# Street Lighting

DIPL Roads Master – July 2023

## Outline Description

Supply, install, test, and commission new street lighting as specified in this worksection and as shown on the drawings.

Modify and replace existing street lighting as specified in this worksection and as shown on the drawings.

## Cross References

Refer to the following sections:

* MISCELLANEOUS PROVISIONS
* EARTHWORKS for excavation and trenching.
* PROVISION FOR TRAFFIC
* MISCELLANEOUS CONCRETE WORKS for light pole footings.

## Standards and Publications

Conform to the following Standards and Publications unless specified otherwise:

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| --- | --- |
| **Table – Standards and Publications – Street Lighting** | |
| References to Standards include Australian Standards, and Australian and New Zealand Standards, and other Standards cited in this Specification.  Use Standards, and their amendments, current as at the date for the close of tenders except where different editions and/or amendments are required by statutory authorities, including, but not limited to, NATA and the National Construction Code. | |
| **Designation** | **Title** |
| AS/NZS 1158 (series) | Lighting for roads and public places. |
| AS/NZS 1158.1.1 | - Vehicular traffic (Category V) lighting – Performance and design requirements |
| AS/NZS 1158.1.2 | - Vehicular traffic (Category V) lighting – Guide to design, installation, operation and maintenance |
| AS 1170 (series) | Structural design actions |
| AS/NZS 1170.2 | - Wind actions |
| AS 1742 (series) | Manual of uniform traffic control devices. |
| AS 1742.3 | - Traffic control for works on roads |
| AS 1798 | Lighting poles and bracket arms - Recommended dimensions |
| AS/NZS 3000 | Electrical installations (Australian/New Zealand Wiring Rules) |
| AS/NZS 4509 (series) | Stand-alone power systems |
| AS/NZS 4509.1 | - Safety and installation |
| AS/NZS 4509.2 | - System design |

**POWER AND WATER CORPORATION**

Design and Construction of Network Assets

Power Supply Volumes – Volume 3 – Street Lighting Manual

**AUSTROADS**

AGTTM – Austroads Guide to Temporary Traffic Management

## Definitions and Acronyms

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| **Table – Definitions and acronyms** | |
| **Term** | **Meaning** |
| BYDA | Before You Dig Australia (a web based service). (Replaces Dial Before You Dig.) |
| LED | Light Emitting Diode |
| MPa | Mega Pascal(s) |
| PE cell | Photo Electric cell |
| RCD | Residual Current Device |
| RODP | Road Owner Distribution Panel |
| uPVC | Unplasticised Polyvinyl Chloride |

## Generally

All works to comply with the requirements of AS/NZS 3000.

Street lighting owned, operated, and maintained by, or on behalf of, the Department of Infrastructure, Planning and Logistics may be exempt from the requirement to have Residual Current Devices (RCDs) installed to the street lighting power supply circuits, in accordance with AS/NZS 3000:2018, clause 2.6.3.2.3.3, Exceptions – disconnection by RCD could be more dangerous than the earth leakage.

Ensure that all work is carried out in a safe manner and that all statutory safety equipment required for the execution of the work is used at all times.

Ensure that existing access by the general public is not unduly disrupted during the execution of the works.

Provide traffic control in accordance with AS 1742.3, AGTTM, and the PROVISION FOR TRAFFIC worksection.

## Sub-Surface Investigations Before Excavating

Before undertaking excavation works contact Before You Dig Australia (BYDA) via <https://www.byda.com.au/> to determine if there are sub-surface services or installations in the proposed excavation area.

Before undertaking excavation works undertake inspection using ground penetrating radar or similar equipment to locate sub-surface services or installations which are not shown on the BYDA reports.

If excavation works are to be carried out in close proximity to sub-surface services or installations use excavation methods which will not damage the services or installations, and are safe for workers. Hand digging a safe distance from electric power cables and from gas pipelines, or water jetting methods might be suitable. Ensure these activities are carried out at safe distances from dangerous or critical infrastructure, such as, but not limited to, power cables, gas pipelines, telecommunications cables, water pipes, and sewer pipes.

## Utilities and Other Services Passing Under existing Pavements – Hold Point

Do not use open trenching to run services below existing pavements.

Utilities and other services which are to be routed under existing pavements located in a road reserve which would otherwise not be subjected to works must be routed through directionally bored channels.

The utilities and other services are to be housed in conduits.

The installations must comply with the requirements of the authorities with jurisdiction over the utilities or services.

Do not cut any trenches in existing pavements located in a road reserve for utilities and other services which are to cross the pavement.

Refer to DIRECTIONAL BORING in the Standard Specification for Roadworks.

Refer to conditions in the Permit to Work in the Road Reserve.

