

# **BACKGROUND PAPER: LIGHT POLLUTION ABATEMENT LEGISLATION**

## **INTRODUCTION**

The Saskatchewan Environment Minister has requested the Law Reform Commission to give advice on possible legal mechanisms to abate light pollution. Light pollution is an issue that is attracting increasing attention from the public and legislators. Bylaws intended to reduce wasteful and inefficient outdoor lighting have been adopted by a growing number of municipalities in the United States, and light pollution abatement statutes have been adopted in at least ten states. In Canada, municipalities in Ontario and British Columbia have light pollution bylaws, and in Saskatchewan the Cypress Hills Provincial Park has been declared an International Dark Sky Reserve.

It is not the Commission's function to make policy recommendations concerning light pollution, and regulation of lighting is necessarily a highly technical matter, requiring the expertise of lighting engineers and municipal planners. The Commission does not intend to deal with the technical issues, much less resolve them. What the Commission can usefully contribute is a review of existing and proposed light pollution abatement legislation to identify a practical legal framework for addressing the problem, and in particular, the legislative response that would be most useful at the provincial level.

## **BACKGROUND**

### **1. Light pollution**

Light pollution is excessive or obtrusive light produced by outdoor lighting of streets, businesses, residences and public places. As the International Dark-Sky Association has observed, “there are many good reasons for artificial lighting at night: To help us see better, for security, safety, utility, and for an attractive nighttime environment around us,” but “far too much of our present nighttime lighting does not meet its objectives.”<sup>1</sup> While it is not the purpose of this paper to assess the case for light pollution abatement, some understanding of the nature of the problem perceived by advocates of abatement is necessary to identify an appropriate legal framework for dealing with it. Critics of light pollution point out that:

- Many types of outdoor lighting designed for advertising, security and visibility are actually wasteful, invasive and a source of disabling glare.
- "Light trespass", the poor control of outdoor lighting which crosses property lines, detracts from our quality of life, and confuses the instinctive daily and seasonal cycles of animals and plants.
- Although perceived as a deterrent to crime, studies by the US Department of Justice and the National Institute of Justice show no conclusive evidence that lighting actually prevents crime.
- Public hazards have been created by the use of glaring, high-wattage floodlighting along roadways and business parking lots, shining directly in the driver's line of sight.
- Public safety is also being compromised by businesses competing with light levels to attract business. The eye's inability to adjust quickly to drastic changes from light to dark leaves a driver temporarily blind when exiting an overlit business area at night. It is not uncommon to see businesses using 3 to 6 times the recognized, lighting industry recommendations for site lighting (IESNA).

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<sup>1</sup>International Dark-Sky Association (IDA), *Light Pollution: The Problem, The Solutions* (Information Sheet #134), Tucson, Arizona, n.d. The IDA is a coalition of organizations concerned about light pollution, with members in the United States, Canada, Europe, South America and Australia. In Canada, the IDA was initially organized by the Royal Astronomical Society.

- The recent awareness of global warming concerns, due in a large part to power plant emissions, now demands an effort to reduce our consumption of electricity.
- Because of this unnecessary condition, many of our children today have already lost much of the starry night sky behind the glow of wasted light, limiting their imaginations to the man-made boundaries around them.
- By correcting these outdoor lighting problems for the future we can save money and electricity, improve public safety and increase visibility, while reducing air pollution and green house gas emissions.<sup>2</sup>

The International Dark-Sky Association attributes much of the problem to lack of awareness of the issue and lack of information about alternatives to wasteful practices:

Unfortunately, poor lighting practice is rampant. Much bad lighting can be blamed on the fact that the user is unaware of the issues of visibility and utility. Careless and excessive use of artificial light in our outdoor environments causes extensive damage to the aesthetics of the nighttime environment, while at the same time it often compromises safety and utility, the very reason for its installation.<sup>3</sup>

It is not surprising that businesses may use light to attract customers, but it is perhaps surprising that bylaws routinely regulate such matters as the size and placement of commercial signs to prevent clutter, while ignoring the glare and clutter that excessive lighting can cause. Municipalities may invest in additional street lighting in an effort to deter crime. But studies suggest that excessive

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<sup>2</sup>International Dark-Sky Association (IDA) *An Introduction to the Issues of Light Pollution*, Tucson, Arizona, n.d. For a more comprehensive and technically sophisticated discussion of light pollution, see Bob Mizon, "Light Pollution: Responses and Remedies," Springer, 2001.

<sup>3</sup>*Outdoor Lighting Code Handbook and USA Pattern Lighting Code*, IDA, Tucson, Arizona, n.d.

lighting may actually increase crime if the lighting is poorly designed.<sup>4</sup> Unshielded street lighting, particularly some cobra-style street lights and popular acorn-style fixtures, produce glare and sky glow. Some cities are adopting more effective full cut-off designs as they change their fixtures, but the alternatives are still not appreciated by all municipalities.<sup>5</sup> Acorn-style fixtures are still being installed in new subdivisions in Saskatchewan.

Increasing concern about energy consumption can be expected to influence public attitudes toward lighting. Energy audits suggest that about 30 to 60 percent of energy consumed in lighting is unneeded, and it has been estimated that in the United States, over-illumination is responsible for an equivalent of two million barrels of oil per day in wasted energy.<sup>6</sup> Public attention will perhaps be most quickly focused on obvious waste, such as all-night lighting of office buildings, decorative lighting, and illumination of buildings by search lights. At present, casino lighting, including planned search light displays, is a controversial issue in Saskatoon.

## **2. Abatement of light pollution**

Regulation of outdoor lighting to abate light pollution originated in the United States in the 1980s. The initial impetus came at the municipal level, and a growing number of cities in the U.S. have developed standards for outdoor lighting designed to abate light pollution.<sup>7</sup> Some Canadian

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<sup>4</sup>See for example James M. Tien et. al., *Street Lighting and Crime: National Evaluation Program, Phase I Final Report*, National Institute of Law Enforcement and Criminal Justice, United States Department of Justice, July 1977.

<sup>5</sup>Eastern Michigan University Project Dark Sky, *Our Vanishing Night: Erosion of the Night Sky by Pollution*, Ypsilanti, Mich., n.d.

<sup>6</sup>Lumina Technologies, Santa Rosa, Ca., *Survey of 156 California commercial buildings energy use*, August, 1996.

<sup>7</sup>For information about municipal light pollution abatement ordinances in the United States, see IDA, *U.S.A. Municipality ODLRs by State*, <http://www.darksky.org/ordsregs/usamunis.html>.

municipalities have adopted similar regulations.<sup>8</sup> Light pollution abatement measures have also been adopted in Europe in recent years. In Italy, for example, 15 regional authorities have placed limits on excess lighting. The Czech Republic and Slovenia have both adopted nation-wide prohibitions on unshielded and excess lighting.<sup>9</sup>

These ordinances and bylaws differ in scope and complexity, but are typically comprehensive in character, specifying types of permitted lighting, allowed intensities, exceptions, and zoning for lighting purposes. A model bylaw prepared by the Royal Astronomical Society of Canada, reproduced as an appendix, is typical of comprehensive U.S. and Canadian municipal regulation. The Indiana Council on Outdoor Lighting's *Framework for outdoor lighting improvement ordinances*, also included as an appendix, attempts to identify the minimum subject matter for municipal regulation. Development of municipal light pollution abatement programs has been assisted by model regulations such as those referred to above, and more comprehensive manuals on light pollution abatement.<sup>10</sup>

In both the United States and Canada, municipal regulation was initially developed without specific enabling legislation at the state or provincial level. There is still no Canadian legislation directly addressing abatement of light pollution, but there has been a trend in recent years toward state legislation on light pollution in the United States.<sup>11</sup> The state legislation is generally less detailed and comprehensive than municipal regulations. Many of the statutes are limited to regulating the

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<sup>8</sup>Royal Astronomical Society of Canada, *Municipal bylaws*, <http://www.rasc.ca/lpa/bylaws.shtml>.

<sup>9</sup>*International lighting regulations*, <http://www.darksky.org/lighting/regulations/international-lighting-regulations.php>. Other nations with local abatement regulations include Argentina, Chile, Australia, New Zealand, Spain, and the United Kingdom.

<sup>10</sup>E.g. *Outdoor Lighting Code Handbook and USA Pattern Lighting Code*, IDA, Tucson, Arizona, n.d.

<sup>11</sup> For information about state light pollution abatement statutes in the United States, see IDA, *U.S. State Laws adopted and proposed*, <http://www.darksky.org/ordsregs/usastate.html>

purchases of light fixtures and lighting systems with state or public funds.<sup>12</sup> Some, however, provide general standards for outdoor lighting, and there appears to be increased interest in this approach. In California, legislation was adopted in 2001 as part of a package responding to the state's energy crisis, giving the California Energy Commission authority to adopt lighting standards for outdoor lighting:

25402.5 (3) (c) The commission shall adopt efficiency standards for outdoor lighting. The standards shall be technologically feasible and cost-effective. As used in this subdivision, "outdoor lighting" . . . includes, but is not limited to, street lights, traffic lights, parking lot lighting, and billboard lighting.<sup>13</sup>

A bill was introduced in Iowa in 2000 to "set standards for outdoor lighting,"<sup>14</sup> and a *State of New Hampshire Outdoor Lighting Control Ordinance* has been proposed.<sup>15</sup>

The California Energy Commission is currently conducting a project to develop lighting standards for all outdoor lighting applications. Although the Energy Commission's approach has not been finalized, it would appear that comprehensive regulation at the state level is contemplated. The Iowa bill and New Hampshire proposals, on the other hand, are perhaps best regarded as minimum state level regulation, which would complement and guide municipal regulation rather than replace it. The "explanation" included in the Iowa Bill describes it as follows:

This bill sets standards for outdoor lighting. Definitions are listed for the terms "fully shielded," "installation," and "outdoor light fixture." The bill subjects a person who

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<sup>12</sup>The Maine statute, reproduced as an appendix, is typical.

