

Manual

Traffic and Road Use Manual Volume 4 – Intelligent Transport Systems and Electrical Technology

Part 2: Road Lighting Maintenance

July 2022

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1 Introduction

Queensland Department of Transport and Main Roads is responsible for the provision, maintenance and management of the major arterial and linking roads and road transport infrastructure throughout Queensland. As part of this network, Transport and Main Roads owns and maintains Rate 3 road lighting installations incorporating more than 40,000 lights. Road lighting is an essential component of road safety infrastructure. Transport and Main Roads is committed to maintaining its road lighting to the stringent safety standards. (Hansard 9 August 2005.)

2 Scope

This document contains maintenance practices applicable to Rate 3 road lighting that will allow these installations to continue operating safely, reliably, efficiently and effectively for the duration of their operational service life.

This document also applies to other Transport and Main Roads-owned lighting installations, including pedestrian crossing and underpass lighting.

The road lighting maintenance regime includes electrical, illumination, structural and environmental aspects – both scheduled and unscheduled.

The scope of this document does not incorporate complete technical guidelines relating to steel pole maintenance. (Note that a separate ITS and Lighting Structures Inspection Manual is under development)

3 Abbreviations

Abbreviation	Meaning
AS	Australian Standard
BLR	Bulk Lamp Replacement
CMS	Road Lighting Control and Monitoring System
EQL	Energy Queensland Limited
ESO	Electrical Safety Office
EWP	Elevated Work Platform
HPS	High Pressure Sodium
HRC	High Rupture Capacity
HTCB	High Tension Clamping Bolts
IER	Immediate Electrical Risk
LED	Light Emitting Diode
MCB	Miniature Circuit Breaker
MRTS	Transport and Main Roads Technical Specifications (available at https://www.tmr.qld.gov.au/)
MUTCD	Manual of Uniform Traffic Control Devices
POS	Point of Supply
RMPC	Road Maintenance Performance Contract

Abbreviation	Meaning
RPEQ	Register Professional Engineer of Queensland
SLC	Smart Lighting Controller
TETS	Traffic Engineering Technology and Systems

4 Definition of terms

Term	Meaning
The Act	<i>Electrical Safety Act 2002, Regulations and Codes of Practice</i>
Current	Current at the time of the maintenance activity
Electricity Entity	As defined in the Act
Electrical Works	As defined in the Act
Wiring Rules	AS/NZS 3000 commonly referred to as the <i>Wiring Rules</i>

5 References

Reference	Title
AS 2550.10	<i>Cranes, hoists and winches – Safe use, Part 10: Mobile elevating work platforms</i>
AS 4748	<i>Acoustic emission testing of fibreglass-insulated booms on elevating work platforms</i>
AS ISO 31000	<i>Risk Management – Guidelines</i>
AS/NZS 1158	<i>Lighting for Roads and Public Spaces (set)</i>
AS/NZS 1418.10	<i>Cranes, hoists and winches, Part 10: Mobile elevating working platforms</i>
AS/NZS 3000	<i>Electrical installations (known as the Australian / New Zealand Wiring Rules)</i>
AS/NZS 3017	<i>Electrical Installations – Verification Guidelines</i>
AS/NZS 3019	<i>Electrical Installations – Periodic Verification</i>
AS/NZS 4680	<i>Hot-dip galvanized (zinc) coatings on fabricated ferrous articles</i>
MRTS91	Technical Specification MRTS91 Conduits and Pits
MRTS92	Technical Specification MRTS92 <i>Traffic Signal and Road Lighting Footings</i>
MRTS94	Technical Specification MRTS94 <i>Road Lighting</i>
MRTS228	Technical Specification MRTS228 <i>Electrical Switchboards</i>
MUTCD	Queensland Manual of Uniform Traffic Control Devices
Rexel Lighting	<i>Rexel & Osram Luminaire Maintenance Factors for Optispan Luminaires</i>
RMPC Manual	Road Maintenance Performance Contract manual
RPDM	Road Planning and Design Manual

Reference	Title
SD1380	Standard Drawing 1380 <i>Road Lighting – Slip Base Pole and Footing Installation Details for No Crossfall</i>
SD1381	Standard Drawing 1381 <i>Road Lighting – Slip Base Pole and Footing Installation Details for Crossfalls Up to and Including 1:6</i>
SD1382	Standard Drawing 1382 <i>Road Lighting – Slip Base Pole and Footing Installation Details for Crossfalls Greater than 1:6 Up to and Including 1:3</i>
SD1429	Standard Drawing 1429 <i>Road Lighting – Slip Base Pole and Footing Installation Details for Crossfalls Greater than 1:6 Up to and Including 1:3 Using Concrete Step Tread</i>
SD1755	Standard Drawing 1755 <i>Slip Base Tethering System for Transport and Main Roads Rate 3 Lighting Poles</i>
TN64	Technical Note TN64 <i>Tensioning and Re-tensioning of Slip Base Lighting Pole Bolts</i>
TN200	Technical Note TN200 <i>Slip Base Pole Clamping Bolt Tethering System Installation</i>

6 General maintenance requirements

6.1 Maintenance programs

Ownership of the road lighting installation is to be confirmed as Rate 3 before any maintenance is undertaken. There are four road lighting tariffs:

- Rate 1 (non-contributed) – Public Lighting is supplied, installed, owned and maintained by the Electricity Entity – (EQL NPL1 tariff).
- Rate 2 (contributed) – Public Lighting is supplied by Transport and Main Roads and owned and maintained by the Electricity Entity – (EQL NPL2 tariff). This is generally the preferred tariff.
- Rate 3 – Public lighting is supplied, owned, installed and maintained by Transport and Main Roads. The Electricity Entity only provides electrical energy to the installation. The primary areas for Rate 3 road lighting are on freeways and high-speed arterial roads – (EQL NPL3 tariff).
- Rate 4 – New tariff where Transport and Main Roads funds the replacement of Rate 1 luminaire with an LED luminaire and gifts the LED luminaire to the Electricity Entity. The associated pole and cabling remain owned, operated and maintained by the Electricity Entity – (EQL NPL4 tariff).

Where road lighting installation ownership / tariff is in doubt, the District / Region concerned is to resolve this with the relevant Electricity Entity.

The programming of maintenance for Rate 3 road lighting is the responsibility of the Districts / Regions and is generally carried out under the Road Maintenance Performance Contract (RMPC). Refer to Element Management Plan No. 15.

