Master Specification
Part RD-EL-C1

Installation of Road Lighting

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RD-EL-C1 Installation of road lighting

1 General

a) This Master Specification Part sets out the requirements for the installation, testing and commissioning of road lighting systems (excluding Tunnel lighting and underpass lighting), including:

i) the documentation requirements, as set out in section 2;

ii) the Contractor's general responsibilities with respect to the installation of road lighting, as set out in section 3;

iii) the requirements regarding the removal of existing lighting assets, as set out in section 4;

iv) the electrical installation requirements, as set out in section 5;

v) the road lighting installation requirements, as set out in section 6;

vi) the testing and commissioning requirements, as set out in section 7;

vii) the Witness Point requirements, as set out in section 8; and

viii) the verification requirements and records, as set out in section 9.

b) This Master Specification Part does not apply to the installation, testing or commissioning of:

i) Tunnel lighting systems or underpass lighting systems (which are otherwise addressed in TUN-ME-DC3 "Tunnel Carriageway and Underpass Lighting");

ii) smart lighting control systems;

iii) pits and conduits (which are otherwise addressed in RD-EL-D3 "Conduit Design for Road Lighting, Traffic Signals and ITS" and RD-EL-C3 "Supply and Installation of Conduits and Pits"); or

iv) the lighting of public transport interchanges, railway stations or railway infrastructure.

c) The installation, testing and commissioning of road lighting systems and associated electrical infrastructure must comply with the Reference Documents, including:

i) AASHTO Manual for Assessing Safety Hardware (MASH);

ii) AEMO National Electricity Market Load Tables for Unmetered Connection Points;

iii) AR-EL-STD-0102 - Guidelines for the Protective Provisions Related to Electrical Safety and Earthing for the Adelaide Metro Electrified Rail Network;

iv) AS 2339 Traffic signal posts, mast arms and attachments;

v) AS/NZS ISO 9001 Quality management systems - Requirements;

vi) AS/NZS 1158 Lighting for roads and public spaces;

vii) AS/NZS 2053 Conduits and fittings for electrical installations;

viii) AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules);

ix) AS/NZS 3008 Electrical installations - Selection of cables;

x) AS/NZS 4677 Steel utility service poles;

xi) Department Asset Data Collection Standard (AM-PRC-005);

xii) Office of the Technical Regulator - Building safely near powerlines;

xiii) Office of the Technical Regulator – Building safely near powerlines;

xiv) SAPN Service & Installation Rules Manual No. 32;

xv) SAPN Technical Standard - TS101 Public Lighting - Design and Installation; and

xvi) TP2-DOC-002020 Guideline for Low Voltage Electrical Earthing and Bonding for the Adelaide Metro Tram Network.

2 Documentation

2.1 Construction Documentation

In addition to the requirements of PC-CN3 “Construction Management”, the Construction Documentation must include:

a) marked up drawings where modifications or revisions to the design drawings are required to accommodate site specific conditions or requirements, as required by section 3b)ii);

b) evidence that the road lighting poles comply with the requirements of RD-EL-S1 “Supply of Luminaires and Lighting Components”, as required by section 3c);

c) notification of road lighting poles scheduled for removal which appear to be in re-useable condition, as required by section 4d);

d) details of all connection point locations, as required by section 5.2a);

e) a copy of SAPN’s written confirmation of the approval of each connection point (as required by RD-EL-D1 “Design of Road Lighting”) as required by section 5.2b);

f) the information required by RD-EL-S1 “Supply of Luminaires and Lighting Components”;

g) the information required by PC-CN1 “Testing and Commissioning”; and

h) connection point information as required by section 5.2a), including a copy of the SAPN REX application.

