



## 28: BIRD SAFE GLASS

*Resources to mitigate bird collisions.*

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# DEVIL'S DETAIL

## INTRODUCTION

According to the American Bird Conservancy (ABC), glass collisions claim the lives of up to a billion birds annually in the U.S. While most people have seen or heard a bird hit a window, they often believe it to have been an unusual event. However, the occurrence is more common than people might think. The ABC is the first organization to take a national approach to solving the glass collision problem. ABC educates and informs architects, planners, and developers about the issue and solutions; advocates for legislation to require use of bird-friendly materials; and develops and evaluates new materials and products.



ABC's "Bird-friendly Building Design" guide, built on the pioneering work of New York City Audubon, adds a review of the science behind available bird-friendly solutions and provides many visual examples of how those solutions can be applied to new construction and existing buildings.

### Read more:

Bird-friendly Building Design: <https://abcbirds.org/program/glass-collisions/bird-friendly-design/>

Truths About Birds and Glass Collisions: <https://abcbirds.org/blog/truth-about-birds-and-glass-collisions>

## FACTORS AFFECTING COLLISIONS

Birds cannot grasp the concept of glass – its transparency, reflectiveness, or the cues humans see to acknowledge glass by context, such as mullions or frames – and therefore fly into the deadly surfaces.

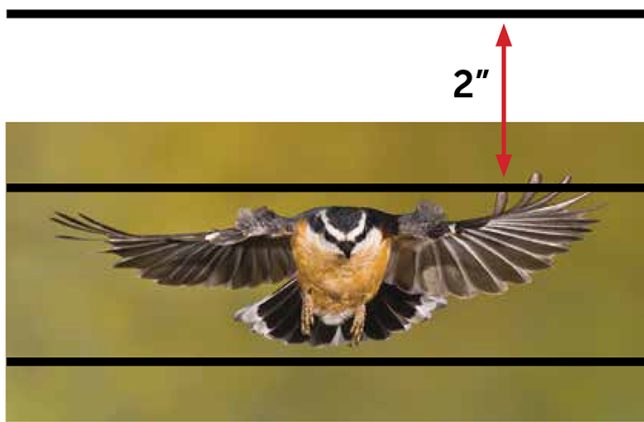
Every site and building combine for a unique set of risk factors. Risk factors related to geography, ecology, and migratory patterns may be difficult to adjust. However, many problems can be mitigated through building design. According to ABC, glass causes virtually all bird collisions with buildings. Studies based on monitoring data have shown a direct relationship between the amount of glass on a building and the number of collisions at that site. Mirrored glass proves especially deadly.

Bird-friendly design strategies fall into three general categories, any or all of which could be combined on a single project. While ABC recommends minimal glass as one option, AGI encourages the second two strategies:

- Use minimal glass
- Place glass behind some type of screening (e.g. netting, screens, grilles, shutters, exterior shades)
- Use glass with inherent collision-reduction properties (e.g. patterns, frits, films, opaque and translucent glass)

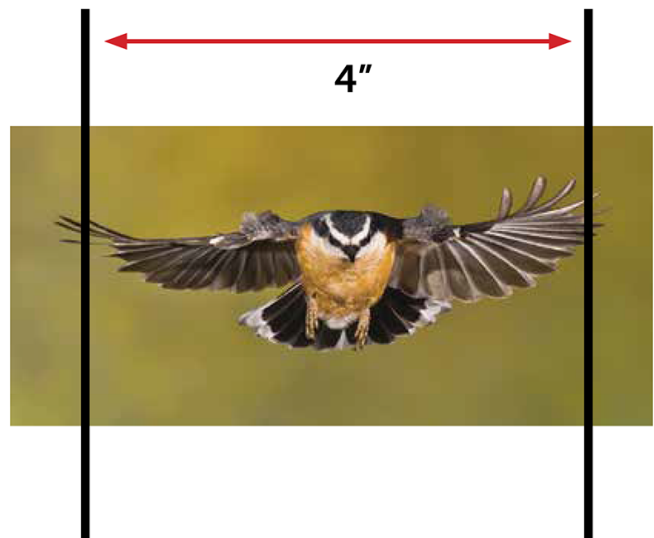


Horizontal lines with a maximum spacing of 2 inches



Red-breasted Nuthatch. Photo by Roy Hancliff

Vertical lines with a maximum spacing of 4 inches



## The 2 x 4 Rule

Research on songbirds, the most numerous victims of collisions, has shown that horizontal lines must be two or fewer inches apart to deter the majority of birds. Vertical spaces must be four or fewer inches apart. This difference presumably has to do with the shape of a flying bird. (Narrower spacing is required to deter collisions by hummingbirds.) Schiffner *et al.* (2014)\* showed that budgies have a very precise understanding of their own physical dimensions. Trained to fly in a tunnel, the birds were then challenged to pass through ever narrowing gaps. They were able to assess the

width of the gaps relative to their body size and adjust their flight behavior accordingly. It seems likely that this is a general avian trait, useful for navigating complex environments at flight speed. Bhagavatula *et al.* (2011) used the same tunnel setup to investigate how optical flow cues guide flight. It appears that birds balance the speeds of images perceived by both eyes, in this case, images to the birds' sides. This reinforces the suggestion of Martin (2011) that humans experience the world as something ahead of them, while for birds in flight, what is ahead of them is not necessarily their primary focus.

