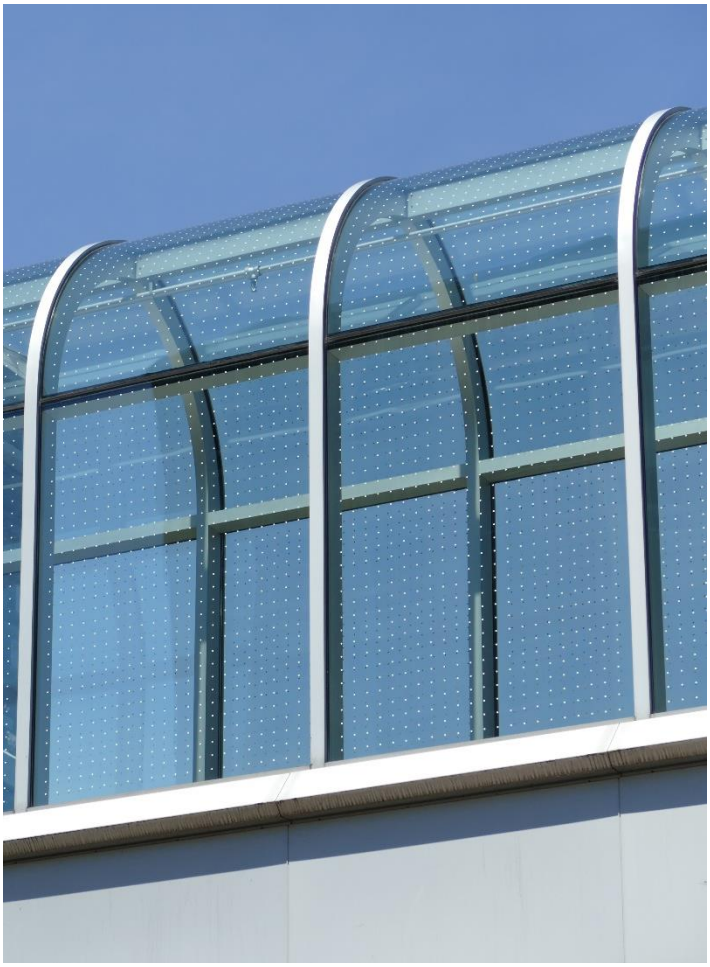
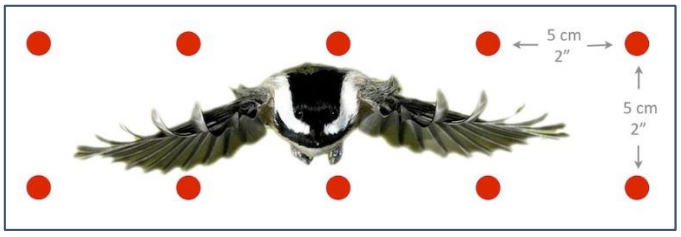
Bird-Safe Design Guidelines





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Cover illustrations: Diagram illustrating proper spacing of markers for bird-safe glass by American Bird Conservancy / Safe Wings Ottawa. Other photos by Amy MacPherson.

Preamble

The City of Ottawa recognises that birds are an essential part of our environment, and that their ability to survive in our city is threatened in part by its buildings and structures. Several cities in North America have already adopted design guidelines to reduce this threat. Ottawa has reviewed these guidelines from other municipalities and jurisdictions and adapted them to suit our City's environmental and planning context, which spans a broad range of settings from downtown core to rural. Ottawa's Bird-Safe Design Guidelines are intended to be used during the planning stage of private or public development projects to minimize the potential risks to birds.

The Bird Friendly Building Program was initially developed by the World Wildlife Fund Canada and Fatal Light Awareness Program (FLAP) Canada in 1995, to address bird collisions with lit buildings at night. Since then, the term "bird-friendly" has grown to include a wide variety of mitigation measures aimed at reducing risks to birds in the built environment. The term "bird-safe" is increasingly being used to more clearly identify design features and other factors that have been scientifically proven to avoid or reduce risks to birds. Other design features, including some which are intended to attract birds, may still be considered "bird-friendly," provided that they do not increase risks to birds. The primary focus of these guidelines is on bird safety.

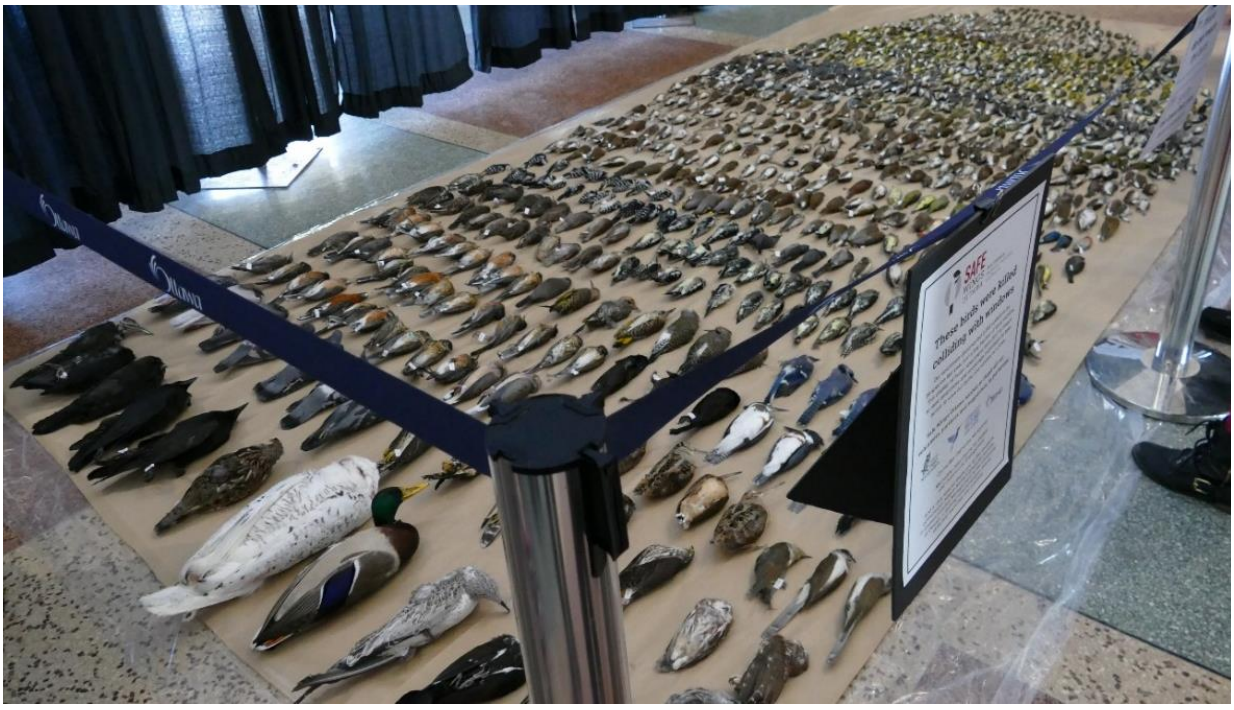


Figure 1: Display of birds killed by collisions with buildings in Ottawa, collected by Safe Wings volunteers in 2017. While most victims of collisions are songbirds, even large birds such as ducks, hawks and owls are vulnerable.