2.2 Quality Management Records

In addition to the requirements of PC-QA1 “Quality Management Requirements” or PC-QA2 “Quality Management Requirements for Major Projects” (as applicable), the Quality Management Records must include:

a) copies of electrical certificates of compliance, as required by section 5.1b)ii);

b) GPS coordinates (latitude and longitude) for each road lighting system asset for inclusion in the Principal’s lighting database;

c) certification that all clamping bolts have been correctly tensioned, as required by section 6.1.2f)vi);

d) the documentation and test records required by section 7c);

e) the verification records required by section 9;

f) details of the road lighting installations, including:

i) conduit size and routing;

ii) pit types and locations including pit lid types and GPS coordinates;

iii) pole and outreach types and locations including pole asset IDs and GPS coordinates of the pole base;

iv) luminaire details including:

A. GPS coordinates of the luminaire;

B. luminaire make, model, type and wattage;

C. serial numbers; and

D. luminaire asset IDs;

v) switchboard types and locations including GPS coordinates;

vi) connection point types and locations including GPS coordinates;

vii) types and locations of any other road lighting related asset, including GPS coordinates; and

viii) electrical single line diagrams (SLDs); and

g) road lighting asset data to be recorded in accordance with:

i) agreed asset management systems;

ii) Department Asset Data Collection Standard (AM-PRC-005); and

iii) PC-EDM5 “Digital Engineering”.

3 Responsibilities

a) The Contractor must, as part of the road lighting installation, testing and commissioning process:

i) source asset numbers from the Principal;

ii) liaise with the Principal, including with nominated technical services department representatives;

iii) where road lighting poles are to be installed on Principal owned roads and any poles are within close proximity to the “minimum safety clearance distance” (as defined in Office of the Technical Regulator - Building safely near powerlines) of:

A. overhead SAPN power lines, arrange swing and sag calculation with SAPN to ensure that all road lighting poles remain outside of the minimum safety clearance distance at maximum calculated power line swing and sag; or

B. underground powerlines, the installation must ensure that minimum safety clearance distances are achieved;

iv) determine suitable connection point locations in accordance with the requirements of SAPN Service & Installation Rules Manual No. 32;

v) ensure Safety in Design requirements are met with respect to installation and maintenance personnel;

vi) for council owned assets and council areas, ensure the installation of road lighting assets comply with the respective council’s specification requirements; and

vii) where the council’s specification requirements are not available, seek endorsement from the respective council.

b) The Contractor must, as part of the road lighting installation, testing, and commissioning process:

i) install road lighting and associated electrical infrastructure in accordance with the lighting design; and

ii) where modifications or revisions are required to accommodate site specific conditions or requirements, provide marked-up drawings as part of the Construction Documentation for as-built updating of the design and re-certification.

c) The Contractor must submit evidence that the road lighting poles comply with the requirements of RD-EL-S1 “Supply of Luminaires and Lighting Components” as part of the Construction Documentation.

4 Removal of existing lighting assets

a) The Contractor must provide the Principal with 10 Business Days’ notice prior to removal of any existing road lighting poles and footings, which constitutes a **Witness Point**.

b) The Contractor must ensure that the backfill of holes resulting from the removal of existing road lighting poles and footings is undertaken in accordance with the requirements of:

   i) RD-EW-C2 “Trench Excavation and Backfill”;

   ii) RD-EW-C3 “Boring”; and

   iii) RD-PV-C6 “Reinstatement of Existing Pavements”.

c) Subject to section 4e), ownership of the removed road lighting poles and luminaires is vested in the Contractor, who must remove them from the Site.

d) The Contractor must provide details in the Construction Documentation of any road lighting poles scheduled for removal which appear to be in re-usable condition.

e) Section 4c) does not apply to:

   i) LED luminaires, which are to be returned to the Principal in the condition they were in prior to removal; or

   ii) any re-usable road lighting poles which the Principal has confirmed via the Construction Documentation that it elects to retain ownership, in which case they must be returned to the Principal.

5 Electrical installation requirements

5.1 General

a) The Contractor must ensure that all electrical installations relevant to the road lighting system and associated electrical infrastructure:

   i) are carried out by an electrical worker who is licensed to perform the relevant electrical works; and

   ii) comply with the requirements of:

      A. AS/NZS 3000 Electrical installations; and

      B. SAPN Service & Installation Rules Manual No. 32.

b) The Contractor must:

   i) comply with the requirements of the OTR when working in the vicinity of existing overhead and underground services;

   ii) provide copies of electronic certificates of compliance to the Principal as part of the Quality Management Records; and

   iii) pay for any applicable fees for the connections.

