

GREEN STANDARDS FOR LIGHT POLLUTION & BIRD-FRIENDLY DEVELOPMENT

Recommendations for the City of London

Prepared for the City of London by the Ecological and Environmental Advisory Committee (EEPAC), the Advisory Committee on the Environment (ACE), and the Animal Welfare Advisory Committee (AWAC)

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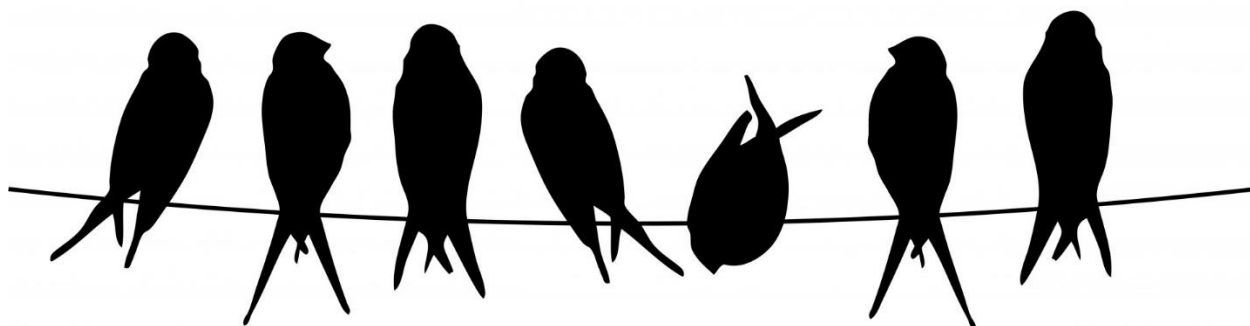


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1. DEFINITIONS

Definitions are derived from pre-existing documents¹⁻⁵. For the purpose of this document, terms shall be defined as follows:

Architectural lighting - lighting for the purpose of drawing attention. Lighting to illuminate landscaping features (e.g. trees, stones, or water), building facades etc., but not signage

Automatic timing device - any device which controls light fixtures/circuits to automatically turn on and off

City - the City of London, Ontario

Council - the elected municipal council of the City

Curfew - a time defined by the authority when outdoor lighting is reduced or switched off

Cut-off shielding -

Decorative lighting - see Vanity lighting

Dwelling unit - any living accommodation comprising a single housekeeping unit design in which both culinary and sanitary facilities are provided for the exclusive use of such individuals

Direct light - light directly emitted from the installed light fixture, off of its **reflector** or luminaire

Emergency conditions - lighting that is only energized during an emergency power source; or the exit paths exclusively during a fire or other emergency situation; or, lighting for security purposes used solely during an alarm

Glare - light emitting from a fixture(s) with intense capacity to diminish a spectator's ability to see, or produces a feeling of discomfort. Undue brightness of a light source.

Hardscape -

HPS - High Pressure Sodium, a type of a light source most commonly used in outdoor lighting areas

IDA - International Dark-Sky Association

IESNA - Illuminating Engineering Society of North America or any successor organization

Indirect light - light which is scattered or reflected off other surfaces

Internally illuminated sign - any sign which all or part of the exterior surface releases light established from an internal light source

Lamp - any artificial source of light, including a bulb or tube

LED - Light Emitting Diodes, a semiconductor light source; the most updated implementation in lighting fixtures, LEDs are more energy efficient, have longer life spans, and produce better colour and light quality than the older HPS lights

Light clutter - excessive grouping of light sources

Light fixture - the complete assembly which can include the lamp(s), housing, reflector, mounting bracket or pole socket

Light pollution - any adverse consequence of synthetic light including but not limited to, glare, light trespass, sky glow, energy waste, compromised safety and security, and impacts on the nocturnal setting

Light trespass - unwanted lighting of an area. Any light which falls beyond the property it is intended to illuminate

Lumen - a measuring unit that quantifies the amount of light produced by a lamp or emitted from a luminaire (distinct from 'watt', a measure of power consumption)

Luminaire – see Light fixture

Lux -

Official Plan - the City of London and Planning Area's Official Plan, as revised periodically

Outdoor lighting - any outdoor artificial illuminating devices, installed or portable, being used for flood lighting, general illumination or advertisement, and any associated lighting control equipment