Introduction

Birds perform vital roles in our environment such as distributing seeds, eating insects, and in some cases pollinating plants. They help to maintain the ecological health of wetlands, forests and valleylands, and provide us with valuable pest control services for agriculture and forestry. Birds also keep Ottawa residents in touch with nature, even in the urban parts of the City, and add to our quality of life. Over 180 bird species nest in the Ottawa area, with approximately two million birds nesting in our urban area alone (Ottawa Bird Count, 2019). Several of these are listed as species at risk under provincial and/or federal legislation. Millions more birds, including a suite of other species, pass through Ottawa during migration, stopping over to rest, forage, or avoid inclement weather.

The State of the Birds report (NABCI, 2019) notes that total North American bird populations have decreased by nearly 30 per cent over the past 50 years, due in large part to habitat loss and degradation, but also to direct mortality from collisions and other anthropogenic factors. Cities provide attractive habitat for many species of birds, particularly in parkland and suburban neighbourhoods, but also force birds to navigate a potentially deadly maze of obstacles. Bird strikes on buildings and other structures are the second largest anthropogenic cause of bird mortality in Canada and the United States, second only to predation by domestic cats (Calvert et al., 2013; Loss et al., 2014). Each year, an estimated 16 to 42 million birds are killed across Canada from collisions with buildings (Machtans et al., 2013). Safe Wings Ottawa estimates the local death toll to be approximately 250,000 birds per year, extrapolating from the national data.

Collision rates increase in proportion to local bird numbers and activity levels at any given time. More collisions typically occur during spring and fall migration, and early in the day when birds are foraging for food (Gelb and Delacretaz, 2009). While different species migrate at different times of year, most migratory activity in our area occurs in the spring from March through May, and in the fall from August through November. Some far northern breeders will begin migrating south as early as July, however.

While public perception often associates bird strikes with high-rise buildings, most collisions occur closer to the ground, where birds are most active. Houses are responsible for approximately 44-90 per cent of bird collisions, while low to mid-rise buildings (up to 11 storeys) account for 10-55 per cent, and high-rise buildings less than 1 per cent (Machtans et al., 2013; Loss et al., 2014). This is largely due to the much greater numbers of houses and low to mid-rise buildings in our landscape, which results in a correspondingly high cumulative mortality rate (Loss et al., 2014). However, **on an individual basis**, large buildings (whether low, mid or high-rise) tend to have higher per-structure kill rates than houses due to their greater surface area and, frequently, their more extensive use of glass and lighting. Targeted mitigation in such buildings can substantially reduce bird deaths, and can be readily achieved for new buildings through

the design process. Mitigating the broader risk to birds from many thousands of existing buildings relies upon raising awareness of the issue and its solutions.

A significant body of knowledge on the causes and prevention of collisions has been amassed, based on years of experience in various jurisdictions. This has resulted in the identification of several design principles that can significantly reduce the risk of bird collisions. Some particularly important aspects of **bird-safe design** include:

- Treating glass to make it more visible as a barrier to birds (see Guideline 2).
- Eliminating design traps such as glass passageways or corners that are invisible to birds (see Guideline 3).
- Designing landscaping to reduce the risk of collisions (see Guideline 5).
- Designing and managing exterior lighting to minimize impacts on night migrating or nocturnal birds (see Guideline 6).
- Turning off or minimizing interior lighting, especially during spring and fall migration periods (see Guideline 7).

Many residents are interested in attracting birds to their yards, using bird-friendly features such as:

- Landscaping with native plant species that supply food and/or shelter to birds.
- Water features that provide clean water for birds to drink and bathe in.
- Birdhouses or nest platforms.

These attractants should not be used without first considering bird-safe design. Safety should be prioritized so that birds are not attracted into an unsafe location where their risk of collisions is increased.

Legislative Context

Bird-safe measures are not currently mandated under the Building Code at either a provincial or national level. However, the Canadian Standards Association (CSA) Group has developed a National Standard of Canada for bird-friendly building design (CSA A460:19). That document was prepared by an extensive multi-disciplinary technical committee, and was published in May 2019. The City's guidelines are consistent with the specifications provided in the CSA document. Should any senior level of government introduce legal requirements for bird-safe measures in future, those requirements would be incorporated into City planning processes.

The Ontario Court of Justice ruled in 2013 that sunlight reflecting from buildings in such a way that causes bird deaths constitutes a "contaminant" under the provincial *Environmental Protection Act* (EPA; Podolsky v. Cadillac Fairview, 2013). The property

owner in that case was charged under both the EPA and the federal *Species at Risk Act*, due to the involvement of federally listed species. The defendants were acquitted because they were able to demonstrate that they were taking reasonable steps to correct the problem by installing window films. This suggests that incorporating bird-safe design measures can reduce legal risks to building owners, by demonstrating positive action to avoid contraventions of the *Environmental Protection Act* and the *Migratory Birds Convention Act*, as well as the *Endangered Species Act* and/or *Species at Risk Act* in areas frequented by endangered or threatened bird species.

Increased demand for bird collision mitigation measures in response to this case, and to the introduction of bird-friendly guidelines in several major jurisdictions, has spurred industry efforts to develop and market new products to meet the demand. Some products have proven more effective than others, and the situation continues to evolve with new technologies being tested.

Purpose and Application

The purpose of these guidelines is to inform building, landscape and lighting design at the planning stage of private or public development projects to minimize the threat of bird collisions. Ottawa's Bird-Safe Design Guidelines are also applicable to other types of projects where relevant (e.g., building retrofits and life cycle renewals). These guidelines are not limited only to buildings; they also apply to other structures that incorporate glass and glass-like panels (e.g. raised passageways, transit shelters, railings). While some aspects of these guidelines may not apply to every project, all should be considered during the planning and design stages to determine their relevance. Proponents are encouraged to follow all applicable guidelines. The overall goal is to reduce the risk of bird collisions in the City's built environment.

The use of these guidelines will be promoted by City staff during pre-application consultations and throughout the planning review process, particularly for site plans (in all parts of the city). They should also apply to some plans of subdivision (i.e., those located in or adjacent to natural areas and greenspaces). In cases where City staff determine that bird-safe measures are necessary based on a project's context or conceptual design, or where such measures are recommended as part of an Environmental Impact Study, conditions of approval may be applied to ensure that those measures are implemented. In such cases, specifications may be required to be shown or noted on accompanying plans and drawings where appropriate.