5.2 Connection points

a) The Contractor must specify all connection point locations relevant to the road lighting system in the Construction Documentation and confirm the position of the connection points on-site and with SAPN before installing conduit runs to these points.

b) The Contractor must submit a copy of SAPN's written confirmation of the approval of each connection point (as required by RD-EL-D1 "Design of Road Lighting") as part of the Construction Documentation.

c) With respect to connection points relevant to the road lighting system, the Contractor must:

   i) complete and submit a SAPN REX application for each connection point;

   ii) provide a copy of SAPN REX application to the Principal as part of the Construction Documentation;

   iii) provide a certificate of compliance to the Principal; and

   iv) apply for an electricity meter where required.

d) The Contractor must ensure that any road lighting assets connected to SAPN connection points are connected in accordance with the requirements of:

   i) SAPN Service & Installation Rules Manual No. 32; and

   ii) SAPN Technical Standard - TS101 Public Lighting - Design and Installation.

e) The Contractor must ensure that:

   i) SAPN supply fuses are not located in road lighting system switchboards;

   ii) isolation pits and fuses are installed in accordance with the Department Standard Drawings; and

   iii) 3-phase installations have all phases identified on both sides of the isolation fuse with appropriate coloured heat shrink.

5.3 Wiring

The Contractor must ensure that all wiring relating to the road lighting system and associated electrical infrastructure complies with the following:

a) combination mast arm poles at signalised intersections must be powered from the traffic signal controller extension housing;

b) combination lighting and signal poles at pedestrian or koala crossings must be via a circuit breaker from within the signal controller;

c) 4-way light poles must have 2 circuits fed from the same phase in accordance with the Department Standard Drawings;

d) all neutral conductors must have black primary insulation;

e) all active and neutral conductors must be double insulated and comply with the requirements of AS/NZS 3000 Electrical installations;

f) all circuit breakers must be as specified in the Design Documentation or Department Standard Drawings;

g) all joints below ground must be waterproofed using approved epoxy jointing kits;

h) tee offs must be of equivalent size to a Scotchcast 90B1 or larger;

i) spare cable must be:

   i) installed in each junction pit and pulling pit equal to the length plus the width of the junction pit; and

   ii) installed neatly in a loop and suitably cable tied;

j) cables in light poles must be demonstrated to be capable of supporting their own weight without compromising the cable;

k) earthing electrodes must be:

i) 13 mm diameter copper sheathed steel stakes;

ii) provided in accordance with the requirements of SAPN Service & Installation Rules Manual No. 32; and

iii) identified and protected in accordance with AS/NZS 3000 Electrical installations; and

l) earthing terminations within road lighting poles, including the sequence of earthing cable terminations, must be installed in accordance with the Department Standard Drawings.

6 Road lighting installation requirements

6.1 Pole footings

6.1.1 Setting out

The Contractor must ensure that when setting out pole footings as required for the road lighting system, the following requirements are satisfied:

a) the positions of the footings must be set out from the coordinates given in the Design Documentation, on the Reference Design or as referenced by chainage and offset;

b) the slip-base V-notch must be oriented in accordance with Department Standard Drawing S-4055, sheets 19 to 22;

c) the access hatch on road lighting poles must be positioned on the rear of the road lighting pole so that the access hatch can be easily and safely accessed;

d) if compliance with section 6.1.1c) is not possible due to site specific constraints, the access hatch on the relevant road lighting pole must be positioned on the side of the road lighting pole opposite to oncoming traffic;

e) the level and slope of the concrete surround must match the required finished levels and slopes of the surrounding ground; and

f) the area surrounding the road lighting pole footing must provide for a safe working area for maintenance personnel.

