4.4 DARK SKY IMPACT

SUMMARY:

REFERENCE DOCUMENTS:

CITY OF EDMONTON:
- City of Edmonton Light Efficient Community Policy C576
  Relevant Section: 7.2 Outdoor Lighting

ROYAL ASTONIMACAL SOCIETY OF CANADA (RASC):
- RASC Environmental Impacts of Light Pollution
  Relevant Section: LED's in Outdoor Lighting
- RASC Sample Lighting Bylaw (2016)
  Relevant Section: 2.0 Regulations

LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED):
- LEED® Canada for Existing Buildings: Operations and Maintenance 2009
  Relevant Section: Sustainable Sites: Light Pollution Reduction

CITY OF EDMONTON LIGHT EFFICIENT POLICY
Relevant Section: 7.2 Outdoor Lighting

CITY POLICY

POLICY NUMBER: C576

REFERENCE:
August 28, 2013 City Council

ADOPTED BY:
City Council

SUPERSEDES:
New

PREPARED BY: Transportation Services

DATE: August 21, 2013

TITLE: **Light Efficient Community Policy**

Policy Statement:

The City of Edmonton strives to provide high quality roadway and outdoor lighting that includes proper lighting for pedestrians, cyclists and motorists through application of appropriate engineering guidelines and standards to ensure safety while minimizing light pollution, power consumption and green house gas generation.

Policy Statement/Overall Objective – Effective, Efficient, Sustainable and Safe Use of Light through:

- Minimizing Light Pollution,
- Reduce Energy Consumption and Reduction of Greenhouse Gas Generation,
- Environmental Stewardship,
- Enhancing Public Health and Safety,
- Implementing Cost Effective Solutions.
- The City will actively pursue industry to adapt more quickly to efficient warmer LEDs and appropriate covers, reflectors, etc. associated with minimizing glare and health issues.
- In light of the fast pace of this technology, this will be reviewed annually with an updated report to address technology advances and how we are implementing them to ensure a healthy city, not on an efficient city.

The purpose of this policy is to:

- Investigate and provide roadway lighting recommendations best serving the community along with reducing energy consumption and greenhouse gas generation.
- Provide outdoor lighting recommendations for facilities such as parking lots, sports fields, parks, transit outdoor facilities, building exteriors best serving the community along with methods of reducing energy consumption and greenhouse gas generation.

7.2.3.3 Buildings

The city currently has a Façade Improvement Program that encourages building owners to invest in façade renovations, which may include lighting. Though this document covers city-owned building and not privately owned commercial buildings, the city should set an example by ensuring they meet the UPD requirements on their own buildings. For all new construction the city currently follows LEED silver requirements which are aimed at reducing energy and off-site light pollution impacts. It is recommended the applicable City departments develop guidelines on lighting requirements and lighting levels.

Building façade or vanity lighting of City facilities can cast excessive sky-glow and light trespass. It should be limited to buildings with historical or cultural significance, and where used should be designed to avoid light trespass, up-light or contribution to sky glow and should have controls to turn lights off when pedestrian activity is reduced. Where façade lighting is required it shall be designed to minimize light pollution to the greatest extent possible.

Lighting building exteriors is mainly an aesthetic choice and has no real safety or security benefits. This lighting is therefore much different than say roadway lighting. The IESNA Lighting Handbook makes some recommendations for architectural lighting however they vary depending on the lighting effect. When lighting building exteriors, the unit power density levels listed should be adhered to and should also be a part of building permit process. Lighting for purely commercial purposes should be avoided.

It is unknown how much lighting exists and how much power is consumed on the exterior lighting of city buildings. We recommend, as an example, that the city lighting either be turned off in peak periods and/or refitted with more energy efficient LED lighting which will also reduce power bills and maintenance costs. Lighting controls should also be mandated to turn off lighting in non-peak periods.

7.2.3.9 Digital Signs

The location, size, lighting, and design of signs on private property are regulated in City Bylaw 12800. Digital signs are not covered in detail elsewhere in this report, as a recent amendment bylaw 15892 covers digital signs. This bylaw is fairly well defined with the exception of limiting the intensity (brightness) of digital signs. In October 2011 an amendment to Bylaw 15892 was presented by the Light Efficient Communities Coalition. The recommended "Revision 1 Brightness Limits", which is defined in subsection 5, adds the following after subsection a. "Brightness level of the Sign shall not exceed 400 nits when measured from the sign face at its maximum brightness, between sunset and sunrise, at those times determined by the Sunrise/Sunset calculator from the national research Council of Canada."

Limiting the source brightness of the sign is very important, as over-bright signs can reduce driver safety and impact local residents. The 400 nit level is reasonable and should be attainable by most suppliers. Some have considered lower brightness levels. The Pattern Outdoor Lighting Code (POLC) proposed in the Maricopa Association of Government (Phoenix, Arizona) Resource Guide and Report recommends a maximum brightness of 100 nits for digital (multi-colour LED) billboards. The standard in some Arizona jurisdictions is 300 nits, a limit supported by the sign industry. Achieving the 100 nit standard may be nearly impossible. Overall, Bylaw 15892 and the proposed amendment make sense and constitute a good step forward.

7.2.3.11 Compliance and Enforcement

As with any policy and regulations created, enforcement is critical. City engineering staff currently reviews designs. In terms of enforcement, outdoor lighting is not well addressed in the current city standards. In terms of energy efficiency and unit power density levels, they should be included in city bylaws and reviewed for compliance as part the city review and permitting process.