<sup>13</sup>California Senate First Extra Session - Bill No. 5, Statutes of 2001.

<sup>14</sup>Iowa House Bill 2014 (2000).

<sup>15</sup>New Hampshire Citizens for Responsible Lighting, New Hampshire Outdoor Lighting Code, December 12, 1998 Version.

installs an outdoor light fixture to shielding requirements.

Other requirements of the bill dictate that a person shall not illuminate the following between eleven p.m. and sunrise: Advertising signs with the exception of signs of a business when the business is open to the public; outdoor illumination, public or private, with the exception of security lighting; an outdoor recreational facility except to complete a specified organized recreational event already in progress; a laser source light, a strobe light, or a high-intensity light for outdoor advertising or entertainment; and searchlights for advertising purposes.

Exempted from the requirements of the bill are airport lighting, emergency lighting, and outdoor light fixtures installed on facilities or land owned or operated by the federal government.

The Iowa bill and New Hampshire proposal are included as appendices.

## **OPTIONS FOR PROVINCIAL REGULATION OF LIGHT POLLUTION**

### **1. Approaches to regulation**

#### **a. Municipal bylaws**

There can be little doubt that the most effective measure for abatement of light pollution would be a comprehensive lighting code of the kind adopted in municipal ordinances in the United States. Lighting systems in contemporary urban settings are complex and technically sophisticated. Municipalities install and pay for most street lighting, regulate commercial signage, and have

responsibility for the building and zoning bylaws that regulate the physical environment of neighbourhoods. Effective regulation requires the same attention to detail found in building codes and zoning bylaws. It is municipalities that are best situated to undertake comprehensive light pollution abatement measures. In Saskatchewan, *The Planning and Development Act, 2007* confers sufficient powers on municipalities to adopt light pollution abatement bylaws.<sup>16</sup>

If the province and municipalities cooperate to abate light pollution, the most useful role for the provincial government may be to assist municipalities:

1. The province could offer information and assistance to municipalities concerning light pollution and abatement measures.
2. The province could make a model light pollution abatement bylaw available for use by municipalities.

Because information about light pollution abatement, such as *the Outdoor Lighting Code Handbook* and *USA Pattern Lighting Code* and model bylaws, is available, it would not be difficult for the province to develop a program to assist municipalities. The content of a model bylaw is discussed below.

#### **b. Comprehensive provincial standards**

The state of California is currently planning state-wide comprehensive regulation. Such an approach

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<sup>16</sup>*The Planning and Development Act, 2007*, S.S. 2007, c. P-13.2 provides:

52(3) A zoning bylaw may contain provisions:

(n) regulating or prohibiting the placement of exterior lighting on buildings or land, and regulating the amount and nature of light emitted from structures;

runs counter to accepted notions of municipal responsibility in both the United States and Canada. The state was motivated to adopt comprehensive regulation as a result of a state-wide energy crisis that resulted in severe shortages of electrical power. No doubt, comprehensive regulation at the state level can be made to work, but in jurisdictions in which there is no energy crisis, may not be desirable. A comprehensive state or provincial code would almost inevitably be less responsive to local needs and less detailed in its application to specific circumstances.

### **c . Provincial minimum standards legislation**

Although comprehensive regulation of lighting is probably best implemented at the municipal level, there may be a place for provincial legislation establishing minimum standards. The Iowa and New Hampshire proposals discussed above are examples of this approach. Such legislation would complement light pollution abatement bylaws. By setting minimum standards, the province would provide a baseline for municipal regulation, and provide regulation in communities without municipal regulation. This would make it unnecessary for smaller communities to adopt their own light pollution abatement bylaws, and ensure that abatement measures would be in place across the province even if full cooperation between levels of governments is not possible.

### **3. The content of bylaws and minimum standards legislation**

Model bylaws and minimum standards legislation share many features in common. The basic content of these models is identified and discussed below. Provincial minimum standards legislation or a basic abatement bylaw could be designed directly from these proposals.

These proposals are drawn in part from the New Hampshire and Iowa model legislation discussed above, and the Royal Astronomical Society of Canada's model bylaw. In addition, the proposals have drawn substantially from the *Framework for outdoor lighting improvement ordinances* drafted

by the Indiana Council on Outdoor Lighting Education.

These models suggest that basic abatement control should address the following topics:

1. Intensity control
2. Shielding requirements
3. Light trespass
4. All night lighting
5. Prohibitions
6. Exemptions
7. Penalties

**Intensity control** – Limits on the intensity of outdoor lighting are part of almost all the legislation and bylaws examined by the Commission. As the explanation appended to the Iowa Standards for Outdoor Lighting bill states, “excessive light levels are unnecessary and wasteful and often result in light which is obtrusive, causing glare, light trespass, and uplight.” However, intensity can be measured and assessed in several ways, and appropriate intensity levels may vary in different circumstances.

The Iowa proposal would specify light levels for different types of lighting: “The illuminating engineering society of North America has recommended light levels for various outdoor lighting applications. These light levels should not be exceeded.” While this approach is likely satisfactory, detailed regulation by type may be more appropriate in a light pollution abatement bylaw than in provincial standards, and may not be necessary. The Indiana *Framework* follows the recommendations of the *USA Pattern Lighting Code*, which sets an overall maximum intensity per parcel of developed land (lumens per acre). The *Code* takes the position that:

A natural inclination is to turn to the lighting profession itself and use recommended lighting levels as defined by the Illuminating Engineering Society of North America (IESNA). For several practical reasons, however, the USA Pattern Lighting Code has

emphasized a different approach, taking a direction that avoids wherever possible technical lighting specifications. The control of the majority of overlighting problems can be addressed effectively by an overall cap on the amount of light permitted, scaled to the area to be developed - lumens per acre caps.

The amount of light included in a design, measured in lumens, is practical and simple to verify from a simple list of lamps, and requires no special lighting expertise. It leaves the maximum flexibility for the lighting designer, while at the same time keeping a cap on the total amount of light used. As long as the lumen amounts permitted provide reasonable amounts of light for the designer to work with, professional quality designs can solve the problems of each lighting situation by trading off the amounts of decorative and general illumination and the areas to be illuminated. IDA believes that creativity in lighting design is enhanced rather than suppressed by this approach.

**Shielding requirements** – Shielded lighting directs light downward into a cone that avoids contributing to glare, light trespass, and sky glow. At present, most street lighting in Saskatchewan is unshielded or only partially shielded, and unshielded fixtures such as acorn lights continue to be installed. All the legislation and bylaws examined by the Commission favour light fixtures with “full cut off,” defined in the *Indiana Framework* as “a light fixture which cuts off all upward transmission of light.” All legislation and bylaws contain similar practical criteria. For example, the *Indiana Framework* provides:

#### DIRECTIONAL CONTROL

All luminaires of 1800 or more lumens shall be full cutoff as installed. For luminaires under 1800 the bulb must be frosted glass or installed behind a translucent cover, except floodlights which must be aimed no higher than 45 degrees below horizontal. This can be accomplished by the use of full-cutoff (fco) fixture design, shielding,

visors, louvers, or other devices.

Care should be taken in specifying shielding requirements to identify appropriate exceptions. Because of the cost of replacing street lighting, application of shielding requirements to existing lighting may be regarded as prohibitively expensive, leading to the conclusion that the requirements should apply only to new or retrofit lighting. It is also likely impractical to apply shielding requirements to door lights or other low intensity lighting, particularly in residential areas. Legislation and bylaws typically exempt light fixtures producing less than a specified intensity. A more difficult problem is application of shielding requirements to illuminated signs. The *Indiana Framework* applies directional control requirements to commercial signs. The Royal Astronomical Society draft bylaw, on the other hand, exempts certain types of signs. It can be argued that illuminated signs should be subject to general intensity rules and prohibitions, but that detailed regulation of signs belongs in zoning bylaws.

**Light trespass** — Light trespass occurs when unwanted light enters property from a light source outside the property, for instance, a light shining over a neighbor's fence. Most bylaws contain provisions directly addressing light trespass. For example, the *Indiana Framework* provides:

#### LIGHT TRESPASS

The maximum illumination at five feet inside an adjacent residential parcel or public right-of-way, or beyond, from light emitted from an artificial light source is .1 horizontal foot candles and .1 vertical foot candles. Said illumination at 10 feet inside an adjacent commercial or industrial parcel or on a public roadway, or beyond, shall not exceed .1 horizontal foot candles or .1 vertical foot candles. No line of sight to a bulb is permitted 5 feet or more beyond a residential or public right-of-way property line by an observer viewing from a position that is level with or higher than the ground below the fixture. Compliance is achieved with fixture shielding, directional control designed into the fixture, fixture location, fixture height, fixture aim, or a combination of these factors.

Regulation at this level of detail may, however, belong only in zoning bylaws, and not in provincial minimum standards. General regulation of intensity and shielding will lead to significant mitigation of light trespass.

**All night lighting**— One of the most wasteful lighting practices is all night lighting that is not required for security or business purposes. Bylaws may provide some detail, but the general rule contained in the *Indiana Framework* may be a satisfactory general rule:

#### ALL-NIGHT LIGHTING

Lighting at places of business or public venues, except for security, shall be turned off no later than one hour after closing. Such lights should be confined to that needed for basic security. The lights of vacant parking lots shall not remain lighted except for illuminating entryways by the fixtures closest to building entrances.

