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American Bird Conservancy Prescriptive Rating Guidelines for Bird-friendly Materials
(applies ONLY to materials similar to those already tested; other products can be found in the spreadsheet, or may need formal evaluation).

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Introduction

In order to keep tunnel testing from creating a bottleneck and to make a range of rated bird-friendly materials available quickly for projects subject to NYC Local Law 15, ABC developed a system to assign Threat Factors to materials similar to those already evaluated. To accomplish this, ABC partnered with the Bird-Safe Building Alliance (BSBA), a group comprising architects experienced in bird-friendly design, conservation biologists working on collisions, and other experts. In a simplistic example, this allows us to assign a score of TF=0 to a brick wall without conducting a test.

TFs may be assigned to products that: a) were tested using other, peer-reviewed protocols that ABC and BSBA have determined to be equivalent or translatable to tunnel testing scores, b) were studied by scientists or experienced building collision monitors with a documented reduction in collisions of at least 50%, c) are identical to products that have previously been tested or d) meet ABC's Prescriptive Standard, (detailed below).

The Prescriptive Standard was created using principles derived from tunnel testing, other collisions research, monitoring data and information from the literature on avian perception. The Prescriptive Standard is very conservative: assigned Threat Factors are likely to be higher than would be obtained in a tunnel or other test. The Prescriptive Standard is not an attempt to describe all bird-friendly glass assemblies, although that is a long-term goal. Currently, the Standard can be used to identify a large number of similar materials that could be used in a calculation for LEED Pilot Credit 55 or qualify for use in projects responding to New York City's Local Law 15. ABC plans to add more guidelines to the Standard as more data become available.

A Note on Spacing

Where early recommendations, based on research by Rössler (2007) and Klem (2009), showed that horizontal lines spaced 2" (5cm) apart and vertical lines spaced 4" (10cm) apart significantly reduced collisions, subsequent monitoring showed that the vertical spacing does not stop collisions by the smallest birds, especially hummingbirds. The spacing guideline for this Standard gives more credit when there is 2" (5 cm) between pattern elements in any direction. This spacing, for two dimensional patterns on glass or window film, is now typically recommended in Canada (Canadian Standard A460) and increasingly in the United States. Thus, what was originally the '2x4 rule' is now the '2x2 rule'. However, 2x4" spacing has been demonstrated to reduce collisions significantly and materials based on that guideline can still receive a 'bird-friendly' rating.

Visual Contrast Threshold

Terminology can be confusing for patterns on glass, glass itself, and whatever is seen through or reflected on glass. For the purposes of this discussion, we will refer to anything seen through glass, or reflected by glass as 'background'. We will refer to the base glass as the 'glass' and the pattern on the glass as 'the pattern'.

For patterns on glass or glass units to successfully deter bird collisions, birds must be

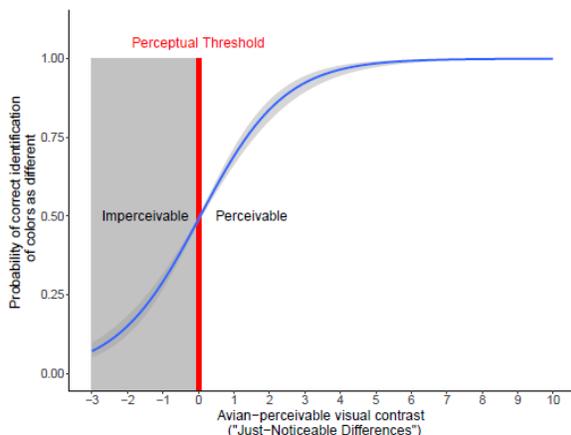
able to perceive them in time to change course. Pattern elements must be of an appropriate size and spacing; pattern must be distinguishable from both glass and background. We have adopted two meters as a standard viewing distance, following the literature.