6.2 Applicable standards

All work is to be carried out in accordance with Transport and Main Roads Technical Specifications, the Queensland MUTCD Part 3 and the *Electrical Safety Act 2002*, Regulations and Codes of Practice (the Act). This document does not detail all activities that must be undertaken to comply with

the requirements of the Act; however, all works, processes and procedures used in maintenance activities associated with the electrical works described herein is be in accordance with the Act. Maintenance is not to be carried out live except as permitted under the Act.

6.3 Installation drawings

Installation drawings are required for the safe maintenance of electrical and lighting installations. Districts / Regions are to work with the maintenance provider to ensure that electrical installation drawings are current and reflect the actual state of the installation. Where drawings are incorrect and/or non-existent, Districts / Regions are to arrange for accurate drawings to be produced. This is to include single line diagram complete with distances between light poles. Drawings are to conform to the requirements of the current Transport and Main Roads Technical Specifications. Final 'As Built' drawings need to be readily available for the department's road lighting maintenance reference.

6.4 Maintenance personnel

All personnel undertaking Rate 3 road lighting maintenance activities (including the Superintendent's Representative) are to have the appropriate qualifications, training and experience necessary to undertake their designated activities in a safe and considered manner. These are to include working in a high-speed road environment, formal electrical qualifications and knowledge of MUTCD Part 3 and the relevant Technical Specifications.

The possession of a valid Occupational Health and Safety Construction Induction card (also known as a 'White Card' or the previous 'Blue Card') and a current adult First Aid Certificate are also prerequisites for all persons working on Rate 3 installations.

Appropriate training of personnel is the responsibility of the organisation providing the maintenance service. Districts / Regions are to undertake random audits to ensure compliance.

6.5 Maintenance plant and equipment

Due to the height of road lighting installations, Elevated Work Platform (EWP) vehicles are to be used. Every operator is to possess a valid EWP operator ticket, relevant driver's licence and is to have an appropriate level of experience in EWP operation. Operators are to have training in safe work procedures and evidence of such training.

Vehicles are to have safety checks and have valid current certification in accordance with the relevant parts of:

AS/NZS 1418.10	<i>Cranes, hoists and winches, Part 10 Mobile elevating working platforms</i>
AS 2550.10	<i>Cranes, hoists and winches – Safe use, Part 10: Mobile elevating working platforms</i>
AS 4748	<i>Acoustic emission testing of fibreglass-insulated booms on elevating work platforms</i>

Equipment used for maintenance is to comply with relevant safety legislation and standards and be appropriate for the application. Testing equipment calibration is to be current with calibration evidence included in the maintenance report. Districts / Regions are to undertake random audits to ensure compliance.

6.6 Maintenance waste disposal

Disposal of lamps after they are removed from service is to be undertaken in an environmentally safe manner. Breakage of lamps before disposal is to be avoided.

Other maintenance waste is to be disposed of appropriately. Disposal records are to be kept in accordance with record keeping requirements and asset disposal information updated accordingly.

6.7 Replacement parts

All replacement parts are to comply with current Transport and Main Roads Technical Specifications.

The current rating and characteristics of electrical circuit protection devices are to be no greater than those specified on the Standard Drawings. Installations that do not comply with the requirements of the Act are to be rectified.

The photometrics and electrical characteristics of replacement luminaires are to be such that the lighting and electrical integrity of the installation are not compromised. Where identical luminaires are not available, design verification for compliance with the standards is to be carried out by an appropriately qualified and experienced electrical Registered Professional Engineer of Queensland (RPEQ).

6.8 Traffic management

Safety and traffic control plans are to be approved by the District / Region before maintenance work is conducted.

All signage used during road lighting maintenance is to be in accordance with the Queensland MUTCD. Where road lighting is expected to be non-operational for more than three days from when the fault is identified, the temporary sign TC1639 'STREET LIGHTING UNDER REPAIR' is to be displayed (refer to Appendix C).

6.9 Reporting requirements

The progress of any maintenance regime being undertaken is to be continually tracked and reported. Periodic maintenance meetings are to be scheduled between the maintenance service provider and the District / Region.

The meetings are to cover as a minimum the following items:

- review of performance of the road lighting installation
- review of performance of the road lighting service provider
- reporting of current progress against expected – for example staffing levels / changes, budgeting / expenditure, and
- discussion of issues / problems and how they are being addressed.

The Districts / Regions are to report systemic issues to Traffic Engineering Technology and Systems (TETS). For lighting and illumination issues, the information is forwarded to Director (ITS Technologies). For electrical and related issues, the information is forwarded to Program Director (ITS Asset Services).

6.10 Record keeping

All road lighting maintenance activities are to be logged in order to monitor road lighting performance and to trend failure and outage rates. Data to be collected are defined in Appendices A and B.

Minimum details required to be logged and reported include:

- item maintained – pole, pit, switchboard, lamp, luminaire, re-openable junction box, ducting, and so on
- identification number of pole
- identification number of switchboard
- date installed
- date maintained
- date last electrically verified
- type of maintenance service – damage / fault, bulk lamp replacement, routine spot, and so on
- name of maintenance service provider (Contractor company name and maintenance personnel)
- name of road and/or road number, and
- light source replacement date.

Asset and site information pertaining to the road light and maintenance activities are to be stored electronically in the Transport and Main Roads ITS and Electrical Road Operations Asset Register.

7 Scheduled inspections and maintenance

7.1 Electrical

Periodic inspections and tests are required on the electrical installation to ensure compliance with the Act. Inspections and tests are to be carried out at a maximum of every six years. Where the risk of degradation of the installation due to environmental or other factors is considered high, more frequent inspections are to be carried out. Spot check audits on parts of high-risk installations are to be carried out at a maximum of 12-month intervals. Typical high-risk factors may include corrosive environments, susceptibility to flood / submergence, devices nearing end of life, vermin habitats and high pedestrian activity.

Periodic verification of electrical installations is to be carried out in accordance with Appendix E.

Immediate electrical risks (including exposed live conductors, unearthed equipment and incorrect polarity) must be made safe and rectified when discovered and the ESO and District / Regional Management notified.

7.1.1 Point of supply maintenance

The road lighting installation power supply is distributed by the Electricity Entity's network infrastructure. Supply or point of supply (POS) can typically be from:

- overhead pole mounted transformer with fuse
- underground pit with fuse
- pillar box with fuse from an underground supply, or
- street lighting column connection.

Maintenance is to include a visual inspection of the point of supply for signs of degradation. Where there is any concern about the integrity of the point of supply or the upstream network, the Electricity Entity is to be advised.

7.1.2 Electrical switchboard verification

Maintenance is to be carried out to ensure the electrical integrity of the switchboard. As the switchboard is the point where lighting circuits originate and are controlled, it is important that all the components are in good condition.