**Prohibitions** — Certain types of outdoor lighting are typically prohibited in legislation and bylaws. These prohibitions focus on practices regarded to be particularly noxious sources of light pollution. Prohibitions include search lights and outdoor strobe lights not required for public safety purposes. A more controversial provision in some bylaws and legislation is prohibition of various high intensity discharge (HID) lights. The New Hampshire proposal, for example, would ban new installation of mercury vapor lamps. These lights, which have been widely used for street lighting, make a significant contribution to sky glow.

**Exceptions**— Legislation must of course include appropriate exceptions. Generally, it would exempt existing lighting. In addition, appropriate exemptions could include:

1. Low intensity lighting
2. Sports facilities when in use
3. Airports

## **CONCLUSION**

If policies to abate light pollution are adopted, there appear to be practical legal mechanisms for implementing these policies. Experience in other jurisdictions suggests that both municipal zoning bylaws and minimum standards legislation provide effective ways to abate light pollution. The province could implement light pollution abatement by encouraging municipalities to adopt a model abatement bylaw, or by adopting a provincial minimum standards statute, or both. The bylaws and statutes discussed in this report suggest the content that could be included in either a model basic bylaw or provincial minimum standards legislation.

## APPENDICES

### **FRAMEWORK FOR OUTDOOR LIGHTING IMPROVEMENT ORDINANCES (Indiana Council on Outdoor Lighting Education)**

Here are suggestions for the components of a comprehensive outdoor lighting ordinance. All ordinances should address misdirection of light and glare, excessive brightness of light, and the indiscriminate all-night usage of light. These are the causes of dangerous and annoying glare, light trespass, and the unnatural brightening of the night sky.

Excessive brightness can be limited by alternate methods. The simplest method is to limit the number of lumens allowed in a given area of land, such as an acre. A lumen is a unit of measure of the intensity of light produced by a lamp (bulb) as indicated by the manufacturer. This method greatly simplifies compliance determination.

Appropriate lighting levels are also somewhat subjective and different communities may have different standards. Alternate methods and varying levels of restrictions are provided below and some will be more appropriate for some communities than others. However, the vision impairment caused by excess illumination should be given utmost consideration.

#### DEFINITIONS

Acre or net acre -- any 43,560 contiguous square feet or total of portions thereof within the same parcel if dissected by existing roads or land dedicated for roads.

Fixture -- The assembly that holds the lamp (bulb) in a lighting system. It includes the elements designed to give light output control, such as a reflector (mirror) or refractor (lens), the ballast, housing, and the attachment parts.

Full-cutoff (fco) -- a light fixture which cuts off all upward transmission of light.

Glare -- discomfort experienced by an observer with a direct line of sight to a light source which often results in visual impairment.

HID lighting -- high intensity discharge lighting, a family of bulb type including mercury vapor, metal halide, high pressure or low pressure sodium, which glow when an electric current is passed through a gas mixture inside the bulb.

Horizontal (or vertical) footcandles -- The amount of light striking a vertical or a horizontal plane.

Inventory of lighting -- a list of lamps indicating the bulb type, bulb wattage, and manufacturer through which the rated lumens can be determined.

Light source -- the bulb and lens, diffuser, or reflective enclosure.

Light trespass -- light projected onto a property from a fixture not located on that property.

Lumen -- measure of brightness of the illumination exiting a bulb, provided by manufacturer.

Luminaire -- The complete lighting unit, including the lamp, the fixture, and other parts.

Non-cutoff -- a light fixture which does not cut off all upward transmission of light.

## DIRECTIONAL CONTROL

All luminaires of 1800 or more lumens shall be full cutoff as installed. For luminaires under 1800 the bulb must be frosted glass or installed behind a translucent cover, except floodlights which must be aimed no higher than 45 degrees below horizontal. This can be accomplished by the use of full-cutoff (fco) fixture design, shielding, visors, louvers, or other devices.

## REASONABLENESS OF INTENSITY

The maximum allowable total lumens generated on each parcel is 80,000 lumens per net acre with full-cutoff (fco) lighting. Parcels less than one net acre are allowed fco lumens in a portion equal to the parcel's portion of a net acre. Lights mounted on the underside of a roof 15 or more feet from any edge of the roof count 1/4 toward the limit. Lights on the underside of a roof less than 15 feet from the edge of the roof count 1/2 toward total lumens.

## ALTERNATIVES

Some communities may wish to establish different lumen per acre maximums according to various zoning designations. For instance, commercially zoned areas in a business district could have a higher lumen per acre maximum than commercially zoned areas adjacent to residential areas.

In certain instances the amount of lighting allowed under the lumen per acre cap may not be sufficient for an application of outdoor lighting that meets minimum illumination levels recommended by the Illuminating Engineering Society. In such cases a community may wish to allow lighting sufficient to meet IES recommendations, provided that properly conducted testing, reviewed by a lighting engineer, indicates such IES recommendations are not exceeded, with the fees to be reimbursed to the community by the applicant.

Some communities may wish to adopt illumination maximums based upon the recommendations of the IES rather than using a lumens per acre method. Doing so requires night site visits by personnel knowledgeable in the proper method of measuring illumination levels with an accurate light meter.

#### LIGHT TRESPASS

The maximum illumination at five feet inside an adjacent residential parcel or public right-of-way, or beyond, from light emitted from an artificial light source is .1 horizontal footcandles and .1 vertical footcandles. Said illumination at 10 feet inside an adjacent commercial or industrial parcel or on a public roadway, or beyond, shall not exceed .1 horizontal footcandles or .1 vertical footcandles. No line of sight to a bulb is permitted 5 feet or more beyond a residential or public right-of-way property line by an observer viewing from a position that is level with or higher than the ground below the fixture. Compliance is achieved with fixture shielding, directional control designed into the fixture, fixture location, fixture height, fixture aim, or a combination of these factors.

#### SIGNAGE

All illuminated signs must be lighted internally or lighted by top-mounted lights pointed downward. No sign may be illuminated with fixtures not shielded from upward transmission of light. The maximum size of the signs and minimum distances between signs should be established. Off-premise signs must be turned off after 10:30 p.m., and on-site signs turned off upon closing if after 10:30p.m. Signs should be white or light colored lettering on dark backgrounds. Lights that flash, pulse, rotate, move, or simulate motion are not permitted. Above includes billboards.

#### ALTERNATIVES

Some communities may require that the lights of off-premise signs be turned off earlier in winter, such as by 10:00 p.m., and later in summer, such as 11:00p.m.

Some communities may disallow lighting for signs over a certain size, or disallow lighting on all signs.

#### SEARCH LIGHTS

The use of search lights except by civil authorities for public safety is prohibited.

#### COMMUNICATIONS TOWER LIGHTING

The nighttime use of white lighting or white strobe lighting is prohibited. (Nighttime white strobe lighting is not required by the FAA.) Applicants must show proof of any such FAA requirement.

#### TEMPORARY LIGHTING

The temporary use of low wattage or low voltage lighting for public festivals, celebrations, and the observance of holidays are exempt from regulation except where they create a hazard or nuisance from glare. Light trespass requirements remain in effect. Permits are required for commercial activities such as carnivals and are valid for up to 7 consecutive days. Where possible lighting should be fco.

#### ALL-NIGHT LIGHTING

Lighting at places of business or public venues, except for security, shall be turned off no later than one hour after closing. Such lights should be confined to that needed for basic security. The lights of vacant parking lots shall not remain lighted except for illuminating entryways by the fixtures closest to building entrances.

#### SPORTS LIGHTING

Sports lighting is exempt from the lumens per net acre limitations as to the playing field only. Full-cutoff fixture design is required and light trespass requirements apply. No outside sporting or entertainment event will start after 10:00p.m. or extend beyond 11:00 p.m.

#### ALTERNATIVES

Some communities may prefer other time limits for concluding outdoor events, depending on such things as the location of the venue relative to residential areas.

Some communities may wish to require that sports lighting be located no closer than a minimum distance from any residence. In order to minimize light trespass from glare it may also be desirable to establish a maximum mounting height.

#### EXEMPTIONS

Airport lighting for navigational purposes is exempt. Continuous colored tube lighting (neon lighting) is exempt except for the requirement that lighting should not remain on after the business has closed or if installed on signage.

#### EFFECTIVE DATE

Lighting already installed when these regulations were adopted is exempt except:

Lighting found by a government agency to create public hazard can be ordered removed or altered at any time.

On the effective date of the ordinance, any light installation which provides for re-aiming of the fixture shall be aimed in compliance with this ordinance without delay.

Upon repair or replacement of any component of any luminaire, or relocation of any luminaire, the requirement that such luminaire be made full-cutoff shall apply.

Upon installation of any new luminaire, this ordinance shall fully apply. An inventory of existing lighting submitted by the applicant will be required when the application for installing new luminaire(s) is made.

Any lighting not in compliance with this ordinance 7 years hence shall be immediately brought into compliance.

## ENFORCEMENT

It is unlawful to sell, lease, loan, or give any light fixture which would cause non-compliance. It is unlawful to install or cause to be installed any light fixture which would cause non-compliance. It is unlawful to operate any light fixture which would cause non-compliance. A permit for the repair, installation, or alteration of any HID light is required beforehand. An inventory of existing lights is required with the application for permit.

Nothing in these regulations shall prevent filing an action for relief from light trespass or glare as a nuisance, or from other relief under any laws which may currently exist. If other laws place added restrictions regarding lighting, they shall apply.