The guidelines also contain suggested treatments for existing buildings, which can be applied by residents or building owners and managers. The City does not have mechanisms to require the use of such measures outside of large-scale redevelopments requiring a Planning Act approval. The successful implementation of such retrofits therefore depends to a large extent on increasing the level of community awareness of the issue and the available solutions.

Building Design Guidelines

The guidelines in this section are presented in order of consideration during planning, from general environmental context to more detailed design features. Proponents are encouraged to follow all applicable guidelines in planning and designing their projects. **Guideline 2** addresses the most critical factor of bird-safe design (glazing) and it should be applied regardless of the project's context.

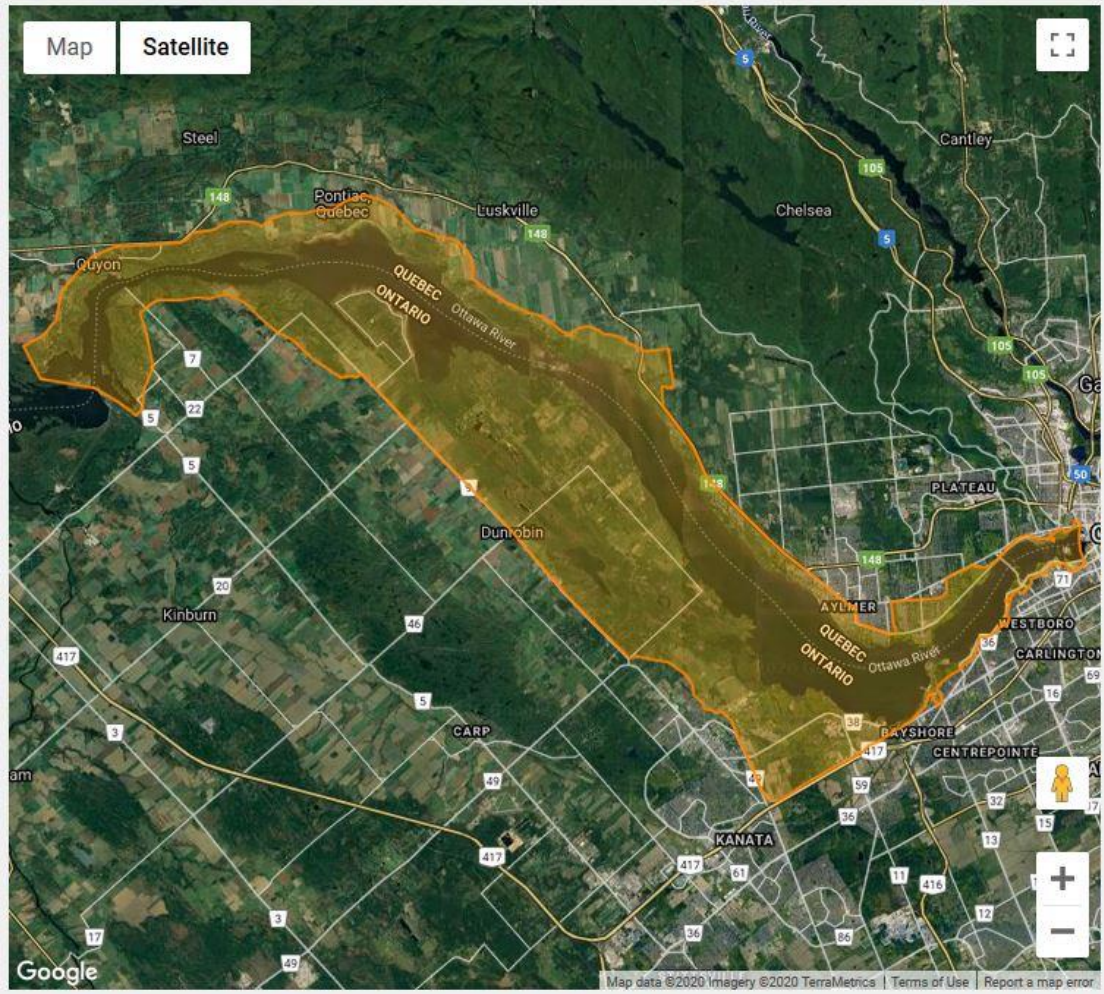
Guideline 1: Consider the environmental context

The siting of buildings in relation to the surrounding environment is always a key consideration in building design, and becomes particularly important in bird-safe design. Generally, buildings located adjacent to forests, parks, waterfront areas and wetlands (see Figure 2 below) are likely to have an increased probability of bird collisions due to the increased numbers and diversity of birds in these areas (Cusa et al., 2015). While many of the City's most sensitive natural areas are largely protected from development, our abundance of greenspaces and waterways means that it is not possible to entirely avoid building near attractants. Indeed, many of these features are also highly attractive to people and contribute to the liveability of our city.

Figure 2: Examples of development adjacent to natural areas.

Buildings and other structures located along known or suspected migration corridors (typically rivers, escarpments, or other linear landscape features) may pose a higher

risk of collision during spring and fall migration. The presence of the internationally recognised Lac Deschênes Important Bird and Biodiversity Area (IBA) along the Ottawa River in the western half of the City (see Figure 3 below) and other known staging habitats for waterfowl along the Bear Brook, Carp, Jock, Rideau and Mississippi River corridors, indicate that our **major waterways** serve a significant migratory function. These migratory pathways are not limited to the watercourses themselves, but include large swaths of the surrounding landscape, including the City's downtown core. Large natural areas in the Greenbelt and the rural parts of the City (e.g., Cumberland Forest, Osgoode Swamp, Marlborough Forest, Long Swamp, Carp Hills, etc.), also support movements of significant numbers of migratory songbirds. Refer to the **Natural Heritage Overlays** and related policies in the Official Plan for more information on the locations of core natural heritage features and linkages.



Disclaimer: IBA boundaries are generalized approximations reflecting dynamic populations of birds and their habitats. Boundaries are frequently reviewed and may change at any time. These data have been released for public interest and to encourage effective conservation.

The IBA Program is an international conservation initiative coordinated by BirdLife International. The Canadian co-partners for the IBA Program are Birds Canada and Nature Canada.

Figure 3: Lac Deschenes Important Bird and Biodiversity Area (IBA Canada, 2020).

Proximity of structures to natural areas and greenspaces also increases the risks to birds **throughout the year**, due to the attractive habitat these areas provide. Daily movement patterns of birds within and between natural areas and other patches of habitat in search of food, water and shelter may lead to collisions with nearby buildings.

