissioning and testing.

The Supply Authority (ActewAGL) shall be informed of the proposed connection and may elect to inspect the street light circuits prior to connection to the streetlight or distribution network.

Hold Point 14.5

Process Held:	Commissioning and Testing
Submission Detail:	The Superintendent shall be supplied with evidence of compliance with Section 8.7 of this specification.
Release of Hold Point:	Successful provision of WAE information to Territory and Municipal Services asset acceptance

8.8 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, energy and plant hire.

8.8.1 Provide Temporary Power Source

Provide compliant temporary lighting until the WAE information is submitted as per [Section 8.10](#) (e.g. generator)

8.8.2 Provide Temporary Metering

Where necessary, arrange with the Power Supply Authority to install a temporary metered point of supply until a compliant WAE information is submitted as per [Section 8.10](#).

8.9 RELOCATION OR REMOVAL OF EXISTING COLUMNS

All relocated or removed columns shall be recorded on a WAE drawing and submitted to Asset Acceptance 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.

No columns or fittings shall be reused, unless specific approval for their reuse is obtained at design stage from TAMS.

8.10 WORKS AS EXECUTED DRAWINGS

All work shall be commissioned and tested as per [Section 8.7](#).

The contractor shall supply the Work As Executed (WAE) documents to the superintendent, who on certifying will lodge them with TAMS Asset 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 [TAMS document Ref-08 WAE Quality Records](#). Evidence of completed Superintendent hold point inspections shall be provided with the WAE documents.

Hold Point I4.6

Process Held:	Connection of Power Supply
Submission Detail:	Works-as-Executed drawings showing dimensions setouts of columns and conduits, maximum demand of connected load and voltage drop, fault loop impedance, to the furthest luminaire and all depth and offset information of cabling conduit, columns etc
Release of Hold Point:	Approval by Territory and Municipal Services Asset Acceptance and Electricity Supply Authority where applicable.

8.11 REQUEST FOR ENERGISATION OF WORKS

Energisation shall not occur until compliant WAE plans have been received and accepted by TAMS. At least five working days shall be allowed for WAE acceptance and transfer of the WAE information to the power supply utility. A longer time frame is likely to be required when non-conforming WAE documents are submitted.

The contractor shall pay all costs associated with, and arrange the energisation of the streetlight circuits through the power supply utility as applicable.

9 MEASUREMENTS AND PAYMENT

Payment shall be made for all activities associated with completing the work detailed in this Specification in accordance with **Pay Item I4 PI-8** inclusive.

If any pay item for which a quantity of work is listed in the Contract has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other pay items for the cost of the activity which has not been priced.

The Contractor shall allow in the pay items generally for the costs associated with all testing required to prove conformance of the works as specified.

9.1 Pay Item I4 PI Lighting Columns

The unit of measurement shall be per lighting column installed of each height as listed in the sub items. This pay item shall be inclusive of all work and materials required for the installation of the columns of each height, including the column, outreach arm, cable terminations, electrical components and erection. A separate pay item shall be included in the Contract for each lighting column height.

I4 PI.1	Less than 6m Column height
I4 PI.2	6.5m Column height
I4 PI.3	9.0m Column height
I4 PI.4	10.5m Column height
I4 PI.5	12.0m Column height
I4 PI.6	15.0m Column height
I4 PI.7	Greater than 15.0m Column height

9.2 Pay Item I4 P2 Lightings and Light Fittings – Watts

The unit of measurement shall be per lighting and/or light fitting installed.

I4 P2.1	70w
I4 P2.2	150w
I4 P2.3	250w

This pay item shall be inclusive of all work and materials required for the installation including the lighting or fitting, lamps, lamp control gear units, electrical components, cabling and erection.

9.3 Pay Item I4 P3 Relocated Lighting Columns

The unit of measurement shall be per lighting column of each height relocated.

This pay item shall be inclusive of all work and materials required for the removal and re-installation of the columns including the removal, cabling and re-erection.

A separate pay item shall be included in the Contract for relocated column height.

R14 P3.1	Less than 6m Column height
R14 P3.2	6.5m Column height
R14 P3.3	9.0m Column height
R14 P3.4	10.5m Column height
R14 P3.5	12.0m Column height
R14 P3.6	15.0m Column height
R14 P3.7	Greater than 15.0m Column height

9.4 Pay Item I4 P4 Streetlighting Fees and Co-Ordination Costs

This shall be a Lump Sum item.

This pay item shall include all fees and charges payable to the Territory and Municipal Services streetlight maintenance contractor, Supply Authority and ACTPLA, co-ordination costs, costs associated with the delivery of Works-as-Executed drawings and other costs not included in other items.

9.5 Pay Item I4 P5 Supply and Lay Conduit

The unit of measurement shall be per lineal metre of conduit installed.

This pay item shall be inclusive of the supply of the conduits and required bends, trenching, laying of conduit in trench or structure, backfilling and the provision of draw wire.

