Road Planning and Design Manual
2nd Edition

Queensland Practice

March 2021

Volume 6 – Lighting

Queensland Government

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Amendment Register

Issue / Rev no.	Reference section	Description of revision	Authorised by	Date
July 2016	8.11	The use of circular pits is preferred to Type 7 pit	Robert Hodges	July 2016
March 2021	8.10	Additional requirements on maintenance area for electrical switchboards	Haider Sabti	March 2021

Contents

Figures

Tables

1 Introduction

'The objective of road lighting is to provide an illuminated environment, which is conducive to the safe and comfortable movement of vehicular and pedestrian traffic at night, and the discouragement of illegal acts'. (AS/NZS 1158 *Lighting for roads and public spaces* Set).

Where lighting is installed on roads and pathways, it has been deliberately designed to achieve the objectives of AS/NZS 1158. The electrical system is an integral part of maintaining the illuminated environment. Consequently, lighting design must balance the electrical safety requirements with traffic safety requirements. Every effort must be made to ensure that the lighting installation remains operational safely.

2 Scope

This Volume describes the Standard Conditions for the Provision of Public Lighting Services for the design, installation and maintenance of Rate 3 public lighting installations on Queensland Department of Transport and Main Roads controlled roads and bikeways throughout Queensland. It is prepared on the basis of assisting road designers to make the necessary allowances for lighting in their designs. Detailed design of the lighting itself must be carried out by the relevant specialists.

Where there is a conflict between the requirements of AS/NZS 1158 and this Volume, the requirements of this Volume take precedence.

3 Definitions

For the purposes of this Volume, the definitions given in AS/NZS 1158.0 *Lighting for roads and public spaces – Introduction* and the following apply.

Table 3 – Definitions

Name	Definition
AADT	Annual Average Daily Traffic in vehicles per day (vpd)
Approved Contractor	Private Company or Public Body authorised by the Electricity entity to install public lighting
Arterial bicycle route	A route marked on a Principal Cycle Network Plan for a district / region or a major route in a relevant local government bicycle network plan
Bikeway	A pathway (paved or unpaved) upon which bicycles or other vehicles are propelled by human power For the purposes of this policy, 'bikeway' includes dedicated bike paths as well as shared paths and separated paths which may be used by pedestrians. The guideline applies to bikeways that are physically separated from the motor vehicle carriageway and which are provided by Transport and Main Roads. It does not apply to bike lanes on a road carriageway.
Channelisation	A system of controlling traffic by the introduction of an island or islands or markings on a carriageway to direct traffic into predetermined paths, usually at an intersection or junction
Interchange	A grade separation of two or more roads with one or more interconnecting carriageways
Motorway	A divided highway for through traffic with full control of access and with interchanges provided at intersections where access to the local road system is required

Name	Definition
Point of Supply	The point where the road lighting installation connects with the Electrical Entity's network and must be determined by the Electricity entity after negotiation with the department
Public Body	A statutory corporation or public body is a corporation created by statute
Public Lighting Tariff	An unmetered tariff set by the Regulator and levied for the provision of Rate 1, 2, 3 or 8 public lighting
Regulator	Must be as defined in the *Electricity Act 1994* (Qld)
Route Lighting	Continuous lighting on stretches of road between intersections
SOA	Transport and Main Roads Standing Offer Arrangement with a supplier
Urban Area	For road lighting purposes, 'urban area' is defined as an area where a network of cross streets exist, and the section of road in question is constructed with a paved roadway, kerbs, gutters and footpaths; or along which the frontages are substantially developed with residential, retail, commercial or industrial premises

4 Legislation and standards

Designers must comply with the requirements of the *Professional Engineers Act* 2002. Completed designs must comply with the requirements of the *Electrical Safety Act* 2002, Electrical Safety Regulation 2013, associated Codes of Practice and the following standards and others as appropriate:

- AS/NZS 1158 *Lighting for Roads and Public Spaces* Set, and
- AS/NZS 3000 *Electrical installations* (*known as the Australian / New Zealand Wiring Rules).*

Legislation and Standards that apply are the latest edition.

5 Objectives of road lighting

In order to realise the department's objectives, lighting must be in accordance with the requirements of this Volume and AS/NZS 1158 and employ the use of sound traffic engineering and safety principles. In the context of this Standard, public lighting is the lighting of roads and other public thoroughfares.

AS/NZS 1158 classifies public lighting into two broad categories:

- Category V – Vehicular Traffic Lighting – lighting which is applicable to roads on which the visual requirements of motorists are dominant, for example, major roads, and
- Category P – Pedestrian Area Lighting – lighting which is applicable to roads and outdoor public areas where the visual requirements of pedestrians are dominant for example, minor roads, car parks, pathways, and so on.

5.1 Objectives for Category V lighting

The objective of major road lighting is to provide a lighted environment that is conducive to the safe and comfortable movement of vehicular and pedestrian traffic at night; however, the visual requirements of the motorist predominate.

To accomplish this, the lighting must reveal necessary visual information. This will consist of the alignment of the road ahead, kerbs, footpaths, road furniture and surface imperfections, together with other road users including pedestrians, cyclists and vehicles, and their movements, and any other animate or inanimate obstacles.

A public lighting scheme designed and installed according to the requirements of AS/NZS 1158 (Category V) achieves these requirements.

5.2 Objectives for Category P lighting

The objective of pedestrian area lighting is to provide a lighted environment to assist pedestrians to orient themselves, detect potential hazards and to discourage crime against both person and property.

The lighting, with certain exceptions, is not meant to provide drivers with adequate visibility if motor vehicle traffic is present at the location; for this, the vehicle headlights are used. The exceptions are where there is interactive pedestrian and vehicular activity in designated areas; for example, transport interchanges, car parks.

A public lighting scheme designed and installed according to the requirements of AS/NZS 1158 (Category P) achieves these requirements.

6 Public lighting tariffs

Ergon – all lighting tariffs are set by the Regulator and are reviewed at regular intervals. There are three relevant unmetered public lighting tariffs – Rate 1, 2, and 3. Rate 1, 2, and 3 tariffs are only available to Public Bodies.

Energex – there are three relevant unmetered public lighting tariffs – Rate 1, 2, and 3. Rate 1, 2, and 3 tariffs are only available to Public Bodies. Due to the introduction of full retail contestability, the pricing of the public lighting tariffs are a matter between the chosen retail entity and the Public Body.

Acceptance of the actual rate for the lighting still remains with Energex.

Energex – Rate 8 unmetered lighting tariff is available to consumers who are in the Energex area and are not public bodies for example, Transurban.

Note that designs according to the standard requirements for one tariff rate are not necessarily equivalent to those of another tariff rate; therefore, it is essential to have the tariff rate for the particular installation confirmed by the electricity entity prior to progressing any design to avoid rework.

It is the preference of the department that a Rate 2 tariff be applied to all lighting where the electricity entity standard conditions can be met.

6.1 Rate 1

Energex Non Contributed (Rate 1) / Ergon Tariff 71 (Rate 1) – public lighting is supplied, installed, owned and maintained by the electricity entity. The tariff includes components supply and installation and recovery over time.

6.2 Rate 2

Energex Contributed (Rate 2) / Ergon Tariff 71 (Rate 2) – public lighting is owned and maintained by the electricity entity.

For Rate 2, lighting design should be undertaken in accordance with the following:

- AS/NZS 1158 *Lighting for roads and public spaces* Set
- Energex – *Public Lighting Standard Conditions for Public Lighting Services*
- Ergon – *QTSC Group Standard Conditions for the Provision of Public Lighting Services*
- *Public Lighting Design Manual*

- *Queensland Public Lighting Construction Manual*
- other relevant Energex or Ergon requirements, and
- other relevant Public Body requirements.

6.3 Rate 3

Energex Unmetered (Rate 3) / Ergon Unmetered Tariff 71 (Rate 3) – public lighting is supplied, installed, owned and maintained by the Public Body. Supply is unmetered, luminaires have a fixed wattage and the installation must comply with the AS/NZS 3000. Beyond the Point of Supply, reticulation is owned and maintained by the consumer.

For Rate 3 Transport and Main Roads installations, this Volume must be read in conjunction with the following:

- AS/NZS 1158 *Lighting for roads and public spaces* Set
- AS/NZS 3000 *Wiring Rules*
- Energex – *Public Lighting Standard Conditions for Public Lighting Services*
- Ergon – *QTSC Group Standard Conditions for the Provision of Public Lighting Services*
- Transport and Main Roads Standing Offer Arrangement No. MRO547 ‘Supply and Delivery of Lighting Poles, Mast Arms, Rag Bolt Assemblies, Pits and Lids’
- Transport and Main Roads Standing Offer Arrangement No. PPB004: *Road Lighting Luminaires and Lamps*
- Transport and Main Roads Standard Drawings Roads
- Transport and Main Roads Technical Specifications
- Transport and Main Roads *Traffic and Road Use Management Manual (TRUM) Volume 4 – ITS and Electrical Technology Manual, Part 3 – Electrical Design Roadside Devices,* and
- Transport and Main Roads *Drafting and Design Presentation Standards Manual (DDPSM) Volume 2 – Road Design Development Presentation*.

For Rate 3 other public body installations, this Volume should be read in conjunction with the following:

- AS/NZS 1158 *Lighting for roads and public spaces* Set
- AS/NZS 3000 *Wiring Rules*
- other relevant Energex or Ergon requirements, and
- public body requirements.

6.4 Rate 8

Energex Unmetered (Rate 8) – public lighting is supplied, installed, owned and maintained by a customer who is not a public body. Supply is unmetered, luminaires have a fixed wattage and the installation must comply with the AS/NZS 3000. Beyond the Point of Supply, reticulation is owned and maintained by the consumer.

The charges are based upon lamp type, wattage and operation by a photoelectric cell and charged on a rate per lamp on an annual basis. For current relevant charges refer to the regulator or the local electricity entity.

For Rate 8 installations, lighting design should be undertaken in accordance with the following:

- AS/NZS 1158 *Lighting for roads and public spaces* Set
- AS/NZS 3000 *Wiring Rules*
- other relevant Energex or Ergon requirements, and
- consumer requirements.

6.5 Metered lighting

There will be instances where an unmetered supply cannot be used, for example tunnels or underpasses where daytime lighting levels are adjusted. The metered tariff pricing structure is different to the unmetered and varies between Energex and Ergon regions. The meters used need to be approved by the electricity entity and are generally mounted with the lighting switchboard.