Inspection is to include but not necessarily be limited to:

- ingress of water and vermin
- deterioration of weatherproof seals and other components
- damage by rodents
- detection of poor connections and joints
- correct earthing
- protection against direct and indirect contact with LV terminals / surfaces
- correct operation of components
- correct internal labelling of components
- mounting or support for the switchboard enclosure, and
- correct enclosure labelling and nameplates.

Electrical tests are to be carried out and documented in accordance with the *Wiring Rules*.

7.1.3 Cable and connection maintenance

Electrical cabling and connections are to be maintained to ensure a low impedance path for the electricity supply. While road lighting cable is expected to last in excess of 25 years under standard operating conditions, a number of factors (such as those previously mentioned) can reduce service life. Consequently, scheduled visual observations and electrical tests are required to ensure continued safety of the installation. Where cable temperatures are significantly high due to poor electrical connections or other issues, insulation damage can occur, which may ultimately result in fire. Clean cable termination surfaces, correct fixing tightness and the application of a protecting grease to terminations can assist in maintaining the integrity of the termination. Thermal imaging equipment can be a cost-effective method for assessing increased temperatures within the installation or early detection of high resistant joints.

Transport and Main Roads Technical Specifications now specify the use of either XLPE / PVC or XLPE / HDPE mains and sub-mains cabling for new installations. PVC / PVC cabling is not designed to be submerged in water for periods of time. The new standard cables are more resilient. Where there is a known water retention problem, the better-quality XLPE / HDPE cable should be used to replace PVC / PVC cables that have reached end of life.

Where waterproof cable terminations are not properly installed and maintained, water ingress can be a problem with subsequent degradation of the cable. Within the cable termination enclosure, the sheath is to be carefully peeled back clear of the insulation, and the bottom of the enclosure filled with a proprietary sealant to fill the area around the cable and the enclosure. The sealant is to encase the

insulation / sheath interface so that any moisture tracking between the insulation and sheath cannot enter the enclosure. Proper closure of the enclosure and maintenance of seals will assist in maintaining a waterproof termination. Poorly fitting enclosures are to be replaced.

Rodent and vermin attack, as well as poor installation methods, can also affect the integrity of the cable sheath. Where damage has occurred, moisture ingress and cable degradation will occur.

Where the rate of insulation resistance degradation reasonably suggests that the cable insulation will not comply at the next periodic inspection interval, inspection frequency is to be increased or rectification undertaken.

Inspection items are to include, but not be limited to:

- joints, connections and terminations for corrosion
- poor, loose, overheated or unsecured connections
- evidence of moisture ingress to cables and/or connections
- damaged insulation
- exposed conductors
- general condition of cable, and
- evidence of rodent / vermin activity.

In accordance with the *Wiring Rules*, electrical tests are to be carried out on cables and results documented.

7.1.4 Pits and conduit maintenance

Pits and conduits are to be inspected visually. Once it has been determined that the conduit installation complies with the required depth, this need no longer be checked except where work to the ground surface has been carried out in the vicinity of the conduit.

Pit lids are to be intact, undamaged and properly fitted to the pit. Pits are to be free of damage, with no collapse of ground around the pit, no collapse of the inside of the pit, and with the pit top level with the surrounding surface. Pits are to be free draining.

Maintenance of pits and conduits is to include but not be limited to:

- ensuring adequate drainage
- replacement of broken or chipped pit lids
- rectifying collapsed pit side walls and other damage, and
- maintaining ground / pit surface level and pit surrounds.

Cement pits and ducts that contain, or are suspected to contain, asbestos materials are to be handled using safe work practices and qualified persons in accordance with workplace health and safety legislation and Transport and Main Roads procedures. All asbestos materials are to be identified and recorded in District Regional registers.

7.2 Lighting

Transport and Main Roads has now phased out the use of mercury vapour luminaires for Rate 3 installations. The department is currently implementing a luminaire replacement program to replace

conventional light sources with LED technology. LED technology provides benefits of improved light source life and reduced rate of lumen depreciation.

When combined with the connection of LED luminaires to a control and monitoring system (CMS), this technology eliminates the need to undertake periodic light outage patrols. Faulty LED lights will be reported by the CMS.

For conventional road lighting, periodic inspections of the lighting installation are to be undertaken to ensure the lighting is operating as designed.

The maximum level of luminaire outages at any one time is not to exceed 5% of the luminaire population.

Routine luminaire maintenance is to be carried out at the following intervals:

- conventional lighting – when replacing lamps (typically three years), and
- LED lighting – six years.

Maintenance of luminaires is to include but not be limited to:

- cleaning of all optical surfaces of the luminaire, both internal and external
- checking of gaskets for deterioration and replacement where necessary
- replacement of damaged / weathered diffuser
- a visual check of the electrical components and wiring for signs of overheating
- checking of all accessible screws, nuts and fixings for tightness
- where undone, application of non-corrosive gel to screw fixing
- realigning of the luminaire as per design as required, and
- cleaning of heatsinks where fitted to ensure luminaires do not fail prematurely.

Where luminaires are installed in high pollution areas, more frequent cleaning may be required.

Note that LED luminaires have a 10-year warranty. No internal repairs are to be undertaken during the warranty period. A like-for-like replacement is to be made for luminaires under warranty. Smart Lighting Controllers (SLCs) are provided by the CMS provider, not the luminaire provider, and have a separate 10-year warranty.

Outside the warranty periods, replaceable parts are surge protectors, LED drivers and SLC.

Where a luminaire is damaged as a result of a pole crash, the SLC should also be replaced.

7.2.1 Bulk lamp replacement

Bulk lamp replacement (BLR) of high-pressure sodium lamps is to be carried out every three years. BLR is where all lamps are replaced at one time, irrespective of their operational status. This corresponds with the design specification and to satisfy the requirements of AS/NZS 1158 *Lighting for Roads and Public Spaces*.

Additional information is included in Appendix D *Bulk Lamp Replacement Interval*.

After bulk lamp replacement has been initiated, spot lamp replacement inspections are to be carried out at least twice during the replacement cycle and more frequently if warranted by the number of failures reported. The rate of lamp mortality is not linear over time.

Where possible, the BLR should take into account the planned LED replacement program.

7.3 Structural

Periodic visual inspections are to be undertaken to ensure at least the following items are examined for compliance with the relevant standards:

- steel poles
- concrete poles
- other luminaire supports (for example, under overpasses)
- vertical distance between the pole slip-plane and surface level, and
- slip base high tensile clamping bolt tension.

Inspections are to be carried out 12 years after original installation and then every six years thereafter. Environmental conditions to which the road lighting installation is subject may require the frequency of inspections to be increased – for example, bridges / overpasses, corrosive environment and areas prone to flooding.