Trenching may be approved by the Principal in an emergency.

**Hold Point** – If the pavement is to be subjected to works, and open trenching for the routing of utilities or services is proposed, and has not been approved as part of the works, obtain approval from the Road Authority and the Superintendent before undertaking any excavation works for trenching across the existing pavement.

## Materials

### Columns

Requirement: Provide columns in accordance with:

* Power and Water Corporation Street Lighting Manual.
* Power and Water Corporation standard drawings.
* The individual street lighting design requirements.
* AS 1798.

Erection: Upon erection ensure columns stand vertically in all directions and under final loading conditions.

Provide ancillary items such as outreaches, lanterns, luminaires, lamps, controls, cables, and other items required for a complete, functional installation.

### Footings and ragbolt assemblies

Construct concrete footings and ragbolt assemblies in accordance with the Power and Water Corporation Street Lighting Manual.

### Terrain category

Standard: To AS/NZS 1170.2.

Footings, ragbolt assemblies, columns, outreaches, lanterns, luminaires, lamps, and other items must be suitable for the wind conditions of the area in which they are to be installed, as defined in AS/NZS 1170.2, and the local rainfall conditions.

### Luminaires

Lighting category: Category V to AS/NZS 1158.1.1.

Provide street light luminaires of the types specified on the drawings.

Install lamps in all luminaires to the sizes and types specified on the drawings.

### Control equipment

Control panels: Control luminaires via time switch controllers located in:

* Nominated substations in underground areas.
* In distribution pillars.
* In pole mounted control panels in overhead areas.

Control packs: Provide control switch pack in the base of each pole.

In each control pack provide:

* A terminal strip for terminating the active.
* Neutral and earthing conductors.
* An automatic circuit breaker if specified or shown on drawings. See RCD Exemptions paragraph below.
* Surge protection for LED lighting.

Size each termination on the terminal strip to accommodate three street lighting conductors without undue bunching.

Protection: Protect the street lighting cables with a 10 Amp single pole miniature DIN type automatic circuit breaker with a rated interrupting capacity of 9 kA at 240V AC symmetrical.

Residual Current Device (RCD): Install a RCD at the Road Owners Distribution Pillar (RODP) at the point of supply.

RCD Exemptions: Street lighting owned, operated, and maintained by, or on behalf of, the Department of Infrastructure, Planning and Logistics may be exempt from the requirement to have Residual Current Devices (RCDs) installed to the street lighting power supply circuits, in accordance with AS/NZS 3000:2018, clause 2.6.3.2.3.3, Exceptions – disconnection by RCD could be more dangerous than the earth leakage.

Multiple Earth Neutral (MEN): To AS/NZS 3000 at the RODP.

[Edit this clause to suit the particular project or delete if not required.]

## Solar Street lighting

### General

Requirement: Provide proprietary solar street lighting assemblies complete with solar panels, lamps, luminaires, lighting control equipment, batteries, charge controller, and accessories.

Lighting category: Category V to AS/NZS 1158.1.1.

Operation: Dusk till dawn every day of the year.

### Manufacturer’s specifications – Hold Point

**Hold Point -** Submit to the Superintendent manufacturer’s specifications for approval.

### Solar panels

Monocrystalline, high efficiency type, sized to meet the lamp size and battery storage requirements. Panels are to be fitted with spikes to prevent birds from landing and standing or sitting on the solar panel.

Orientation: North.

Tilt adjustment: Optimised based on the path of the sun during the period of lowest expected solar insolation.

Working life: Minimum life of 20 years with no less than 80% rated output during that period.

Efficiency: ≥ 21%.

### Batteries

Standard: To AS/NZS 4509.

Maintenance free, deep cycle gel type, sized to meet the run time and lamp wattage requirements.

Autonomy period: 3 days.

Location: Securely placed inside the control cabinet so that it is not accessible by the public.

Ingress protection: IP68.

### Lamp

Lamp type: High performance LED, sized to meet the lighting level requirement.

Lamp control: Local PE cell mounted within the unit.

### Warranty

Solar panels: 25 years.

Battery: 10 years.

## Excavation

### General

Excavate for footings and trenches as shown on the drawings.

### Column footings – Witness Point

Excavate all column footing holes.

Excavate footing holes 150 mm greater than the maximum dimension of the footing. Avoid larger than necessary excavations.

Where necessary carry out pumping to remove ground, storm, and/or surface water.

If for any reason, the final hole is larger than required backfill with concrete to the undisturbed soil.

In areas where unrippable rock is encountered, and the use of explosives becomes necessary, the depth of excavation may be reduced, subject to acceptance by the Superintendent.

**Witness Point -** Notify the Superintendent immediately if rock is encountered.

### Trenches – Witness Point

Nominal trench width: 600 mm.