9.6 Pay Item I4 P6 Supply and Lay Cable

The unit of measurement shall be per lineal metre of cable installed.

This pay item shall be inclusive of the supply of the cable and installation of the cable in the conduits. Ie from power source to column base.

9.7 Pay Item I4 P7 Cable Pits

The unit of measurement shall be per pit installed.

This pay item shall be inclusive of the supply of cable pits, excavation and installation.

9.8 Pay Item I4 P8 Concrete Plinth for Lighting Column

The unit of measurement shall be per plinth installed.

This pay item shall be inclusive of all work and materials required for the construction of the plinth including excavation, concrete, anchor bolts assembly, conduits and cable jointing pit.

9.9 SCHEDULE OF HOLD POINTS, INSTALLATION TEST PROCEDURE (ITP) EXAMPLE

An ITP or similar document to this example shall be provided to Territory and Municipal Services Asset Acceptance immediately following the energisation of the works. The inspection percentages shown in the table below shall be regarded as the minimum inspections required for compliance with Territory and Municipal Services Specifications and Standards.

Location (per column)		Material 100%#	Plinth installation 50% #	Trench 25%#	Column /luminaire Installation 25%#	Testing and Commissioning 100% #	Connection of Power 100% #	Comments
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Initials of Superintendent completing QA check shall be placed in the spaces below.

Signature of designer: _____ Signature of installer: _____ Signature of Superintendent: _____

Print Name: _____ Print Name: _____ Print Name: _____

Date: _____ Date: _____ Date: _____

ITP page ___ of ___

10 REFERENCES

ACT Government 2000, Utilities Act, ACT Government, Canberra, ACT.

ACT Government 2012, *Trunk road infrastructure technical specifications*, Canberra, ACT.

ACT Planning & Land Authority 2007, *Canberra Central design manual*, ACT Government, Canberra, ACT.

ACT Planning & Land Authority, *Electrical note 2: Electrical installation of street lights, traffic lights, combination street and traffic lights and street area lighting*, ACT Government, Canberra, ACT.

Austrroads 2010, *Glossary of Austrroads terms*, Austrroads, Sydney, NSW.

Standards Australia 1983, *AS/NZS 1214: Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)*, Standards Australia, Sydney, NSW.

Standards Australia 1999, *AS/NZS 4251: Conduits Electromagnetic compatibility*, Standards Australia, Sydney, NSW.

Standards Australia 2000, *AS 1379: Specification and supply of concrete*, Standards Australia, Sydney, NSW.

Standards Australia 2002, *AS/NZS 2053: Conduits and fittings for electrical installations*, Standards Australia, Sydney, NSW.

Standards Australia 2005, *AS/NZS 1627: Metal finishing*, Standards Australia, Sydney, NSW.

Standards Australia 2006, *AS/NZS 4680: Hot-dip galvanized (zinc) coatings on fabricated ferrous articles*, Standards Australia, Sydney, NSW.

Standards Australia 2006, *AS/NZS 4792: Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialized process*, Standards Australia, Sydney, NSW.

Standards Australia 2007, *AS/NZS 3000: Electrical installations (known as the Australian/New Zealand wiring rules)*, Standards Australia, Sydney, NSW.

Standards Australia 2008, *AS/NZS 3750: Paints for steel structures*, Standards Australia, Sydney, NSW.

Standards Australia 2009, *AS/NZS 3600: Concrete structures*, Standards Australia, Sydney, NSW.

Standards Australia 2010, *AS/NZS 1158: Lighting for roads and public spaces*, Standards Australia, Sydney, NSW.

Standards Australia 2010, *AS/NZS 4677: Steel utility services poles*, Standards Australia, Sydney, NSW.

Standards Australia 2011, *AS/NZS 2700: Colour standards for general purposes*, Standards Australia, Sydney, NSW.

Standards Australia 2012, *AS/NZS 1554: Structural steel welding*, Standards Australia, Sydney, NSW.

Territory and Municipal Services 2010, *Reference Document 8: Requirements for works as executed quality records*, ACT Government, Canberra, ACT.

11 STANDARD DRAWINGS

An index of the standard drawings is as shown below.

Lighting Standard	No.	Rev.
<u>DS12-01 Wiring, Cables & Information</u>		
Blank Panels for Streetlight Columns	DS12-01-01	0
Minor Streetlight Panel for Integral Luminaires on Concrete Post Top Columns	DS12-01-02	0