Outdoor recreational facilities

Over-illumination - lighting of areas at levels beyond those at which human vision is able to differentiate

Owner - the person appearing as the registered Owner according to the records of the proper land registry office or a person in the actual occupation of land sold to the Director in accordance with the Veterans' Land Act (Canada) shall also be considered to be the Owner

Partly shielded luminaire - a luminaire with opaque top and transparent or perforated sides, designed to emit most light downward

Repair(s) - reconstruction or renewal of any part of an existing luminaire for the purpose of its ongoing operation, other than relamping or replacement of components including capacitor, ballast, or photocell. Note that retrofitting a luminaire with new lamp and/or ballast technology is not considered a repair and for the purposes of this ordinance the luminaire shall be treated as if new. "Repair" does not include normal relamping or replacement of components including capacitor, ballast, or photocell **[[straight from MLO]]**

Replacement lighting - specific installations that will replace existing lighting which is sufficiently broken beyond repair

Person - includes but is not limited to, an individual, sole proprietorship, partnership, association or corporation

Shielded directional luminaire - refers to luminaires with an adjustable mounting device allowing aim in any direction and contains a shield, louver, or baffle to reduce direct view of lamp

Sky Glow - any brightening of the nighttime sky that results from scattering and reflection of artificial light by moisture and dust particles in the atmosphere; it is caused by light directed or reflected upwards and sideways; reduces one's ability to view the night sky

Street -

Street townhouse -

Sufficient daylight -

Third party - contracts that provide lighting, such as a utility company

Transparent noise barriers -

Vanity lighting - lighting for the purpose of drawing attention. Lighting to illuminate landscaping features (e.g. trees, stones, or water), building facades etc., but not signage

Ventilation grates -

Vertical illuminance - illuminance measured or calculated in a plane perpendicular to the site boundary or property line

Visual markers -

Wall-pack light fixture - light fixtures on exterior of buildings or walls

Yard lighting - fixtures mounted on poles or building faces which brightens broad areas such as parking lots, driveways, landscaped and recreational areas

2. PURPOSE AND JUSTIFICATION

Direction 4 of the new London Plan (The London Plan, p. 21) is for the City of London to become one of the greenest cities in Canada by reducing carbon footprint and human impacts on the environment, to manage costs of growth, and to ensure a high quality of life and health for all Londoners⁶. Specifically, The London Plan aims to minimize bird strikes on buildings and reduce negative impacts of light pollution⁶. The purpose of this document is to provide recommendations and guidelines for by-law development that the City of London can implement to minimize both light pollution and mortality of birds. These recommendations can be applied to all types of development (high, low rise, residential, commercial, industrial, and institutional), and are based on a number of pre-existing guidelines in Ontario cities^{2-5,7-10}.

2.1 Ecological Impacts

Light pollution impacts the behaviour and survival of birds, mammals, amphibians, fish, and arthropods, and therefore has large consequences on ecological health both locally and nationally¹¹. Specific threats to wildlife include disruption of movement and migration¹²⁻¹⁵, altered communication and reproductive behaviour (e.g. songbird call times)¹⁶, shifts in diversity and interspecific interactions^{17,18}, disruption of foraging behaviour, and increased mortality¹⁹⁻²². In Canada it is estimated that 25 million birds die from collisions with buildings annually²³.

2.2 Carbon Footprint and Cost

Goals of the 2014 London Community Energy Action Plan²⁴ include an 80% reduction in greenhouse emissions by 2050 in addition to energy cost savings. Policy and design standards to reduce wasted lighting energy are crucial if the City of London is to achieve these goals; wasted energy in the United States is estimated at 17.4 billion kilowatt-hours—or 32 million barrels of oil²⁵, which is the equivalent to between 1 and 2.5 tons of CO₂²⁵. The negative economic impacts of light pollution on health, wildlife, and astronomy are estimated at \$7 billion each year in the US¹¹.