Nominal trench depth: 1200 mm.

[Reflects a 12 m post top and 9 m single outreach.]

Refer to Power and Water Corporation standard drawings.

**Witness Point** - Notify the Superintendent when trench excavation is complete and before backfilling has commenced.

If new services are to cross a pavement, comply with the requirements of the **Utilities and other services passing under existing pavements** clause in this work section.

### Existing services

Refer to the **Sub-surface investigations before excavation** clause in this work section.

Locate and protect services: Locate and protect all services and utilities before carrying out any excavation work.

Excavate with care when crossing existing underground services. Increase the trench depth to provide a minimum of 150 mm clearance between the lowest part of the service and the first layer of marking tape.

Ramp the trench back from the obstruction.

Any damage incurred as a result of the Contractor’s failure to locate a service or utility to be repaired at no cost to the Principal.

## Footings

### Concrete

Supply and place concrete in accordance with the MISCELLANEOUS CONCRETE WORKS worksection.

Compressive strength: 20 MPa minimum.

## Backfilling

### Material – Witness Point

Backfill with select fill as specified in the EARTHWORKS worksection.

Bedding sand: Clean washed river sand.

**Witness Point -** Provide samples of bedding sand and select fill if requested by the Superintendent.

### Cable installation

Carry out backfilling of the trenches in accordance with the following:

* Enclose all underground power cables in suitably sized heavy duty orange uPVC underground conduit.
* Cover the bottom of the trench with a 50 mm tamped sand bed.
* Lay conduits and earth conductor on the sand bed.
* Top up with sand to form a layer 150 mm minimum over cables.
* Lay the first marker tape.
* Complete the backfilling of the trench with a second marker tape at a depth of 300 mm below finished ground level.

### Cable marker tapes

Lay two cable marker tape strips as follows:

* Strip 1: On top of the150 mm sand layer covering the conduit.
* Strip 2: 300 mm below the finished ground level.

Lay marker tapes with a 600 mm minimum overlap at joins.

### Placing backfill

Place backfill in 150 mm maximum layers and compact to 95% MMDD (Maximum Modified Dry Density).

## Installation of Columns

Install columns, outreaches, lanterns, luminaires, lamps, and fittings in accordance with the Power and Water Corporation standard drawings.

## Connection

Connect service cables between new street lighting poles in accordance with the design drawings.

Arrange with Power and Water Corporation to connect the new street lighting installation to the existing Power and Water Corporation network and pay all associated costs.

## Existing Street Lighting

### Disconnection and removal

Make safe, disconnect and remove existing wiring.

Dismantle existing street lighting installations, taking care to avoid damage to items during dismantling operations and transport.

[Ensure the salvaged items clause in the Preliminaries Section is included]

Deliver the salvaged materials to a storage shed to be nominated by the Superintendent.

Delivery point: *complete/edit*

[Alter the delivery point if required]

Excavate and remove from the site all traces of abandoned concrete footings, hold down bolts and cabling.

### Temporary lighting – Hold Point

Provide temporary lighting, in accordance with Power and Water Corporation standards, at intersections during periods of construction if existing street lighting is removed before new street lighting is installed.

Provide temporary lighting to Category V3 of AS/NZS 1158.1.1 and AS/NZS 1158.1.2.

**Hold point** – Submit plans of the proposed temporary street lighting to the Superintendent for approval before removal of existing street lights.

## Testing and Commissioning

### Testing

Measure and record in Megohms the insulation resistance between each conductor and earth.

Check continuity of each cable installed.

Check correct phasings of all active cables of the low voltage distribution system.

Check polarity at each street lighting column to ensure that neutral and active cables are not inadvertently interchanged. Incorrect polarity at a street lighting column would result in a live column.

Rectify all faults at no cost to the Principal. Re-test after rectification is complete, at no cost to the Principal.

### Commissioning

After the test results are acceptable, arrange for Power and Water Corporation to carry out the commissioning work to energise the newly installed low voltage distribution system.

Check the works to ensure the lighting is functioning properly. Rectify any faults at no cost to the Principal.

### Compliance – Witness Point

**Witness Point -** Submit a compliance certificate stating that all works have been completed as specified to this worksection and to Power and Water Corporation requirements.

## Reinstatement

Reinstate any damage to roads, footpaths, verges, drainage structures, vehicle driveways, and anything else incidentally affected by the works to their original condition.

## Completion

### Operation and maintenance manuals – Hold Point

**Hold Point -** Submit to the Superintendent Operation and Maintenance manuals for the installed lighting system.

### Warranties – Hold Point

**Hold Point -** Submit to the Superintendent the manufacturer’s published product warranties in the name of the Principal for the installed lighting system.