For departmental Rate 3 lighting installations, consideration should be given to the use of metered lighting instead of Rate 3 unmetered tariff where there is an economic benefit and use of meters is feasible.

7 Warrants for departmental road and bikeway lighting

The requirement for road or bikeway lighting must be determined by consideration of the warrants set out following; however, it should be recognised that, while warrants may or may not be met, all relevant factors need to be taken into consideration and sound engineering judgement exercised as to the need and/or appropriateness of road or bikeway lighting.

7.1 Intersection lighting

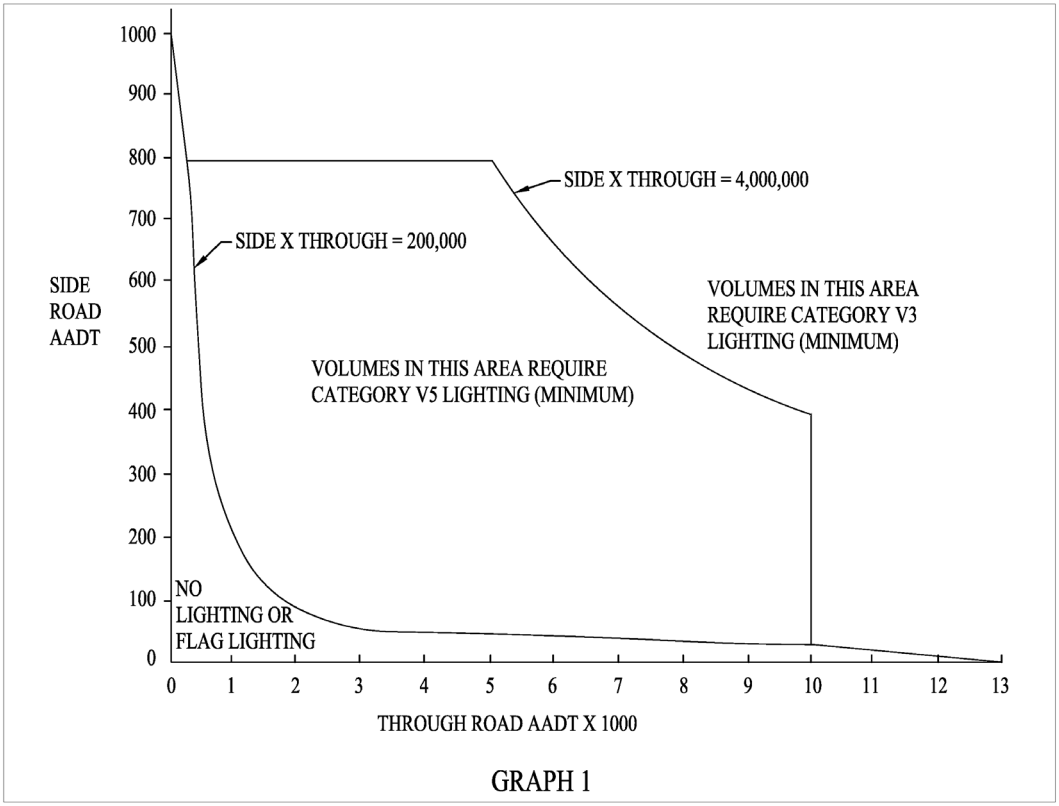
7.1.1 General provisions

Lighting must be considered at intersections with channelisation where traffic volumes (AADTs) approximating those given in Figure 7.1.1 are encountered. This figure also gives the category of lighting to be applied in accordance with AS/NZS 1158.

Where intersection channelisation is in the form of raised islands or medians, lighting must be provided over the extent of that channelisation in accordance with AS/NZS 1158, regardless of the vehicle volumes. Turning or verge roadway kerb does not require lighting, as it is not considered ‘raised channelisation’ for road lighting design.

Where the values in Figure 7.1.1 are met but the intersection channelisation is in the form of painted islands or medians, lighting may not be required if retroreflectorised signage and pavement markers are installed and deemed adequate for delineation of the intersection; however, a further determination should be made with reference to the ‘Special Cases’ sub-section as to the appropriateness of lighting.

Figure 7.1.1 – Warrants for consideration of road lighting



7.1.2 Intersection design area

If Category V lighting is deemed necessary at an intersection because of the traffic volumes or any special road safety concerns, then the minimum design area must comprise the surface of the carriageway extending at least 10 m beyond the prolongation of the kerb lines of the intersecting roads. This must be further extended to include raised islands and medians, changes in road alignment and locations of potential traffic conflict in or near the intersection.

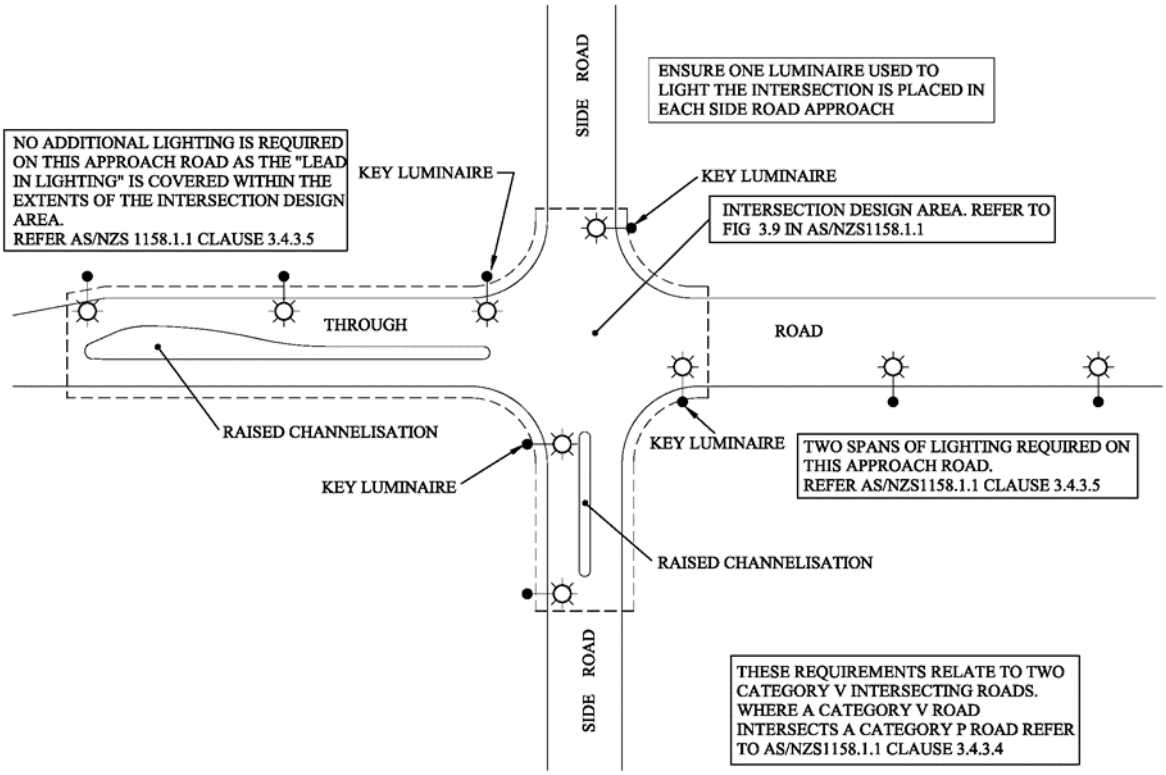
In addition to this minimum design area, an additional two spans of lighting must be provided on the main through road approaches in accordance with AS/NZS 1158.1.1 *Lighting for roads and public spaces, Part 1.1: Vehicular traffic (Category V) lighting - Performance and design requirements*.

Note: The designer should exercise some judgement ascertaining whether this additional lighting is covered under the extent of the intersection conflict points or changes in carriageway width to avoid unnecessary costs in over-extending the design limits (refer Figure 7.1.2).

Where the intersecting roads have comparable traffic volumes, then the additional two spans of lighting as detailed previously must be provided on each approach.

To aid in the identification of the intersection for motorists approaching from the side road(s), ensure that one luminaire is located in each side road approach (refer Figure 7.1.2).

Figure 7.1.2 – Example of lighting at an intersection of two Category V roads



Where painted channelisation is present, the use of retroreflectorised raised pavement markers in accordance with the department's *Manual of Uniform Traffic Control Devices* (MUTCD) is highly recommended to define the extent of the intersection.

7.1.3 Signalised intersections

At locations involving the upgrading or installation of traffic signals, intersection lighting to Category V standard should be provided regardless of the road lighting categories or traffic volumes of the intersecting roads. The minimum lighting category shall be V5 but, where one of the intersecting roads would be expected to be lit with V3, when assessing against departmental warrants, then this shall be the level of lighting provided for the intersection.

7.1.4 Special cases

Provision of lighting under special cases is subject to the approval of the District Director.

For volumes less than those requiring lighting according to Figure 7.1.1 or at intersections without raised channelisation, other conditions that may justify the provision of intersection lighting include:

a) Restricted visibility: where traffic facilities are not visible at night over an approach distance of:

   i. 120 m in a 60 km / hr zone, or

   ii. 200 m in a 100 km / hr zone.

b) Adverse conditions such as:
    i. road location and geometry
    ii. background lighting (including offset of opposing headlights)
    iii. weather conditions (such as frequent fog)
    iv. separate needs of pedestrians indicates the existence of a special road safety risk, or
    v. high night to day accident ratio (for example, Ratio > 1.3:1).
c) Painted channelisation or auxiliary passing lanes in cases such as:
    i. predominant heavy right turn volumes
    ii. predominant movements of heavy vehicles, or
    iii. tourist areas where drivers are not familiar with local conditions.
d) Isolated conflicts.