The following measures should be used to address potential risks to birds based on the project's environmental context:

a) In cases where an Environmental Impact Study is required, the EIS should specifically include consideration of risks to birds and recommend mitigation measures in accordance with all applicable guidelines below. The assessment of potential risks should consider any planned greenspaces and landscaping within the new development, not just existing habitat areas. For plans of subdivision, mitigation measures may include recommendations relating to the content of owner awareness packages to inform and educate future homeowners.
b) In cases where no EIS is required, but the project is located adjacent to a river corridor or other greenspace (e.g., park, stormwater management facility, etc.) the following should apply:
    i. Where possible, site layout should minimize intrusion into habitat areas by buildings and other potentially hazardous structures;
    ii. Orientation of buildings should avoid or reduce reflection of attractive elements in glazing, to the extent possible (see also Guideline 2 below).

It is important to note that buildings and other structures in completely urban contexts can still pose a risk to birds (Cusa et al., 2015; Safe Wings Ottawa observations). Due to the presence of birds throughout our urban landscape, projects that are not located adjacent to natural areas or greenspaces should still be designed with consideration for potential risks to birds, with particular attention to Guideline 2 below.

Guideline 2: Minimize the transparency and reflectivity of glazing

Glazing is the most critical factor in bird-safe design. Glass, whether reflective, tinted or clear, is effectively invisible to birds. Any structure that incorporates glass or similarly transparent or reflective material in the design (including polished metal) can therefore cause bird collisions. The amount of glass on the exterior of a building is proportionally related to the number of bird collisions which are likely to occur (Klem et al., 2009; Hager et al., 2013, Cusa et al., 2015). From a "green buildings" perspective, while glass is important for bringing light into a building, increasing the window-to-wall ratio of a building will also increase the amount of energy required for heating and cooling (BC Housing, 2017). Fortunately, glazing options that can assist with energy conservation, glare reduction, and bird safety while still maintaining aesthetic appeal, are available. A building that results in preventable bird deaths should not be considered sustainable or "green".

There are two primary risk factors leading birds to collide with glass: **transparency** and **reflectivity**.

Transparency: Birds strike transparent panes because they simply do not see the glass and try to fly through it to reach habitat and/or sky on the other side. Buildings and other structures with glass corners or walkways, or that have large areas of parallel facing windows, are particularly hazardous. Large indoor plants or green walls visible through transparent glass windows may also attract birds and contribute to collision risks (Ross, 1946; Klem et al., 2009).

Figure 4: Transparent glass transit shelter.

Reflectivity: Birds also strike reflective panes while attempting to reach areas of sky or habitat mirrored in the surface. This can occur when light reflects off any type of glass or other highly polished surface, not just on mirrored or tinted glass. The birds perceive only the reflected image, rather than the hard surface itself. Reflections of shrubs and trees cause more collisions than pavement or grass (Gelb and Delacretaz, 2009).

Figure 5: Glass reflecting landscaping and buildings across the street.

The following guidelines are strongly recommended for **all projects** involving glazing, to reduce risks to birds:

a) Avoid monolithic, undistinguished expanses of glazing.
b) Incorporate visual interest or differentiation of material, texture, colour, opacity, or other features to fragment reflections.
c) Where glazing is used, bird-safe glass or glass with integrated protection measures is preferred (as per specifications below). Treatments should be applied to a **minimum** of 90 per cent of the glass within the first 16 metres of height as measured from the finished grade, or to the height of the adjacent mature tree canopy, whichever is greater.

d) Where green roofs, rooftop gardens or terraces are included in a design, any adjacent glazing should also be treated to a height of 4 m from the surface of the roof or terrace or the height of the adjacent mature vegetation, whichever is greater.

Specifications for Bird-Safe Glass

Several techniques can be used to make glass more visible to birds as a solid barrier. These include the use of closely spaced grilles or muntins (i.e., bars dividing individual panes of glass) and the application of commercial films and visual markers. Patterns and images can be applied directly to the glass during manufacture using ceramic fritting, acid etching, digital printing or silk-screening. Creative solutions such as painted murals may also be an option in some cases. Permanent or built-in treatments are preferred for their durability, but other solutions can be effective as long as they are properly maintained and replaced when necessary.

In cases where transparent glass is not required for visibility, low-reflectance opaque or frosted glass (including channel glass and glass blocks) are excellent options to reduce or eliminate collisions. Various finishes are available with differing levels of light transmission. This may include reflective or low-emissivity coatings that have an outside reflectance of 15 per cent or less. Opaque or frosted glass with an outside reflectance of greater than 15 per cent should only be used in combination with other strategies such as visual markers.

Specifications for effective visual markers:

- High colour contrast to the glass surface.
- Must be applied to the **exterior (first) surface** of the glass.
- Any pattern of visual marker is acceptable (i.e. lines, dots, etc.) as long as a maximum spacing of 50 mm by 50 mm is used (see Figure 6 below).
- Individual marker elements should be a **minimum** of 4 mm diameter, or 2 mm wide by 8 mm long for linear elements.

Treatments applied to interior surfaces of the glass **will not** adequately address reflectivity issues. They will also be less effective at reducing transparency issues if reflectivity is not addressed.

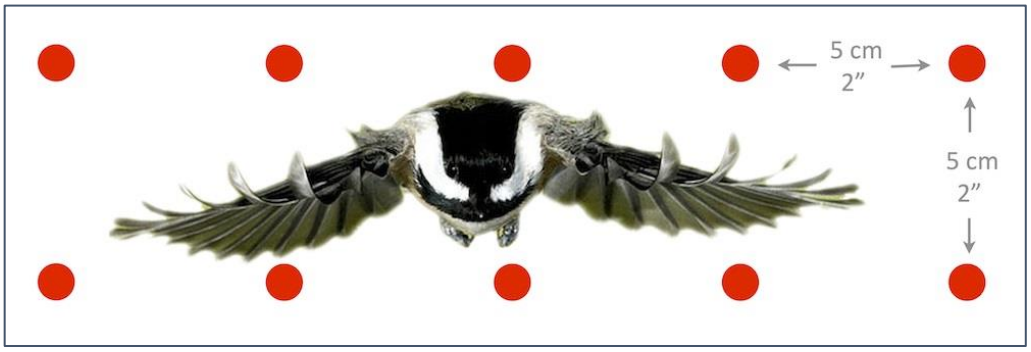


Figure 6: The spacing of markers is representative of the area occupied by a flying songbird, the most numerous victims of collisions (American Bird Conservancy / Safe Wings Ottawa).

Specifications for Integrated Protection Measures

Exterior treatments over windows (i.e. screens, grilles, shutters, shades) are common elements that can make glass safe for birds when correctly installed and maintained. The choice of treatment should be carefully considered in each case, as some treatments are more suited to specific building types (e.g., residential vs. commercial).

Stationary exterior shutters with gaps not larger than 50 mm are considered sufficient protection and do not require the use of bird-safe glass in any areas covered by such shutters.

Exterior, motorized solar screens and shades are effective at controlling heat and light, increase security, and can be adjusted to maximize view or bird and sun protection at different times; however, where adjustable measures are proposed, bird-safe glass should also be used to ensure that birds are always protected.