Slip Base Panel Layout Wiring Diagram	DS12-01-03	0
Streetlighting Contactor Panel Pole Mounted	DS12-01-04	0
Slip Base Column Base Wiring	DS12-01-05	0
Link Panel for Integral Luminaires on Energy Absorbing Columns	DS12-01-06	0
Link Panel for Integral Luminaires on 3.5m Column	DS12-01-07	0
Link Panel for Integral Luminaires on Slip Base Columns	DS12-01-08	0
Link Panel for Integral Luminaires on 4.1m Post Top Columns (Suitable for Bega Lights & Kim Arche Luminaires)	DS12-01-09	0
Streetlight Control Panel for Non-Integral Metal Halide Luminaires	DS12-01-10	0
Streetlight Control Panel for Twin/Traffic 150/250W HPS Non-Integral Luminaires Layout & Schematic	DS12-01-11	0
Streetlight Control Panel for 400W MV Single Non-Integral Luminaires	DS12-01-12	0
Streetlight Control Panel for 250W MV Single Non-Integral Luminaires	DS12-01-13	0
Streetlight Control Panel for 250W Metal Halide Lamps	DS12-01-14	0
Streetlight Control Panel for Single Line Diagram	DS12-01-15	0
Streetlight Control Cubicle	DS12-01-16	0
Streetlight Control Cubicle ActewAGL Service Connection Arrangement	DS12-01-17	0
Streetlight Control Box	DS12-01-18	0
Sports Oval Lighting Control Box Pole Mounted	DS12-01-19	0
MEN Earthing of Streetlight	DS12-01-20	0
Streetlighting 1Ø Neutral Screen Straight Through Joint	DS12-01-21	0
Streetlighting 3Ø Neutral Screen Straight Through Joint	DS12-01-22	0
Streetlight Column Identification Plate	DS12-01-23	0
PEC Activation Time Graph	DS12-01-24	0
 <u>DS12-02 Footings</u>		
Streetlighting Column Installation	DS12-02-01	0
Concrete Footing Details & Streetlight Control Cubicle	DS12-02-02	0
Indicative Footing Details for Octagonal Columns	DS12-02-03	0
 <u>DS12-03 Columns</u>		
Complap Concrete Streetlight Column	DS12-03-01	0
4.0m Tapered Streetlight Column	DS12-03-02	0
4.5m Tapered Streetlight Column	DS12-03-03	0
6.5m Tapered Streetlight Column with Ladder Rest	DS12-03-04	0
6.5m Tapered Octagonal Single Streetlight	DS12-03-05	0
9.0m Impact Absorbing Column Base Plate Mounted	DS12-03-06	0
9.0m Impact Absorbing Column in Ground Mounted	DS12-03-07	0
10.5m Impact Absorbing Column Base Plate Mounted	DS12-03-08	0
10.5m Impact Absorbing Column in Ground Mounted	DS12-03-09	0
12.0m Impact Absorbing Column Base Plate Mounted	DS12-03-10	0
12.0m Impact Absorbing Column in Ground Mounted	DS12-03-11	0
9.0m Slip Base	DS12-03-12	0
10.5m Slip Base	DS12-03-13	0
12.0m Slip Base	DS12-03-14	0
6.5m Dual Streetlight Column	DS12-03-15	0
6.5m Decorative Streetlight Column	DS12-03-16	0
4.5m Forde Type 1 in Ground Mounted Decorative Streetlight Column	DS12-03-17	0
4.5m Forde Type 2 in Ground Mounted Decorative Streetlight Column	DS12-03-18	0
6.5m Forde Type 3 in Ground Mounted Decorative Streetlight Column	DS12-03-19	0
6.5m Forde Type 2 in Ground Mounted Decorative Streetlight Column	DS12-03-20	0
9.0m Forde Type 3 in Ground Mounted Decorative Streetlight Column	DS12-03-21	0
9.0m Forde Type 4 in Ground Mounted Decorative Streetlight Pole	DS12-03-22	0
Canberra Multipole Streetlight	DS12-03-23	0
12.0 m Tapered Octagonal Column	DS12-03-24	0
 <u>DS12-04 Outreach Arms & Brackets</u>		
Electrical Pole Bracket	DS12-04-01	0
Streetlight Bracket Arm for Wood Poles	DS12-04-02	0
Pedestrian Lighting Bracket	DS12-04-03	0
Mid Arm Mounting Bracket for Pedestrian Flood Lights	DS12-04-04	0
0.5m Outreach Pole Mounted Bracket	DS12-04-05	0
1.5m 4 way Pipe Outreach Arm	DS12-04-06	0
VFACTOR750 R-2 Streetlight Outreach	DS12-04-07	0
Dual 1.5m Outreach	DS12-04-08	0
VFACTORW1.5S 1.5m Single Outreach	DS12-04-09	0

VPACTORW3.0D Dual 3m Outreach	DS12-04-10	0
VPACTORW3.0S 3m Single Outreach	DS12-04-11	0
VPACTORW3.7D Dual 3.5m Outreach	DS12-04-12	0
VPACTORW3.7D-90 Dual 3.5m Outreach 90 Degree	DS12-04-13	0
VPACTORW3.75S 3.5m Single Outreach	DS12-04-14	0
VPACTORW4.5D Dual 4.5m Outreach	DS12-04-15	0
VPACTORW4.5S Single 4.5m Outreach	DS12-04-16	0
VPACTORW4.5D-90 Dual 4.5m Outreach 90 Degrees	DS12-04-17	0