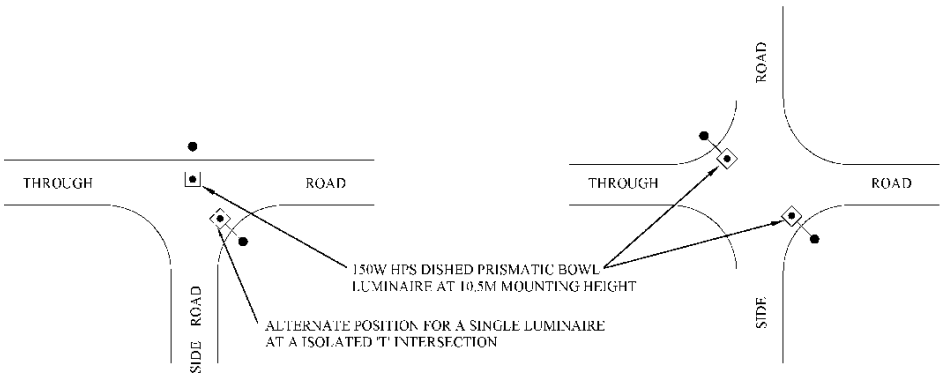
In practice there will be locations that will require lighting for indication purposes only or to highlight isolated localised conflicts, even though the requirements of the warrants mentioned previously are not met. Such lighting is known as ‘flag’ lighting and this is illustrated at Figure 7.1.4(a). These locations may require special treatment that is not strictly in accordance with the lighting objectives of AS/NZS 1158; however, where the warrants mentioned previously exist, full road lighting must be provided.

Any ‘flag’ lighting used must not constitute a safety hazard. Only dished prismatic bowl type luminaires are to be used where flag lighting is installed, as there will only be one or two luminaires around the immediate vicinity of the intersection. These are used to draw the attention of the motorists to the presence of an intersection from a sufficient distance away.

A maximum 150 W luminaire should be used at a mounting height of 10.5 m.

Alternatively, where there is no local mains power supply economically available at the site, an approved standalone solar powered luminaire installation may be used. The system must have a minimum four nights’ autonomy based on the longest dark hours in winter for the specific region. The luminaire should have a minimum output of 2200 lms. It is recommended that a minimum 4000 K Correlated Colour Temperature be used for these low output luminaires. Mounting heights of between 8 m and 10.5 m are acceptable.

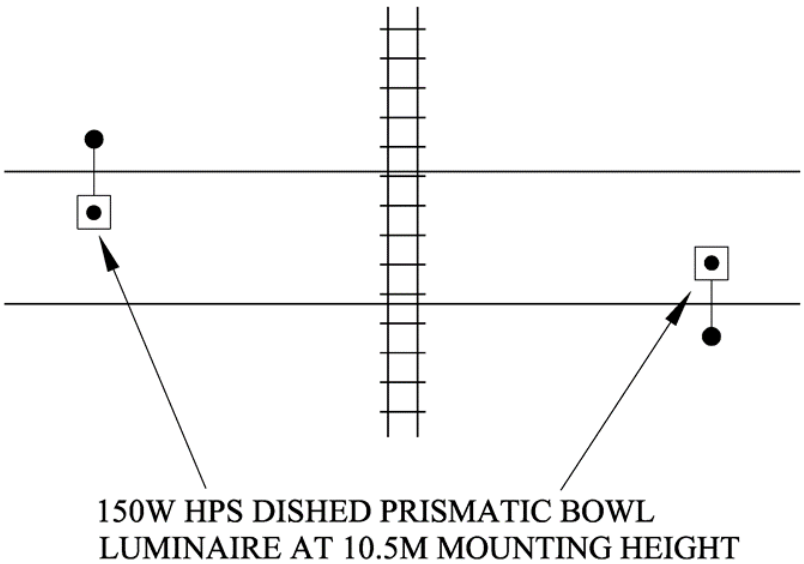
Figure 7.1.4(a) – Flag lighting at isolated intersections



Examples of some special locations that may require consideration are as follows:

- isolated intersections in fog prone areas – these locations may require one or two luminaires so that, on foggy nights, the turn-off can be readily identified
- train crossings where there is regular shunting or the crossing is frequently blocked at night – these sites may require one luminaire situated on either side of the road in appropriate locations to provide lighting in accordance with AS/NZS 1158 only on the actual rail crossing conflict; for example, on a 9 m carriageway, a luminaire located 20 m from the track on either side as shown in Figure 7.1.4(b) will provide approximately V5 coverage on the crossing conflict, and
- painted channelised intersections not provided with lighting in accordance with AS/NZS 1158.

Figure 7.1.4(b) – Flag lighting at train crossing



Luminaires must be located and their light directed so as not to interfere with, or obscure visibility of either road or railway devices.

7.2 Roundabouts

Category V lighting should be provided on roundabouts regardless of the road lighting categories or traffic volumes of the intersecting roads. The minimum lighting category shall be V5 but, where one of the intersecting roads would be expected to be lit with V3, when assessing against departmental warrants, then this shall be the level of lighting provided for the roundabout.

7.3 Motorway and interchange lighting

7.3.1 Motorways and interchanges

This section applies to all divided highways for through traffic that have no access for traffic between interchanges and that have grade separation at all intersections.

Generally, route lighting (continuous through lighting) is not provided on urban or rural motorways. Because of their inherent safety features with respect to design, control of access and usage, motorways usually have low accident rates and operate safely at night without continuous route lighting.

Isolated lighting at interchanges may be justified where there is a staged development aimed at improving the level of service in the following situations (listed in order of precedence):

- ramp intersections, including the crossroad between these intersections
- at ramp exits, including gore areas
- at ramp entries, including gore areas
- along ramps, particularly where substandard alignment is involved, and
- at converge, diverge and weaving areas on the motorway.

7.3.2 Motorways in urban areas

The following guidelines are suggested in respect to the provision of lighting on urban motorways.

a) Continuous full motorway lighting is warranted where one or more of the following conditions exist:

   i. the unlit sections are less than 1 km long between sections of complete lighting

   ii. if road design standards are significantly less than normal (particularly alignment, sight distance, cross-section and clearance)

   iii. if a significant night-time accident record is likely to be corrected by lighting, and/or

   iv. if adjacent roads are provided with Category V lighting, or where the background illumination in the vicinity of the motorway is likely to reduce roadway visibility for motorists if lighting is not provided.

b) Full lighting of interchanges (that is, lighting of ramps, intersections, crossroads and main carriageways through the interchange only) is warranted where one or more of the following conditions exist:

   i. if the total AADT (existing or estimated) on the ramps is greater than 10 000 vpd. (that is, the sum of the volumes entering and leaving the motorway at the interchange)

   ii. if connecting roads are provided with Category V lighting that might reduce roadway visibility for motorists using the interchange, and/or

   iii. if warrants for continuous motorway lighting are satisfied.

c) Partial lighting of interchanges (that is, lighting of the entry and exit gore areas plus ramps, intersections and crossroads) is warranted where one or more of the following conditions exist:

   i. if the current AADT on the motorway is greater than 25 000 vpd

   ii. if the total AADT on the ramps is greater than 5 000 vpd. (that is, the sum of the volumes entering and leaving the motorway at the interchange)

   iii. if the road design standards are significantly below those of the approaches

   iv. if a significant night-time accident record exists that is likely to be corrected by lighting, and/or

   v. if connecting roads are provided with Category V lighting that might reduce roadway visibility for motorists using the interchange.

d) The lighting of the ramp crossroad intersections and the crossroad between them is warranted when one or more of the following conditions exist:

   i. if continuous motorway or complicated interchange lighting is provided

   ii. if the crossroad approaches are lit

   iii. if the crossroad is divided between the ramp intersections, or if there are raised islands at the ramp intersections, and/or

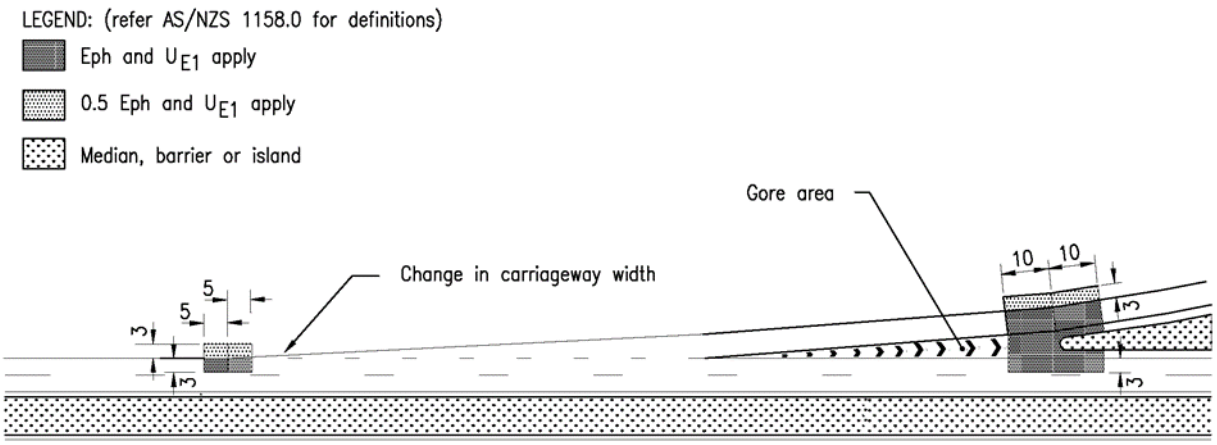
   iv. if the volume on the crossroad through the intersection is 3 600 vpd or greater.

e) The lighting of crossroads, without connections to motorways, is warranted if the crossroad approaches are lit, or if there is a possibility of glare or distraction from the motorway lighting.

Diverging traffic streams

Where the motorway has been lit in accordance with a Category V luminance design, a specific luminaire is not required within 5 m of the diverge point provided the illuminance criteria for that lighting Category is met at the diverge point as shown in Figure 7.3.2(a). A luminance design is acceptable between the diverge point and the gore area.