Structural inspections are to be completed in accordance with Structures Section requirements. (Note that a separate ITS and Lighting Structures Inspection Manual is under development)

7.3.1 Steel pole maintenance

Generally, once steel poles have been installed and commissioned, minimal maintenance is required; however, the following aspects are to be inspected as a minimum:

- testing the thickness of galvanic protection at the pole base and other areas in accordance with AS/NZS 4680 *Hot-dip galvanized (zinc) coatings on fabricated ferrous articles*
- pole vertical alignment tolerance check, and
- surrounding area assessment.

The immediate area around the base of the pole is to be kept clear of debris and soil build up to ensure that the steelwork does not corrode.

Road lighting poles can suffer damage from both major and minor incidents. They are to be replaced when any of the following damage is evident:

- horizontal cut(s) or tear(s) exist and exceeds 20% of the pole circumference
- deformation of pole due to impact exceeds 20% of the pole diameter, or
- hatchway door cannot be securely fastened or is damaged to the extent it cannot be replaced or repaired (even if the pole is not damaged).

Where sharp edges are present, but it is not considered necessary to replace the pole, the edges are to be rectified to remove the risk of personal injury. Where hatchway doors and/or fixings are damaged and can be replaced without the need for replacing the pole, the damaged part(s) are to be replaced.

Welding on poles is only to be undertaken at the initial pole fabrication stage. No additional welding of poles is to be undertaken.

7.3.2 Concrete pole maintenance

Concrete road lighting poles are to be replaced when any of the following damage is evident:

- where the concrete has been cracked or damaged to the extent that the reinforcing is subject to corrosion, or
- if the hatchway door cannot be securely fastened or is damaged to the extent that it cannot be replaced or repaired (even if the pole is not damaged).

Where hatchway doors and/or fixings are damaged and can be replaced without the need for replacing the pole, the damaged part(s) are to be replaced.

7.3.3 Pole slip-plane and surface level

Some road lighting poles employ a 'Slip' base fixing type which enables the pole to be displaced safely in the event of being directly impacted by a vehicle during a road crash. The intent of this design is to limit the damage caused to the vehicle and potentially reduce injury to vehicle occupants.

To ensure that the slip base mechanism will continue to activate effectively in the event of an impact collision, the distance between the slip-plane and the ground surface is to be checked in accordance with the following:

- Clause 8.3.5.2 of MRTS92 *Traffic Signal and Road Lighting Footings*
- Transport and Main Roads Standard Drawing 1380 where no crossfall exists
- Transport and Main Roads Standard Drawing 1381 where crossfall exists, and
- Transport and Main Roads Standard Drawings 1382, 1429 for crossfalls between 1:6 and 1:3.

These checks are to be continued over time as the surrounding surface level may change, such as due to the following examples:

- natural settling of surrounding earth
- water erosion, and/or
- landscaping.

Where the slip-plane height is not correct, this is to be prioritised for rectification works.

Any debris or soil build up in the slip base recess is to be removed to ensure that the steelwork does not corrode.

7.3.4 Slip base high tensile clamping bolt re-tensioning

The tension of the high tensile clamping bolts (HTCBs) are set at installation in accordance with MRTS92 *Traffic Signal and Road Lighting Footings* and Transport and Main Roads Standard Drawings 1380, 1381, 1382 and 1429. Over the life of the road lighting installation, the HTCBs may require re-tensioning to ensure that the integrity of the slip base safety mechanism is upheld.

Re-tensioning is to be done in accordance with Structures Section recommendations. Refer to TN64 *Tensioning and Re-tensioning of Slip Base Lighting Pole Bolts*.

Inspect clamping bolts and shear washer for visual signs of damage.

7.3.5 Slip base pole clamping bolt tethering systems

Clamping bolt tethering systems, where installed, prevent bolts from being projected at high speed or a long distance from the pole upon impact by errant vehicles.

Inspect the components of tethering systems for damage or deterioration and replace if required.

Tethering systems are to be installed in accordance with Standard Drawing 1755 *Slip Base Tethering System for Transport and Main Roads Rate 3 Lighting Poles* and Technical Note TN200 *Slip Base Pole Clamping Bolt Tethering System Installation*.

7.4 Environmental

7.4.1 Vegetation management

The growth of vegetation near luminaires has the potential to reduce significantly the effectiveness of road lighting installations. Where vegetation or other obstructions have, or may have an impact on road lighting performance, they are to be removed or otherwise treated to remove the risk.

Vegetation may also reduce security, increase the likelihood of vermin and/or hinder access to switchgear and electrical pits and is to be managed accordingly. Concrete surrounds should be installed around equipment, particularly switchboards.

7.4.2 Vermin

Evidence of vermin infestation is to be removed, and damage caused by vermin is to be rectified. The installation is to be treated / modified to prevent / minimise the likelihood of reinfestation.

7.4.3 Maintenance access

Where necessary, access to sites is to be remedied to allow safe, all-weather access by maintenance personnel.

7.4.4 General tidy up

Each site is to be cleaned of all waste / rubbish so as to present a clean, tidy area that reflects well on Transport and Main Roads.

8 Unscheduled maintenance

8.1 Damage

Urgent emergency repairs following damage to road lighting due to road crashes, storms, and the like is to be undertaken to make the installation safe for workers, motorists, and pedestrians. Reports of such damage are to be attended to within four hours of notification of the incident. Completion of the remainder of the repairs should be completed within three working days of being reported.

8.2 Reported fault

Notification of lamp outages from the public, Electricity Entities, emergency services and by departmental staff is to be used to supplement spot replacement information. Each District / Region is to have an efficient and effective reporting system in place to cater for reported lamp outages.

Recommended maximum response time for reported lamp outages is three days; however, a hazard analysis of the particular situation should be the deciding criterion.

Where immediate rectification is necessary due to immediate electrical risks, details are to be reported immediately to the Electrical Safety Office and to District / Regional management.

Appendix A: Rate 3 road lighting asset and site information

The following information is to be maintained.