The provisions of this ordinance are severable, and if any provision of this ordinance or the application thereof is held invalid, the invalidity shall not affect other provisions or applications of this ordinance.

## SAMPLE BYLAW

### **(2007 Royal Astronomical Society of Canada)**

This is a sample bylaw is based upon the bylaw prepared for the Town of XXXX and can be used as the basis for developing and discussing bylaw changes in most Canadian municipalities.

#### 1. Definitions

##### 1.1 In this By-law:

(a) "Automatic Timing Device" means a device which automatically turns light fixtures or circuits on and off;

(b) "Average Maintained Horizontal Illuminance: means the density of light flux in an outdoor area or areas calculated:

(i) on a horizontal plane at ground level;

(ii) as an average flux density over the surface of the outdoor area or areas; and

(iii) applying a light loss factor calculated by methods prescribed by the lighting handbook of the Illuminating Engineering Society or any successor publication;

with calculations made by, or on the basis of lighting plans and other information provided by, manufacturers or suppliers of the Outdoor Light Fixtures and made in a manner consistent with the lighting handbook of the Illuminating Engineering Society or any successor publication;

(c) "Average Maintained Vertical Illuminance" means the density of light flux in an outdoor area or areas calculated:

(i) on a vertical plane at the vertical surface of that part of the Building or other structure being illuminated;

(ii) as an average flux density over the entire exterior surface of that part of the Building or other structure being illuminated; and

(iii) applying a light loss factor calculated by methods prescribed by the lighting handbook of the Illuminating Engineering Society or any successor publication;

with calculations made by, or on the basis of lighting plans and other information provided by, manufacturers or suppliers of the Outdoor Light Fixtures and made in a manner consistent with the lighting handbook of the Illuminating Engineering Society or any successor publication;

(d) "Building" has the meaning ascribed to it in the Building Code Act, 1992, or any successor legislation;

(e) "By-law Enforcement Officer" means all individuals from time to time appointed by Council of the Corporation as by-law enforcement officers for the purpose of enforcing the provisions of this By-law;

(f) "Chief Building Official" means the Corporation's chief building official;

(g) "Commissioner of Transportation and Works" means the person holding the position of the Corporation's commissioner of transportation and works;

(h) "Corporation" means The Corporation of the Town of XXXXXX;

(i) "Designated Official" means the Commissioner of Transportation and Works or any other Person designated by Council of the Corporation to administer certain provisions of this By-law;

(j) "Dwelling Unit" means living accommodation comprising a single housekeeping unit designated or intended for use by one individual or by individuals living together as a single housekeeping unit and consisting of a room or suite or rooms in which both culinary and sanitary facilities are provided for the exclusive use of such individual or individuals;

(k) "Existing Outdoor Light Fixtures" has the meaning ascribed to it in Subsection 11.1;

(l) "Grade" means, with reference to a Building or to an Outdoor Light Fixture affixed to a Building, the average level of proposed or finished ground adjoining the Building at all exterior walls and,

when used with reference to an Outdoor Light Fixture affixed to a pole or to a structure other than a Building, means the average level of proposed or finished ground immediately surrounding such pole or structure other than a Building;

(m) "Illuminating Engineering Society" means the Illuminating Engineering Society of North America or any successor organisation;

(n) "Internally Illuminated Sign" means a Sign of which all or part of the external surface emits light received from an internal light source;

(o) "Lamp" means an artificial source of light and includes a bulb or tube;

(p) "Lane" means a public or a private means of access which affords a secondary means of access to an abutting property in addition to a Street;

(q) "Light Fixture" means a complete artificial lighting unit consisting of one or more Lamps and their ballasts, where applicable, together with parts designed to distribute the light, position and protect the Lamps and connect the Lamps to the power supply;

(r) "Lot" means a parcel or tract of land:

(i) which is a whole lot as shown on a registered plan of subdivision, but a registered plan of subdivision for the purpose of this definition does not include a registered plan of subdivision which has been deemed not to be a registered plan of subdivision under a by-law passed pursuant to Subsection 50(4) of the Planning Act or a predecessor thereof; or

(ii) which fronts on a Street and is a separate parcel of land without any adjoining lands being owned by the same owner or owners as of the date of passing of this By-law, or

(iii) the description of which is the same as in a deed which has been given consent pursuant to Section 50 of the Planning Act, or a predecessor thereof,

but for the purpose of this definition, no parcel or tract of land ceases to be a lot by reason only of the fact that part or parts of it has or have been conveyed to or acquired by the Corporation, Her Majesty in Right of Ontario, Her Majesty in Right of Canada, Etc.;

(s) "Outdoor Light Fixture" means a Light Fixture, permanent or portable, used or for use out of doors, including search lights, spotlights and floodlights, but not including Internally Illuminated signs;

(t) "Outdoor Recreational Facilities" means lands or facilities used for recreational purposes, including without limitation playgrounds, racquet courts, softball diamonds, baseball diamonds, soccer fields or other athletic fields, lawn bowling greens, golf courses, skating rinks, swimming pools and snow skiing, carried on in whole or in part outside a fully-enclosed Building and together with necessary accessory Buildings and structures;

(u) "Owner" includes the registered owner of real property, the Person who owns a leasehold estate in real property, and any Person having control of real property, and also includes a Person the owner authorises in writing to act on his or her behalf;

(v) "Person" means any individual, partnership, joint venture, corporation or other entity;

(w) "Shielded" means that 100% of the lumens emitted from the Light Fixture are projected below an imaginary horizontal plane passing through the highest point on the fixture from which light is emitted;

(x) "Sign" means any advertising device or notice and means any medium including its structure and any other component parts which is used or is capable of being used to attract attention to a specific subject matter;

(y) "Street" means a public highway as defined by the Municipal Act and shall exclude a Lane or any private right-of-way or unopened road allowance or any street which is shown on a registered plan of subdivision which has been deemed not to be a registered plan of subdivision for the purposes of Subsection 50(3) of the Planning Act, or a predecessor thereof;

(z) "Street Townhouse" means a Building divided vertically into three or more Dwelling Units, each of which shares a wall above Grade, and each of which has frontage on a Street.

## PART I - APPLICATION AND COMPLIANCE

### 2. Appliance of By-law

2.1 Except as otherwise provided in this By-law, this By-law applies to all Outdoor Light Fixtures erected, installed or used in the Town of XXXXXX in conjunction with:

- (a) commercial uses, including parking lots;
- (b) industrial uses;
- (c) institutional uses;
- (d) recreational or athletic uses; or
- (e) residential uses of five Dwelling Units or more on a single Lot.

2.2 All Outdoor Light Fixtures which produce light directly or indirectly by the combustion of natural gas or other fossil fuels, such as gas lamps, are exempt from the requirements of the By-law.

2.3 Outdoor Light Fixtures used exclusively in conjunction with Street Townhouses are exempt from the requirements of this By-law.

2.4 Nothing in this By-law prohibits the temporary display of incandescent lights, other than search lights, as part of the celebration of a religious or cultural event during a reasonable period of celebration of that event which reasonable period shall in no event extend for more than thirty days

prior to the date of the event or celebration or thirty days after such date.

2.5 Except as provided in Subsection 11.1, the provisions in Parts II and III of this By-law do not apply to Outdoor Light Fixtures existing and installed prior to the effective date of this By-law.

### 3. Compliance

No Person shall erect, install or use, or permit to be erected, installed or used, an Outdoor Light Fixture otherwise than in compliance with the provisions of this By-law.

## PART II - GENERAL REQUIREMENTS REGARDING INSTALLATION OF OUTDOOR LIGHT FIXTURES

### 4. Shielding

4.1 Except as provided in Subsection 4.2, no Person shall erect, install, or use, or permit to be erected, installed or used, an Outdoor Light Fixture which is not Shielded.

4.2 The following Outdoor Light Fixtures are not required to be Shielded:

(a) Outdoor Light Fixtures which are illuminance tube lighting containing neon, argon or krypton;

(b) Outdoor Light Fixtures Illuminating Building entrance or exit doorways where such fixtures are incandescent fixtures with each fixture having light sources totalling not more than 150 watts and provided that there are not more than two fixtures lighting each entrance or exit doorway;

(c) Outdoor Light Fixtures used exclusively for and in connection with the television broadcasting of events at Outdoor Recreational Facilities, but only while the television broadcasting is being carried on;

(d) Outdoor Light Fixtures used exclusively for an in connection with the production of movies or commercials, but only while production is being carried on and provided that any permits required from the Corporation or any other governmental authority for the production of such movies or commercials have been obtained; and

(e) Outdoor Light Fixtures used exclusively for an in connection with the presentation of concerts, plays or other non-athletic entertainment events in parks or on other lands owned by the Corporation and used for public purposes.

4.3 Where Outdoor Light Fixtures are required to be Shielded, no Person shall erect, install or use, or permit to be erected, installed or used, an Outdoor Light Fixture which is of a design which allows the direction of light projection to be modified after installation unless the Outdoor Light Fixture is Shielded in all possible configurations of the fixture.

## 5. Wavelength Distribution

5.1 Except as provided in Subsection 5.2, no Person shall erect, install or use or permit to be erected, installed or used a Lamp or an Outdoor Light Fixture which includes or is designed to include a Lamp which is of a type other than:

- (a) incandescent;
- (b) low pressure sodium;
- (c) high pressure sodium;
- (d) carbon arc; or
- (e) any other type which satisfies the wavelength distribution requirements set out in Schedule A.

