Good Lighting and Dark Skies

A Pathway for Progress

A Joint Position Statement from:
Lighting Council New Zealand
Illuminating Engineering Society of ANZ – New Zealand Chapter

This Position Statement on astronomical and ecological aspects of light at night is provided as a joint lighting organisation statement from lighting industry and lighting engineers to provide information about the characteristics of LED outdoor lighting and ways of assisting with appropriate application in New Zealand.

Executive Summary

Appropriate application and use of light at night is important for enhancing safety and/or the perception of safety, and providing ambience in urban environments that people frequent. Equally important is controlling any unwanted effects of lighting, such as spill light, glare, and skyglow. Only applying light at night where and when it is actually needed reduces these effects, to people and to the environment, and has the added benefit of reducing the power use, and thereby carbon emissions.

The use of competent, professional lighting designers, selection and specification of good quality luminaires, lighting control systems, and careful installation and monitoring of the lighting scheme is recommended.

For those wanting to make a tangible contribution to improving outcomes, please contact IESANZ and LCNZ, who contribute along with other interested parties to the development of AS/NZS technical standards publications for both New Zealand and Australia.

Outdoor Lighting Commentary

In recent years there has been much general media and internet commentary about the characteristics of LED outdoor lighting, much of it focusing on the perceived shortcomings of the technology from an astronomical and ecological perspective. Most of this comment does not include professional lighting input and only considers a limited range of light spectral and application issues. When assessing the suitability of outdoor lighting the task is not only about light physics, it is essential to also recognise the overarching issues of public safety, the New Zealand design and application context, the role of technical standards, local government regulation, and practical budget considerations.

International case studies and reports are often cited as relevant to New Zealand, but without expert lighting technical advice to meaningfully translate for differences in local design standards and application regulation, there is much scope for misinterpretation. There is undoubtedly a need for lighting scheme owners and managers, lighting designers, and lighting equipment suppliers to consider and act on astronomical and ecological issues but there are many other considerations to balance.

Over the last decade the driving force in the New Zealand outdoor lighting market has been an understandable desire to capture the 50-80% energy reductions possible with LED lighting, and around 50% maintenance cost savings for local government and private sector lighting scheme owners. Technology is rapidly advancing with the recent availability of affordable digital lighting controls, and this second wave of step-change innovation opens up more avenues for energy savings, as well as meeting growing market demands for low-carbon infrastructure and more environmentally astute solutions.

Benefits of Light at Night

Good lighting at night is important for the safety and comfort of pedestrians outdoors in places such as streets, parking lots, parks, and precincts. An overview of the outdoor surroundings and the ability to detect other people at sufficient distance is essential to feel safe at night. Good urban lighting can contribute greatly to the feel and character of a retail or hospitality zone, influencing mood and behaviour and facilitating economic growth. Main road lighting contributes significantly to transport safety, enabling road users to detect obstacles, moving vehicles and potentially dangerous situations.

Importance of Night Protection

The introduction of electric light into the built environment can cause skyglow effects which limit the opportunity for astronomical study, and the enjoyment of the vista of the stars in a dark night sky. It can also disorient and detrimentally affect the well-being and breeding habits of endangered nocturnal wildlife. It is very important that the decision to install outdoor lighting is a considered decision, and if deemed necessary, the lighting scheme is competently designed and installed, and is operated in a manner that is environmentally respectful and preserves the night sky experience.

Low specification luminaires, ineptly designed or improperly installed lighting, can detract from night sky protection, create neighbourhood nuisance, and waste energy and money. If residential bedroom windows are in a spill light zone, obtrusive light can disrupt occupant sleep patterns. It is well-known that inadequate sleep can lead to a range of serious short and long term human ailments. Any urban light that is spilled appreciably beyond the designed and targeted application area should be avoided, and any such unwanted light should be seen as a design or installation error.

Importance of Lighting Design

Successful outdoor lighting application requires a professional understanding of lighting science and technology as well as AS/NZS standards and local council regulation. There are no ‘one-size-fits-all’ lighting solutions. In all instances it is important to engage the services of a lighting designer experienced in outdoor lighting and a member of the Illuminating Engineering Society of ANZ (MIESANZ). The designer should be provided with a detailed client brief that clearly sets out the goals and priorities. The design brief should also have realistic consultancy budgets that include any special design requirements, developing adaptive light schedules, and verification of control system commissioning. Additional advisory services could include compilation of luminaire and controls tender specifications, and participation as a technical expert in the tender assessment panel.