Rate 3 – Road lighting

Inventory on electrical switchboards

Region:					
Switchboard ID:					
Description:					
Road No.:		LGA No.:		Job No.:	
Road name:				Suburb:	
Latitude:		Longitude:			
Plan No.:		Plan rev.:		Rev. date:	

Inventory

Item	Value				
Switchboard type:	<input type="checkbox"/> Main	<input type="checkbox"/> Submain	Main switchboard ID:		
Size of consumer mains (mm²):	<input type="checkbox"/> 10	<input type="checkbox"/> 16	<input type="checkbox"/> 20	<input type="checkbox"/> 25	<input type="checkbox"/> 35
Type of consumer mains table:	<input type="checkbox"/> V75	<input type="checkbox"/> V90	<input type="checkbox"/> XLPE		
Distance from LV terminals / source (m):	<input type="checkbox"/> within 10 m	<input type="checkbox"/> within 100 m	<input type="checkbox"/> within 500 m		
	<input type="checkbox"/> within 50 m	<input type="checkbox"/> within 200 m	<input type="checkbox"/> greater than 500 m		
Main switch type:	<input type="checkbox"/> Fuse	<input type="checkbox"/> Isolator	<input type="checkbox"/> MCB	Size: <input type="checkbox"/> 63A <input type="checkbox"/> 80A	
No. of circuits:					
No. of spaces for additional circuits:					
No. of phases:	<input type="checkbox"/> Single phase	<input type="checkbox"/> 2 phase	<input type="checkbox"/> 3 phase		
Photocell type:	<input type="checkbox"/> NEMA	<input type="checkbox"/> Other			
Photocell location:	<input type="checkbox"/> 4.1 m post	<input type="checkbox"/> Power pole	<input type="checkbox"/> Other		
Housing / cabinet type:	<input type="checkbox"/> Pillar box	<input type="checkbox"/> Ground cabinet	<input type="checkbox"/> Pole cabinet		
Type of earth:	<input type="checkbox"/> Common earth	<input type="checkbox"/> MEN			
Location of MEN point:	<input type="checkbox"/> Switchboard	<input type="checkbox"/> Distribution board			
Type of earth electrode:	<input type="checkbox"/> Pole footing	<input type="checkbox"/> Earth stake	Size: <input type="checkbox"/> 12 mm <input type="checkbox"/> 16 mm		

Rate 3 – Road lighting

Inventory on electrical switchboards

Current status with respect to the last audit / inspection:

- Last audit / inspection outcomes not yet reviewed to determine remedial works
- No work required from last audit / inspection
- Decommissioned
- Design phase
- Tender phase
- Construction phase
- Remedial works certified and completed

Additional comments:

Inspector name:

Inspector signature:

Inspection date:

Rate 3 – Road lighting

Inventory on circuits and cables

Region:					
Switchboard ID:					
Description:					
Circuit ID:					
Description:					
Road No.:		LGA No.:		Job No.:	
Road name:				Suburb:	
Latitude:		Longitude:			
Plan No.:		Plan rev.:		Rev. date:	

Inventory

Item	Value					
Circuit / cable protection type:	<input type="checkbox"/> HRC Fuse	<input type="checkbox"/> MCB B	<input type="checkbox"/> MCB C	<input type="checkbox"/> Contractor		
Size (A):	<input type="checkbox"/> 10	<input type="checkbox"/> 16	<input type="checkbox"/> 20	<input type="checkbox"/> 25	<input type="checkbox"/> 32	
Cable protection configuration (phase):	<input type="checkbox"/> Single phase		<input type="checkbox"/> 2 phase		<input type="checkbox"/> 3 phase	
Cable type:	<input type="checkbox"/> V75		<input type="checkbox"/> V90		<input type="checkbox"/> XLPE	
Cable configuration:	<input type="checkbox"/> SDI	<input type="checkbox"/> Multicore	<input type="checkbox"/> Circular	<input type="checkbox"/> Flat		
No. of cores:	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5		
Active conductor size (mm²):	<input type="checkbox"/> 4	<input type="checkbox"/> 6	<input type="checkbox"/> 10	<input type="checkbox"/> 16	<input type="checkbox"/> 25	<input type="checkbox"/> 35
Earth size (mm²):	<input type="checkbox"/> 4	<input type="checkbox"/> 6	<input type="checkbox"/> 10	<input type="checkbox"/> 16	<input type="checkbox"/> 25	<input type="checkbox"/> 35
Pole guard type:	<input type="checkbox"/> None	<input type="checkbox"/> Steel	<input type="checkbox"/> Timber	<input type="checkbox"/> Steel earthed	<input type="checkbox"/> Plastic	

Rate 3 – Road lighting

Inventory on circuits and cables

Current status with respect to the last audit / inspection:

- Last audit / inspection outcomes not yet reviewed to determine remedial works
- No work required from last audit / inspection
- Decommissioned
- Design phase
- Tender phase
- Construction phase
- Remedial works certified and completed

Additional comments:

Inspector name:

Inspector signature:

Inspection date:

Rate 3 – Road lighting

Inventory on poles

Region:					
Switchboard ID:					
Description:					
Circuit ID:					
Description:					
Pole ID:					
Description:					
Pole number (Energex / Ergon):					
Road No.:		LGA No.:		Job No.:	
Road name:				Suburb:	
Latitude:		Longitude:			
Plan No.:		Plan rev.:		Rev. date:	

Inventory

Item	Value									
Is this a joint use pole?	<input type="checkbox"/> Yes		<input type="checkbox"/> No							
Pole type:	<input type="checkbox"/> Slip	<input type="checkbox"/> Fixed	<input type="checkbox"/> Hex	<input type="checkbox"/> Round	<input type="checkbox"/> Mast arm combination					
Pole height (m):	<input type="checkbox"/> 7.5	<input type="checkbox"/> 8.5	<input type="checkbox"/> 10	<input type="checkbox"/> 12	<input type="checkbox"/> 13	<input type="checkbox"/> 15				
Outreach type	<input type="checkbox"/> N/A	<input type="checkbox"/> Single	<input type="checkbox"/> Double	<input type="checkbox"/> Triple	<input type="checkbox"/> Quad					
Outreach size (m)	<input type="checkbox"/> N/A	<input type="checkbox"/> 1.0	<input type="checkbox"/> 1.5	<input type="checkbox"/> 3						
Outreach orientation to road (°):										
Outreach upcast angle (°):	<input type="checkbox"/> N/A	<input type="checkbox"/> 0	<input type="checkbox"/> 5	<input type="checkbox"/> 10						
Rate 3 label:	<input type="checkbox"/> Yes		<input type="checkbox"/> No							
Foot diameter (mm):										
Cable size from terminal panel to luminaire (mm ²):	<input type="checkbox"/> N/A	<input type="checkbox"/> 1.5	<input type="checkbox"/> 2.5	<input type="checkbox"/> 4	<input type="checkbox"/> 6	<input type="checkbox"/> 10	<input type="checkbox"/> 12	<input type="checkbox"/> 16	<input type="checkbox"/> 25	
Cable size from pit to terminal panel (mm ²):	<input type="checkbox"/> N/A	<input type="checkbox"/> 1.5	<input type="checkbox"/> 2.5	<input type="checkbox"/> 4	<input type="checkbox"/> 6	<input type="checkbox"/> 10	<input type="checkbox"/> 12	<input type="checkbox"/> 16	<input type="checkbox"/> 25	