5.2 The provisions of Subsection 5.1 do not apply;

- (a) to Lamps or Outdoor Light Fixtures that illuminate areas used for the outdoor display of merchandise for sale, provided that the applicable zoning by-law and other applicable law permits such outdoor display of merchandise;
- (b) to Lamps or Outdoor Light Fixtures which come within the provisions of paragraphs (c), (d) or (e) of Subsection 4.2.

## 6. Mounting Height

6.1 Except as provided in Subsection 6.2, no Person shall erect, install or use or permit to be erected, installed or used an Outdoor Light Fixture at a mounting height of 9.2 meters above Grade.

Mounting height refers to the height of the Lamp, or the highest of the Lamps if there is more than one Lamp, forming part of the Outdoor Light Fixture.

6.2 There is no restriction on the mounting height of Outdoor Light Fixtures lighting Outdoor Recreational Facilities or Streets.

## 7. Automatic Timing Devices

7.1

(a) No Person shall erect, install or use or permit to be erected, installed or used, Outdoor Light Fixtures in conjunction with uses described in paragraphs (a), (b), (c) and (d) of Subsection 2.1 unless a sufficient number of such Outdoor Light Fixtures are equipped with Automatic Timing

Devices which turn off Outdoor Light Fixtures between 11:00 p.m. and sunrise the following day to satisfy the requirements of Section 10.

(b) The Owners of real property on which Outdoor Light Fixtures have been equipped with Automatic Timing Devices shall maintain the Automatic Timing Devices in good state of repair and replace any Automatic Timing Devices which are damaged, destroyed or removed.

### PART III - ILLUMINANCE LEVELS

#### 8. Horizontal Illuminance

8.1 All Persons erecting, installing or using, or permitting to be erected, installed or used, Outdoor Light Fixtures in conjunction with uses described in Subsection 2.1 shall ensure that:

(a) Except as provided in paragraph (b) and (c), the Average Maintained Horizontal Illuminance of all outdoor areas on a Lot shall not exceed 16.5 lux (1.5 footcandles);

(b) In an area used for the outdoor display of merchandise for sale, provided that the applicable zoning by-law and other applicable law permits such outdoor display of merchandise, the Average Maintained Horizontal Illuminance shall not exceed 215.2 lux (20 footcandles); and

(c) In an Outdoor Recreational Facility, the Average Maintained Horizontal Illuminance shall not exceed 323 lux (30 footcandles).

#### 9. Illumination of Vertical Surfaces

9.1 (a) Except as provided in paragraph (b), where vertical surfaces of Buildings or other structures are illuminated for decorative purposes or for any other purpose, the Average Maintained Vertical Illuminance of such vertical surfaces shall not exceed 64.6 lux (6 footcandles);

(b) The provisions of paragraph (a) shall not apply to Outdoor Light Fixtures installed in conjunction with Outdoor Recreational Facilities.

### PART IV - HOURS OF OPERATION

#### 10. Turning Off Outdoor Light Fixtures

10.1 All Owners of property on which Outdoor Light Fixtures are erected, installed or used in conjunction with the uses described in paragraphs (a), (b), (c) and (d) of Subsection 2.1 shall ensure that those Outdoor Light Fixtures are turned off between 11:00 p.m. and sunrise the following day except as follows:

(a) Outdoor Light Fixtures may remain on to illuminate outdoor areas for security purposes provided

that they are shielded and that the Average Horizontal Illuminance of outdoor areas shall not exceed:

(i) 10.76 lux (1 foot-candle) for all outdoor areas other than those described in subparagraph (ii); and

(ii) 53.8 lux (5 footcandles) in any area which is used for the outdoor display of merchandise for sale, provided that such outdoor display of merchandise is permitted under the applicable zoning by-law or any other applicable law;

(b) where an outdoor recreational use in an Outdoor Recreational Facility continues after 11:00 p.m., Outdoor Light Fixtures required to be on in connection with that use are permitted, but only while that use continues;

(c) where a concert, play or other entertainment event in a park or on other lands owned by the Corporation and used for public purposes takes place or continues after 11:00 p.m., Outdoor Light Fixtures required to be on in connection with that event are permitted, but only while the event takes place or continues; and

(d) in an area which is used for commercial, industrial or institutional uses where such uses are carried on after 11:00 p.m. and personnel relevant to such uses are carried on after 11:00 p.m. and personnel relevant to such uses are working on the premises, Outdoor Light Fixtures required to be on in connection with such uses are permitted, but only while as such uses are carried on.

## PART V - REPLACING EXISTING OUTDOOR LIGHT FIXTURES

### 11. Existing Outdoor Light Fixtures

#### 11.1

(a) Except as provided in paragraphs (b) and (c), Outdoor Light Fixtures existing and installed on a Lot prior to the effective date of this By-law ("Existing Outdoor Light Fixtures") are exempt from the provisions of this By-law save and except the provisions of Part IV-Hours of Operation.

(b) No Person shall modify or permit to be modified an Outdoor Light Fixture including an Existing Outdoor Light Fixture in a way which changes that fixture from a fixture which is Shielded to a fixture which is not Shielded or from a fixture which satisfies the requirements of Section 5.1 to a fixture which does not satisfy those requirements.

(c) Where an Owner:

(i) constructs a Building on a Lot which is used or intended to be used for one or more purposes described in Subsection 2.1 and on which there are Existing Outdoor Light Fixtures, and

(ii) in conjunction with that construction, replaces 50% or more of the Existing Outdoor Light Fixtures on the Lot or increases by 50% or more the number of Outdoor Light Fixtures existing on the Lot immediately prior to the effective date of this By-law,

the Owner shall ensure that all Outdoor Light Fixtures on that Lot, including Existing Outdoor Light Fixtures, comply with all of the provisions of this By-law and if Existing Outdoor Light Fixtures are required to be replaced or modified to achieve compliance, the Owner shall replace or modify those Existing Outdoor Light Fixtures.

## PART VI - PLANS AND DOCUMENTS

### 12. Plans and Documents

#### 12.1 Where a Person:

(a) proposes to lay out and establish a commercial parking lot or proposes to construct a Building on a Lot used or intended to be used for one or more purposes described in Subsection 2.1; and

(b) proposes to install or erect Outdoor Light Fixtures in conjunction with such commercial parking lot or Building;

that Person shall file with the Designated Official a lighting plan together with related documents and information to satisfy the Designated Official that the proposed lighting will comply with the provisions of this By-law. Where the provisions of paragraph (c) of Subsection 11.1 apply, the lighting plan, documents and information also shall satisfy the Designated Official that Existing Outdoor Light Fixtures will comply with the provisions of this By-law.

#### 12.2 The Submission shall contain, but shall not be limited to the following:

(a) plans indicating;

(i) the location of all Buildings and structures on the property,

(ii) the location, number, type, position, elevation and mounting height of all Outdoor Light Fixtures;

(iii) the number and location of Outdoor Light Fixtures to be equipped with Automatic Timing Devices; and

(iv) any building design or other features which may affect the nature, intensity or direction of light emission from Outdoor Light fixtures;

(b) description of and background information regarding all Outdoor Light Fixtures, including;

- (i) power (in watts);
  - (ii) type of light source;
  - (iii) filtering, if any;
  - (iv) information evidencing whether or not Outdoor Light Fixtures are Shielded;
  - (v) information as to light distribution in the horizontal and vertical phase planes;
  - (vi) information as to light distribution in the horizontal plane between 11:00 p.m. and sunrise the following day; and
  - (vii) manufacturer's catalogue information and drawings; and
- (c) information regarding the design capability of the Outdoor Light Fixture to permit any change in the items referred to in paragraphs (a) and (b).

The above required plans and descriptions shall be sufficiently complete to enable the Designated Official to readily determine whether the requirements of this By-law will be complied with.

12.3 If the plans and descriptions referred in Subsection 12.1 do not enable the Designated Official to readily determine whether the requirements of this By-law will be complied with, the Person referred to in Subsection 12.1 shall submit further evidence of compliance, such as reports of tests evidencing compliance performed and certified by a testing laboratory recognised by the Illuminating Engineering Society.

12.4

(a) The Chief Building Official shall not issue a building permit for any construction in respect of which a lighting plan is required pursuant to Subsection 12.1 if the required plan has not been filed and approved by the Designated Official.

(b) When a lighting plan is required to be filed under this By-law in connection with the laying out and establishment of a commercial parking lot, Council of the Corporation or its designated official for granting site plan approval shall refuse to grant site plan approval for such development if the required lighting plan has not been filed and approved by the Designated Official.

12.5 No Person shall commence construction of any development referred to in Subsection 12.1 until the lighting plan has been filed and approved by the Designated Official.

12.6

(a) Where an approved lighting plan is required, no Person shall erect or install, or permit to be erected or installed, Outdoor Light Fixtures except in accordance with the approved lighting plan or a change application approved in accordance with paragraph (b).

(b) If there is an approved lighting plan in place and a Person proposes to modify the approved lighting plan or to install Outdoor Light Fixtures otherwise than in accordance with the approved lighting plan (including any change in the type of Lamp shown on the approved plan) the applicant shall submit a change request to the Designated Official together with adequate information to evidence compliance with the requirements of this By-law.

## PART VII - COMPLIANCE ALTERNATIVES AND ADMINISTRATIVE EXEMPTIONS

### 13. Compliance Alternatives

13.1 The provisions of this By-law are not intended to prevent the use of any design, material or method of installation not specifically prescribed by this By-law, provided any such alternate design, material or method of installation has been approved by the Designated Official. The Designated Official may approve any such proposed alternative provided that he or she finds that it:

(a) provides at least approximate equivalents to the applicable specific requirements of this By-law; and

(b) is otherwise satisfactory and complies with the intent of this By-law.