2.3 Health, Crime, and Road Safety

Our circadian rhythms rely on light-dark cycles that are increasingly disrupted by artificial night-time lighting. Loss of circadian rhythm affects our behaviour, suppresses melatonin release (which increases risk of breast cancer)^{11,26}, and may exacerbate depression and mood disorders, obesity, diabetes, and reproductive problems²⁷⁻²⁹. Light pollution also reduces the ability of our eyes to adjust to darkness and to see the Milky Way or other astronomical objects³⁰. Over time this leads to a shifting baseline of appreciation for nature in our city^{31,32}.

It is commonly believed that night-time lighting provides security against crime, however numerous studies have failed to show reduction in crime rates with enhanced night-time lighting^{33,34}. In Chicago, crime (mainly substance abuse) actually increased when alley lighting was increased³⁵. Furthermore, power outages and reductions in night-time lighting have been correlated with reduced crime rates³³. Night-time lighting has also been shown to decrease road safety due to glare²⁷. Reduction in road lighting was not found to increase crime or collisions at night, and dimming of road lights may even reduce crime³⁶.

3. GENERAL INFORMATION

3.1 Light Pollution

City of London's Advisory Committee on the Environment (ACE), Environmental and Ecological Protection Advisory Committee (EEPAC), and Animal Welfare Advisory Committee (AWAC) (or 'we the committees') collectively recognize that it is optimistic to encourage and protect the night time dark skies through responsible city lighting policies and education of the public. These committees recognize that other Canadian cities have passed outdoor lighting ordinances while reducing glare and light intrusion while promoting energy conservation and healthier neighborhoods. Most notably the Town of Richmond Hill which applies to all outdoor light fixtures erected, installed or used in the Town in conjunction with:

- commercial uses, including parking lots;
- industrial uses;

- institutional uses;
- recreational or athletic uses;
- or residential uses of five dwelling units or more on a single lot.

By utilizing the International Dark Sky Alliance and the Illuminating Engineering Society of North America’s (IESNA) approved *Model Lighting Ordinance* (MLO), an outdoor lighting template designed to help municipalities develop outdoor lighting standards that reduces glare, light intrusion, and sky-glow.

Light pollution is defined by Gallaway *et al.* as “excessive or obtrusive artificial light caused by bad lighting design”¹¹. Proper lighting design and illumination standards can reduce light pollution by preventing lighting in specific areas, limiting lighting duration, reducing light trespass, and reducing light intensity²¹. This document outlines the requirements for any person installing outdoor lighting within the boundaries of the City of London.

3.2 Bird-Friendly Design

Bird-friendly site design is an important part of creating a city wide progressive green development standard and should be implemented where ever possible to include as many of the above outlined bird friendly strategies for reducing light pollution and reflective glass, along with type of ventilation grates to effectively reduce migratory bird deaths. These bird-friendly development recommendations have been informed by The City of Toronto’s Bird Friendly Development Guidelines⁹ and contain rationales for policy and standards for city building design and development, and information and recommendations for businesses, residents, and building owners. Information contained in this document can be referenced in order to further understand how the following recommendations relate to reducing migratory bird fatalities in the urban cityscape.

In accordance with The City of London’s Humane Urban Wildlife Conflict Policy, we the committees recommend the City of London take measures to reduce the thousands of bird fatalities due to light pollution and reflective glass through:

- Placement of bird-friendly exterior light fixtures in conjunction with glass design elements within the parameters of proper building and safety codes.
- The adoption of a migratory bird policy (Refer to City of Toronto’s Green Development Standard Bird Friendly Guideline)⁹
- Provision of a comprehensive list of design based development strategy options to architects, planners, urban designers, building owners and managers, tenants, and homeowners that can be applied to new or existing buildings.
- A campaign that promotes awareness of the dangers the urban environment poses to migrating birds such as the City of Toronto’s “Lights Out Toronto” event coinciding with the spring and fall bird migration.
- A rating and acknowledgment system that recognizes and rewards participating buildings for efforts to implement these recommendations.
- Bird friendly site ventilation grates (ventilation grates with porosity no greater than 2 cm x 2 cm or ventilation grates covered with netting to prevent injured birds from falling through).

- Use of transparent noise barriers be avoided or treated in such a way as to create visual markers for birds to perceive them.
- Elimination of mirrors as part of exterior landscape or building design. Mirrors create reflected habitat which kill and maim birds as they are unable to distinguish reflected habitat from real habitat.