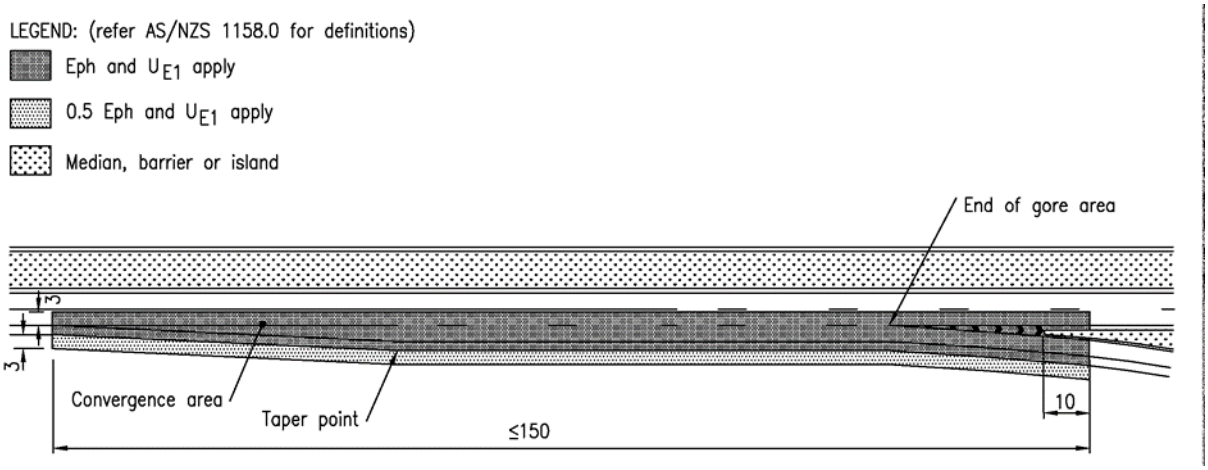
Figure 7.3.2(a) – Extent of lighting on exit ramp of urban motorway



Converging traffic streams

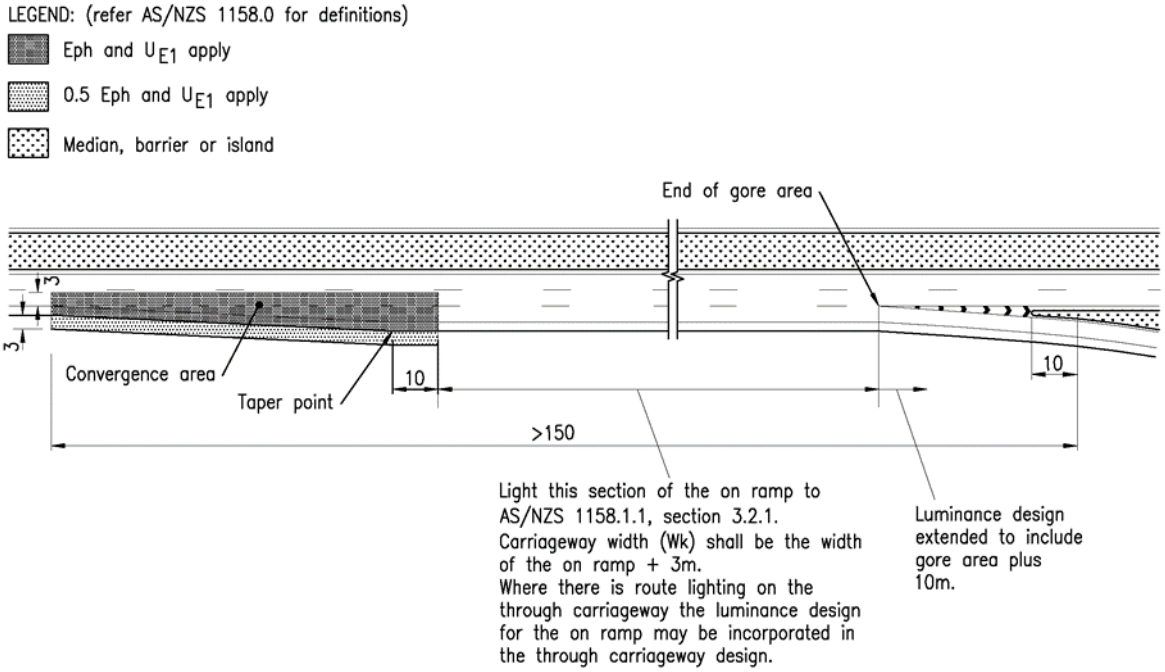
For converging traffic streams less than or equal to 150 m in length, an illuminance-based design must be carried out for the full length of the converge.

Figure 7.3.2(b) – Extent of lighting on short entry ramp of urban motorway



For converging traffic streams greater than 150 m in length, the lighting requirements shall be assessed against the ‘Long Entry Ramp’ requirements in Figure 7.3.2(c).

Figure 7.3.2(c) – Extent of lighting on long entry ramp of urban motorway



7.3.3 Motorways in rural areas

In general, rural motorways need not be provided with route lighting; however, at interchanges, as a minimum, the entry and exit gore areas should be lit with an illuminance design (refer Figures 7.3.3(a) and 7.3.3(b)).

Figure 7.3.3(a) – Extent of lighting for exit ramps for rural motorways

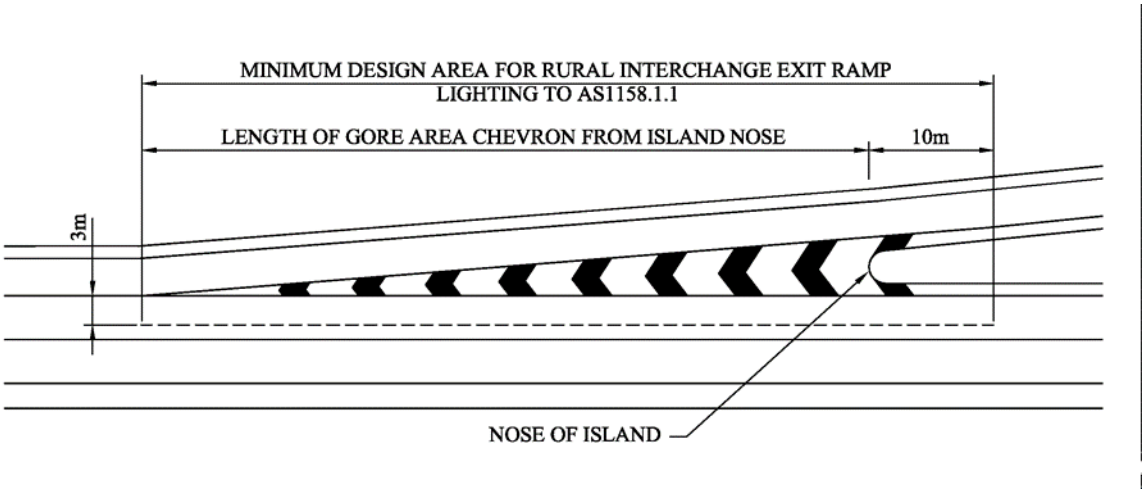
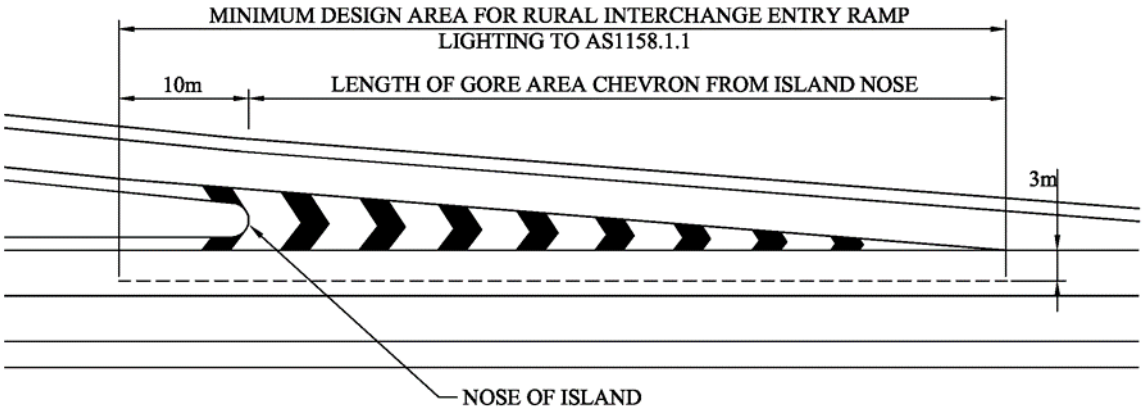


Figure 7.3.3(b) – Extent of lighting for entry ramps for rural motorways



Provision of additional lighting for rural motorways may apply in the following situations:

- where there are unusual conditions such as a location with a high night-time accident rate likely to be corrected by lighting
- a high volume interchange exists with reduced geometric standards, and
- at a location where the background of illumination in the vicinity of the motorway is likely to reduce roadway visibility for motorists if lighting is not provided.

7.4 Route lighting

General provision

Lighting may be provided in areas where:

- the traffic volume (AADT) is approaching or exceeds 10 000 vpd, and/or
- the District Director considers that the road is associated with a special road safety risk that warrants route lighting, and
- the department and local government have indicated their willingness to participate in cost sharing arrangements as detailed in the agreement between the Local Government Association of Queensland and the department's *Cost Sharing Based on Responsibilities within State Controlled Roads*.

7.5 Tunnels and underpasses

Tunnel and underpass lighting shall be designed in accordance with AS/NZS 1158.5 *Lighting for Roads and public spaces – Tunnels and underpasses*. The choice of tunnel or underpass lighting category shall be confirmed with the department at the planning stage of the design.

Where an underpass has been determined as requiring daytime lighting, then a further analysis shall be done for daylight penetration as detailed in AS/NZS 1158.5 Appendix D.2.3, to minimise the amount of artificial lighting required.

Only luminaires producing a symmetrical light output distribution shall be used for tunnels and underpasses.

The control system for the tunnel lighting and daytime underpass lighting shall be confirmed with the department at the planning stage of the project.

For underpasses less than 25 m in length, luminaires will generally not need to be installed within the underpass. The underpass should be considered as a key point in the design and, where practicable, located approximately mid-span between two road lighting luminaire positions. Where the underpass cannot be effectively lit from luminaires located on the outside, supplementary luminaires should be installed within the underpass. These luminaires shall be of the aeroscreen type. Mounting position for the luminaire, outreach and conduiting needs to be confirmed with the bridge designer to ensure minimum clearances and structural integrity is maintained. The lighting design should be illuminance based and satisfy the requirements for intersections and other specified locations in AS/NZS 1158.1.1 *Lighting for roads and public spaces, Part 1.1: Vehicular traffic (Category V) lighting - Performance and design requirements*.

7.6 Supplementary lighting at pedestrian crossings

Lighting may be provided in areas where the traffic volume (AADT) exceeds 1000 vpd. Where lighting is provided, it must be designed in accordance with AS/NZS 1158.4 *Lighting for roads and public spaces – Lighting of pedestrian crossings* with the following amendment.

- appropriate Category V lighting for the road (minimum V5) shall be provided for one span only either side of the crossing.

Pedestrian crossings should not be installed in areas where the posted speed is greater than 60 km / h.

Lighting to AS/NZS 1158.4 is not required at zebra crossings on slip lanes where a full Category V lighting scheme is applied to the intersection and covers the location of the crossing.

7.6.1 Special cases

Provision of lighting under special cases is subject to the approval of the District Director.

For volumes of less than 1 000 vpd, other conditions that may suggest supplementary lighting at pedestrian crossings include the following:

- road location geometry
- background lighting (including offsets of opposing headlights)
- weather conditions (such as fog)
- separate needs of pedestrians indicate the existence of a special risk, and
- accident history.