### 14. Administrative Exemptions

14.1 Council of the Corporation may grant an exemption or minor variance from some or all of the provisions of this By-law upon the application of any Person if in the opinion of council compliance with the By-law is impracticable and the general intent and purpose of the By-law are maintained.

14.2 If the request for an exemption or minor variance is approved by council, a written record of the request and approval shall be kept by the Corporation and shall be open to public inspection.

## PART VIII - INSPECTION AND OFFENCES

### 15. Inspectors

15.1 All By-law Enforcement Officers hereby are appointed inspectors for the enforcement of this By-law.

### 16. Entry

16.1 For the purpose of determining whether there is compliance with this By-law, an inspector may

have access to or enter any land, Building or structure governed by this By-law between the hours of 6:00 am and 9:00 p.m. and may conduct an inspection.

16.2 No inspector may enter a Building or structure that is also a dwelling without the consent of the occupant or without first obtaining and producing a warrant.

16.3 An inspector conducting an inspection shall produce identification issued by the clerk of the Corporation upon request.

#### 17. Powers on Inspection

17.1 Any inspector conducting an inspection may inspect the land, Building or structure and may question a Person on matters relevant to the inspection.

17.2 No Person shall hinder or obstruct an inspector lawfully conducting an inspection under this Act.

17.3 Any Person who contravenes Subsection 17.2 is guilty of an offence.

#### 18. Application for Warrant

18.1 An inspector may apply to a Justice of the Peace for a warrant if:

- (a) the inspector has been denied access or entry to any land, Building or structure;
- (b) the inspector has been instructed or directed to leave any land, Building or structure; or
- (c) the inspector has been obstructed in the conduct of the inspection.

#### 19. Offence and Penalty

19.1 Whenever in this By-law there is a duty imposed upon any Person and such Person fails to perform such duty, such Person is guilty of an offence under this By-law and upon conviction is liable to a maximum fine as established pursuant to the Provincial Offences Act, or any successor legislation.

19.2 Without limiting any other provision of this By-law and in addition thereto, any Person who otherwise contravenes the provisions of this By-law is guilty of an offence and upon conviction is liable to a maximum fine as established pursuant to the Provincial Offences Act, or any successor legislation.

### PART IX - MISCELLANEOUS

## 20. Citation

20.1 This By-law may be cited as the "Light Pollution By-law".

## 21. Illuminating Engineering Society

Notwithstanding any other provisions in this By-law, nothing in this By-law shall have the effect of requiring outdoor lighting which provides a lower level of illuminance for a use or activity than the minimum level of illuminance recommended for such use or activity in the lighting handbook of the Illuminating Engineering Society in effect at the time of installation or replacement of Outdoor Light Fixtures or any successor publication.

## 22. General

22.1 Schedule A hereto is incorporated in and forms part of this By-law.

22.2 The references to footcandles in this By-law are for convenience only and represent the approximate imperial equivalent of the measurements expressed in lux. When the measurements expressed in lux and footcandles are different, the measurements expressed in lux shall prevail.

22.3 The division of this By-law into parts, sections, subsections, paragraphs and subparagraphs and the insertion of headings are for convenience of reference only and shall not affect the construction or interpretation of this By-law.

22.4 If any provision of this By-law or the application thereof to any Person or circumstance is invalid, this invalidity shall not affect other provisions or application of this By-law which can be given effect without the invalid provision or application, and to this end the provisions of this By-law are severable.

## 23. Effective Date

23.1 This By-law shall come into effect upon third reading and passage of the By-law.

## SCHEDULE A - WAVELENGTH DISTRIBUTION REQUIREMENTS

For purposes of this Schedule A "Total Emergent Flux" means the total amount of light energy emitted by a Lamp in the wavelength band between 320 and 700 nanometers.

Lamps of Outdoor Light Fixtures satisfy the requirements of Section %.1 of the By-law:

(a) where

(i) not more than 5% of the Total Emergent Flux emitted by the Lamp or the Lamp or Lamps forming part of the Outdoor Light Fixture is at wavelengths between 320 nanometers and 340 nanometers;

(ii) Not more than 20% of the Total Emergent Flux emitted by the Lamp or the Lamp or Lamps forming part of the Outdoor Light Fixture is at wavelengths between 340 nanometers and 440 nanometers; and

(iii) Not more than 15% of the Total Emergent Flux emitted by the Lamp or the Lamp or Lamps forming part of the Outdoor Light Fixture is at wavelengths between 641 nanometers and 700 nanometers; or

(b) where the Lamp or the Lamp or Lamps forming part of the Outdoor Light Fixture emit light energy in a smooth continuum without an emission line anywhere in the wavelength range of 320 nanometers to 700 nanometers.

**MAINE OUTDOOR LIGHTING STATUTE**  
**(Title 5, Part 4 Chapter 153. 1-A : Energy Conservation in Buildings)**

§1769. Outdoor lighting

1. Definitions. As used in this section, unless the context otherwise indicates, the following terms have the following meanings.

A. "Direct light" means light emitted directly from a lamp off a reflector or through a refractor of a luminaire. [1991, c. 481, §1 (new).]

B. "Fixture" means the assembly that holds the lamp and may include an assembly housing, a mounting bracket or pole socket, a lamp holder, a ballast, a reflector or mirror and a refractor or lens.

C. "Footcandle" means an illuminance equal to one lumen per square foot.

D. "Full cutoff luminaire" means a luminaire that allows no direct light emissions above a horizontal plane through the luminaire's lowest light-emitting part.

E. "Glare" means direct light emitting from a luminaire that causes reduced vision or momentary blindness.

F. "Illuminance" means the level of light measured at a surface.

G. "Lamp" means the component of a luminaire that produces the light.

H. "Light trespass" means light emitted by a luminaire that shines beyond the boundaries of the property on which the luminaire is located.

I. "Lumen" means a unit of measurement of luminous flux.

J. "Luminaire" means the complete lighting system, including the lamp and the fixture.

K. "Permanent outdoor luminaire" means any luminaire or system of luminaires that is outdoors and that is intended to be used for 7 days or longer.

L. "State funds" means any bond revenues or any money appropriated or allocated by the Legislature.

2.. Permanent outdoor luminaires. A person may not use any state funds to install or replace any permanent outdoor luminaire unless:

A. The luminaire is a full cutoff luminaire when the rated output of the luminaire is greater than 1,800 lumens;

B. The luminaire's maximum illuminance does not exceed the minimum illuminance recommended for that purpose by the Illuminating Engineering Society of America or the federal Department of Transportation; and

C. The Director of the Bureau of Public Improvements ensures that consideration is given to minimizing glare and light trespass.

3. Exceptions. Exceptions from the provisions of this section are permitted only when:

A. Federal laws, rules and regulations take precedence over these provisions; or

B. The Director of the Bureau of Public Improvements determines that there is a compelling safety interest that can not be addressed by any other method.

## **PROPOSAL FOR A STATE OF NEW HAMPSHIRE OUTDOOR LIGHTING CONTROL ORDINANCE**

**(New Hampshire Outdoor Lighting Code, December 12, 1998 Version)**

Section 1. Purpose and Intent: The purpose of this Code is to provide standards for outdoor lighting

so that its use does not interfere with the beauty and quality of the New Hampshire night sky. It is the intent of this Code to encourage, through the regulation of the types, kinds, construction, installation, and uses of outdoor electrically powered illuminating devices, lighting practices, and systems, to conserve energy without decreasing safety, utility, security, and productivity while enhancing nighttime enjoyment of property within the jurisdiction of the State of New Hampshire. It is also the intent of this Code to minimize the intrusion of lighting across property lines, therefore avoiding disruption of the quality of life for nearby private residences, and, to avoid the disruption of natural instinctive cycles of flora and fauna within nearby natural areas.

Section 2. Conformance with Applicable Codes: All outdoor electrically powered illuminating devices shall be installed in conformance with the provisions of this Code, the Building Code, the Electrical Code, and the Sign Code of the jurisdiction as applicable and under appropriate permit and inspection.

Section 3. Approved Materials, Methods of Construction, or Installation/Operation: The provisions of this Code are not intended to prevent the use of any design, material, or method of installation or operation not specifically prescribed by this Code, provided any such alternate has been approved. The building official may approve any such proposed alternate providing he finds that it:

- a. Provides at least approximate equivalence to that applicable specific requirements of this Code,
- b. Is otherwise satisfactory and complies with the intent of this Code,
- c. Has been designed or approved by a registered professional engineer and that the content and function promotes the intent of this Code.

Section 4. Definitions: As used in this Code, unless the context clearly indicates, certain words and phrases used in this chapter shall mean the following:

Sec. 4.1. "Person" means any individual, tenant, lessee, owner, or any commercial entity including but not limited to firm, business, partnership, joint venture, or corporation.

Sec. 4.2. "Installed" means the attachment, or assembly fixed in place, whether or not connected to a power source, of any outdoor lighting fixture.

Sec. 4.3. "Outdoor lighting fixture" means outdoor electrically powered illuminating devices, outdoor lighting or reflective surfaces, lamps and similar devices, permanently installed or portable, used for illumination, decoration, or advertisement. Such devices shall include, but are not limited to search, spot, and flood lights at or on:

1. Buildings and structures,
2. Recreational areas,
3. Parking lot lighting,
4. Landscape lighting,

- 5. Billboards and other signs (advertising or other),
- 6. Street lighting,
- 7. Product display area lighting,
- 8. Building overhangs and open canopies,

Sec. 4.4. "Light Trespass" means any artificial light falling outside of the boundaries of the property upon which it is installed.>

Section 5. Shielding: All nonexempt outdoor lighting fixtures shall have shielding as required by Table 5 of this Code.