4. LIGHTING DESIGN CRITERIA

All general recommendations found in Section 4.2 (below) are applicable to all newly installed lighting fixtures and are based on Hiscocks City of Toronto Guidelines from 2011⁸. More specific design details can be found in the following sections based on site usage type. These guidelines do not take precedence over highway and road lighting bylaws. These recommendations and criteria are amalgamated from the design guideline recommendations of the Model Lighting Ordinance, and various documents from the City of Toronto, City of Burlington, and the City of Richmond.

4.1 Grandfathered Lighting

All existing light fixtures in place at the time of this policy shall be grandfathered. Grandfathered light fixtures which are determined to cause excessive glare or light trespass may be required to be shielded, redirected, or removed. Any modification, relocation, repair, or reinstallation of any grandfathered light fixture must meet the design criteria laid out below (Sections 4.2 - 4.12). Should a property undergo a use or zoning change, all light fixtures must be updated to meet the design criteria below. All new fixtures installed after the date of this policy must meet the design criteria below.

4.2 Universal Outdoor Light Fixture Requirements

The general recommendations laid out below apply to all properties and lots unless otherwise stated.

- All outdoor light fixture installations must use fully shielded or full cut-off fixtures.
- Light fixture mounts/poles must have a non-reflective finish to reduce glare.
- Maximum lumen levels for different light fixture heights must conform to the table below:

Table 4.2A

Mounting Height (ft.)	Maximum Single Light Fixture Lumens
6	500 – 1000
8	600 – 1600
10	1000 – 2000
12	1600 – 2400

- All installed lighting must incorporate an automatic switch which will extinguish all outdoor lighting upon sufficient daylight. These switches can include photoelectric, astronomic, programmable, building automation switch and must include a backup power device (battery or other).
- Occupancy sensors/timers/motion sensors on all outdoor light fixtures must be installed (excluding service stations, gas stations, signage, garage entrances, tunnels, pedestrian, or roadway lighting).
- Light trespass at the property line will not exceed 11.6 lumens per square foot for commercial/industrial property boundaries or 5.8 lumens per square foot for residential property

boundaries. In the case of a mixed residential/commercial boundary, the value for the residential shall take precedence.

- Adjustable, or swivel fixtures, are prohibited.
- Pole heights cannot exceed a height = (distance to property line) * 4 and should not exceed height of adjacent structures (with the exception of large parking lots/garages). If a commercial zone light fixture must be installed higher due to safety considerations, greater cut-off shielding must be installed.
- Glare to adjacent properties, roadways, and pedestrian thoroughways is prohibited. This may require the use of additional shielding.
- No installed light fixtures will ever emit light above 90 degrees from a direct downward plane.
- All light fixtures must be directed in such a way so that the light source is not directly visible from adjacent properties.
- Openings in buildings which will contribute to light spillage must be blocked or shielded to transmit less than 10% light during the overnight hours (11 PM - 6 AM).

4.3 Residential

All residential zones (R1 through R11) must adhere to the requirements listed above. If the residential zone is combined with a non-residential zone, lighting may follow the non-residential site lumen allowance listed in Section 4.4. These properties are strongly encouraged to meet both non-residential and residential guidelines. Otherwise, residential guidelines are found below.

- Maximum single fixture lumen allowance at a main entrance will not exceed 1,260 lumens.
- Maximum lumen allowance for each additional fixture, excluding main entrance, driveway/parking (Section 4.5.2), and motion sensed security lighting (Section 4.5.7), is 315 lumens.
- All residential buildings with 5 or more stories, shielded directional floodlights for security are not to exceed 1,260 lumens each.

Additional design criteria for specific types of sites or property uses are included in Section 4.5. This includes parking lots and security lighting, which may be utilized for residential properties.

4.4 Non-Residential

For all non-residential sites, Table 4.4A must be followed. Site total lumen allowance will be determined by number of parking spaces (if site has fewer than 10) or total square footage of hardscape. Some specific types of site usage will have additional design considerations or may receive additional lumen allowance. These site lumens may be divided among all light fixtures on the property, so long as they adhere to the universal guidelines noted above (Section 4.2) and any specific site guidelines below.

