

# 'Bird-Friendly' Design Strategies Reducing Daytime Collisions

By: Mark Clemmensen



Mark Clemmensen  
(Vice Chair)

**Just recently I visited a facility and I was faced with an issue that is of growing concern in our industry. A topic that I now realize I was first introduced to when walking from the subway to the office one sunny morning, and many of you may also have faced similar experiences as well.**

At the time I didn't understand the issue so I shrugged it off and went on with my day, but I realized that it was a serious problem when the Toronto Green Standard was issued in 2010, and under the Ecology Section of the version titled "For New Mid to High-Rise Residential and Industrial, Commercial and Institutional (ICI) Development, 4 Storeys or Higher", the topic was identified for all to see.

**EC 5 - Glass and Other Design Features for Migratory Birds:** Ensure that design features minimize the risk for migratory bird collisions.

When this article is published, the fall migratory season will have just concluded therefore reducing the number of bird 'collisions' or 'strikes'. During the two annual migration periods, the resident bird population experiences a significant influx of migratory birds. These are birds observing their annual cycle of migration; north in the spring to their summer breeding grounds and, south in the fall to warmer regions where they spend the winter. During their biannual flyovers they become confused by the combination of light pollution and the effects of glass in the urban environment. This often results in significant numbers of birds colliding with buildings<sup>1</sup>. Spring and fall migration spans from mid-March to early June, and from mid-August to early November respectfully.

There are two main causes of bird collisions: night time strikes caused by light pollution from skyscrapers, and daytime strikes. Daytime strikes occur because birds cannot perceive images reflected in glass as reflections, and thus fly into windows that they think are trees or the sky. Clear glass also poses a danger as birds (like humans) have no natural sense designed to perceive clear glass as a solid object. Birds will strike clear glass while attempting to reach habitat and sky seen through corridors, or windows

positioned opposite each other in a room. The impact of striking a reflective or clear window in full flight often results in death<sup>2</sup>. An estimated minimum of one million birds die each year in Toronto due to collision with buildings.

There are three requirements outlined in the Toronto Green Standard which must be followed to meet EC 5.0, which will drastically minimize the number of daytime strikes:

- Treat glass with a density pattern between 10cm-28cm (4"-11") apart for a minimum of the first 10m-12m (32'-39') of a building above grade OR mute reflections for a minimum of the first 10m-12m (32'-39') of a building above grade.
- Where a green (vegetated) roof is constructed, that is adjacent to glass surface, ensure that the glass is treated to a height of at least 12m (39') above the level of the green roof.
- Ensure ground level ventilation grates have a porosity of less than 2cm x 2cm (13/16" x 13/16").

Muted reflections are created by distorting the visual image. This can be done by angling the glass surface a minimum of 20 degrees, providing awnings, overhangs or external sunshades. These systems help to reduce bird collisions but they are regarded as less effective than providing a density pattern on the glass, because the initial images are still visible to birds.

"...buildings do not have to be skyscrapers to be lethal. A dead chickadee and red-breasted nuthatch lay at the base of a small industrial building that featured mirrored blue glass and reflected an adjacent woodlot."<sup>3</sup>

It has been documented that residential structures take more birds lives than commercial structures, due to the vast amount of residential buildings constructed, but one commercial skyscraper complex could receive hundreds to thousands of bird collisions per year compared to maybe one or two per residential property.

Applied visual markers must be installed onto the exterior surface of the glass to increase effectiveness, and the height of the markers should be determined by the height or anticipated height at maturity of the surrounding natural vegetation.

<sup>1</sup> City of Toronto Green Development Standard; Bird-Friendly Development Guidelines, March 2007, pg#7

<sup>2</sup> City of Toronto Green Development Standard; Bird-Friendly Development Guidelines, March 2007, pg#8

<sup>3</sup> Ian Austen (2012, October 27), Casualties of Toronto's Urban Skies. The New York Times

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Therefore, if the anticipated height of the surrounding tree species canopy is expected to average 18m, then best practice suggests that the visual markers extend to that height.

"The key to bird-safe buildings is to provide birds with the visual cues they need to alert them to the presence of glass and reflective building exteriors."<sup>4</sup>

Visual markers can be accomplished by a number of methods, including but not limited to the following:

- **Architectural Pattern:** Design a denser exterior facade pattern by increasing angles, corners, and projections. This option would be typically utilized for new construction, and is the most costly of the applications.
- **Patterned Glass:** Decorative images etched or embedded in the glass.
- **Film:** Applied after glass installation, and can be utilized on new, retrofit or heritage buildings. Wide variety of patterns or images allowing for advertising or complementing the architectural design.
- **Decals:** Externally placed decals with clear spaces of not more than 28cm (11") is considered bird-friendly.
- **Fenestration Pattern:** Vertical and horizontal mullions create visual effects and like decals, must conform to providing not more than 28cm (11") of clear space between the pattern.
- **Decorative Grilles and Louvers:** Installed on the exterior.

Three major issues with implementing some of these bird-friendly design strategies indicated above would be identified as the following:

- **Cost:** Although all of these strategies would add cost to the project, some are extremely expensive when all the parameters are investigated. Wind loading, weight, attachment/support, and material cost are just some of the reasons why a few proposals could be value engineered out.
- **Project Type:** The project scope could greatly determine which type of bird-friendly measure would be taken. A small retrofit may not have the budget or a renovated historical site might not be able to drastically change the overall appearance to meet the minimum requirements outlined in the Toronto Green Standard.