Our instinct is to use human vision as a proxy for what birds can see. However, although birds can see more colors and even perceive the earth's magnetic field, humans have much better visual acuity. 'Visual acuity', the ability to resolve spatial features of an image, depends on the size of the eye and the number of photoreceptors in the retina. Songbird eyes are much smaller than human eyes. Because of this, birds, particularly small birds like songbirds, have very poor visual acuity in comparison to humans. Therefore, a pattern that appears quite visible to us may not be apparent at all to birds (Caves, Brandley and Johnsen, 2018).

The BirdVis App: Avian visual contrast levels

Because human perception is unreliable for evaluating what is sufficiently visible to birds, the Bird-safe Building Alliance contracted for the creation of an app, based on properties of the avian retina and studies of avian visual acuity. The BirdVis app ([3.140.67.204:3838](https://doi.org/10.3140/67.204:3838) Luro, 2021) calculates contrast level between pattern and glass (visual contrast level or VCL) and also displays pattern resolution.

BirdVis uses the spectral reflectance of glass and associated pattern, as well as data on avian eyes to model visibility of a pattern applied or integral to a particular glass. Visual Contrast Levels (VCL) are quantitative estimates of how visible (to birds) a pattern is against the associated glass.



BirdVis sets an avian-‘just perceivable’ visual contrast level at 0. This means a pattern/glass combination with a VCL value > 0 is determined to be sufficiently visible to birds (perceivable), while VCL values ≤ 0 indicate the pattern will likely not be seen against the glass by birds (unperceivable). Contrast values much greater than 0 (e.g., 5 and above) are predicted to be highly visible to birds.

The BirdVis model incorporates 4 main variables:

- 1) the avian visual system (bird photoreceptor sensitivities + simulated “neural noise” for each photoreceptor type),
- 2) the reflectance of glass and pattern samples,
- 3) the background against which the glass sample/pattern is viewed (this is ignored in

the current model; it doesn't change the model estimates much because of visual adaptation to backgrounds), and
4) the types of light illuminating the glass and glass pattern (illuminants).

The model uses three illuminants: Midday sunlight (or Daylight, "D65, the international [CIE-standard illuminant for average midday sunlight](#). cf Schanda, 2007), Blue Sky, and Forest Shade (Endler, 1993). The calculated avian visual contrast values are the mean of visual models across a handful of passerine species using all three illuminants (every bird visual system+illuminant combination is modeled). We can eventually change the illuminant using any light source as long as we can get absolute spectral irradiance measurements for it, meaning we could model how the glass appears at different locations and times of day.

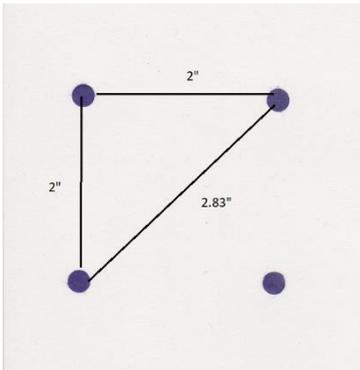
Prescriptive Standard for Glass with Non-UV, 2" x 2" Patterns

Other products can be found in the database, or may need evaluation

Bird-friendly glass assemblies that meet the following requirements are assigned a **Threat Factor of 20.**

The glass assembly must have **all** of the following characteristics:

1. Surface one VLR $\leq 15\%$
2. opaque frit, ceramic ink or other opaque marker type.
(Or Visible Contrast Level $>.0$)
3. Low e coatings behind pattern; Coating Visible Light Outdoor Reflection ≤ 15
4. Clear or low-iron glass.
5. A pattern that is made up of one of the following elements or a combination:
 - a. Continuous solid lines at least $1/8$ " wide, nowhere more than 2" apart, measured edge to edge.
 - b. Circular, square, or irregular solid shapes that are nowhere more than 2" from another shape, measured horizontally or vertically, (edge to edge) or 2.83" diagonally (see diagram below). Each shape must have a minimum area of ≥ 0.20 square inches, which corresponds approximately with circles of diameter $1/4$ " ($\sim 6\text{mm}$).
6. Patterns on side 1 or side 2 only.
7. As viewed from surface 1, all low e coatings must be behind the pattern.