7.6.2 Signalised mid-block pedestrian crossings

At locations involving the upgrading or installation of signalised mid-block pedestrian crossings, lighting to Category V standard should be provided regardless of the traffic volume of the road. The category of lighting chosen shall be the same lighting subcategory as the through road. The illuminance requirements shall extend 10 m either side of the crossing. No lead-in lighting is required.

7.7 Bikeways

7.7.1 General provision

Where lighting is provided, bikeway lighting must comply with the requirements of AS/NZS 1158.3.1 *Lighting for roads and public spaces – Pedestrian area (Category P)*

lighting – Performance and design requirements. Of particular importance is consideration of how maintenance of the luminaires is to be achieved.

Where suitable access for an elevated working platform vehicle is not available, hinged poles should be used. Refer to the department's Standard Drawing SD1682 *Pathway Lighting – Typical Lighting Requirements for Off-Road Pathways* for typical lighting requirements for off-road bikeways.

7.7.2 New bikeways

Provision of lighting shall only occur after approval by the department. Advice within Appendix A of this Volume may be used to assess the need or otherwise for lighting of new bikeways.

If a new bikeway is part of an arterial bicycle route and is adjacent to a roadway that warrants route lighting, the bikeway shall be lit in accordance with AS/NZS 1158.3.1, Table 2.2, note (e).

Where the arterial bicycle route is remote from the roadway, then it shall be lit to a minimum level of P3 from AS/NZS 1158.3.1.

7.7.3 Existing bikeways

Provision of lighting shall only occur after approval by the department. Existing bikeways (or sections of bikeways) on arterial routes which do not have P3 level lighting will be assessed and prioritised for installation of lighting using the following equally weighted criteria:

- safety
- security
- usage, and
- proximity to existing lighting.

For more information refer to Appendix A in this Volume.

7.7.4 Footbridges

Footbridges shall be lit to a minimum P9 level (AS/NZS 1158.3.1). Careful consideration needs to be given to the choice of luminaire to minimise any adverse effects on road users.

7.7.5 Underpasses / subways

Underpasses shall be lit to a minimum P10 level (AS/NZS 1158.3.1).

7.7.6 Alternatives to mains supply lighting

Solar powered overhead lighting

Solar powered overhead lights are an alternative way of addressing personal safety concerns on bikeways.

These lights may be suitable for areas that require a single or few lights and/or where no existing mains supply point is available.

Solar powered path markers

This lighting treatment delineates pathways and discourages users from straying from the path. These lights allow for extended hours of pathway use, particularly in winter due to the shorter daylight hours. The increased use of paths due to the installation of path markers can increase casual surveillance and improve the general perception of personal security.

Note that installing solar powered path markers on their own will not light a path to P3 level. In some cases, path markers may be used as an interim measure to improve safety and delineation until P3 lighting can be installed. Path markers may also be used to improve safety at particular points if other lighting is switched off late at night.

7.8 Vehicle interception sites

7.8.1 General provision

While an interception site may be located on only one side of the road, the provision of floodlighting from both sides of the inspection bay or road (depending on location) is recommended. This will improve safety for the inspectors and aid in performing the work functions required.

The vehicle inspection area must be floodlit with a white light source for example, metal halide or LED.

Aiming of the floodlights must be directly across the vehicle inspection area with the maximum intensity at 1.5 m above and parallel to the edge of the inspection pad.

Where mains supply is available at the site, it must be metered in accordance with local electricity entity requirements. Alternatively, a portable generator of suitable characteristics that will permit the complete electrical installation to comply with the requirements of AS/NZS 3000 *Wiring Rules* may be provided. Secure switching of the installations must be in accordance with the District Director's operational requirements for the site.

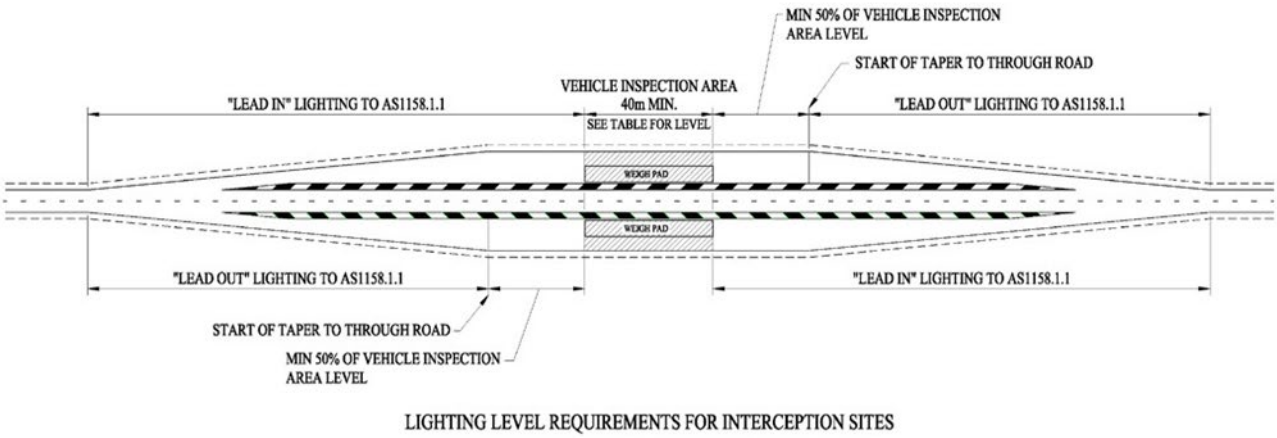
7.8.2 Urban interception sites

The lighting shall use either Metal Halide or LED technology. A 4000 K correlated colour temperature (CCT) is recommended for LEDs. Metal Halide lamps are to have a maximum wattage of 1000 W. LEDs would be expected to use significantly less power to achieve the same lighting performance.

Floodlights must have a maximum mounting height of 15 m.

The 'lead-in' and 'lead-out' lighting, as shown in Figure 7.8.2, to the same lighting subcategory as the through road, must be provided in accordance with AS/NZS 1158.1.1 *Lighting for roads and public spaces – Vehicular traffic (Category V) lighting – Performance and design requirements*.

Figure 7.8.2 – Lighting level requirements for urban interception site



LIGHTING LEVEL REQUIREMENTS FOR INTERCEPTION SITES

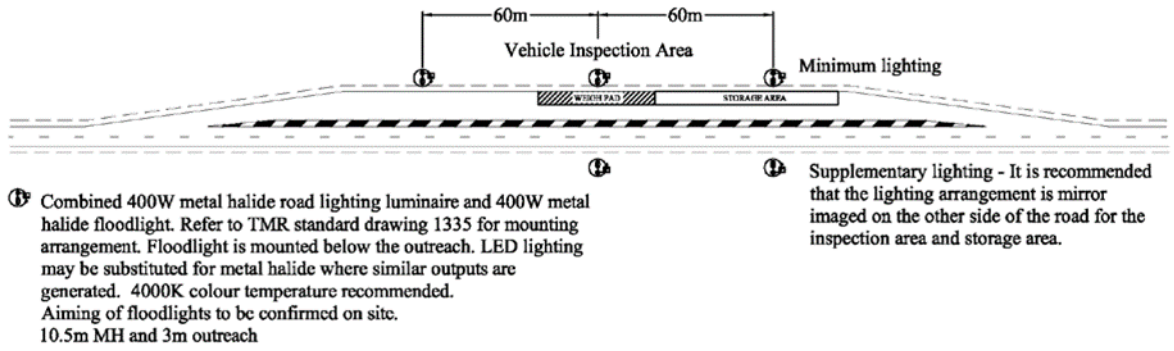
Table 7.8.2 – Urban vehicle inspection area lighting levels

Vehicle inspection area lighting levels			
Through road	**Average horizontal illuminance at ground level (lux)**	**Maximum illuminance (horizontal) uniformity (E_{max}/E_{min})**	**Minimum point vertical illuminance (lux)**
With route lighting	70	8	7
Without route lighting	30	8	7

7.8.3 Rural interception sites

Lighting requirements for rural interception sites are as shown in Figure 7.8.3.

Figure 7.8.3 – Lighting requirements for rural interception site



7.9 Lighting in the vicinity of aerodromes

The Civil Aviation Safety Authority (CASA) *Manual of Standards* Part 139 – *Aerodromes* Section 9.21: *Lighting in the Vicinity of Aerodromes* provides the requirements to minimise the potential hazard to aircraft operations from lighting systems. Lighting designs must comply with these requirements where the installation is located within 6 km of an aerodrome or other areas where aircraft safety may be affected by the lighting.

Aeroscreen luminaires should be used within the 6 km radius and the upcast angle may need to be reduced to 0°.

Height restriction limits may exist where lighting is installed in the vicinity of the runway approaches and there may be a requirement for obstacle lighting.

Where lighting is designed in the vicinity of an aerodrome, the local airport operator and CASA shall be contacted.

7.10 Lighting in the vicinity of ports and railways

Where lighting is to be installed in the vicinity of sea ports, navigation channels, railway lines, railway stations and the like where the type or location of lighting could cause navigation or other hazard, the relevant authority should be contacted. Road lighting must be designed so as not to interfere with the safety systems of other installations.

7.11 Temporary lighting during construction

Where road lighting already exists, the existing lighting levels should be maintained throughout the construction period. If, because of staging or construction issues, this requirement cannot be adhered to, the contractor shall detail what strategies are to be implemented to manage any associated risk due to a reduction in lighting levels.

If mobile lighting towers are proposed for use, then the floodlights shall be aimed such that they do not create a glare issue for the travelling public. Mobile towers using road lighting luminaires, not floodlights, are preferred for on-road applications.

8 Requirements for road lighting

The department is responsible for the provision of road lighting on declared roads in Queensland. Rate 3 public lighting may only be installed on roads or other public thoroughfares with the written approval of the department. Under this rate, the complete public lighting installation is supplied, installed, owned and maintained by the department.

The design of public lighting is divided into three distinct functions:

- lighting design
- civil design integration, and
- electrical design.

Where designs are more than two years old, they must be reviewed for compliance with the current standards and updated as required prior to being issued for construction.

Only equipment complying with current departmental specifications at the design date, where the design date is no more than two years prior to construction, may be used.