*\*Refer to Bird-friendly Building Design link on page 1 for complete list of references.*

## BIRD-SAFE GLASS

Building codes, standards and green certification programs increasingly call for bird friendly design (and bird glass).

According to the National Audubon Society, "bird-safe glass is specially designed to make glass a visible obstacle to birds." Audubon cites approaches such as fritting, silk-screening, or ultraviolet (UV) coating to create patterns that break up the reflectivity of glass.

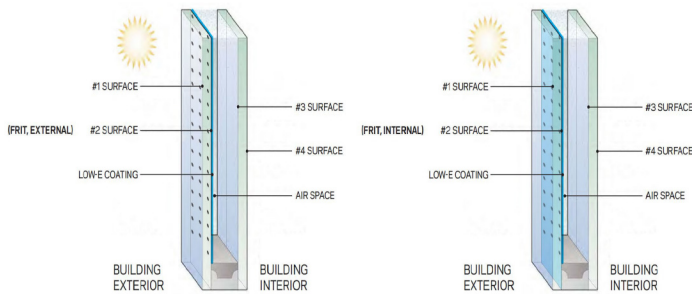
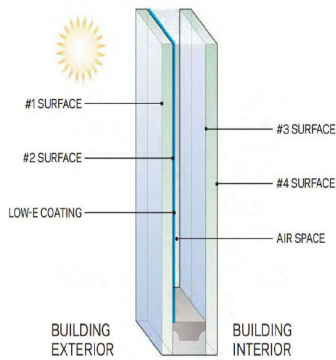
"More important than the technique used to create the pattern is its spacing. Testing has shown that the '2 x 4 rule' is most effective – meaning that the silk, coating, or markings are added across the pane, spaced two inches apart horizontally and four inches apart vertically. Research has shown that birds will not fly through spaces less than two inches high or four inches wide."

An illustration of the 2 x 4 Rule (courtesy of ABC) is pictured and described above in greater detail.

## BIRD-FRIENDLY BUILDINGS

ABC describes a bird-friendly building as one with:

- At least 90% of the material in each exposed facade, including walls around inner courtyards, from ground level to 75 feet (the primary bird collision zone) has a threat score of <30, as defined by the ABC rating system.
- At least 60% of material in the exposed facade above the collision zone meets the above standard.
- There are no "see through" passageways or corners (i.e. where two areas of untreated glass meet in a corner) in collision zones from ground level to 75 feet.
- Building lighting meets International Dark Sky Association standards (learn more at <https://www.darksky.org>).
- Building monitoring for collisions occurs on a regular basis and areas causing collisions are remediated.



Above: diagrams illustrating clear glass, which can be harmful to birds, and glass with bird-safe frit applied externally and internally.



## CASE STUDY:

### ASPLUNDH CANCER PAVILION

Abington-Jefferson Health | Abington, Pa.

AGI member R.A. Kennedy & Sons installed 20 different types of glass at the 86,000-square-foot Asplundh Cancer Pavilion. Since the project sought LEED Certification, fritted glass was selected both to reduce thermal heat load and provide adequate bird safety. Frit patterns and colors were coordinated across the building's two masses, connecting bridge, and all facades to ensure consistency.

[Read the case study.](#)

## NGA RESPONSE

In February 2020, The National Glass Association (NGA) announced publication of Bird-Friendly Glass Design Strategies, one of six new Glass Technical Papers (GTPs) written to reflect the latest industry developments and trends.

The GTP addresses the background of bird-friendly building design and provides key definitions and surface orientations specific to the application. Visual markers, reflections, and the impact of light are discussed, as well as the latest legislative and regulatory developments with respect to material use, local ordinances, and zoning requirements.

Read the GTP:

[http://www.mmsend2.com/link.cfm?r=gRSK8nL\\_C3nyIZ37GzQ8Aw~~&pe=2eusezFGc8nCaaXhknMvHi7-yRy6GsGu9W477edk06RWuQpxMURJzWJAD45hK846fotcoX1hGxptHB3YeMSalQ~~&t=6vCRA6KbUi4-GHMzuLuSmA~~](http://www.mmsend2.com/link.cfm?r=gRSK8nL_C3nyIZ37GzQ8Aw~~&pe=2eusezFGc8nCaaXhknMvHi7-yRy6GsGu9W477edk06RWuQpxMURJzWJAD45hK846fotcoX1hGxptHB3YeMSalQ~~&t=6vCRA6KbUi4-GHMzuLuSmA~~)

## USGBC PILOT CREDIT

The U.S. Green Building Council (USGBC) has also addressed bird safety by adding a Pilot Credit, Reducing Bird Mortality, to the LEED rating system. "Until recently, this problem has been almost unrecognized as an issue of sustainability," explains the USGBC. "Moving into the future, it will be increasingly necessary to design structures with impact on birds in mind."