Table 4.4A

Light Zone Code	City of London Property Zone Code(s)			Lumen allowance	
				Lumens / parking space (for sites <= 10 parking spaces)	Lumens / ft ² of hardscape (sites > 10 parking spaces)
LZ-0	AG	ER	OS	350	0.5
	UR				
LZ-1	AG	DC	HER	490	1.25
	C				
	OC	RO	RRC		
	T	TGS			
LZ-2	AC	GI	OF	630	2.5
	ASA	HS	OR		
	BDC	LI	RSC		
	CC	NF	NSA		
	CF	CSA	OB		
	CR				
LZ-3	DA	RF	SS	840	5
	EX	RSA			
	HI	RT			

Values obtained from ⁵.
Residential zones have been excluded. This table is intended for non-residential zones only.

4.5 Specific Use Design Considerations and Lumen Allowance Additions

The following sections have been provided for guidance for all commercial and industrial zones. Additionally, some residential zones or high density residential zones that require guidance on security, parking lot lighting, or vanity lighting can reference the below sections as well.

4.5.1 Entertainment Venues and Events

Entertainment venues and specific events are to be evaluated individually on a case by case basis.

4.5.2 Parking Lots/Garages

Lighting in parking lots and garages are primarily for the safety of pedestrians. Parking structure lighting should be modulated so that they transition to match, but not exceed, adjacent roadway lighting levels at exits/entrances. All parking lots must meet the maximum lumens at property line as described in Section 4.2.

In general, all parking lots shall have an average horizontal illuminance of no more than 25 lux with a point maximum not to exceed 40 lux. In the individualized case that a parking lot requires

enhanced security due to the threat of vandalism or personal safety, the average horizontal illuminance and maximum point value illuminance may be no greater than 75 lux.

These recommendations apply to any and all residential, institutional, customer, employee, or general use parking lots and are additional design considerations in conjunction with the lumen allowance for non-residential sites.

4.5.3 Outdoor Sales Lots

Illumination of sales lots is employed to draw attention to the displayed product and/or for security purposes. The lighting requirements include a graduated illuminance level from the front row (between the roadway and the front row of merchandise) to the last row. In addition to the universal guidelines presented in section 4.2, site maximum horizontal illuminance is not to exceed:

- 100 lux at the front row,
- 50 lux at all other rows,
- 20 lux at all pathways/drives on the property.

In addition to the lumen allowance provided in Table 4.4A, outdoor sales lots used exclusively for the sale of vehicles have an additional allowance of:

- LZ-1, additional 4 lumens per square foot,
- LZ-2, additional 8 lumens per square foot,
- LZ-3, additional 16 lumens per square foot.

These recommendations apply to every outdoor sales lot to be illuminated and are to be incorporated into the light fixture design in accordance to the lumen allowance for non-residential areas.

4.5.4 Service Stations/Gas Stations

The purpose of lighting a service/gas station is to ensure patron safety and to draw attention and interest to the business. Over-illumination of the property is prohibited, and the illumination limits for property boundaries must be maintained. Installed fixtures are to be limited to a canopy whenever possible. In addition to adherence to the universal guidelines presented in section 4.2, site average horizontal illuminance is not to exceed:

- 100 lux for pump island/under canopy,
- 30 lux for service areas, and
- 20 lux for pathways/drives.

In addition to the allowance provided in Table 4.4A, service stations/gas stations have additional allowed lumens:

- LZ-1, 4000 additional lumens per pump,
- LZ-2, 8000 additional lumens per pump,
- LZ-3, 16,000 additional lumens per pump.

These values are additional design criteria which need to be implemented in conjunction with the lumen allowance provided for non-residential sites.

4.5.5 Sports Recreational Fields

Outdoor sports fields require lighting for clear illumination of players. Sports/recreational fields have been divided into 4 classes:

1. More than 5,000 attendance seats (i.e. universities, colleges, semi-pro players)
2. 1,500 – 5,000 attendance seats (i.e. small universities or colleges, high-attendance high schools)
3. 500 – 1,500 attendance seats (i.e. high schools, training clubs with spectator seats)
4. Less than 500 attendance seats (i.e. leagues, elementary schools, little league, social events)

Using this classification system, illumination levels and equipment must adhere to the IESNA Recommended Practice for Sports and Recreational Area Lighting (RP-6, latest edition). Values, positioning, pole height, curfew timing mandated in the IESNA RP-6 shall take precedence over the requirements outlined in this document.

