



NORTHERN
ALLIANCE FOR
GREENHOUSE
ACTION

Sustainable Public Lighting Action Program



Sustainable Design and Maintenance Notes

**Recommendations for new public lighting installations –
Category P1- 4 (& for P5 for luminaire selection)**

Version 1.0 ~ June 2008

Introduction

About NAGA and Public Lighting

The Northern Alliance for Greenhouse Action (NAGA) has been operating since 2002 as an informal network that shares information, coordinates Councils' community based emission reduction activities and cooperates on the research and development of innovative corporate emissions projects.

NAGA's founding members are the Cities of Banyule, Darebin, Hume, Moreland, Whittlesea, Nillumbik Shire Council and the Moreland Energy Foundation Limited (MEFL); in early 2006, the Cities of Manningham, Melbourne and Yarra joined NAGA.

Over the period 2006-9, NAGA, with funding from the Department of Sustainability and Environment through the Sustainability Accord, will be delivering the NAGA Public Lighting Action Program. The program, facilitated by Ironbark Sustainability, aims to ensure its members are ready to take advantage of the opportunity to install more sustainable public lighting when it is possible to do so. Specifically the program will:

- Provide workshop opportunities to brief council staff on the latest trends in sustainable public lighting in Victoria.
- Assist environmental, planning, engineering and finance staff to prepare detailed responses to the challenge of ensuring sustainable public lighting.
- Support the work of wider bodies to deliver outcomes through regional and state-wide action groups such as the Victorian Sustainable Public Lighting Action Group and the network of Regional Greenhouse Alliances.

About the design and maintenance notes

These Sustainable Design and Maintenance Notes have been funded by this program and draw upon the work previously completed as part of the NAGA Sustainable Public Lighting Initiative in 2004-6, where design notes for new developments were developed.

There was a need to simplify the design notes into one or two key points to allow easy integration into existing policies and plans.

The design notes that begin on page 2 are for use by Engineers, lighting designers and developers who are installing lighting in new residential developments, parks and car parks. The information is relevant for all installations categorised under P1-4 of the Australian Standards (AS 1158.3.1:2005) and for P5 when selecting luminaire types.

These notes were developed by Paul Brown and Ray Simms (Ironbark Sustainability), in consultation, Darren Williames (Saferoads), Lev Shinkarsky (Yarra City Council), Kim Wright (Nillumbik Shire Council), Brent Tyrer (Vicpole), Clayton Simpson and Bec Olsen (Banyule City Council), Stuart Nesbitt (Darebin City Council) and Martin Butcher (Martin Butcher Lighting Design).

It is recommended that these design notes be updated annually to include recent case studies and relevant changes to sustainable lighting in Australia and New Zealand.

The Notes that follow this introductory section comprise of three components:

1. Best Practice Maintenance requirements
2. Best Practice Design Recommendations
3. Case Study 1 – Banyule City Council – Haward Walkway

1. Best practice sustainable maintenance notes

Pole requirements

The following pole requirements are for new public lighting installations categorised under P1-4 of Australian /New Zealand Standard (AS/NZS) 1158.3.1:2005 and AS 3000:2007.

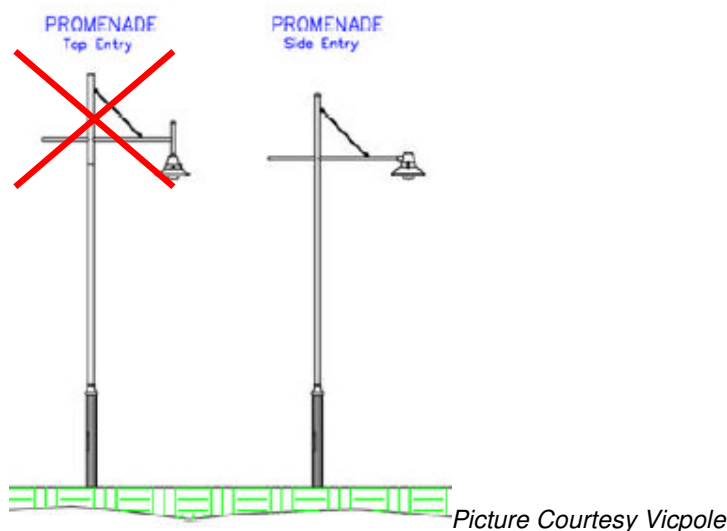
- ➡ For standard URD poles the height of the pole spigot mounting height for bracket installation shall be no less than 6.5m above ground level.

Increasing the pole heights reduces vandalism, increases pole spacing (particularly when road reserve widths are over 18m. This results in reduced light numbers, ongoing maintenance and energy costs and greenhouse emissions. This is not relevant for parks or decorative fittings where increase of heights has a minimal impact on spacing of decorative lighting and the light quality can be detrimentally affected by trees. Also note that light spill into areas outside road reserves is undesirable. This aspect needs to be evaluated in areas that are sensitive to this, including narrow road reserves or laneways and areas of ecological significance

- ➡ The pole shall allow compatibility for a side entry installation for the light fitting.