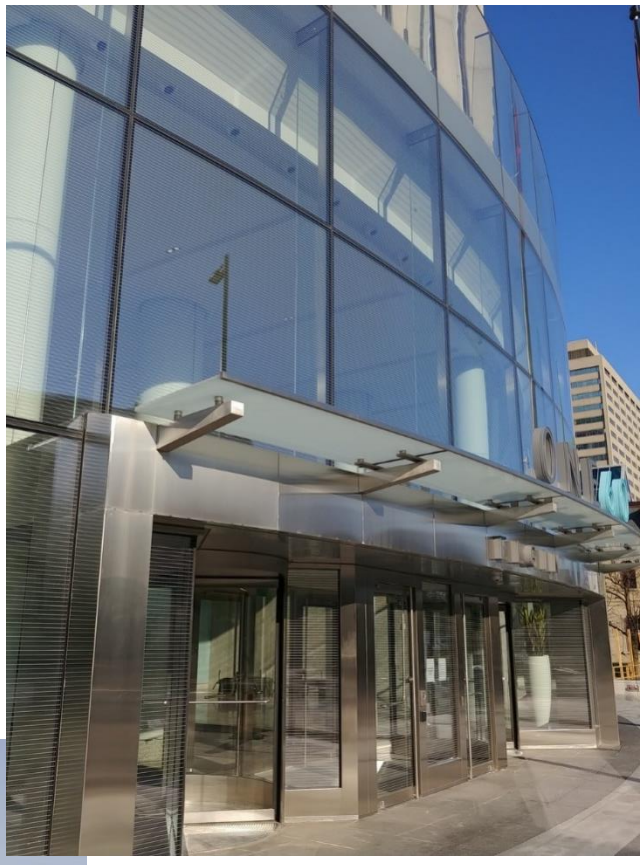
Shades, louvers and decorative or aesthetic screens should be:

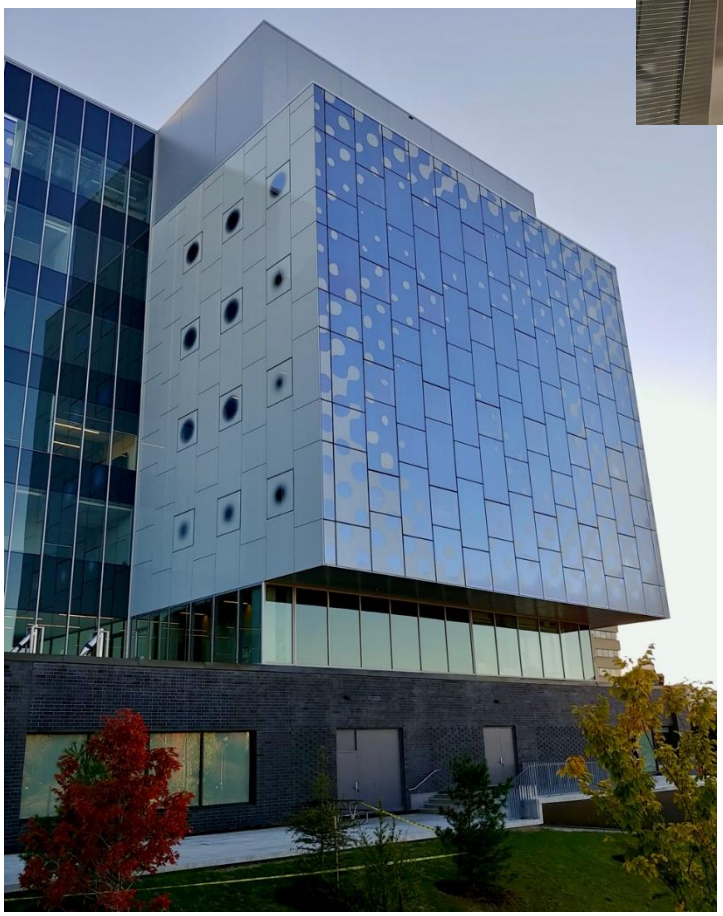
- placed so that the material surface is not more than 1 metre from the parallel surface of the glass;
- installed parallel or angled to the glass surfaces; and,
- made of architectural wire mesh, lattices, trellises, or any opaque or translucent non-reflective material that
    - has apertures no greater than 50 mm; and
    - has a solid-to-void ratio not less than 50 per cent

Screens, grilles, netting and mesh elements designed to prevent the entry of birds must be installed in front of the glazing and must be seamless and taut to prevent birds from becoming entangled or trapped. Netting and mesh are commonly used as a temporary exclusion measure during construction, but are **not recommended** for ongoing use in commercial buildings or large-scale projects due to the technical challenges involved in sourcing, installing and maintaining the barrier. If used, aviary mesh or nets should have a maximum aperture size of 19 mm by 19 mm and be installed at least 50 mm in front of the glazing. They **must** be inspected and maintained regularly.

Screens designed to prevent the entry of insects will only be considered suitable for reducing bird collision risks if they are installed exterior to the glazing.

Note: interior shades and similar measures are **not effective** at reducing risks to birds from reflectivity but can help to reduce risks from transparency and from nocturnal lighting (see Guideline 7). They should therefore be combined with other measures that address reflectivity.





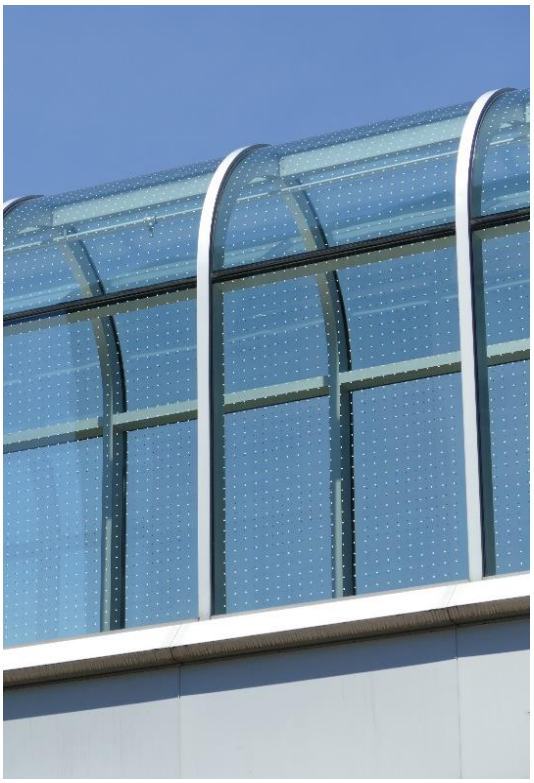


Figure 7: Local examples of bird-safe glass at 160 Elgin (top), uOttawa (bottom left) and Ottawa City Hall (bottom right). Top right and lower left photos courtesy of Safe Wings Ottawa.