4.5.6 Architectural/Vanity Lighting

Architectural lighting is used to highlight and attract attention to architectural features, heritage features, and municipal landscaping, monuments, or fountains. Architectural/vanity lighting is prohibited for residences less than 5 stories. No fixture will be installed to emit light above the horizontal plane (e.g. directly upwards). No light fixture will be aimed at reflective or polished surfaces such as glass, smooth stone, glazed tile, etc. The maximum total illuminance shall not exceed 100 lux.

Lumens from architectural light fixtures must be included in the site lumen count for the allowance for non-residential sites.

4.5.7 Security Lighting

Lighting to ensure the safety of pedestrians shall be lit as required. Light fixtures for this purpose shall:

- Reduce brightness contrast
- Ensure no light is directed 90 degrees above the horizontal.
- Employ motion sensors

These guidelines shall apply to all pedestrian trafficked areas and will be included in the site/lot lumen allowance.

5. HOURS OF OPERATION

Recommendations for luminance and timing of lighting are intended to reduce or eliminate unnecessary lighting. “Typically, curfews go into effect one hour after the close of business. Restaurants, bars, and major entertainment facilities such as sports stadiums may require the curfew go into effect two hours after the close of business. The *authority* may elect to have no curfew for facilities with shift workers and 24 hour

operations, or to extend the curfew time to meet specific needs. Areas without street lights or with very low ambient light levels should consider turning off all non-emergency lighting at curfew while commercial areas or urban areas may prefer a reduction in lighting levels. A reduction of at least 30% is recommended for most uses¹. Illuminated signs are subject to the curfew³⁷.

5.1 Application - All outdoor light fixtures except as otherwise indicated; this Chapter applies to all outdoor light fixtures erected, installed or used in the city of London in combination 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

5.2 Outdoor Light Fixtures

All property owners on which outdoor light fixtures are erected or installed shall ensure that those outdoor light fixtures are turned off between 11:00 PM and sunrise the following day except.

5.3 Recreational use - after 11 PM - limitation

Where an outdoor recreational use in an outdoor recreational facility continues after 11 PM, outdoor light fixtures required to be on in connection with that use are permitted, but only while that use continues.

5.4 Entertainment event - after 11 PM - limitation

Where a concert, play or other entertainment event in a park or on other land owned by the Corporation and used for public purposes takes place or continues after 11 PM, outdoor light fixtures required to be on in connection with that event are permitted, but only while the event takes place or continues.

5.5 Commercial/Industrial/Institutional Areas

In areas used for commercial, industrial, or institutional purposes where personnel relevant to such uses are working on the premises after 11 PM, outdoor light fixtures are required to be on in connection with such uses are permitted, but only while such uses are carried on.

- Outdoor light fixtures, including wall- pack lights, will be completely shielded. This includes outdoor lighting for all residential, commercial, industrial, recreational and green space areas.
- Lamps of 100 watts or more are limited to light sources with a maximum of 60 lumens per watts.
- Luminaires with adjustable or swivel type heads are not permitted.
- Any poles or structures utilized for mounting outdoor luminaries will have a non-reflective finish, to minimize the reflected the glare.
- Energy will be conserved by controlling the light's turn-on and turn-off times in accordance with the provisions of the Ontario Building Code, Sentence 12.3.4.11. Refer to Appendix () for the maximum allowable lighting power densities as an indicator of consumption for various types of outdoor areas, in accordance to the Ontario Building Code Sentence 12.3.4.10.
- As a means of limiting sky glow, consideration shall be given to reducing the wattage of luminaries and reducing the lighting in periods of limited activity.