The Pilot Credit 55 aims to "reduce bird injury and mortality from in-flight collisions with buildings," by requiring compliance with building facade and site structural design parameters, exterior lighting guidelines, and a performance monitoring plan.

Read more about the credit:

<https://www.usgbc.org/credits/new-construction-core-and-shell-schools-new-construction-retail-new-construction-healthca-44>

## USGBC RESOURCES

USGBC offers educational programming, case studies, slides, and a calculator to illustrate bird hazards in the built environment, identify available strategies for reducing bird mortality, and show how bird-safe design can contribute to heat and light controls and security.

Taking Flight: Bird-Safe Buildings Policy Continues to Proliferate  
<https://www.usgbc.org/resources/taking-flight-birdsafe-buildings-policy-continues-proliferate>

Bird Collision Threat Rating Calculation Spreadsheet  
<https://www.usgbc.org/resources/bird-collision-threat-rating-calculation-spreadsheet>

## AUDUBON ACTIONS

New York City Audubon and Portland Audubon have strong programs related to bird safety. Learn more about their actions on their respective websites:

New York City Audubon: <http://nycaudubon.org>  
Portland Audubon: <https://audubonportland.org>

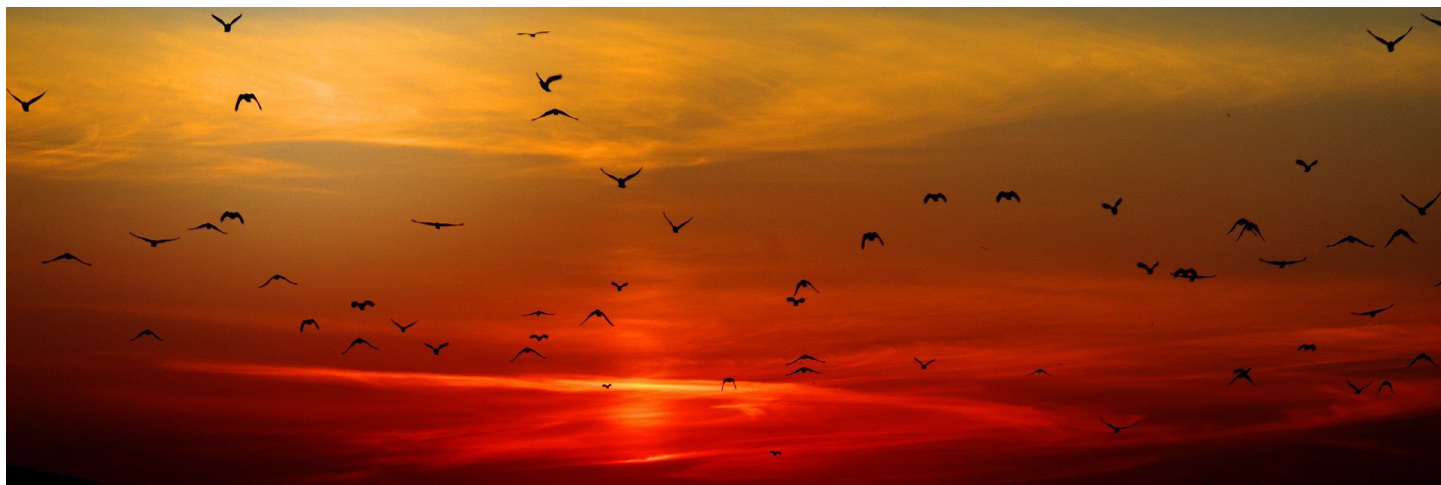
## ABOUT ABC

The American Bird Conservancy is the Western Hemisphere's bird conservation specialist – the only organization with a single and steadfast commitment to achieving conservation results for native birds and their habitats throughout the Americas. With a focus on efficiency and working in partnership, the American Bird Conservancy takes on the toughest problems facing birds today, innovating and building on sound science to halt extinctions, protect habitats, eliminate threats, and build capacity for bird conservation.



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## About the Devil's Details

The AGI educational series illustrates and describes common glazing challenges as a means to communicate best practices for the design and construction industry, not as a sole source for design guidance. AGI recommends design professionals consult with an AGI contractor regarding specific project challenges. AGI contractor profiles may be accessed at [www.theagi.org](http://www.theagi.org). To share a devilish detail of your own, contact [info@theagi.org](mailto:info@theagi.org).