Sec. 5.1. "Fully shielded" shall mean outdoor light fixtures shielded or constructed so that no light rays are emitted by the installed fixture at angles greater than 20 degrees below the horizontal plane as certified by a photometry test report.

Sec. 5.2. "Partially shielded" shall mean outdoor light fixtures shielded or constructed so that no more than ten percent of the light rays are emitted by the installed fixture at angles greater than 20 degrees below the horizontal plane as certified by a photometry test report.

Table 5:  
Shielding Requirements

Fixture Lamp Type	Shield Type
Low Pressure Sodium (LPS)	Full (1)
High Pressure Sodium (HPS)	Full
Mercury Vapor Lamps	Prohibited
Metal Halide Lamps (HID) Other than Mercury Vapor	Full (2), (6), (7)
Fluorescent	Full (3), (5)
Quartz	Prohibited (4)
Any light source 20 watts or greater.	Full
Any light source of 20 watts or less.	None
Glass tubes filled with neon, argon, krypton.	None
Other sources	As approved by the Building Official

Footnotes:

1. This is the preferred light source to minimize undesirable light emission into the night sky affecting nature, recreational viewing, and astronomical observations. Fully shielded fixtures are required as described in Section 5.1.

2. Metal Halide lighting, used primarily for display purposes, shall not be used for security lighting after 11:00 PM or after closing hours if before 11:00 PM, local time. Fully shielded fixtures are required as described in Section 5.1.

3. Outdoor advertising signs of the type constructed of translucent materials and wholly illuminated from within, do not require shielding. Dark backgrounds with light lettering or symbols are preferred, to minimize detrimental effects. Unless conforming to the above dark background preference, total lamp wattage per property shall be less than 41 watts.

4. For the purposes of this Code, quartz lamps shall not be considered an incandescent light source.

5. Warm white and natural lamps are preferred to minimize detrimental effects.

6. A mixture of fully shielded Low Pressure Sodium and Metal Halide fixtures shall be allowed for applications where the designing engineer deems that color rendering is critical.

7. Fully shielded and installed metal halide fixtures shall be allowed for applications where the designing engineer deems that color rendering is critical.

Section 6. Outdoor Advertising Signs:

Sec 6.1. Top Mounted Fixtures Required: Lighting fixtures used to illuminate any outdoor advertising sign, street sign, or directive sign, shall be mounted on the top of the sign structure. All such fixtures shall comply with the shielding requirements of Section 5 and the time controls of minor Section 8.5.

Sec 6.2. Light Spillage: Lighting fixtures used to illuminate any outdoor advertising sign, street sign, or directive sign, shall not cause light to spill beyond the boundaries of such sign.

Sec. 6.3. Prohibitions: See Section 8.5 for prohibitions.

Sec. 6.4. Compliance Limit: Any and All existing outdoor structures shall be brought into conformance with this Code within four years from the date of adoption of this provision.

Section 7. Submission of Plans and Evidence of Compliance with Code Subdivision Plans:

Sec 7.1. Submission Contents: The applicant for any permit required by any provision of the laws of this jurisdiction, in connection with proposed work involving outdoor lighting fixtures, shall submit (as part of the application for permit) evidence that the proposed work will comply with this Code. The submission shall contain, but shall not necessarily be limited to the following, all or part of which may be required elsewhere in the laws of this jurisdiction upon application for the required

permit:

1. Plans indicating the location on the premises, and the type of illuminating devices, fixtures, lamps, supports, reflectors, and other devices;
2. Description of the illuminating devices, fixtures, lamps, supports, reflectors, and other devices. Additionally, the description may include, but is not limited to, catalog cuts by manufacturers and drawings (including sections where required);
3. Photometry data, such as that furnished by manufacturers or similar showing the angle of cut off or light emissions.

Sec 7.2. Additional Submissions: The above required plans, descriptions, and data shall be sufficiently complete to enable the plans examiner to readily determine whether compliance with the requirements of this Code will be secured. If such plans, descriptions, and data cannot enable this ready determination, by reason of the nature or configuration of the devices, fixtures, or lamps proposed, the applicant shall additionally submit as evidence of compliance to enable such determination such certified reports of tests as will do so provided that these tests shall have been performed and certified by a recognized testing laboratory.

Sec. 7.3. Subdivision Plan Certification: If any subdivision proposes to have installed street or other common or public area outdoor lighting, the final plan shall contain a statement certifying that said plan will adhere to the applicable provisions of the State of New Hampshire Outdoor Lighting Code.

Sec 7.4. Lamp or Fixture Substitution: Should any outdoor light fixture or the type of light source therein be changed after the permit has been issued, a change request must be submitted to the building official for his approval, together with adequate information to assure compliance with this code, which must be received prior to substitution.

## Section 8. Prohibitions:

### Sec 8.1. Mercury Vapor Lamps and Fixtures:

1. The installation, sale, offer for sale, lease or purchase of any mercury vapor fixture, lamp element, or part thereof, for use as outdoor lighting of any form, shall be prohibited immediately upon adoption of this provision.
2. Any and All Mercury Vapor Lamps and Fixtures will be removed upon need of service or five years after the adoption of this provision.

Sec 8.2. Certain Other Lamps and Fixtures: The installation, sale, offering for sale, lease or purchase of any low pressure sodium, high pressure sodium, metal halide, fluorescent, quartz or incandescent outdoor lighting fixture, lamp, or part thereof, the use of which is not allowed by Table 5 is prohibited.

Sec 8.3. Laser Source Lights: Except as provided in minor Section 8.4, the use of laser source light or any similar high intensity light for outdoor advertising or entertainment, when projected above

20 degrees below the horizontal is prohibited.

Sec 8.4. Searchlights: The operation of searchlights for advertising purposes shall be prohibited between 10:00 p.m. and sunrise the following morning.

Sec. 8.5. Outdoor Advertising Off-Site Signs: Electrical illumination of outdoor advertising off-site signs between the hours of 11:00 p.m. and sunrise shall be prohibited upon adoption of this provision.

## Section 9. Special Uses.

Sec. 9.1. Recreational Facilities: Any light source permitted by this Code may be used for lighting of outdoor recreational facilities (public or private), such as, but not limited to, football fields, soccer fields, baseball fields, softball fields, tennis courts, auto race tracks, horse race tracks, ski slopes, or show areas, provided all of the following conditions are met:

a. Lighting for parking lots and other areas surrounding the playing field, court, or track, shall comply with this Code as defined in Section 4 of this Code.

b. All fixtures used for event lighting shall be fully shielded as defined in Section 5 of this Code, or be designed or provided with sharp cut-off capability, to prohibit upward light, spill-light, light trespass, and glare.

c. All events shall be scheduled to complete all activity before or as near to 10:00 p.m. as practical. Under no circumstances shall any illumination of the playing field, court, slope, or track be permitted after 11:00 p.m. Except to conclude a scheduled event that was in progress before 11:00 p.m. and circumstances prevented concluding before 11:00 p.m.

Exceptions: Any recreational facilities located along roads and streets designated as scenic routes shall be lighted only using approved fixtures, as defined in Section 5 of this Code.

Sec. 9.2. Outdoor Display Lots: Any light source permitted by this Code may be used for lighting of outdoor display lots such as, but not limited to, automobile sales or rentals, recreational vehicle sales, or building material sales, provided all of the following conditions are met:

a. Lighting for parking lots and other areas surrounding the display lot shall comply with this Code for lighting as defined in Section 5 of this Code.

b. All fixtures used for display lighting shall be fully shielded as defined in Section 5 of this Code, or be designed or provided with sharp cut-off capability, so as to prohibit upward light, spill-light, light trespass, or glare.

c. Display lot lighting shall be turned off within thirty minutes after closing of the business. Under no circumstances shall the full illumination of the lot be permitted after 11:00 p.m. Any lighting used after 11:00 p.m. shall be used as security lighting.

## Section 10. Temporary Exemptions:

Sec. 10.1. Any temporary emergency lighting needed by Police and Fire Departments, or other emergency services, as well as all vehicular luminaries, shall be exempt from the requirements of this article.

Sec. 10.2. Any hazard warning luminaries that are required by Federal regulatory agencies shall be exempt from the requirements of this article. Except that all luminaries used must be red in color and must be shown to be as close as possible to the Federally required minimum lumen output requirement for the specific task.

Sec. 10.3. Request; Renewal, Information Required: Any person may submit a written request, on a form prepared by the jurisdiction, to the building official for a temporary exemption request. A temporary exemption shall contain the following information:

1. Specific exemption or exemptions requested,
2. Type and use of the light fixture involved,
3. Duration of time requested exemption,
4. Type of lamp and calculated lumens,
5. Total wattage of lamp or lamps,
6. Proposed location on premises of the light fixture(s),
7. Previous temporary exemptions, if any, and addresses of premises thereunder,
8. Physical size of light fixture(s) and type of shielding provided,
9. Such other data and information as may be required by the building official.

Sec. 10.4. Approval and Duration: The building official shall have five business days from the date of submission of the request for temporary exemption to act, in writing, on the request. If approved, the exemption shall be valid for not more than thirty days from the date of issuance, of the approval. The approval shall be renewable at the discretion of the building official upon a consideration of all the circumstances. Each such renewed exemption shall be valid for not more than thirty days.