- As a means of limiting light trespass, consideration should be given to location of poles, shielding of luminaires, lowering mounting height of luminaries, in proximity of property limits and utilizing lower wattage luminaries.
- Prohibitions for advertising or entertainment purposes:
 - Laser source light
 - Searchlights
 - Strobe/Twinkling/Chasing lights

6. BIRD-FRIENDLY DESIGN

- The following strategies outline recommendations for achieving green standards for bird-friendly development, and are derived from the City of Toronto Green Development Standard: Bird-Friendly Development Guidelines, (2007 #43}. **(*Replace this first statement with): The following strategies recommendations for achieving green standards for bird-friendly development and are derived from the City of Toronto's Green Standard (TGS) 2014 and it's supporting document, 2016 Bird Friendly Best Practices Glass) Add in: Further, we recommend that all new projects, significant renovations to City owned buildings, and its Agencies, Commissions, and Corporations be required to uphold a higher level of protection for birds by applying exterior glazing within the first 16m of the building, with a denser pattern of visual markers on glass at a spacing of 50mm x 50mm.**

Options for creating visual markers, treating glass, and muting reflection shall be applied wherever possible to glass features and windows for the first 12 m above grade (dimensions relate to typical tree heights). Dimensions for visual markers and muting reflection applications are subject to building design and site conditions:

6.1 Visual Markers

Visual markers are the most effective technique to reduce window strikes. The distance between patterns or applications on glass must be no further than 28 cm, with a distance of 10 cm or less being the most effective pattern for projecting buildings as solid objects to birds. **(*Replace this paragraph with updated as follows:) are the most effective technique to reduce window strikes when applied in combination with opaque contrasting points/patterns. The distance between points/patterns on glass must be a minimum of 5mm with a maximum spacing of 100 mmx100 mm and must be applied to low reflectance glass, be high contrast, to be the most effective pattern for projecting buildings as solid objects to birds.**

6.2 Glass Treatment

- Glass treatments shall be applied above 12 m to the height of or anticipated height of the surrounding tree canopy (add) whichever is greater and vegetation at maturity in sites close to natural areas such as ravines or woodlots. Glass treatments must also be applied to glass adjacent to or in the vicinity of elevated landscapes such as podium gardens and green roofs. Glass treatment options must also be applied to windbreaks, solariums and greenhouses in order to create sufficient visual markers for birds **(*Add:) Areas posing a high risk for bird collisions must be treated using visual markers. This include glass balcony railings, fly-through conditions, parallel glass (such as bridges and walkways), and areas adjacent to roof top vegetation.**

Patterned or 'fritted' glass refers to glass which contains opaque or translucent images or abstract patterns. The images are created by using dots in a variety of sizes and densities. Only non-reflective glass should be used when combined with fritted patterns.

Film products refers to external film applications or laminates which contain images or patterns and can be designed to enhance the architectural design of the building. (*Add in:) This application is not recommended for new buildings due to its short lifespan (a fraction of the overall operating life of a building).

(*Add in) **Opaque and Translucent Glass includes etched, stained, glass block, and frosted glass.**

(* Add in) **UV Glass** able to reflect and absorb light and must be demonstrable. (See Toronto Green Standard version 2.0 and 2016 Bird Friendly Best Practices Glass pg. 29 for performance measures.)

(*Add in:) **Low Reflectance Glass less than 15 percent reflectance is not a sufficient deterrent on its own and must only be applied with visual markers.**

(*Decals deleted)

(*Add in:) **Exterior Screens, Grills, Shudders and Sunshades** (*Take out: **Decorative Grilles and Louvres**) Decorative facades, netting, screens, grilles, shutters, and exterior shades applied to exterior grille features can be retrofitted on or applied to existing, and new developments.

Fenestration Patterns refer to multiple paned glass containing horizontal and vertical mullions. Panes must be no more than 28 cm with 10 cm or less the most effective visual marker.

Art work applied to the interior or exterior of windows can be used to provide sufficient visual markers while allowing for natural light.

(*Add in:) **Building Envelope** with a total window surface area of 25-40 percent relative to the entire building façade.

(*Add in:) **Design to Eliminate Fly-Through Conditions** such as glass bridges, walkways, outdoor railings, free standing glass, glass wall and or window corners.

(*Add in:) **Treat All Existing Glass Corners** within the first 12 meters of the building and all glazing at building corners with visual mark at a spacing of no greater than 100mm x 100m.

(*Add in:) **Treat All Parallel Glass** at all heights with visual markers at a spacing of no greater than 100mm x 100m.

(*Add in:) **Roof Top Vegetation:** Treat glazing to the first 4m above the feature with a buffer width of a minimum of 2.5 m on either side of the feature.