For specifications for road lighting equipment refer to the department's Technical Specifications and Standard Drawing SD1699 *Traffic signals / Road lighting / ITS – Parts list.*

8.1 Lighting design

The lighting layout design must comply with AS/NZS 1158 and departmental policies and standards. Careful consideration needs to be given to the appropriate warrants and minimum design parameters to avoid overdesign and to minimise capital and whole-of-life costs. Route lighting must be designed in accordance with luminance requirements, and only modified for illuminance where specific conflicts exist along the route.

As a general rule for route lighting designs, the design spacing should be the maximum allowable minus five metres. This allows for some variation in pole placement due to site conditions when installation occurs.

Light sources shall be of the high efficiency type with the highest practical efficacy for the relevant lighting application. With the introduction of LED road lighting, all major Rate 3 lighting projects should be investigated for AS/NZS 1158 compliance using LED luminaires. As a guide, the use of LED luminaires should either match the High Pressure Sodium (HPS) design or not increase the luminaires needed by more than 5%. An energy audit of the LED luminaire design should show a minimum energy saving of 30% over conventional HPS technology.

8.2 Civil design integration

Pole locations must comply with the requirements of AS/NZS 1158 and departmental Technical Specifications and Standard Drawings. Particular attention must be made to the placement of poles, crash barriers, noise barriers and drains.

Refer to Section 9 of this Volume for guidelines on pole placement.

The designer should be aware of any other possible conflicts between the lighting infrastructure and public utility plant. This would generally be done by assessing against the civil plans but may require investigation through 'Dial before you Dig', if this type of survey information is unavailable.

8.3 Electrical design

Refer to the department's *TRUM Manual Volume 4, Part 3*.

8.4 Aeroscreen luminaires

Aeroscreen luminaires should only be used in a lighting design where:

- an increase in luminaire glare may result in loss of visual performance for motorists or pedestrians, or
- where a reduction in stray light is deemed appropriate.

Typical examples of appropriate use of aeroscreen luminaires are as follows:

a) to satisfy the requirements of the Civil Aviation Safety Authority in areas surrounding airports

b) to reduce spill light onto properties abutting roads that require Category V lighting, for example, residential properties adjacent to motorways, and

c) to reduce glare at locations where the background is intrinsically dark, for example, isolated intersections, small radius crest vertical curves, bridges and overpasses.

8.5 Alterations to existing luminaires

It is generally not the policy of the department to fix internal or external shields to road lighting luminaires (intended to minimise glare or spill light), or to retrofit existing dish prismatic bowl type luminaires with aeroscreen luminaires.

The fitting of shields or aeroscreen luminaires will interfere with the light distribution such that compliance with AS/NZS 1158 may be compromised. Where it is determined that the fitting of a shield is required the department shall be consulted to confirm the required course of action.

8.6 Removal of existing luminaires

Approval is required from the department where the removal of existing luminaires may impact on the traffic operations; for example, where an existing road is being modified and the luminaire is marked for removal but, in its present location, it is providing temporary lighting for traffic movements while construction takes place.

If a luminaire is removed, then a record of the date it is de-energised needs to be detailed in writing and provided to the department and the local electricity entity. This information is important to maintain accurate network data and ensure correct billing takes place. The department's *DDPSM Volume 2, Part 2 – Development Phase Drawings (Preliminary and Detailed Design Phase)*, Chapter 2 – *Urban Road Design Drawings*, Section 2.13.2.5 provides a table, which should be used to detail any removal of road lighting equipment.

8.7 Joint use poles and combination mast arms

Wherever possible, when lighting intersections and junctions at which traffic signals are to be installed, joint use road lighting poles and combination traffic signal mast arms should be used. This reduces the amount of roadside furniture around the intersection or junction.

8.8 Road lighting poles

Only road lighting equipment and approved banners may be installed / attached to Rate 3 poles. Where banners are to be attached to poles, banners and installation must comply with Standard Drawing SD1518 *Banners on light poles – 2 metre banner installation and support details* (2 sheets). Banners may be installed only on base plate mounted poles.

No signs or decorations are permitted to be either temporarily or permanently installed / attached to road lighting poles.

High access hatchways are required in poles installed in concrete median barriers and other locations where access to the lower hatchway is not practical.

8.9 Solar lighting

Where there is no economical access to the local power grid, solar lighting may be an acceptable alternative to traditional lighting. Solar lighting is generally available using two lamp types:

- fluorescent lamps, and
- LED.

Given the right road geometry, it may be possible to achieve Category V5 road lighting levels. Solar lighting may also be used in:

- isolated car parks
- isolated rest areas
- amenities blocks, and
- ‘flag’ lighting.

A minimum four nights’ autonomy is required for all solar lighting sites.

For small installations, for example, flag lighting, pole mounted solar panels should be used. For larger installations, consideration should be given to the use of ground mounted solar arrays where there is an economic benefit and the use of this type of technology is feasible.

8.10 Switchboards

The use of circular pits is preferable than Type 7 pits.

All switchboards must be installed in positions that allow for access by maintenance personnel 24 hours, seven days per week, without the need to implement any form of traffic control or lane closures.

Refer to MRTS201 *General Equipment Requirements* regarding requirements on maintenance area for electrical switchboards.

Provision must be made to park a service vehicle within 30 m of all switchboards and clear of any trafficked roadway.

All circuits must be separately labelled on the design drawings for identification.

Rate 3 lighting and electrical equipment installed must not have any part of its installation (including conduits) in common with Tariff Rate 1 and Tariff Rate 2 systems.

8.11 Pits and conduits

All new electrical conduits shall be 100 mm diameter unless specified otherwise on the applicable departmental Standard Drawings or project specific drawings. Generally, the standard alignment for departmental lighting conduit is from pole to pole.

All new electrical and communication pits shall be circular type unless specified otherwise on the applicable departmental Standard Drawings. Where physical constraints or service conflicts exist, the use of No. 4, No. 7 or No. 8 rectangular pits can be used if approved by the relevant departmental representative.

Other pre-approved exceptions are:

1. No. 3 pits shall be used for termination of the vehicle detector loop feeder cable.
2. An additional No. 4 pit may be used for signal footing which is more than 3 m away from a circular pit, and
3. No. 8 pits may be used for fibre optic joints where a circular pit is too small.

Circular pits shall be manufactured to the dimensions and arrangement shown on Standard Drawing SD1415 *Traffic signals / Road lighting – Circular cable jointing pit types 60 and 100*.

9 Road lighting pole placement guidelines

For guidelines for the use and placement of rigid and frangible road lighting poles refer to AS/NZS 1158.1.2 *Lighting for roads and public spaces – Vehicular traffic (Category V) lighting – Guide to design, installation, operation and maintenance* Appendix B.

9.1 Urban areas

In addition to the guidelines set out in AS/NZS 1158.1.2 for lighting in urban areas, road lighting poles should be located on an alignment with property boundary junctions wherever possible.

9.2 Motorways

The department's preferred location for poles on motorways is in either the centre median or concrete median barrier. Where this location is unavailable, and in addition to the guidelines set out in AS/NZS 1158.1.2, road lighting poles on motorways should be located a minimum of 1500 mm from the edge of shoulder.

9.3 Joint use road lighting poles

Where joint use poles are located in medians, they should be located at least 1000 mm from the median nose and not in medians less than 2000 mm wide.

9.4 Road lighting poles in medians

Road lighting poles should not be located in medians less than 2000 mm wide.

9.5 Road lighting poles on batters

Wherever possible the preferred location for the pole is on the flat surface of the road edge no closer than 600 mm to the batter hinge point. If this is not possible, then poles should not be installed on batters greater than 1:3. Where site conditions do not permit this, then access for maintenance crews shall be taken into account in design of the footing location.

9.6 Semi-rigid and flexible roadside barriers

Poles located behind roadside barriers should be base plate mounted and must be located at the correct offset from the barrier to be clear of the deflection zone. The use of frangible poles is not recommended, as the correct operation of the pole cannot be guaranteed if impacted.

As a general rule, if the centre of pole is required to be closer than 1200 mm to the front of a semi-rigid barrier (for example, W-beam, Thrie-beam) or 2000 mm to a flexible barrier (for example, wire rope), the pole position must be confirmed with the road designer to ensure that the pole is not located in the deflection zone of the barrier. Also, poles are not to be located within the runout length of barriers. The pole position must be confirmed with the road designer.

9.7 Noise barriers and fences

Centre of road lighting poles should be a minimum of 500 mm from the roadside of a noise barrier or fence. Poles and associated pits must both be placed on the road side of the noise barrier or fence. Switchboards and associated pits must both be placed on the road side of the noise barrier or fence. The pole hatchway must be oriented on the departure side of the pole and must be easily accessed.

9.8 Drains and waterways

Road lighting poles, pits and switchboards must not be installed in drains and waterways.

9.9 Lighting on or in the vicinity of bridges

Where a bridge crosses a road to be lit, the bridge should be flagged as a major point for consideration early in the design process. Wherever possible, the luminaires should be located so the bridge position is mid-span between two luminaires. This reduces the amount of shadowing under the bridge and helps reduce glare to over bridge traffic. If a luminaire must be placed close to a bridge, then it is recommended that it be placed a minimum distance of 15 m from the bridge and an aeroscreen luminaire installed.

If poles must be placed on a bridge, due its length, or to maintain a lighting layout, then it is imperative that the bridge designer is made aware of this requirement early in the design process. Only through consultation with the bridge designer can an accurate determination be made on the location of the road lighting poles. Also, at this time of consultation, the requirements for conduits and cable access at the pole must be stipulated. Details of the conduit and cable access junction box must be shown on the bridge drawings.

9.10 Signage gantries

Generally, because of the highly reflective materials used in road signage, there is no requirement to install supplementary lighting on sign gantries. If a luminaire must be placed close to an overhead gantry, then it is recommended that it is placed a minimum distance of 15 m from the gantry.

9.11 Clearances from overhead lines

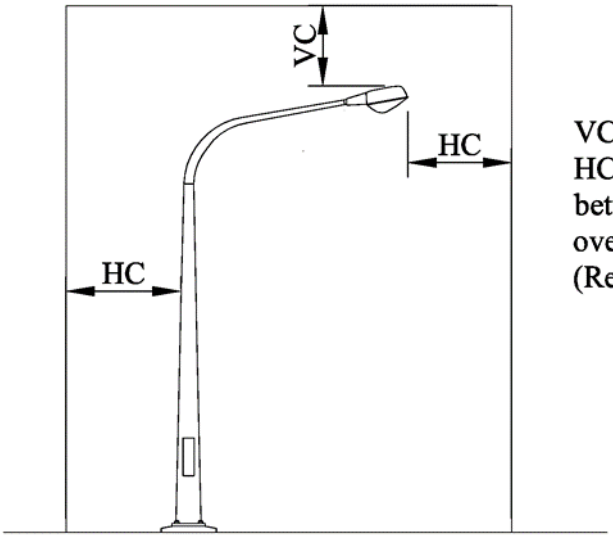
Care should be taken with the placement of poles in the vicinity of overhead lines and stay wires. Allowances should be made for design, constructional, dynamic and maintenance clearances as appropriate. The local electricity entity should be consulted during design with respect to agreed clearances having regard to applicable legislation and practical application.