6.1.2 Setting up

a) The Contractor must ensure that the following pole footing setting up requirements are satisfied in relation to the road lighting system:

i) where steel footing units are used, the footings units must be firmly supported to prevent movement during pouring of concrete;

ii) where holding down bolts are used, the bolts must be firmly held in position by a jig;

iii) welding to secure the position of the bolts must not be used; and

iv) all conduits must be plugged to prevent the entry of concrete during pouring.

b) The Principal must be notified 5 days in advance of pouring concrete for footing units, which will constitute a **Witness Point**.

c) In relation to setting up the road lighting system, the Contractor must ensure that footing units and mounting plates comply with the following:

i) the level of the top of the footing mounting plate or holding down bolts must be determined from the required finished levels for the surrounding ground;

ii) the mounting plate must be set at gradient of no more than 1:250 from the horizontal to ensure acceptable verticality of the pole; and

iii) footing units or bolts must be placed within the tolerances specified in Table RD-EL-C1 6-1.

d) The Contractor must ensure that concrete elements relevant to the road lighting system comply with the following requirements:

i) concrete must be compacted by use of a pencil vibrator;

ii) the surface of the concrete footing surround must be a wood float finish with the edges arised with an edging tool;

iii) the exposed part of the steel footing unit or exposed bolts must be cleaned immediately after pouring of concrete is completed;

iv) all vent holes must be left clean and have any anti-corrosive tape completely removed from the vent holes;

v) where steel footing units are used for slip-base poles, the concrete inside the footing unit must be:

A. dished down by approximately 25 mm to the bottom of the conduit drainage holes to ensure that no water pools in the base; and

B. a smooth finish; and

vi) backfill must not cover the concrete surround.

e) The Contractor must ensure that the assembly and erection of road lighting poles relevant to the road lighting system complies with the following requirements:

i) road lighting poles must be assembled in accordance with the manufacturer's instructions;

ii) road lighting poles must be mechanically pulled together with an appropriate force to prevent the rotation of outreaches;

iii) the joint between road lighting pole sections must be snug and the top section must cover the minimum overlap mark;

iv) for energy-absorbing road lighting poles:

A. levelling nuts must not be used to support the road lighting pole base plate; and

B. wedges or shims must be used to support the base plate during the grouting process;

v) after erection, all poles must be vertical within tolerances specified in this Master Specification Part;

vi) road lighting poles must be marked:

A. adopting the Principal's nominated asset identification numbers;

B. using a vinyl film label with permanent acrylic adhesive material (Brady B-7569 or equivalent); and

C. in accordance with the following:

I. the label must have a white background with black numbers;

II. numbering must be at least 40 mm high using a bold, sans-serif font;

III. labels must be horizontally attached to the poles at a height of 1.7 m; and

IV. labels must be orientated 45^{o} degrees towards the oncoming traffic so that it can be easily read from an approaching vehicle; and

vii) where combination traffic signal and road lighting poles are installed in ELV traffic signal intersections, if road lighting is fed from a LV supply, "Dual Voltage 230V AC and 42V C voltages present" stickers must be affixed to the access door of the combination pole.

f) The Contractor must ensure that all slip base lighting poles relevant to the road lighting system comply with the following requirements:

i) the Contractor must provide a copy of the current calibration certificate for all torque wrenches used to install slip-base lighting poles;

ii) calibration certificates must not be dated more than 12 months prior to the date of installation;

iii) all calibration certificates for torque wrenches to be used must be provided to the Principal as part of the Quality Management Records;

iv) threads must be cleaned to allow hand tightening of clamping bolts prior to torque being applied;

v) the clamping bolts must be tightened to the torque specified by the manufacturer using a calibrated torque wrench;

vi) the Quality Management Records must include a statement from the Contractor that all clamping bolts have been correctly tensioned in accordance with this section 6.1.2f);

vii) vent holes in the road lighting pole base must not be blocked by concrete or protective tape around the road lighting pole base;

viii) the top of the base flange must be 90 mm (+0 mm, -10 mm) above the concrete pad finished level in accordance with the Department Standard Drawings;

ix) road lighting pole risers must not be used for any purpose including to compensate for incorrectly installed footings; and

x) a protective coating must be applied to the connection between the earth cable and the steel conduit inside the pit at the base of each slip base pole.