(*Add in:) **Spandrel Glass** must have either solid black-painted frit or silicone backing opaque coating or reflective or low e coatings with a reflectance no greater than 15 percent.

6.3 Muting Reflections Options

(Internal screens deleted)

Awnings and overhangs to mute images at ground floor level **(Add in) are far less effective than visual markers applied directly to glass.*

*(*Add in:) **Building-Integrated Structures** include opaque awnings, sunshades, exterior screens, shutters, grilles, overhangs, and balconies that provide shade at a ratio no greater than 1:1 below projection. *Shade cast by buildings/or adjacent buildings do not deter bird collisions.*

*(*Sunshades deleted)*

*(*Angled Glass deleted)*

6.4 External Lighting

Decorative Lighting should be eliminated wherever possible. For existing buildings, decorative lighting should be projected downward and turned off during migratory season.

Advertising Lighting must be lit from above to reduce the volume of light being projected unnecessarily into the night sky.

Event and Festival Lighting such as spotlights and search lights must be prohibited during bird migration season.

Roof Top Lighting that should be prohibited. Vanity lighting may be allowed only if the following conditions are met:

- Exterior light fixtures are installed to prevent unnecessary light spillage.
- Vanity lighting is turned off from 11PM-5AM year round without exception utilizing an automatic device.

Overrides after hours may be provided by a manual or occupant sensing device with a limit of a 30 min.

6.5 Interior Lighting

Bird Friendly Operational Systems and Practices refers to the use of operating and system practices by residents, tenants, building owners, and managers that help to reduce migratory bird fatalities. The following strategies can be used:

Installation of interior task lighting at work stations be the recommended light source during evening work hours, increasing energy efficiency, reducing light pollution, and migratory bird fatalities. Overhead lighting be turned off at night and focused lighting such as task lighting be used during bird migration season.

Provision of shielding from interior generated light with less than 10 % transmittance overnight for all fenestrations (windows, doors, skylights, curtained walls), for example blinds and curtains.

Motion-Sensitive Lighting to be installed and retrofitted in lobbies, walkways, corridors, and **operating systems** that automatically turn off lights during after work hours.

Internal Location of Greenery: Building owners and managers must locate greenery away from clear glass and minimize lighting levels through motion sensing lighting in ground floor lobbies, walkways and corridors and retrofit glass in these areas wherever possible with bird friendly window applications in order to meet the Bird Friendly Green Standard. (Birds drawn into cityscapes by light pollution seek safety by flying towards greenery and are extremely dangerous in these areas.)

7. BIRD AND LIGHT GUIDELINE EXEMPTIONS

7.1. Temporary Exemptions

Any person may submit a written request for temporary exemption from the recommendations by completing a written request form prepared by the City.

The written request should include:

- Specific exemption request
- Type and use of exterior lighting involved
- Date(s) of the event
- Duration of the event
- Location of exterior lighting
- Size, wattage, and height of proposed lighting

The owner of the land upon which the prohibited light(s) will be placed shall apply to the city for an exemption. Plans for the location and fixture specifications for the specified light(s) shall be submitted with the application.

An exemption may be granted in whole or in part with terms and conditions. Any breach by the applicant of any of the terms or conditions will render the exemption null and void.

7.2. General Exemptions

- Temporary/seasonal low wattage lighting (e.g. Christmas lighting or other holiday decorative lighting). Should a building or residence leave these temporary seasonal/holiday lighting up beyond a period of 4 months after the given holiday, they will no longer be exempt from these guidelines
- Vehicular and temporary emergency lighting required by Fire and Police departments, or other emergency services shall be exempt from the requirements of the By-law.
- All airport lighting. This includes navigation, runway, and taxiways lighting. All radio communications and navigation towers that require lights shall also be exempt.
- Outdoor lighting utilizing fossil fuels, including torches, lanterns, and open flames.
- Lights used for identification by contractors, providing the lights are located on the property where such work is taking place and only during hours where work is occurring.
- The requirements of the By-law do not apply to theatrical, film, or television productions approved by the City.
- Specific instances where concern for public safety conflicts with the guidelines outlined in this document will be evaluated on a case-by-case basis.

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