- **Obstruction:** Designers and Owners may not be willing to visually influence the overall design by either drawing ones attention away from key design elements or minimizing the natural light or views that the Designer or Owner wants to achieve.

The real challenge is to reduce bird collisions and enhance rather than detract from the overall appearance of a building, without adversely affecting the overall budget cost. Exterior film treatment on surface one of the glazing does just that. It can easily be site applied to new or existing buildings, and the design can be adjusted to suit form and function of the building. The effectiveness is determined by the markers' size, colour and spacing on the film.

The denser the pattern in the design of the exterior, the more effective a building becomes in projecting itself as a solid object to birds.<sup>5</sup> Therefore the tighter the spacing of the markers, the smaller the birds will need to be to miss the marker and strike the glass. Typical marker sizes and spacing can range, but research by Dr. Daniel Klem Jr., Sarkis Acopian Professor of Ornithology and Conservation Biology at Muhlenberg College in Pennsylvania, has determined that markers of 6mm (1/4") in diameter or 6mm x 6mm (1/4" x 1/4") squares; and spaced at 100mm (4") vertically and 50mm (2") horizontally will yield the best results for all sizes of birds.

When asked if colour of the markers played a critical role in the effectiveness of the film, Vahid Seyfaie, Operations Manager at Convenience Group, stated that the "Colour of the visual marker is dependent on the colour of the glass and the surroundings. Blue skies and gray skies will reflect differently in clear or tinted glass, therefore each project is treated on a case-by-case basis."

Due to the custom nature of the bird-deterrent film application, designers are able to select the shape of the markers, and even adjust the markers size, spacing and colour. "Multiple colours of markers can be specified to positively adjust the film to react to different atmospheric conditions", said Todd Vogelsberg, A/D Consultant at Convenience Group, during a meeting outside their testing facility located just West of Toronto's downtown core.

<sup>4</sup> Fatal Light Awareness Program. Retrieved from <http://www.flap.org/commercial.php>

<sup>5</sup> City of Toronto Green Development Standard; Bird-Friendly Development Guidelines, March 2007, pg#14

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"A combination of white and red markers will counter the reflection of a changing sky and surrounding vegetation, allowing the birds to detect that the glass is a solid object between 2-5' away."

The City of Markham has already experienced the advantages to applying bird-deterrent film on buildings. The Markham Civic Centre, located at 101 Town Centre Boulevard, and the Markham Direct Energy building located at 8100 Warden Avenue have both seen bird collisions drop drastically since the installation of bird-deterrent film. In May 2011, the Markham City Council was presented a certificate for bird-friendliness and is regarded as the first municipality in Canada to successfully address one of the leading causes of bird mortality - collisions with buildings. FLAP, a non-profit organization whose abbreviated name stands for "Fatal Light Awareness Program", presented the certificate to Markham in thanks for their close collaboration in [the implementation of] bird-friendly buildings.

Michael Mesure, Executive Director of FLAP, commented that 8100 Warden Avenue employees provided positive feedback for visually enhancing the building facade by adding the film, and when told that the film would reduce bird collisions with their building, employees were delighted that the City of Markham had taken steps to better the natural environment.

FLAP has approximately 100 dedicated volunteers and is the first organization in the world to address the issue of birds in collisions with buildings. Since 1993, FLAP volunteers have picked up over 50,000 injured or dead birds from 164 species in the Toronto region. 64 of these species are in serious population decline, and this includes several species deemed at risk under Federal legislation. 40% of the injured birds rescued by FLAP, survived to be released back into the wild. FLAP has instituted leading-edge programs and policies that begin to address the issue of bird collisions and their research has resulted in the publication of collision prevention guidelines for use on both corporate and residential structures.

Mr Mesure also pointed out that FLAP's consulting arm can now provide a 'Building Assessment for Wildlife Sustainability' on residential or commercial property for a nominal fee. This assessment addresses key factors such as building height, glass type; reflectivity and visibility, surrounding area, and a number of other areas which increase the level of risk of bird collisions.

Recommendations are then presented to the building owner, helping in creating a bird-friendly building. For more information about services offered by FLAP, or how you can volunteer or donate to this organization, please visit [www.flap.org](http://www.flap.org)

An article recently published in the New York Times on October 27, 2012, titled 'Casualties of Toronto's Urban Skies', stated that although "there is no precise ranking of the world's most deadly cities for migratory birds,... Toronto is considered a top contender for the title."<sup>6</sup>

Bird deterrent practices are not new to our industry. There are a few 'ineffective' techniques which have been thought to reduce bird collisions with glass:

- **Single window decals:** These only cover one small area of the window, and unless the bird is headed directly for that one spot, it will not be alerted.
- **Shape of the window decal:** Shape is unimportant and doesn't frighten birds.
- **Noise deterrents and magnetic fields:** These systems can interfere with the birds senses causing them to be disoriented and may cause bird collisions.
- **Plastic owls:** Birds soon learn that these are not a threat and they are not frightened.

Please note that the next time you are faced with designing an eco friendly/energy efficient building, remember that a 'bird-friendly' building is considered an important component of a 'green development'.

*A special thanks to the Convenience Group team of Todd Vogelsberg, Goerge Turjanica, and Vahid Seyfaie, as well as Michael Mesure, Executive Director of Fatal Light Awareness Program (FLAP), who were instrumental in the creation of this article. As FLAP would say "No birds were harmed in the creation of this article".*



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<sup>6</sup> Ian Austen (2012, October 27), Casualties of Toronto's Urban Skies. The New York Times