g) The Contractor must ensure that all road lighting pole columns and outreaches forming part of the road lighting system are appropriately stored to protect their surfaces prior to installation.

h) The Contractor must ensure that any damage to the road lighting poles (including damage to galvanizing) is repaired in accordance with the requirements of RD-EL-S1 “Supply of Luminaires and Lighting Components”.

Table RD-EL-C1 6-1 Footing units and bolt tolerances

Component	Tolerance
Vertical	
Height of base (slip-base poles)	+0, -10 mm
Height of threaded rod (impact-absorbing poles)	±5 mm
Horizontal	
Distance from face of kerb	-20 mm, +50 mm
Chainage along kerb line	±100 mm

6.2 Installation of luminaires

The Contractor must ensure that the installation of luminaires forming part of the road lighting system complies with the following:

a) where required by the Contract Documents (if at all), and prior to installation of luminaires, the Contractor must arrange for a randomly selected luminaire (selected by the Principal) for each unique luminaire type that has been supplied to be installed to undergo photometric testing by a NATA accredited testing facility;

b) the results of the photometric test on the randomly selected luminaires undertaken in accordance with section 6.2a) must match the test results provided pursuant to RD-EL-S1 “Supply of Luminaires and Lighting Components”;

c) luminaires must be mounted:

i) horizontally with 0^{o} degree upcast; and

ii) perpendicular to the road;

d) luminaires must be attached to the road lighting pole spigot:

   i) to achieve the requirements of part 6.2c) in their installed position; and

   ii) with the bolt torque specified by the luminaire manufacturer; and

e) all single insulated conductors in the luminaires must have a heat rating appropriate for the expected temperatures in their location in the housing.

7 Testing and commissioning

a) The Contractor must ensure that all required testing and commissioning complies with the requirements of PC-CN1 “Testing and Commissioning”.

b) As a condition precedent to achieving Handover, the Contractor must demonstrate that all installations forming part of the road lighting system are operational as designed and comply with the requirements of the Contract Documents.

c) Following installation, the Contractor must ensure that the road lighting system is tested in accordance with the following:

   i) earth continuity tests as required by AS 3000 Electrical installations;

   ii) insulation resistance tests as required by AS 3000 Electrical installations; and

   iii) earth fault loop impedance tests as required by AS 3000 Electrical installations.

d) The Contractor must provide the following documents and test results to the Principal as part of the Quality Management Records:

   i) As-Built Records for the road lighting system in accordance with the requirements of PC-QA1 “Quality Management Requirements” or PC-QA2 “Quality Management Requirements for Major Projects” (as applicable); and

   ii) results of the tests required by section 7c).

e) The Contractor must ensure that valid and current test instrument calibration certificates (as provided by a NATA accredited calibration house) are attached to all test results and certification documentation provided.

f) All pits and infrastructure must be free of water and debris at Handover.

8 Witness Points

Table RD-EL-C1 8-1 details the review period or notification period, and type (documentation or construction quality) for each Witness Point referred to in this Master Specification Part.

Table RD-EL-C1 8-1 Witness Points

Section reference	Witness Point	Documentation or construction quality	Review period or notification period
4a)	Notice prior to removal of any existing road lighting poles and footings	Documentation	10 Business Days review
6.1.2b)	Prior to pouring of concrete for pole footings	Construction quality	5 days notification

9 Verification requirements and records

The Contractor must supply written verification as part of the Quality Management Records that the requirements listed in Table RD-EL-C1 9-1 have been complied with.

Table RD-EL-C1 9-1 Verification requirements

Section reference	Record
PC-SI1 “Site Surveys”	Position verification certificate for road lighting assets as required by PC-SI1 “Site Surveys”.