Side entry poles allow a wider range of light fittings (luminaires) to be refitted on the pole at a later date. Top entry poles do not allow some technologies including energy efficient lineal fluorescent luminaires to be fitted. Also note that modular poles with removable outreach arms can allow refitting of a top entry arm to allow side entry lights.

Note that this recommendation recognises that lower wattage lineal fluorescent lights (for minor roads, parks, car parks etc.) need the option of side entry installations. For major lighting, where typically higher wattage lighting (e.g. 150W MH/HPS etc.) is used, this recommendation is not relevant because lineal fluorescents do not perform as well at these lighting levels and other lighting types do not require side entry designs.



- ➡ The recommended coating system consists of a heavy duty zinc protective coating or 2 pack adhesion promoting primer over a sand blasted, galvanised steel pole to prevent corrosion, followed by 2 coats of 2 pack aliphatic polyurethane¹. *Ensuring a long service life and reduced maintenance. This is the Premium paint coating system for main Victorian pole manufacturers.*

¹ Examples of products recommended include (Wattyl) Sigma EP universal primer/Epinamel primer 250 and Sigadur400/Poly U400 or Dulux 2 Pak Acrathane IF paint for the finishing coats.

- ➔ Surface scratches can be repainted with the recommended finishing coat. If rust is present, it must be removed and the affected area repainted in accordance with the recommended method for new poles.
- ➔ Uncoated galvanised steel poles aren't recommended for use in marine environments. Exposure forms zinc salts/oxides which lead to early signs of corrosion.
- ➔ When the poles are located in parks, gardens and shopping centres and where there is high vandalism the base shall be on a rag bolt assembly secured into a reinforced concreted base into the ground (This shall be done in accordance with manufacturers specifications and local site conditions). In all other situations the base of the pole shall be mounted onto a base plate mounted to the pole. Note that in some decorative situations a cover may be used to hide the bolts. *To ensure base strength and longevity.*
- ➔ Where the pole is decorative it shall be modular in construction with at least three main components – the base, straight pole and bracket arm. *The intention is that the base & straight pole can be the same across Councils asset base and the bracket can be used to differentiate different design sectors. If a section of the pole is damaged, it can easily be replaced, thereby reducing future maintenance costs & material wastage. Should a top entry light require replacement with a side entry light, the bracket can be replaced instead of the entire pole.*

Luminaire requirements

The following luminaire requirements and comments are for new public lighting installations categorised under P1-5 of Australian /New Zealand Standard (AS/NZS) 1158.3.1:2005 and AS 3000:2007.

- ➔ Only luminaires that have been approved by the local distributor can be currently used in unmetered power schemes². *Proof can include a copy of the approval letter for luminaire.*
- ➔ Luminaires used in metered power schemes (including Council parks and gardens) can be approved by the council for use. Approvals should include assessment of spacing, maintenance and luminaire robustness. We recommend minimum approvals to include conforming to AS/NZS 1158.6:2004 (Lighting for roads and public spaces: Luminaires) and AS/NZS 1158.3.1:2005 (Lighting for roads and public spaces: Pedestrian area (Category P) lighting – performance and design requirements). Proof of conformity to these standards to be supplied by a NATA registered laboratory before approval for use³.
- ➔ The lamp shall have an efficacy of no less than 60 lumens per watt after 4 yrs of lamp life. See **Appendix 1** for more details on the main lighting types and efficacy. *This eliminates energy inefficient light types such as the 80W Mercury Vapour (MV). Note for Category V lighting HPS lights are recommended as the most cost and energy effective⁴.*
- ➔ The lamp shall provide a spectral component that includes blue end light. *Yellow light sources that exclude blue light (such as most low & high pressure sodium lamps) can lead to poorer recognition of facial features and colours. Thus for best seeing conditions in low light situations (such as parks and residential streets) we recommend excluding light sources that do not provide blue end light. Note that this recommendation is not relevant for feature lighting.*
- ➔ PE cells supplied shall be electronic. *Recent testing shows that electronic PE cells are more accurate, last longer and use less energy than basic thermal D2 cells. For further details of PE cell analysis contact Ironbark Sustainability.*

² For Council owned assets we strongly recommend Councils require any light fittings to be assessed for adherence to the applicable Australian Standards and maintenance implications prior to use in external applications. This process needs to be independent of major manufacturers and suppliers of lighting technologies.

³ Additionally manufacturers will need to provide I tables in CIE format to enable optimum pole spacing to be calculated

⁴ 'Roadway lighting guide to traffic engineering practice part 12', AUSTRROADS.