The AS/NZS 1158 series and AS/NZS 4282 lighting application standards play an important role in defining New Zealand fit-for-purpose lighting requirements and procurement

specifications. AS/NZS standards committees are a critical local forum for stakeholder debate and consensus about appropriately balancing the needs of safety, procurement budgets and environmental protection. Both committees for these standards include expert representatives from dark skies NGOs. It is noteworthy that the AS/NZS standardised minimum light levels for New Zealand residential roads are much lower than those specified in most other developed countries.

Outdoor Lighting in General Areas

A distinct benefit of the use of LED luminaires is that precise optical control is facilitated by multiple light distribution options, a substantial improvement over legacy technologies. This allows lighting designers greater flexibility for minimisation of spill light and obtrusive light effects. Growing user preferences for warmer light is leading to NZ councils more frequently specifying lower correlated colour temperatures (CCT) for public lighting. There is an extensive range of LED product options available locally, including luminaires with specialised CCT and spectral power distribution (SPD), if buyers have preferences for these options.

Lighting controls have advanced greatly in recent years and are a practical way of adjusting light levels and illuminated locations according to time-of-need, avoiding excessive or unnecessary lighting. For private precincts, real-time presence sensor switching is very effective, as is timer control for illuminated building facades and advertising billboards. For larger public precincts and roads, internet connected Central Management System (CMS) controls deliver programmed trimming, dimming and switching. As a result of substantial Waka Kotahi NZTA funding assistance many New Zealand councils have now installed world-class CMS control systems for public lighting, and the astute use of these controls is a pathway to improved night sky protection.

Outdoor Lighting in Sensitive Areas

Good outdoor lighting is critical for facilitating safe human movement and activity at night for communities and for road transport networks. In some regions there are sensitive areas where other activities need to be prioritised for specific attention. Such areas could be in the proximity of astronomical observatories, dark sky reserves or wildlife sanctuaries with endangered species such as migratory birds, bats, or insects.

In these areas, disturbance from outdoor lighting can be minimised by using special LED luminaires with optimised SPD using very low CCT or amber LED in combination with internet connected CMS lighting controls. Luminaires with precise photometric distribution and optical shielding should be selected, and installed and aimed in a way that limits unintended light spill. Lighting schemes with CMS controls can be trimmed, dimmed or switched off at selected locations and times when light is not needed for human safety and amenity.

For sensitive areas, procurement processes should include budgets that recognise additional lighting design input and the cost of specialty luminaires.

Best Practice Recommendations

The provision of high quality and fit-for-purpose outdoor lighting is a joint responsibility of owners and managers of lighting schemes, lighting designers, and lighting equipment suppliers.

The following list is a prompt on the main points of focus for decision makers:

1. Implement good lighting design
- Engage MIESANZ qualified professional lighting designers
- Apply latest AS/NZS lighting standards and avoid overlighting
- Include special design requirements for sensitive areas where applicable
- Verify correct luminaire installation (positioning) and controls commissioning

2. Use good luminaires
- Select quality luminaires based on superior design performance and life cycle value
- Select shielded luminaires with photometric distribution to limit spill light and glare
- Select special luminaires for sensitive areas where applicable

3. Use good lighting controls
- Install real-time lighting controls with presence sensor switching where possible
- Install CMS lighting controls for adaptive trimming, dimming and switching

4. Operate lighting only where needed
- Install and aim luminaires to avoid spill light and neighbourhood nuisance
- Dim or switch off luminaires at selected locations at times of off-peak activity

5. Operate lighting only when needed
- Operate lighting schemes with adaptive light levels in accord with night activity/need
- Dim or switch off luminaires at times of off-peak activity

A Pathway for Progress

For material advancements to be made in New Zealand in dark sky lighting practice it would be valuable to progress additional stakeholder interaction. The appropriate forums are AS/NZS standards committees with input that incorporates the interests of all stakeholders. This includes astronomical and ecological communities alongside those of local government, property owners, lighting scientists, lighting designers and the supply industry.

Reference Sources

For further exploration, there are many international reference documents available on outdoor lighting technicalities and application available from independent and non-commercial organisations. Some examples are:
- Illuminating Engineering Society of North America (IESNA) – USA
- International Commission on Illumination (CIE) – Austria
- Institution of Lighting Professionals (ILP) – UK
- US Department of Energy (US-DoE) – USA
- Illuminating Engineering Society of Australia and NZ (IESANZ) Australia and NZ
- Institute of Public Works Engineering Australasia (IPWEA) – Australia and NZ

Lighting Council New Zealand (LCNZ) *is the industry association for lighting product manufacturing, importing, and distribution companies in New Zealand.*
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*The **Illuminating Engineering Society of ANZ (IESANZ**) is a professional association in the art and science of lighting and the education of lighting professionals.*
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