Guideline 3: Avoid or mitigate design traps

Features such as courtyards and open-topped atria can fatally entrap birds, especially if they are heavily planted and surrounded by windows or other glazed surfaces. Birds that fly down into such places may not find their way out again, instead flying directly into the surrounding glass. Alcoves or entranceways with transparent or reflective surfaces can also become traps from which disoriented birds are unable to escape.

Glass elements used in parallel or perpendicular settings, allowing a clear line of sight through a structure, are dangerous because birds will not perceive the obstacle and will try to fly through it to sky or habitat on the other side (i.e., fly-through effect). Glass sky walks, outdoor guardrails or parapets, and building corners, as well as buildings with parallel expanses of windows, are common examples. This is also an issue in some residential designs where windows are set in adjacent or opposite walls of the house.

Deeply shadowed alcoves or other conditions causing glass to appear black may inadvertently create the impression of a passage where there is none, sometimes known as a “black hole” effect. The use of reflective surfaces around alcoves and courtyards can also create a mirror maze that birds are unable to escape.

If these traps cannot be completely eliminated from a building’s design, the following measures should be used to reduce the risk to birds:

a) All glazing that could create a fly-through, mirror maze or black hole effect should use bird-safe glass or integrated protection measures as described in Guideline 2.
b) Glass corners should be treated to render them bird-safe for at least 5 metres in each direction.
c) Glass railings, parapets, and similar clear barriers should use bird-safe glass as specified in Guideline 2.

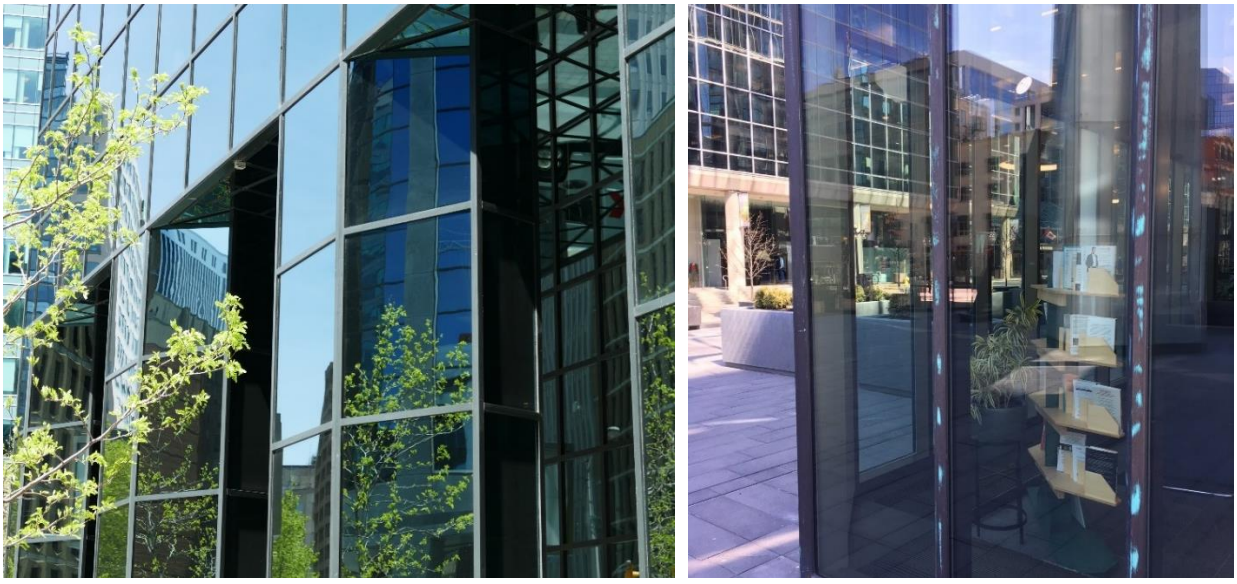


Figure 8: Potential design traps (mirror maze and black hole effect on left, corner glass on right).

Guideline 4: Consider other structural features

Glass is not the only hazard associated with buildings and structures. Birds have also been injured or killed as a result of collisions with antennas and guy wires (usually when migrating at night). Ventilation grates can also be an issue. Young birds may become trapped if they fall through grates located below their nesting site; grates located below collision-prone glazing can also trap stunned or otherwise injured birds (see Figure 9). Pipes, flues and vents are typically capped or screened to prevent wildlife entry, but if left open can also entrap birds or lead to human-wildlife conflicts. To reduce these risks:

a) Minimize the number of exterior antennas and other tall structures, including cell phone, television and other media equipment. Consolidate all necessary antennas and tall equipment into a single tower, where possible, and locate it to minimize conflicts with birds.
b) Utilize self-supporting lattice or monopole towers that do not require the use of guy wire supports.
c) Avoid up-lighting rooftop antennas and tall equipment, as well as decorative architectural spires (see also Guideline 6 below).
d) Grates should have a maximum porosity of 20 mm by 20 mm or 40 mm by 10 mm, or should be screened to prevent birds from falling through.
e) Ensure that pipes, flues and vents are capped or screened to prevent wildlife entry.

Figure 9: Open grate beneath reflective glass windows.

Landscape Design Guidelines

Landscaping is a key component of our built environment, which contributes directly to our quality of life. It can provide benefits to wildlife as well, but may increase risks to birds if not carefully planned. Trees and water features will attract birds and may put them at risk of collision with nearby windows or glass façades. Features such as rows of trees, berms or walkways that provide an open flight path through a vegetated landscape can channel birds toward buildings.

Green roofs, garden terraces and green walls also provide elements which are attractive to birds, and must be carefully designed to ensure they do not increase collision risks. These guidelines apply to all such features regardless of how high up they are situated.

The following should be applied **in conjunction with Guideline 2** to fully address risks associated with glass.

Guideline 5: Create safe bird-friendly landscaping

a) Design landscape plantings to minimize reflections of trees and shrubs in nearby buildings. In cases where landscape planting near a glazed building façade or other reflective surface is desirable for shading or other purposes, Guideline 2 must be applied to obscure habitat reflections.
b) Avoid or minimize the number of linear landscape features leading directly into glass façades or doors. Where such features cannot be avoided, Guideline 2 must be applied.
c) Avoid using plant species known to attract birds (e.g., those with abundant fruit or seed crops, or with flowers attractive to hummingbirds) in locations that could result in harmful collisions.
d) Minimize the reflection of rooftop landscapes in adjacent building features or surrounding properties.
e) Minimize the exterior visibility of any indoor vegetation, green walls or water features to reduce their attractiveness to birds.
f) Avoid locating ornamental fountains, ponds, stormwater retention basins, wetlands, swales or related infrastructure near glass façades or windows.