Design clearances should be calculated taking into account:

- the most adverse position to which a conductor may swing under the influence of wind
- the worst position a conductor may assume by sag under the influence of load current
- the maximum design deflection of the lighting structure under the influence of wind, and
- the movement of impacted frangible poles.

Clearances 'VC and HC' in Figure 9.11 between poles and overhead lines must comply with the department's Standard Drawing SD1333 *Traffic signals / Road lighting / ITS – Minimum clearance of overhead electric lines from ground and structures*. In all cases, clearances apply to both rigid and frangible poles; however, in general, dynamic clearances will be the determining factor for frangible poles. For the purposes of calculating vertical clearances, the distance should be taken as the vertical distance between the conductor and the horizontal projection of the highest point on the lighting structure (refer Figure 9.11).

Figure 9.11 – Static design clearances



VC = Vertical Clearance
HC = Horizontal Clearance
between the lighting structure and the overhead line.
(Refer to TMR Standard Drawing No. 1333)

9.11.1 Constructional clearances

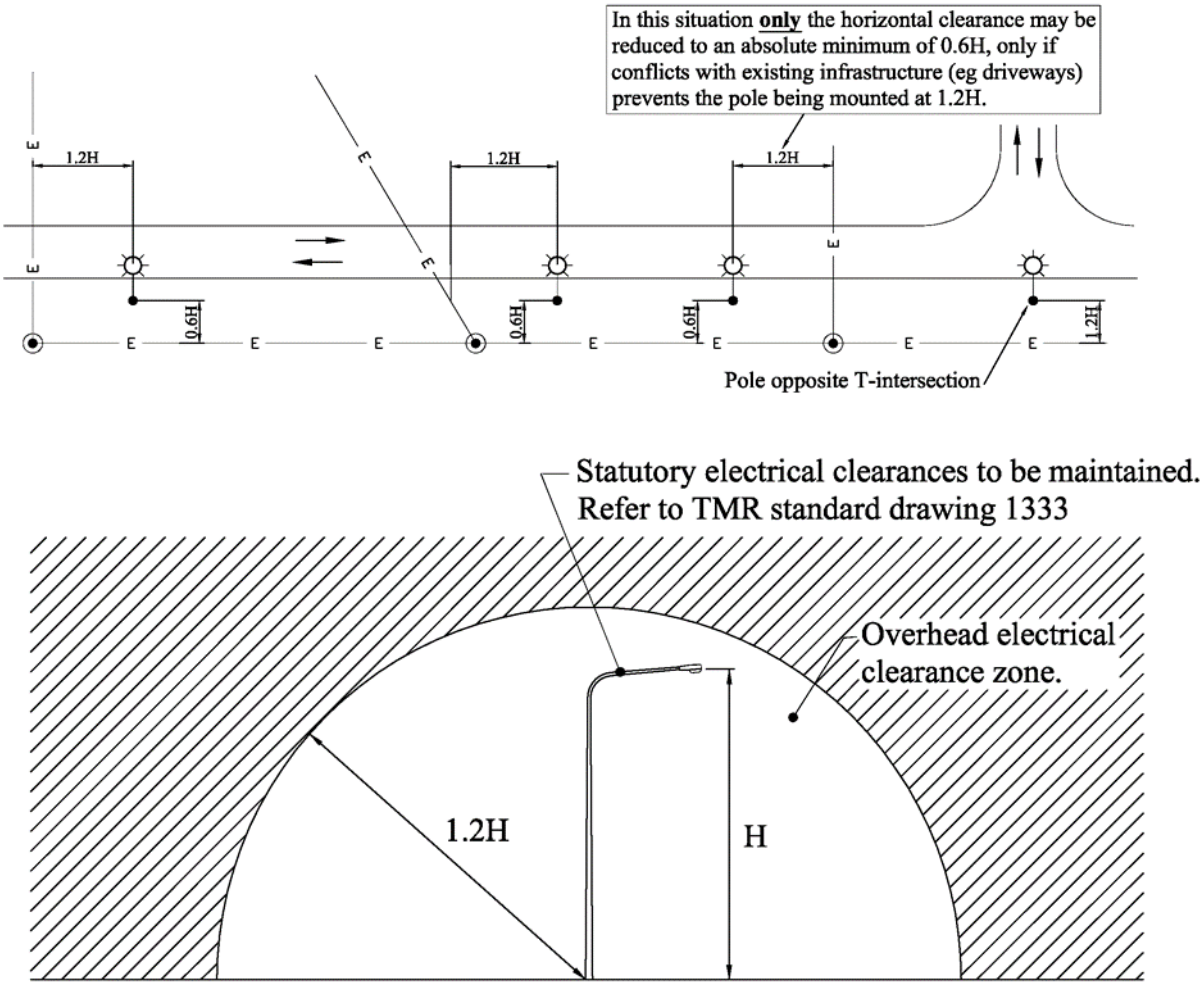
Where it is necessary to install a pole near an overhead line, statutory clearances must be adhered to during the works program; however, statutory constructional clearances may be reduced by prior arrangement with the local electricity entity if the lines can be de-energised or shrouded.

9.11.2 Dynamic clearances

Dynamic clearances should be used for frangible poles (slip base poles currently used by the department) to minimise the likelihood of any gyrating lighting structure (resulting from vehicle impact) striking the conductors of a nearby overhead line.

The recommended clearances are illustrated in Figure 9.11.2. Clearance 1.2H is a hemispherical radius from the base of the pole to the nearest conductor. Clearance 0.6H is a reduced horizontal clearance from any point on the road lighting station to the nearest conductor.

Figure 9.11.2 – Dynamic clearances



The recommended minimum horizontal clearance of a slip base pole from an overhead line is 0.6H, where H is the mounting height of the luminaire; however, if the overhead line traverses the direction of traffic flow, the clearance for slip base poles should be increased to 1.2H. This situation occurs at an intersection or when an overhead line crosses the carriageway (refer Figure 9.11.2).

10 Lighting design presentation

Road lighting drawings must comply with the requirements of the department's *DDPSM Volume 2, Part 2, Chapter 2*, Section 2.13.

11 Lighting design compliance

A Certificate of Compliance for the lighting design must be included on the lighting drawings in accordance with the requirements of the department's *DDPSM Volume 2, Part 2, Chapter 2,* Section 2.13.

A Registered Professional Engineer of Queensland (RPEQ) with the appropriate qualifications must certify compliance of the lighting design.

The RPEQ registered in the electrical college must certify compliance of the electrical design.

12 Landscaping

Where landscaping is to be installed in the vicinity of a road lighting installation, adequate clearance must be maintained around the poles, pits, and switchboards to allow free maintenance access.

The location and height of plants must not interfere with the overhead lighting or wires, cast undesirable shadows on the road formation or cause non-uniform illumination of the roadway.

13 Documentation for submission

Documentation for road lighting must include the following:

- one A3 set of drawings in accordance with the department's *DDPSM Volume 2*
- completed lighting Certificate of Compliance with AS/NZS 1158 stating category of lighting completed and certified by an RPEQ (included on drawings)
- one A3 set of isoplot sketch drawings (not for construction) of illuminance calculations showing Category V or P isoplot lines; luminance based route lighting designs do not require isoplot overlays unless specifically requested by Transport and Main Roads
- SAA STAN printouts for route lighting luminance calculations clearly detailing where the calculations were carried out
- AS/NZS 1158.1.1 derating table used for luminance calculations for curves (if used)
- one soft copy of drawings in AutoCAD 2013 or later on DVD or USB, and
- a copy of the electrical design calculations and electrical design certification as detailed in TRUM Volume 4, Part 3.

14 Installation

14.1 General

Road lighting installation must be carried out in accordance with the relevant departmental Technical Specifications.

The public lighting installation may be carried out by the department or an Approved Contractor.

The electricity entity provides only electrical power to the installation. Rate 3 luminaires or luminaire equipment will not normally be permitted on electricity entity poles.

The electricity entity will not commission the public lighting installation until all requirements comply with the Electrical Safety Regulation 2013.

Under no circumstances may the electrical contractor connect the new public lighting installation to the electricity entity point of supply. The connection will be carried out by the electricity entity personnel or authorised contractor after inspection at the time of commissioning.

Once commissioned, no electrical alterations can be made to a Rate 3 public lighting installation without the written approval of the electricity entity.

14.2 Pole identification

All departmental Rate 3 public lighting installations must be marked with the label MR3 attached to the roadside of the pole or structure. The department is responsible for ensuring that the label is always clearly visible. Where individual pole numbers are required, they are to be located below the MR3 label. Refer to the department's Standard Drawings SD1671 *Traffic signals / Road lighting – Road lighting labels installation* and SD1673 *Traffic signals / Road lighting – Labels* for installation and specific label requirements.

15 Maintenance

As the road lighting installation is a traffic safety system, it must be designed so that it can be readily maintainable. Other roadside installations, such as landscaping and noise barriers, must in no way affect the integrity, safety or maintainability of the road lighting installation.

Maintenance of road lighting must be carried out in accordance with TRUM Volume 4, Part 2 – *Road Lighting Maintenance* to maintain serviceability of 95% in accordance with AS/NZS 1158.1.2.