Rate 3 – Road lighting

Inventory on poles

Current status with respect to the last audit / inspection:

- Last audit / inspection outcomes not yet reviewed to determine remedial works
- No work required from last audit / inspection
- Decommissioned
- Design phase
- Tender phase
- Construction phase
- Remedial works certified and completed

Additional comments:

Inspector name:

Inspector signature:

Inspection date:

Rate 3 – Road lighting**Inventory on luminaires**

Region:					
Switchboard ID:					
Description:					
Circuit ID:					
Description:					
Pole ID:					
Description:					
Luminaire ID:					
Description:					
Pole number (Energex / Ergon):					
Road No.:		LGA No.:		Job No.:	
Road name:				Suburb:	
Latitude:		Longitude:			
Plan No.:		Plan rev.:		Rev. date:	

Inventory

Item	Value				
Outreach arm extension size (mm):	<input type="checkbox"/> N/A	<input type="checkbox"/> 1.0	<input type="checkbox"/> 1.5	<input type="checkbox"/> 2	
Luminaire brand:	<input type="checkbox"/> Rexel	<input type="checkbox"/> Sylvania	<input type="checkbox"/> GEC	<input type="checkbox"/> Gough	<input type="checkbox"/> Crouse H <input type="checkbox"/> Osram
Luminaire type:	<input type="checkbox"/> SCO	<input type="checkbox"/> CO	<input type="checkbox"/> HM	<input type="checkbox"/> FL	
Lamp type:	<input type="checkbox"/> SON T	<input type="checkbox"/> SON E	<input type="checkbox"/> MH	<input type="checkbox"/> MV	<input type="checkbox"/> FL
Lamp wattage:	<input type="checkbox"/> 70	<input type="checkbox"/> 100	<input type="checkbox"/> 150	<input type="checkbox"/> 250	<input type="checkbox"/> 400
Power factor correction:	<input type="checkbox"/> Yes	<input type="checkbox"/> No			
Photocell:	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Shorted		

Rate 3 – Road lighting

Inventory on luminaires

Current status with respect to the last audit / inspection:

- Last audit / inspection outcomes not yet reviewed to determine remedial works
- No work required from last audit / inspection
- Decommissioned
- Design phase
- Tender phase
- Construction phase
- Remedial works certified and completed

Additional comments:

Inspector name:

Inspector signature:

Inspection date:

Rate 3 – Road lighting

Inventory on pits and conduits

Region:					
Switchboard ID:					
Description:					
Pit ID:					
Description:					
Pit connected to:	<input type="checkbox"/> Switchboard	<input type="checkbox"/> Road lighting pole	<input type="checkbox"/> Other		
Pole ID:					
Description:					
Pole number (Energex/Ergon):					
Road No.:		LGA No.:		Job No.:	
Road name:				Suburb:	
Latitude:		Longitude:			
Plan No.:		Plan rev.:		Rev. date:	

Inventory

Item	Value				
Pit type:	<input type="checkbox"/> No 4	<input type="checkbox"/> No 7	<input type="checkbox"/> Round		
Pit material:	<input type="checkbox"/> Plastic	<input type="checkbox"/> Fibro	<input type="checkbox"/> Concrete	<input type="checkbox"/> Fibreglass	
Asbestos in pit material:	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Possible		
Asbestos in conduit material:	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Possible		
Asbestos contamination in pit:	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Not tested		
Pit lid material:	<input type="checkbox"/> Concrete	<input type="checkbox"/> Steel	<input type="checkbox"/> Plastic		
Conduit type:	<input type="checkbox"/> HD	<input type="checkbox"/> MD	<input type="checkbox"/> Corrugated		
Number of conduits:			Size (mm):	<input type="checkbox"/> 40	<input type="checkbox"/> 80
				<input type="checkbox"/> 50	<input type="checkbox"/> 100
Conduit colour:	<input type="checkbox"/> Orange	<input type="checkbox"/> White	<input type="checkbox"/> Grey		
Joint type:	<input type="checkbox"/> None	<input type="checkbox"/> Reopenable	<input type="checkbox"/> 90B1	<input type="checkbox"/> Heatshrink	
Cables in pit:	<input type="checkbox"/> Lighting	<input type="checkbox"/> Signal	<input type="checkbox"/> Detector	<input type="checkbox"/> Other ITS	
Slack cable in pit (m):					
Fuse size in cable joint kit:	<input type="checkbox"/> N/A	<input type="checkbox"/> 10A	<input type="checkbox"/> 16A	<input type="checkbox"/> 20A	<input type="checkbox"/> 25A <input type="checkbox"/> 32A

Rate 3 – Road lighting

Inventory on pits and conduits

Current status with respect to the last audit / inspection:

- Last audit / inspection outcomes not yet reviewed to determine remedial works
- No work required from last audit / inspection
- Decommissioned
- Design phase
- Tender phase
- Construction phase
- Remedial works certified and completed

Additional comments:

Inspector name:

Inspector signature:

Inspection date:

Appendix B: Rate 3 road lighting maintenance reports

The following inspection reports are to be produced.

Rate 3 – Road lighting

Inspection on electrical switchboards

Region:					
Switchboard ID:					
Description:					
Road No.:		LGA No.:		Job No.:	
Road name:				Suburb:	
Latitude:		Longitude:			
Plan No.:		Plan rev.:		Rev. date:	

Inventory

Item	Pass	Fail			Corrective Action Required
		IER	AS	MRTS	
Safe location	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Safe access (present and future)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Pole guard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Seal against vermin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Protection against direct contact	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Signs of degradation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Main switch labelled	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Protection devices labelled	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
MEN link	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Earth conductor / clamp / stake	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Neutral link	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Photocell (operation, orientation, fixture, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Drawing / conduit schedule correct	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Submain connection correct	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Exposed conductors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Unearthed equipment (including all metallic fixtures)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Suitable IP rating	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Rate 3 – Road lighting

Inspection on electrical switchboards

Tests

Item	Value	Pass	Fail			Corrective Action Required
			IER	AS	MRT S	
Main earth conductor resistance (Ohm)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Insulation resistance (MOhm)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Earth Fault Loop Impedance (Ohm) (External EFLI into supply)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Polarity	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Maximum Demand (A)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Voltage (V)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Additional comments:

Inspector name:

Inspector signature:

Inspection date:

Rate 3 – Road lighting**Inspection on circuits and cables**

Region:					
Switchboard ID:					
Description:					
Circuit ID:					
Description:					
Road No.:		LGA No.:		Job No.:	
Road name:				Suburb:	
Latitude:		Longitude:			
Plan No.:		Plan rev.:		Rev. date:	

Inspections

Item	Pass	Fail			Corrective Action Required
		IER	AS	MRTS	
Correctly terminated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Correctly labelled	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Correct colour coding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Signs of degradation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Cable protection type / size	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Drawing correct	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Correct circuit connections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Tests

Item	Value	Pass	Fail			Corrective Action Required
			IER	AS	MRTS	
Insulation resistance (MOhm)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Earth fault loop impedance (Ohm)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Full load current		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Polarity	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Rate 3 – Road lighting

Inspection on circuits and cables

Additional comments:

--

Inspector name:

--

Inspector signature:

--

Inspection date:

--

Rate 3 – Road lighting**Inspection on poles**

Region:					
Switchboard ID:					
Description:					
Circuit ID:					
Description:					
Pole ID:					
Description:					
Pole number (Energex/Ergon):					
Road No.:		LGA No.:		Job No.:	
Road name:				Suburb:	
Latitude:		Longitude:			
Plan No.:		Plan rev.:		Rev. date:	

Inspections

Item	Value	Pass	Fail			Corrective Action Required
			IER	AS	MRTS	
Distance from HV lines (m)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Distance from LV lines (m)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Distance from communication lines (m)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Proximity to power poles (m)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Proximity to trees (m)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Clearance from railway lines (m)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Clearance from driveway (m)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Clearance from drainage (m)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Correct pole type	<i>N/A</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Slip base orientation	<i>N/A</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Bolt tension		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Height of slip plane to surface level		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Height of top of cage to finished level		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Grouting	<i>N/A</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Stop tread		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Correct conduit installation	<i>N/A</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Rate 3 – Road lighting

Inspection on poles

Electrical inspections

Item	Pass	Fail			Corrective Action Required
		IER	AS	MRTS	
Door and screw orientation/condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Terminal panel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Earth connection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
MEN link	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Continuous neutral (same lug)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Continuous earth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Correct connection of slip base pins	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Correct connection of GPO	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Fixed incoming wiring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Luminaire circuit protection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Cable size to luminaire (mm ²)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Cable fixed to catenary	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Drawing correct	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Polarity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Tests

Item	Value	Pass	Fail			Corrective Action Required
			IER	AS	MRTS	
Earth integrity		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Additional comments:

Inspector name:

Inspector signature:

Inspection date:

Rate 3 – Road lighting

Inspection on luminaires

Region:					
Switchboard ID:					
Description:					
Circuit ID:					
Description:					
Pole ID:					
Description:					
Luminaire ID:					
Description:					
Pole number (Energex/Ergon):					
Road No.:		LGA No.:		Job No.:	
Road name:				Suburb:	
Latitude:		Longitude:			
Plan No.:		Plan rev.:		Rev. date:	

Inspections

Item	Pass	Fail			Corrective Action Required
		IER	AS	MRTS	
Luminaire check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Additional comments:

Inspector name:

Inspector signature:

Inspection date:

Rate 3 – Road lighting**Inspection on pits and conduits**

Region:					
Switchboard ID:					
Description:					
Pit ID:					
Description:					
Pit connected to:	<input type="checkbox"/> Switchboard	<input type="checkbox"/> Road lighting pole	<input type="checkbox"/> Other		
Pole ID:					
Description:					
Pole number (Energex/Ergon):					
Road No.:		LGA No.:		Job No.:	
Road name:				Suburb:	
Latitude:		Longitude:			
Plan No.:		Plan rev.:		Rev. date:	

Inspections

Item	Pass	Fail			Corrective Action Required
		IER	AS	MRTS	
Pit surround	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Pit level with surrounding surface	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Earth subsidence round pit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Pit wall deflection/damage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Pit lid intact	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Pit marker	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Pit in suitable location	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Water in pit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Pit clean	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Conduit depth (mm)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Conduit protruding > 100 mm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Conduit sealed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Drawing correct	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Cable joint condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Cable joint kit condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Heatshrink condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Ingress of moisture in cable joint (water in joint kit)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Item	Pass	Fail			Corrective Action Required
		IER	AS	MRTS	
Correct active connection in joint kit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Correct neutral connection in joint kit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Correct MEN link	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Correct cable size for earth, neutral and active to pole	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Support for cable joint kit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Exposed conductors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

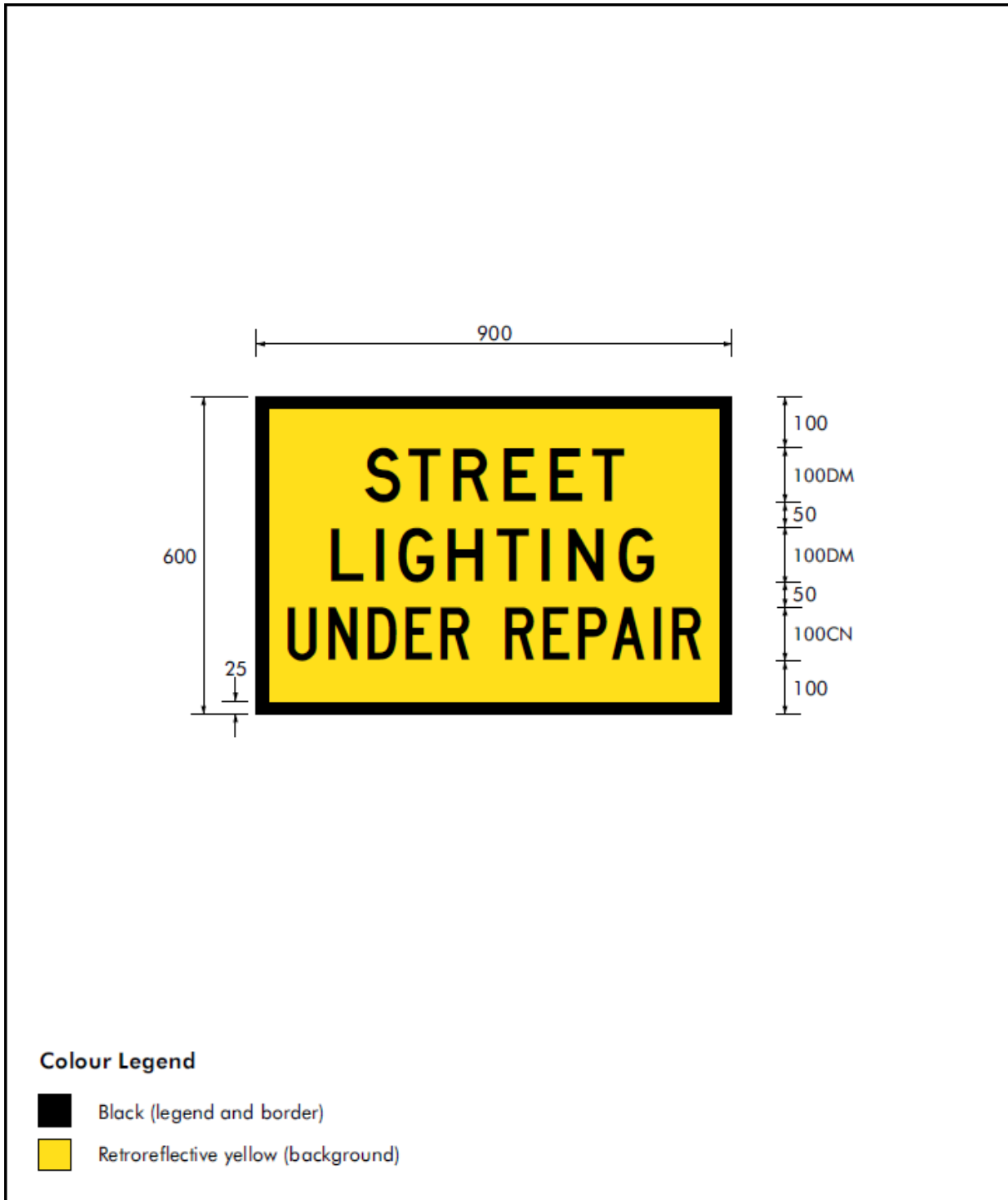
Additional comments:

Inspector name:

Inspector signature:

Inspection date:

Appendix C: Temporary road lighting repair sign



Colour Legend

- Black (legend and border)
- Retroreflective yellow (background)

<p>Queensland Government Department of Main Roads</p>	<p>TEMPORARY SIGN "STREET LIGHTING UNDER REPAIR"</p>		
<p>Planning, Design and Operations Division Traffic Engineering Section</p>		<p><u>ORIGINAL APPROVED AS OFFICIAL TRAFFIC SIGN</u></p>	
<p>Designed TV 4/07</p>	<p>Checked JD 4/07</p>	<p>Scale Not to scale</p>	<p> 03/04/07 PRINCIPAL ENGINEER (Traffic Engineering) Date</p>
			<p>TC1639</p>
			<p>A </p>

Appendix D: Bulk lamp replacement interval for HPS Lamps

Data available from lamp manufacturer Osram for their 250 w and 400 w high pressure sodium tubular lamps show the following lamp survival rates and lamp depreciation factors:

Months burning	Survival rate (%)	Luminous flux (%)
18	98	94
24	97	92
36	92	89
48	81	84

AS/NZS 1158 *Lighting for Roads and Public Spaces* specifies service availability of 95%. Using the manufacturer's survival rate data, approximately 92% of the lamps will still be burning after three years. The failure rate increases rapidly after that time. A spot replacement program will assist in achieving the 95% level.

Maintenance factors (MF) used in lighting design are the product of the luminaire maintenance factor (LMF) and the lamp lumens maintenance factor (LLMF). Luminaire maintenance factors for IP5X and IP6X rated luminaires are found in AS 1158.1.1 *Lighting for Roads and Public Spaces – Vehicular Traffic (Category V) Lighting – Performance and Design Requirements*. Rexel Optispan luminaires installed before February 2002 are rated at IP54. Luminaires installed after this date are rated at IP66.

The following table provides the maintenance factors for various lamps, IP rating and pollution category for a 36 month cleaning interval based on the Rexel and Osram data:

Rexel Optispan maintenance factors for 36 month cleaning interval							
		IP5X			IP6X		
		Pollution category			Pollution category		
		Low	Med	High	Low	Med	High
250/400W	LMF	0.88	0.82	0.76	0.90	0.87	0.83
	LLMF	0.89	0.89	0.89	0.89	0.89	0.89
	MF	0.78	0.73	0.68	0.80	0.77	0.74

Maximum allowable maintenance factors for IP5X luminaires is 0.7 and IP6X luminaires is 0.8.

Having bulk lamp changes every three years with a minimal spot replacement program will enable the service availability compliance to be achieved as well as optimising road lighting design.

Appendix E: Periodic verification of electrical installations

Periodic verifications are to be in accordance with the requirements as set out in AS/NZS 3019 *Electrical installations - Periodic verification* and as follows.

Clause 2.1 Immediate electrical risks (including exposed live conductors, unearthed equipment and incorrect polarity) must be made safe and rectified when discovered and the ESO and District Management notified.

Where other test results of an installation are found not to comply with the requirements of AS/NZS 3000 *Wiring Rules* consideration must be given to the risk to road users of having lighting switched off.

Clause 2.8 For standard installations, the maximum interval between inspections is six years. Where harsh environmental conditions exist, more frequent inspections must be carried out. Once inspections have a documented history, frequencies may be adjusted to suit the specific installation requirements.

Clause 3.2 (c) – not required

Clause 3.2 (d) – not required

Clause 3.2 (h) – not required

Clause 3.2 (j) – not required

Clause 3.2 (l) – not required

Add the following clauses to 3.2.

Clause 3.2 (n) Covers/lids are not broken or missing

Clause 3.2 (o) Electricity entity side of the point of supply is not showing signs of deterioration.

Clause 3.2 (p) Electrical components have been replaced with identical units.

Clause 3.2 (q) Switchboards and poles are adequately sealed against vermin.

Clause 4.2 (h) – not required

Add the following clause to 4.2.

Clause 4.2 (k) Ensure that a lamp of correct rating and type are installed in luminaires

Clause 4.3 (b) – not required

Clause 4.3 (j) – not required

Clause 4.6 – not required

Clause 4.7 (b) – not required

Clause 4.7 (e) – not required

Clause 4.7.2 – not required

Clause 4.7.3 (a) – This also includes every three-phase switch and protective device.

Clause 4.7.3 (b) – not required

Clause 4.7.4 – Leakage current testing is required on the consumers mains.

Clause 4.7.5 – not required

Clause 5.3 – not required

Clause 5.4 – Insulation resistance testing is required on submains.

Clause 5.5 – Earth fault loop impedance measurements are required at the switchboard for external impedance and at the end of each submain run, including spurs, for total circuit impedance.

The end of circuit measurements are to be taken with the supply connected but with each pole fuse removed and each pole earth disconnected.

Clause 5.7 – not required

Clause 5.9 – not required