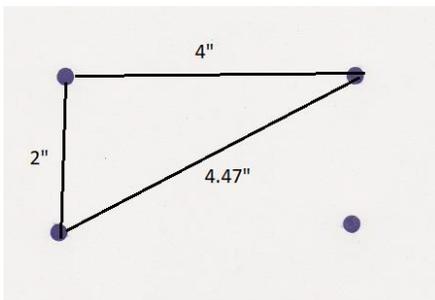


Prescriptive Standard for Glass with Non-UV, 2" x 4" Patterns

Bird-friendly glass that meets the following requirements is assigned a **Threat Factor of 25**.

The glass assembly must have all of the following characteristics:

1. Surface 1 VLR $\leq 15\%$
2. opaque frit, ceramic ink or other opaque pattern.
(Or VCL $>.0$)
- 3 Low e coatings behind pattern; Coating Visible Light Outdoor Reflection $\leq 15\%$
- 4 Clear or low-iron glass.
- 5 A pattern that is made up of one of the following elements or a combination:
 - a. Continuous solid lines at least $1/8$ " wide, nowhere more than 2" apart for horizontal or angled lines, 4" for vertical lines, measured edge to edge.
 - b. Circular, square, or irregular solid shapes that are nowhere more than 2" from another shape vertically and nowhere more than 4" from another shape horizontally, or 4.47" diagonally, measured edge to edge (see diagram below). Each shape must have an area of ≥ 0.20 in², which corresponds approximately with circles of diameter $1/4$ " (~ 6 mm).
6. Patterns on side 1 or side 2 only.
7. As viewed from surface 1, all low e coatings must be behind the pattern.



Prescriptive Standard for Glass with Non-UV Patterns spaced <2"

Bird-friendly glass builds with opaque patterns that meet the following requirements are assigned a **Threat Factor of 25**.

1. Surface 1 VLR $\leq 15\%$
2. Contrast threshold > 0 or pattern with opaque frit, ceramic ink or other opaque material
3. Low e coatings behind frit; Coating Visible Light Outdoor Reflection ≤ 15
4. Clear or low-iron glass.
5. A pattern that is made up of one of the following elements or a combination:
 - a. Continuous solid lines at least $\frac{1}{4}$ " wide and spacing equivalent to line width, measured edge to edge.
 - b. Circular, square, or irregular, solid shapes at least $\frac{1}{4}$ inch in diameter, spacing between shapes no less than diameter of pattern elements measured edge to edge.

Patterns can be on side 1 or side 2

Low e coatings must be behind the pattern

ASSIGNED THREAT FACTOR = 25

Prescriptive Standard for Spandrel Glass

Spandrel glass can be bird-friendly when it incorporates deterrent patterns. For surface 1 continuous etch glass builds, see database.

Prescriptive Standard for External Façade Materials

Protective Screen External to Glass (fixed in place)

Horizontal or vertical slats with $\frac{1}{8}$ " minimum face thickness and 2" maximum space between horizontal elements and 4" maximum space between vertical elements.

ASSIGNED THREAT FACTOR=5

Horizontal or vertical slats with $\frac{1}{8}$ " minimum face thickness. Slat depth and spacing ratio shall obscure 85% of glass when analyzed from all possible viewing angles

ASSIGNED THREAT FACTOR=15

Expanded metal or perforated screens having elements with maximum spacing of 2" horizontal or 4" vertical

ASSIGNED THREAT FACTOR=10

Welded wire mesh with minimum $\frac{1}{8}$ " dia. wire and 2" maximum space between horizontal elements and 4" maximum space between vertical elements.

ASSIGNED THREAT FACTOR=10

Poly or nylon netting with maximum 1" opening, installed taut, 6" minimum outboard of glass

ASSIGNED THREAT FACTOR=25

Operable Shutters External to Glass

Vertical sunshade, maximum horizontal spacing 9", minimum depth 9"

ASSIGNED THREAT FACTOR=25

Horizontal sunshade, maximum vertical spacing 6", minimum depth 6"

ASSIGNED THREAT FACTOR=25

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