Figure 10: Cedar waxwings and other songbirds are often attracted to flowering crabapples and other trees that retain their fruit over winter. Entire flocks of waxwings may be injured or killed in collisions with nearby buildings.

Lighting Design Guidelines

Most migratory songbirds migrate at night, embarking at dusk and landing before dawn. Birds rely on natural cues for guidance on direction including stars and moonlight. Artificial light obscures those natural signals and can cause birds to become disoriented, change the direction of their flight path, slow down, or fly in circles. They may become exhausted as a result, and be forced to land.

Light pollution contributes significantly to bird collisions by drawing birds into hazardous built environments where they are at risk of both nighttime and daytime collisions. While daytime collisions are largely due to the transparency or reflectivity of glass, nighttime collisions mostly tend to be in response to the exterior surfaces of structures being illuminated and shining in the night sky, such as towers or monuments. This can cause a beacon effect to occur whereby birds are attracted to the object and then fly towards it. Light colour and intensity also have been shown to have varying effects on birds, with blue light seemingly attracting fewer birds (Sheppard and Phillips, 2015) but warmer tones being less disruptive to wildlife overall (IDA, 2020).

Due to the potential impacts of light pollution on birds and other wildlife, as well as human health, the use of these guidelines is encouraged throughout the city. Many of the recommended measures will also help conserve energy.

Guideline 6: Design exterior lighting to minimize light trespass at night

The following recommendations apply to both permanent and temporary or event-based exterior lighting.

a) Avoid up-lighting.
b) Specify Dark Sky compliant, full-cutoff exterior fixtures to reduce light trespass.
c) Use motion detectors and other automatic lighting controls to reduce or extinguish non-essential lighting between 11 pm and 6 am.
d) Use minimum wattage fixtures to achieve appropriate lighting levels (note: minimum required lighting levels are established in the Ontario Building Code).
e) Minimize amount and visual impact of perimeter lighting.
f) Avoid use of floodlighting.

Exception: Sites within the Airport Vicinity Development Zone

- Developments that must install lighting should use minimum intensity blue-white strobe lighting with a three second flash interval instead of continuous flood lighting, rotating lights, or red lighting.
- Ensure that all exterior light fixtures are properly selected, mounted and aimed to prevent unintended light trespass.

Guideline 7: Avoid nighttime light trespass from the building's interior

This is strongly encouraged throughout the year, not just during migration.

a) Use window shades or blinds to prevent light trespass from occupied spaces between sunset and sunrise.
b) Use motion detectors and/or other automatic lighting controls to extinguish lights from unoccupied spaces in non-residential buildings after business hours.
c) Create smaller zones in lighting layouts to discourage wholesale area illumination.
d) Incorporate and encourage the use of localized task lighting.
e) Install light dimmers in lobbies, atria and perimeter corridors for nighttime use.

Quick Fixes for Existing Buildings

Many thousands of existing homes and other buildings in Ottawa are already contributing to bird mortality and it is impractical to expect that they will all be retrofitted to meet these guidelines. There are several measures that can be applied by property owners and managers who want to reduce the risks to birds, without a complete retrofit. The City encourages all residents to learn more about bird safety, and what they can do to help.

Many collisions go unnoticed because homeowners or building tenants are away during the day or are in another room. Dead or stunned birds are often scavenged by neighbourhood cats or wildlife before being noticed by people. Birds may also recover sufficiently to move away from the building but succumb to their injuries later. The cumulative impacts resulting from these collisions in our existing built-up landscape present a significant mitigation challenge, requiring a much broader communications and awareness strategy and solutions that are both simple and cost-effective, to motivate sufficiently large numbers of residents and building owners to act. Organizations like Safe Wings Ottawa and FLAP Canada are attempting to address this issue, and provide valuable outreach and education resources.

FLAP Canada has produced an online self-assessment tool as well as a mobile application to assess the threat level of a building, which may be useful in determining what needs to be done. In many cases it is not necessary to treat every window in order to substantially reduce risks to birds. Once building owners become aware of the risk factors and recognise which ones apply to their property, they can target their solutions appropriately. Several strategies that can be applied separately or in combination are presented below.

Assess the Risk

You can assess the risk posed by a residential or commercial building using FLAP Canada's BirdSafe assessment tool, or their mobile application (available for both iOS and Android devices):

- https://birdsafe.ca/homeowner-self-assessment/
- https://birdsafe.ca/business-self-assessment/
- https://www.flapapp.ca/

Window Treatments

Treatments must be applied to the exterior of the window in order to be effective.

- If you are replacing your windows, or planning to expand or renovate your building, inquire about bird-safe glass options. Ensure that your architect and/or contractor is familiar with the specifications in Guideline 2.
- Install visual markers or transparent or perforated patterned, non-reflective window films that make glass visible to birds. Ensure that the pattern you choose

meets the specifications for effective visual markers in Guideline 2 (i.e., maximum spacing of 5 cm x 5 cm, minimum element size 4 mm diameter). Examples include:
    - Feather Friendly (available as Do It Yourself Tape or professionally installed product)
    - CollidEscape (clear product not recommended)
    - Make a pattern with vinyl automotive trim tape (e.g. Trimbrite) or other commercially available products (e.g., Mactac, Oracal 651).
- Hang lengths of ribbon, string or parachute cord in front of windows, spaced no more than 5 cm (2″) apart (e.g., Acopian BirdSavers).
- Stretch lightweight netting or screening across the outside of your windows, leaving at least 5 cm (2″) of space between the netting and glass. Make sure the material is stretched taut and stays that way, to keep birds from becoming entangled or trapped. This method is best suited for use in low-rise residential homes, and **must** be regularly inspected and maintained. It is **not recommended** for large expanses of glass or situations where it cannot be easily maintained.
- Apply decals or stickers in a dense pattern with a maximum spacing of 5 cm x 5 cm (see Figure 6); too much space between decals will significantly reduce their effectiveness. NOTE: falcon silhouettes, previously thought to help deter bird collisions, are ineffective when applied individually.

Temporary Measures

The following short-term strategies may be useful to prevent collisions until a more permanent solution can be applied, or to prevent periodic issues with territorial birds attacking their own reflections during the breeding season. Like all treatments, these must be applied to the exterior of the window in order to be effective.

- Tape densely patterned cellophane wrapping (available at dollar stores) to the exterior of the window.
- Decorate windows with tempera paint (from art supply or craft store) applied with a brush, sponge or stencil. Tempera is long-lasting, non-toxic, and can be wiped off with a damp rag or sponge.
- “Paint” windows with soap, erasable marker or a highlighter pen (reapply after rain).
- Apply whitewash (made from hydrated lime powder from the hardware store) to windows at the start of spring (March through May) and fall (August through November) migration periods, and wash it off at the end.