16 References

AS/NZS 1158 *Lighting for roads and public spaces* Set

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

Civil Aviation Safety Authority *Manual of Standards Part 139 – Aerodromes* Section 9.21: *Lighting in the Vicinity of Aerodromes*

Electrical Codes of Practice

Electrical Safety Act 2002

Electrical Safety Regulation 2013

Energex – Public Lighting Design Manual – Standard Conditions for Public Lighting Services

Ergon – Specification for Underground Distribution Construction (UDC) Design – QTSC Group Standard Conditions for the Provision of Public Lighting Services

Professional Engineers Act 2002

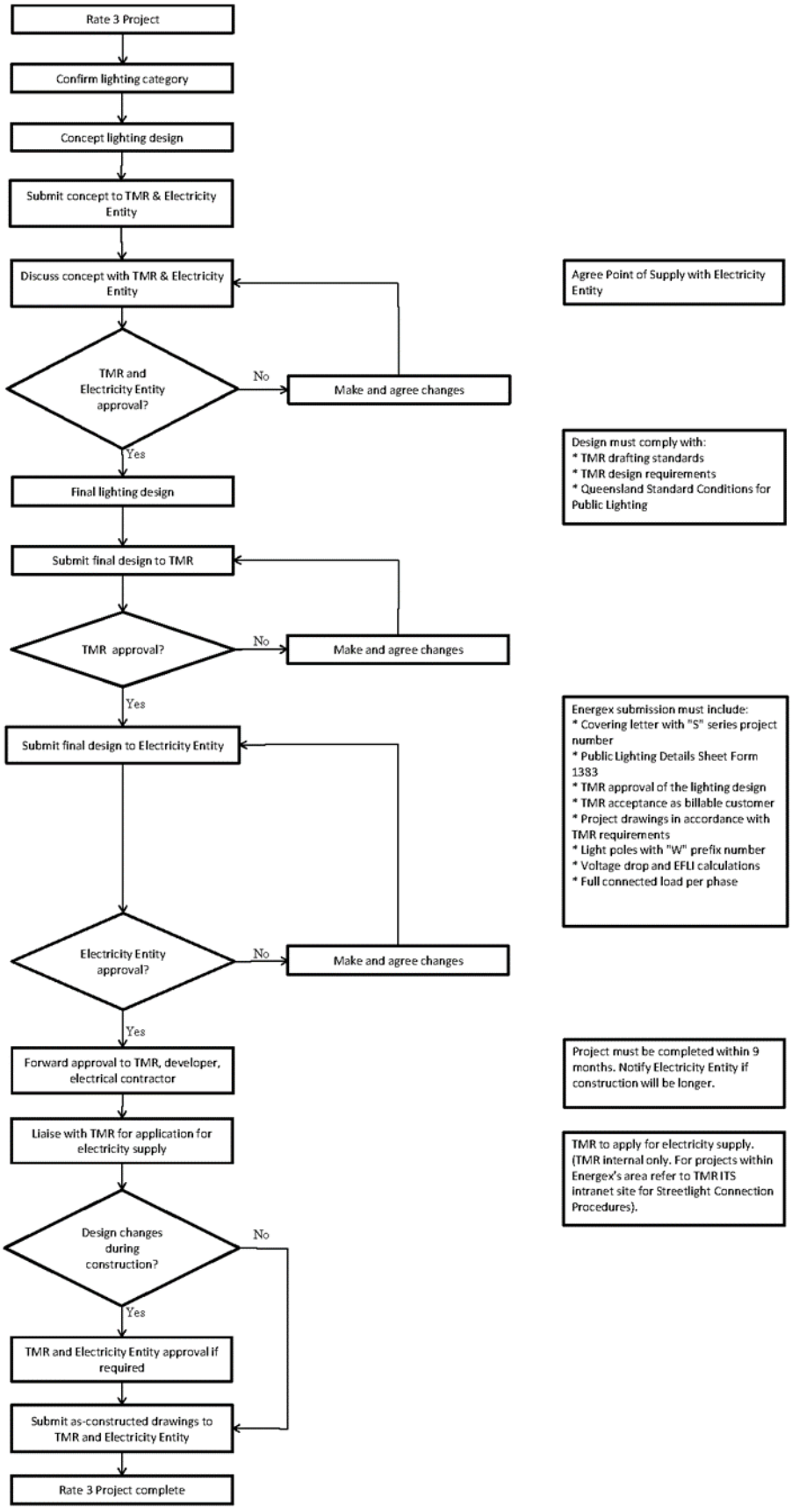
Transport and Main Roads *Drafting and Design Presentation Standards Manual (DDPSM)* Volume 2 – *Road Design Development Presentation*

Transport and Main Roads Standard Drawings

Transport and Main Roads Technical Specifications

Transport and Main Roads *Traffic and Road Use Management Manual (TRUM)*.

17 Process for Rate 3 Public lighting



Appendix A: Criteria for prioritisation of bikeway lighting projects

Four key assessment criteria shall be used to help prioritise the sites for future bikeway lighting projects:

1. safety
2. security
3. usage, and
4. proximity to existing lighting facilities.

Each potential lighting project will be scored according to how well the four criteria are met. Scores range between 1 and 5, with 5 being the highest priority.

The overall score and individual breakup must be submitted to the department for further assessment on the appropriateness or otherwise of lighting.

Safety

Safety is assessed in terms of 'Personal safety' to the user of the shared pathway. Consider:

- does the shared pathway contain safety hazards such as obstacles, no hand railings, uneven surfaces, steep drop offs, enclosing vegetation, blind corners, pot holes and so on?
- relevant Australian Standards and the Queensland MUTCD
- *Austroads Guide to Road Design,* and
- any incidents compromising user safety along the pathway reported by members of the community, cycling groups or local representatives.

A bikeway that has numerous safety hazards, several reported safety incidents (as documented in WebCrash or reported through correspondence to Transport and Main Roads or local governments) and does not comply with current Australian Standards and guidelines would be given a high score. A shared pathway that complies with current Australian Standards and guidelines and has had no reported safety incidents or safety hazards and would be given a lower score.

Score	Description
1	No reported safety (crash) incidents in the last five years; complies with current Australian Standards; contains no safety hazards
2	One reported safety (crash) incident in the last five years; contains some safety hazards
3	Two to three reported safety (crash) incidents in the last five years; contains a few safety hazards
4	Three to five reported safety (crash) incidents in the last five years; contains several safety hazards
5	Five or more reported safety (crash) incidents in the last five years; does not comply with current Australian Standards and contains numerous safety hazards

Security

Security is assessed in terms of 'Personal Security' to the user of the bikeway. Consider:

- does the bikeway have recorded incidents such as assault, robbery, graffiti, theft, and so on? Contact the relevant police stations to gain these records and check correspondence received by Transport and Main Roads or local governments. If there is a high incidence of graffiti or vandalism evident, but no reported incidents, a higher score may be warranted.
- compliance with Crime Prevention Through Environmental Design (CPTED) principles (for further information, go to the Queensland Police Service website at www.police.qld.gov.au and search for 'CPTED'), such as frequent opportunities for contact with other users
- the level of casual surveillance of the site – is it visible and exposed to general passers-by? is the site isolated?
- are bikeway users likely to encounter other bikeway users or people from neighbouring land uses along the route?

An isolated site, with little casual surveillance or visibility, and reported incidents of personal attack, would score highly. An open site with no records of personal attack would score lower.

Entrapment locations and vegetation obstructions should be treated irrespective of lighting warrants.

Score	Description
1	Best practice design and meets CPTED principles (the whole bikeway can be seen from nearby land uses or roads); frequent contact opportunities with other users; no reported security incidents over the last five years
2	Good casual surveillance (about 70% of the bikeway can be seen from nearby land uses or roads); regular contact opportunities with other users; one reported security incident over the last five years
3	Moderate casual surveillance (about 50% of the bikeway can be seen from nearby land uses or roads); some contact opportunities with other users; two reported security incidents over the last five years
4	Some casual surveillance (about 30% of the bikeway can be seen from nearby land uses or roads); limited contact opportunities with other users; three reported security incidents over the last five years
5	Isolated, poor casual surveillance (none of the bikeway can be seen from nearby land uses or roads); very limited contact opportunities with other users; four reported security incidents over the last five years

Usage

Undertake a minimum two-week automated 24 hour count of bicycle usage (preferably outside school or major holidays and not during extended rain periods). Use the average daily count for the assessment following.

Also consider whether pedestrians use the bikeway. One period of observation between 6 am and 9 am on a weekday should reveal whether there is pedestrian usage.

Consider whether there is latent demand which may be brought out by bikeway lighting. Count the number of major attractors and generators within 5 km of the bikeway (including regional shopping areas, CBDs, high schools, universities or TAFE colleges, large areas of medium to high density

housing, significant recreational facilities, hospitals, significant industrial areas) and use in the assessment following.

A busy bikeway close to major cycling generators and which also carries pedestrian traffic will score well in this criterion.

A score of three or greater on this criterion is desirable before proceeding with lighting projects.

24 hour bicycle counts are used rather than dusk / dark counts. This is because the lack of lighting can be a deterrent to riding after dark. The 24-hour counts are a more reliable indicator of the level of demand on the route.

Score	Description
1	Very low average daily usage (<60 per day) and little latent demand (more than 5 km from a major attractor or generator of cycling); no obvious pedestrian use
2	Low average daily usage (60–100 / day), minor latent demand (more than 4 km from a major attractor or generator of cycling); no obvious pedestrian use
3	Medium daily cycling demand (100–150 / day), some latent demand (within 4 km of a major attractor or generator of cycling); some obvious pedestrian use
4	High daily cycling demand (150–200 / day), reasonable latent demand (within 3 km of at least two major attractors or generators of cycling); regular use by pedestrians
5	Very high daily cycling demand (>200 / day), high latent demand (within 2 km of at least four major attractors or generators of cycling); regular use by pedestrians.

Proximity to existing lighting facilities

The proximity of existing lighting to the bikeway should be considered when prioritising potential lighting projects.

Sections of the bikeway which are already lit to P3 level from surround illumination lighting do not need separate lighting and should not be assessed here. Sections which receive surround illumination lighting but not to the full P3 level may not be as high a priority for lighting as other sites.

Consider:

- is there any existing road or park lighting that provides light spill over onto the pathway?
- are there any plans for the future lighting that may provide light surround illumination?
- is there any existing lighting not working near the pathway that could be fixed to provide light spill over?
- is there any existing lighting fixed to surrounding facilities such as shops, buildings, schools, sporting fields, and so on?

A pathway that is in close proximity to any existing lighting would score lower as it is already partially lit from surround illumination. A pathway that is not located near any existing lighting would score higher as none of the pathway is lit.

Score	Description
1	>80% of the pathway is already lit (but less than P3 level) from existing lighting around the pathway
2	60–80% of the pathway is already lit (but less than P3 level) from existing lighting around the pathway
3	40–60% of the pathway is already lit (but less than P3 level) from existing lighting around the pathway
4	20–40% of the pathway is already lit (but less than P3 level) from existing lighting around the pathway
5	<20% of the pathway is lit as there is no existing lighting around the pathway

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