Lighting controls are somewhat more difficult to enforce as their operation can be changed or turned off over time by those who control them. Lighting controls for city outdoor lighting should, therefore, be under full control of the city senior staff. Senior staff, not those operating the system, must approve changes to controls.

Much information and many recommendations have been provided throughout this document. Some are provided for general information and to aid in good design practice while other are aimed purely at saving power. It is critical to define a future direction in order for information to be implemented and new policies established and followed.

RASC ENVIRONMENTAL IMPACTS OF LIGHT POLLUTION:
Relevant Section: LED's in Outdoor Lighting

Summary

Although recent LED lighting products are not much better than the current HPS bulbs, they hold great promise to change the nature of artificial lighting. The brightness of the lamps can be relatively easily adjusted and the directionality of the emitted light can more easily be tailored to a specific distribution pattern, thereby reducing glare and light trespass. They can more easily create a uniform illumination pattern, and their light output is more easily controlled. If their sensitivity to temperature can be significantly reduced, LED useful life could eventually exceed that of the current HID bulbs of over 20,000 hours.

As the efficacy of LED luminaires improve, LEDs will allow a significant reduction in the energy used for lighting. This last point will encourage the replacement of old, unshielded luminaires for ones that reduce glare, light trespass, and illumination levels, thereby reducing all forms of urban light pollution, including sky glow. In the future, we must restrain ourselves from squandering the higher-energy efficiencies by illuminating the night landscapes to brighter levels.

RASC SAMPLE LIGHTING BYLAW (2016):
Relevant Section: 2.0 Regulations

2.4 Structural Illumination

2.4.1 All new wall-mounted commercial lighting shall be FCO or ShCO fixtures.

2.4.2 All existing grandfathered wall-mounted lights shall be encouraged to adhere to the requirements of Section 2.2. Property owners whose structures are furnished with unshielded wall-packs shall be encouraged to shield such fixtures.

2.4.3 All architectural lighting and building accent lighting shall be mounted such that the accent light is aimed down. There shall be no glare emanating from the fixture in accordance with fully shielded design.

2.4.4 The use of low wattage lights for decoration purposes such as Christmas lighting and property ornamentation shall be exempt from Section 2.4.3.

2.7 Lighting Of Outdoor Advertising Signs

Outdoor advertising signs, and light fixtures used to illuminate signs or billboards shall minimize light pollution by being mounted on top of the sign facing down, must utilize full cut-off fixtures and must be in compliance with other sections of this by-law. Examples are provided in Appendix 4.

2.12 Establishment of the Town of XXXX Outdoor Illumination Committee

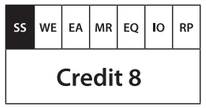
The maintenance of this By-law shall be the responsibility of a committee known as the Town of XXXX Outdoor Illumination Committee. The Committee's responsibility is to help enforce this By-law in both new and existing developments by:

a. providing consultation on outdoor and building lighting design

b. providing outdoor lighting problem resolution (light trespass and light pollution)

c. conducting standards research and area investigation

d. examining submissions for new lighting developments



1 Point

SUSTAINABLE SITES

LIGHT POLLUTION REDUCTION

INTENT

Eliminate light trespass from the building and site, improve night sky access and reduce development impact on nocturnal environments.

REQUIREMENTS

Interior Lighting.

All nonemergency built-in lighting with a direct line of sight to any openings in the envelope (translucent or transparent, wall or ceiling) must be automatically controlled to turn off during all after-hours periods during the performance period. The total duration of all programmed after-hours periods annually must equal or exceed 2,190 hours per year (50% of annual nighttime hours, eg. the hours between 11pm and 5am). Manual override capability may be provided for occasional after-hours use.

Implement a program to ensure that the lighting control system is being properly used to adjust lighting levels during all after-hours periods.

Exterior and Site Lighting

Choose one of the following options:

OPTION A
If the project is certified under *LEED® for New Construction and Major Renovations,* show that SS Credit 8 was earned. If the project is certified under *LEED® for Core and Shell* and 75% of the floor area is *LEED® for Commercial Interiors,* show that Light Pollution Reduction was earned for both systems.

OR

OPTION B
Partially or fully shield all exterior luminaries with 1000 initial lamp lumens or more; all exterior luminaries with more than 3500 initial lamp lumens to meet the Illuminating Engineering Society of North America (IESNA) Full Cutoff Classification, as defined by the IESNA Recommended Practice Manual: Lighting for Exterior Environments (RP-33-99), so they do not directly emit light to the night sky.

OR

OPTION C
Measure the night illumination levels at regularly spaced points around the perimeter of the property, taking the measurements with the building's exterior and site lights both on and off. The building's interior lights must be in the same state during both measurements. At least eight measurements are required at a maximum spacing of 30 m (100 feet) apart, so as to be representative of the illumination levels at the perimeter of the property. The illumination level measured with the lights on must not be more than 20% above the level measured with the lights off. This requirement must be met for each measurement point; averaging of all points is prohibited.

POTENTIAL TECHNOLOGIES & STRATEGIES

Implement site lighting criteria to maintain safe light levels while avoiding off-site lighting and night sky pollution. Minimize site lighting where possible and use a computer model to predict impacts when changing lighting. Technologies to reduce light pollution include full-cutoff luminaries and low-reflectance surfaces.