Figure 11: Examples of window treatments (oil-based paint marker mural top left, Feather Friendly DIY tape bottom left, Acopian BirdSaver on right). Photos courtesy of Kate Stolwyk, Karen Gordon and Safe Wings Ottawa, respectively.

Other Strategies

- Locate bird feeders and bird baths less than 50 cm (1 1/2 feet) from windows. While this may seem counter-intuitive, the close proximity to the (treated) glass reduces the risk by ensuring that any collisions that may occur are at such low velocity that the birds will not be injured.
- Place new landscaping and water features away from glass doors, bay windows or glazed building façades so that no reflection occurs.
- Close curtains or blinds to reduce clear views through opposite or adjacent windows.
- Relocate large indoor plants away from windows.
- Minimize light pollution by turning lights off when not in use and/or closing curtains or blinds (see also Guideline 7).

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Migratory Birds – federal government web page about migratory birds in Canada https://www.canada.ca/en/services/environment/wildlife-plants-species/migratory-birds.html

Muhlenberg College: Birds and Windows – scientific literature and other resources https://www.muhlenberg.edu/academics/biology/faculty/klem/aco/Bird-window.html

Safe Wings Ottawa – local bird collision research, prevention advice and rescue services https://safewings.ca/

Checklist of Bird-Safe Design Guidelines

The guidelines are presented in order of consideration during planning, from general environmental context to more detailed design features. Proponents are encouraged to follow all applicable guidelines in planning and designing their projects. **Guideline 2** addresses the most critical factor of bird-safe design (glazing) and it should be applied regardless of the project's context.

Guideline 1: Consider the environmental context

The following measures should be used to address potential risks to birds based on the project's environmental context:

a) In cases where an Environmental Impact Study is required, the EIS should specifically include consideration of risks to birds and recommend mitigation measures in accordance with all applicable guidelines below. The assessment of potential risks should consider any planned greenspaces and landscaping within the new development, not just existing habitat areas. For plans of subdivision, mitigation measures may include recommendations relating to the content of owner awareness packages to inform and educate future homeowners.
b) In cases where no EIS is required, but the project is located adjacent to a river corridor or other greenspace (e.g., park, stormwater management facility, etc.) the following should apply:
    i. Where possible, site layout should minimize intrusion into habitat areas by buildings and other potentially hazardous structures;
    ii. Orientation of buildings should avoid or reduce reflection of attractive elements in glazing, to the extent possible (see also Guideline 2 below).

Guideline 2: Minimize the transparency and reflectivity of glazing

The following guidelines are strongly recommended for **all projects involving glazing**, to reduce risks to birds:

a) Avoid monolithic, undistinguished expanses of glazing.
b) Incorporate visual interest or differentiation of material, texture, colour, opacity, or other features to fragment reflections.
c) Where glazing is used, bird-safe glass or glass with integrated protection measures is preferred (as per specifications on pages 12 and 13). Treatments should be applied to a minimum of 90 per cent of the glass within the first 16 metres of height as measured from the finished grade, or to the height of the adjacent mature tree canopy, whichever is greater.
d) Where green roofs, rooftop gardens or terraces are included in a design, any adjacent glazing should also be treated to a height of 4 m from the surface of the roof or terrace or the height of the adjacent mature vegetation, whichever is greater.

Guideline 3: Avoid or mitigate design traps

If design traps cannot be completely eliminated from a building's design, the following measures should be used to reduce the risk to birds:

a) All glazing that could create a fly-through, mirror maze or black hole effect should use bird-safe glass or integrated protection measures as described in Guideline 2.
b) Glass corners should be treated to render them bird-safe for at least 5 metres in each direction.
c) Glass railings, parapets, and similar clear barriers should use bird-safe glass as specified in Guideline 2.

Guideline 4: Consider other structural features

To reduce risks associated with structural features such as antennas, grates, pipes, flues and vents:

a) Minimize the number of exterior antennas and other tall structures, including cell phone, television and other media equipment. Consolidate all necessary antennas and tall equipment into a single tower, where possible, and locate it to minimize conflicts with birds.
b) Utilize self-supporting lattice or monopole towers that do not require the use of guy wire supports.
c) Avoid up-lighting rooftop antennas and tall equipment, as well as decorative architectural spires (see also Guideline 6 below).
d) Grates should have a maximum porosity of 20 mm by 20 mm or 40 mm by 10 mm, or should be screened to prevent birds from falling through.
e) Ensure that pipes, flues and vents are capped or screened to prevent wildlife entry.

Guideline 5: Create safe bird-friendly landscaping

The following should be applied in conjunction with Guideline 2 to fully address risks associated with glass.

a) Design landscape plantings to minimize reflections of trees and shrubs in nearby buildings. In cases where landscape planting near a glazed building façade or other reflective surface is desirable for shading or other purposes, Guideline 2 must be applied to obscure habitat reflections.
b) Avoid or minimize the number of linear landscape features leading directly into glass façades or doors. Where such features cannot be avoided, Guideline 2 must be applied.
c) Avoid using plant species known to attract birds (e.g., those with abundant fruit or seed crops, or with flowers attractive to hummingbirds) in locations that could result in harmful collisions.

d) Minimize the reflection of rooftop landscapes in adjacent building features or surrounding properties.
e) Minimize the exterior visibility of any indoor vegetation, green walls or water features to reduce their attractiveness to birds.
f) Avoid locating ornamental fountains, ponds, stormwater retention basins, wetlands, swales or related infrastructure near glass façades or windows.

Guideline 6: Design exterior lighting to minimize light trespass at night

The following recommendations apply to both permanent and temporary or event-based exterior lighting.

a) Avoid up-lighting.
b) Specify Dark Sky compliant, full-cutoff exterior fixtures to reduce light trespass.
c) Use motion detectors and other automatic lighting controls to reduce or extinguish non-essential lighting between 11 pm and 6 am.
d) Use minimum wattage fixtures to achieve appropriate lighting levels (note: minimum required lighting levels are established in the Ontario Building Code).
e) Minimize amount and visual impact of perimeter lighting.
f) Avoid use of floodlighting.

Exception: Sites within the Airport Vicinity Development Zone

- Developments that must install lighting should use minimum intensity blue-white strobe lighting with a three second flash interval instead of continuous flood lighting, rotating lights, or red lighting.
- Ensure that all exterior light fixtures are properly selected, mounted and aimed to prevent unintended light trespass.

Guideline 7: Avoid nighttime light trespass from the building's interior

This is strongly encouraged throughout the year, not just during migration.

a) Use window shades or blinds to prevent light trespass from occupied spaces between sunset and sunrise.
b) Use motion detectors and/or other automatic lighting controls to extinguish lights from unoccupied spaces in non-residential buildings after business hours.
c) Create smaller zones in lighting layouts to discourage wholesale area illumination.
d) Incorporate and encourage the use of localized task lighting.
e) Install light dimmers in lobbies, atria and perimeter corridors for nighttime use.