Best practice sustainable design considerations⁵

The following considerations are for new public lighting installations categorised under P1-4 of AS 1158.3.1:2005 or for metered supply under AS 3000:2007. In addition to the requirements specified above consideration in the design phase of the installation is recommended in the following areas:

Criteria	Example of relevance	Confirmed features	Features to investigate	Comments
1. Need for installation. Is it required at all? Council to answer prior to designer engaged.	My Local Shire Council was planning to illuminate a local park. They surveyed local residents and realised that the park was only used during the day. So decided lighting was unnecessary.			
2. Does the light need to be on all night? Consideration of efficient PE cells, time based dimming or switching.	Banyule City Council installed a new lighting scheme in a park (See Case Study 1) Community consultation discovered that the residents were very keen to have the lights go off at 11pm so they could get a good night's sleep!			
3. Efficiency of Lighting Design. Rationalisation and avoidance of duplication	Hume City Council was designing a cycle path. They reviewed the lighting design and found to meet the required standard light numbers could be reduced from 25 to 17. Thus savings energy & money.			
4. Fitting design. Minimising light pollution and spill	My Local Council were replacing Sphere & Flinders Encounter lights that spread the lighting up, down and all around. They were replaced with half the number of new lights that focussed the lighting where it was required (on the ground).			
5. Fit for purpose Using appropriate Australian Standard.	My Local Council were completing a review of lighting in a mall. Council considered carefully the lighting classification before designing. Council was able to reduce the classification by one level. The required lighting level that resulted was halved. Resulting in significant energy savings from the area not being overlit.			
6. Life cycle considerations. Disposal at end of life. Number of light fittings and poles.	My Local Council wanted to install low mercury lights. They found that by avoiding Mercury Vapour lamps they were able to avoid almost all of the Mercury from the fitting.			

⁵ This table was adapted with permission from an original table developed by Martin Butcher Lighting Design.



Case Study 1:

Banyule City Council – Haward Walkway

About the site and the installation

Haward Walkway is a newly named park in Rosanna a middle suburb of Melbourne. The park is small and a new installation of playground equipment, walking path, seats and lighting was proposed in 2006.

Banyule City Council had been involved in a 4 year trial of new lighting technologies with several other local Councils and were keen to ensure the lighting was as efficient as possible whilst meeting the lighting requirements of the site.

The community was consulted about the design of these components and the question asked whether the local residents wanted lighting in the park.

The answer to this question saved the majority of the greenhouse emissions from the lighting design.

The residents responded by indicating they wanted the lights to go off at night after 4 hours. By controlling the lights in this way it would both reduce the light pollution into residents' houses after dark and also reduce the propensity of people to use the park late at night.

Design Solution

The Council instructed the designers to consider the following to ensure the installation was as efficient as possible and met the needs of the residents:

- Use of a timer that turned the lights off at night;
- Installation of twin 14W T5 light fittings

The final design included a timer to turn the lights off four hours after the lights turned on (by the use of a photo-electric cell) and the installation of 5 poles with twin 14W T5 light fittings.

Benefits (Table)

Annual project savings relevant to an equivalent project using the standard 80W MV.

Energy Savings	1,880 kWh
Greenhouse Savings	2.5 Tonnes of CO2-e
Energy Cost Savings	\$ 187.98
Maintenance Cost Savings	-\$ 16.65
Total cost savings over 20 years	\$ 3,426.50

Things to alter in future installations

This project is an excellent example of what can be achieved with a little foresight. However, as with all projects hindsight is a wonderful thing. Some things that can be improved in future include:

- The timer installed turned the lights off after 4 hours. Feedback from residents supported the timer turning off but wanted to see the lights go back on early in the morning so that they could walk their dogs. One option is to install a 24 hour timer that is used only to override the four hour timer at around 5am to turn the lights back on. If installing in a new installation we recommend installing a PE cell to turn the lights on and off and then a 24 hour timer with battery back up that controls the lights at night (e.g. turns the lights off at 11pm and back on at 5am – or not at all)
- Spacing of lights. Remove up to two (of five) poles at the entrances to park as the light from the streetlights are adequate to light the park for the first 20 metres or so. See adjacent picture. This action would save around \$7,000 during the installation.
- Height of poles. As these poles are standard URD poles they could be higher, but only if design requires it to gain the best spacing of the lights or vandalism is an issue (which it isn't in this location). Also designers would need to consider the impact of light spill into neighbouring properties.



This pole next to the street duplicates lighting from the road

Contact

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Appendix 1

Lamp Efficacy

The tables below provide information on the efficacy and colour rendering of different technologies. The higher the efficacy the better the lamp is in terms of turning energy into light output. By dividing the lumen output by the wattage of any given light you can determine the efficacy. The specific examples below are listed after 4 years of use and includes depreciation of the lumen output (10% depreciation from the T5, 20% from the 42W CFL and 34% from the 80W MV)

For example the 14W T5 lamp at 25°C generates 1080 lumens after 4 years (1200*90%) and uses 14W of electricity. The lumens per Watt is thus 1200/14 or 86. Note we have not included other loads such as control gear and PE cells for simplicity.

Specific Lamp Examples	Efficacy (lumens/Watt)
14W T5	77
42W CFL	61
80W MV	31

Generic Lamp type	Efficacy (lumens/Watt)
Incandescent	6-22
Halogen	18-24
Fluorescent	50-110
Compact Fluorescent Lamp (CFL)	50-80
Mercury Vapour (MV)	25-50
Metal Halide (MH)	40-105
Low Pressure Sodium (LPS)	140-180
High Pressure Sodium (HPS)	40-140