Sec 10.5. Disapproval and Appeal: If the request for temporary exemption is disapproved, the person making the request will have the appeal rights provided in Section 13.

Section 11. Other Exemptions:

Sec 11.1. Nonconformance:

1. Mercury Vapor Lamps in use for outdoor lighting on the effective date of the ordinance codified in this chapter shall not be so used.
2. Bottom-mounted outdoor sign lighting shall not be used, except as provided in Section 6.
3. All other outdoor light fixtures lawfully installed prior to and operable on the effective date of the ordinance codified in this chapter shall be brought into compliance with this code within seven years from that date. There shall be no change in use or lamp type, or any replacement or structural alteration made, without conforming to all applicable requirements of this Code.
4. It shall a direct violation of this provision to direct any light onto an adjacent property either

directly or indirectly and without express permission of said property owner.

Sec. 11.2. Fossil Fuel Light: All outdoor light fixtures producing light directly by the combustion of natural gas or other fossil fuels are exempt from all requirements of this Code.

Sec. 11.3. State and Federal Facilities: Outdoor light fixtures installed on, and in connection with those facilities, and land, owned or operated by the Federal Government or the State of New Hampshire, or any department, division, agency or instrumentality thereof, shall meet all requirements of this Code.

Section 12. Appeals: Any person substantially aggrieved by any decision of the building official made in administration of the Code has the right and responsibilities of appeal to the Advisory/Appeals Board of this jurisdiction.

Section 13. Law Governing Conflicts: Where any provision of federal, state, county, or city statutes, codes, or laws conflicts with any provision of this code, the most restrictive shall govern unless otherwise regulated by law.

Section 14. Violations: It shall be a violation for any person to violate any of the provisions of this Code. Each day during which the violation continues shall constitute a separate offense.

Section 15. Enforcement and Penalty: Sec 15.1. As per Title 62, Chapter 651, section 651:2 of the New Hampshire Criminal Code:

1. When a violation of this Code is determined, the following penalty shall be imposed:

a. A fine of not more than twelve hundred dollars per violation shall be imposed. The imposition of a fine under this Code shall not be suspended.

b. Any other order deemed necessary in the discretion of the hearing officer, including correction or abatement of the violation.

2. Failure of a defendant to comply with any order contained in a judgment under this Code shall result in an additional fine of not more than twelve hundred dollars for each day the defendant fails to comply.

## **IOWA STANDARDS FOR OUTDOOR LIGHTING**

### **Iowa House Bill 2014(2000)**

PAG LIN

1 1 Section 1. NEW SECTION. 459.1 OUTDOOR LIGHT FIXTURE

1 2 EFFICIENCY – DEFINITIONS.

1 3 As used in this section unless the context otherwise  
1 4 requires:

- 1 5 1. "Celestial objects" means stars, constellations, the  
1 6 milky way, meteors, comets, the northern lights, star  
1 7 clusters, nebulae, galaxies, the moon, and the planets.
- 1 8 2. "Full cutoff" means no more than one-tenth of a percent  
1 9 of the total light emitted by a fixture is emitted above a  
1 10 horizontal plane through the lowest part of the fixture.
- 1 11 3. "Glare" means light from a light source that draws  
1 12 attention to the light source itself rather than to what the  
1 13 light source is illuminating, and that causes visual  
1 14 discomfort, eye fatigue, or a loss in visual performance.
- 1 15 4. "Light pollution" means the obtrusive elements of  
1 16 outdoor lighting, namely uplight, glare, light trespass, and  
1 17 excessive light levels.
- 1 18 5. "Light trespass" means light that shines into or onto  
1 19 neighboring properties, and is of an intrusive and  
1 20 objectionable nature.
- 1 21 6. "Night sky" means the sky overhead on a clear night.
- 1 22 7. "Outdoor light fixture" means an electricity powered  
1 23 illuminating device which is permanently installed outdoors  
1 24 containing a total light source of more than one thousand  
1 25 eight hundred lumens per fixture.
- 1 26 8. "Terrestrial light" means light produced by electric  
1 27 light sources.
- 1 28 9. "Uplight" means light that goes directly up into the  
1 29 night sky from a light fixture.

1 30 Sec. 2. NEW SECTION. 459.2 FINDINGS.

1 31 The general assembly makes all of the following findings:

- 1 32 1. The night sky is an important part of the natural  
1 33 heritage of the citizens of this state and steps should be  
1 34 taken to minimize the amount of terrestrial light that shines  
1 35 up into the night sky. Uplight from terrestrial light sources  
2 1 is wasteful and has made it increasingly difficult for the  
2 2 citizens of the state to enjoy the night sky because celestial  
2 3 objects are obscured.
- 2 4 2. Outdoor light fixtures that produce uplight usually  
2 5 also produce glare. Outdoor light fixtures that do not  
2 6 produce uplight generally do not produce much glare. Glare  
2 7 often hinders visibility and produces a cluttered,  
2 8 unattractive nighttime environment. Glare should be kept to a  
2 9 minimum. Light that leaves a fixture in or near the  
2 10 horizontal plane through the lowest part of the fixture

2 11 produces glare.

2 12 3. Outdoor light fixtures should direct light only to  
2 13 where the light is wanted or needed. When practicable,  
2 14 outdoor light fixtures should produce light only when that  
2 15 light is needed. This will result in energy savings, lower  
2 16 operating costs, and more efficient utilization of the light.  
2 17 Other benefits include improved night sky visibility, reduced  
2 18 glare, improved safety and security due to better nighttime  
2 19 visibility, and a more attractive environment.

2 20 4. The illuminating engineering society of North America  
2 21 has recommended light levels for various outdoor lighting  
2 22 applications. These light levels should not be exceeded.  
2 23 Excessive light levels are unnecessary and wasteful and often  
2 24 result in light which is obtrusive, causing glare, light  
2 25 trespass, and uplight.

2 26 5. Uplight, glare, light trespass, and excessive light  
2 27 levels all constitute light pollution. Steps must be taken  
2 28 immediately to begin the long process of reducing light  
2 29 pollution caused by outdoor lighting in this state.

2 30 Sec. 3. NEW SECTION. 459.3 LOCAL GOALS AND REGULATIONS.

2 31 By January 1, 2003, all political subdivisions of the state  
2 32 shall take steps to address the obtrusive elements of outdoor  
2 33 lighting through new or revised local ordinances. These  
2 34 ordinances shall include any of the following:

2 35 1. Requirements that a high percentage of or all new and  
3 1 replacement outdoor light fixtures be full cutoff outdoor  
3 2 light fixtures.

3 3 2. Requirements that a high percentage of or all new and  
3 4 replacement outdoor light fixtures emit no more than four  
3 5 percent of their light in the zone from the horizontal plane  
3 6 through the lowest part of the fixture to fifteen degrees  
3 7 below the horizontal plane.

3 8 3. Set maximum allowable light levels for various outdoor  
3 9 lighting applications based on illuminating engineering  
3 10 society of North America recommendations.

3 11 4. Prohibition of outdoor lighting which shines or  
3 12 reflects light onto or into a neighboring property, so as to  
3 13 annoy or disturb the persons inhabiting such neighboring  
3 14 property, as constituting a nuisance.

3 15 5. Require electric utilities serving rural customers to  
3 16 offer as an option, if not required as in subsection 1, full  
3 17 cutoff outdoor light fixtures to their customers for dusk-to-  
3 18 dawn security lights.

3 19

EXPLANATION

3 20 This bill relates to outdoor light fixture efficiency and  
3 21 goals for local regulations regarding outdoor light  
3 22 efficiency.

3 23 The bill lists the following legislative findings:

3 24 1. The night sky, defined as the sky overhead on a clear  
3 25 night, is important to the citizens and uplight, defined as  
3 26 light that goes directly up into the night sky from a light  
3 27 fixture, is wasteful.

3 28 2. Glare, defined as light from a light source that draws  
3 29 attention to the light source itself rather than to what the  
3 30 light source is illuminating and that causes visual  
3 31 discomfort, eye fatigue, or a loss of visual performance,  
3 32 hinders visibility and should be kept to a minimum.

3 33 3. Outdoor light fixtures should direct light only to  
3 34 where the light is wanted and should only produce light when  
3 35 that light is needed.

4 1 4. The illuminating engineering society of North America  
4 2 has recommended light levels for various outdoor lighting  
4 3 applications and these light levels should not be exceeded.

4 4 5. Steps must be taken to reduce light pollution, defined  
4 5 as obtrusive elements of outdoor lighting.

4 6 The bill provides that by January 1, 2003, all political  
4 7 subdivisions of the state shall take steps to address the  
4 8 obtrusive elements of outdoor lighting through new or revised  
4 9 local ordinances. These ordinances shall include any of the  
4 10 following:

4 11 1. Requirements that new and replacement light fixtures be  
4 12 full cutoff.

4 13 2. Recommendations for new and replacement light fixtures  
4 14 to emit no more than 4 percent of their light in the zone from  
4 15 the horizontal plane through the lowest part of the fixture to  
4 16 15 degrees below the horizontal plane.

4 17 3. Set maximum allowable light levels for various outdoor  
4 18 lighting applications based on illuminating engineering  
4 19 society of North America recommendations.

4 20 4. Prohibitions of outdoor lighting which shines or  
4 21 reflects light onto or into a neighboring property, so as to  
4 22 annoy or disturb the persons inhabiting such neighboring  
4 23 property as constituting a nuisance.

4 24 5. Require electric utilities serving rural customers to  
4 25 offer as an option, if not otherwise required, full cutoff  
4 26 light fixtures to their customers for dusk-to-dawn security

4 27 lights.