Glass facades deliver many benefits including daylight, views and dynamic aesthetics. A counterpoint is that birds do not perceive glass as an obstacle to their flight path. This document provides information to balance glass benefits with the adverse impact on birds.
BIRD FRIENDLY GLASS

Multiple organizations are involved in researching the ability of birds to perceive glass. The research has shown that adding a pattern can increase a bird’s ability to perceive glass, thus reducing the likelihood of a collision. This awareness has lead organizations, cities and states to develop bird-safe building guidelines, laws and official standards, such as Standards for Bird-Safe Buildings (San Francisco Planning Department 2011) and Bird-Friendly Building Design (Sheppard and Phillips 2015).

VIRACON’S INVOLVEMENT

As a glass fabricator, Viracon has been actively involved in the on-going research to understand various glass products’ potential to reduce bird strikes. To date, our focus has been on finding practical solutions using conventional glass products with applied patterns.

Viracon’s printed insulating glass units were tested during the fall 2010 and 2017 bird migration utilizing a tunnel test designed by the American Bird Conservancy (ABC), based on prior tests performed in Austria. The testing was performed at Powderrmill Avian Research Center (PARC) in Pennsylvania.

PARC is part of Carnegie Museum of Natural History’s biological research station, Powderrmill Nature Reserve. PARC has an extensive bird banding program, conducts bioacoustical research and evaluates avian perception of glass using the tunnel test designed by ABC.

THE TUNNEL TEST

Birds are released into one end of a test tunnel (Figure 1). They fly toward the opposite end of the tunnel where there is an opening with a clear control sample and a test sample with a pattern (Figure 2). Birds respond by flying toward the control sample or the test sample as they attempt to exit the tunnel (light netting is installed in front of the glass to prevent collisions with the glass). Researchers record each flight and study the response to score the test sample. The score for the sample is the percentage of birds tested that fly towards the clear glass (American Bird Conservancy 2012).

Product Scoring and Threat Factors

Scores from the ABC tunnel test are utilized by ABC and the U.S. Green Building Council® (USGBC) to assign a threat factor for each tested material. A lower threat factor means that the product deterred more birds in the tunnel test than a product with a higher threat factor.

Threat factors are a key component in comparing bird deterrence products and in achieving the bird collision deterrence pilot credit in the LEED® for Building Design and Construction rating system. Designing a façade where all materials have a threat factor of 15 or less means the project is exempt from additional calculations. If any material with a threat factor >15 is used, then Bird Collision Threat Rating (BCTR) calculations are required (U.S. Green Building Council 2019).
A current list of product threat factors can be downloaded from USGBC’s website: https://www.usgbc.org/resources/bird-collision-deterrence-summary-threat-factors

**TESTED PRODUCTS**

The Viracon patterns tested in 2010 and 2017 were incorporated into 1” insulating units. The outboard glass ply was 1/4” clear glass with a ceramic enamel (frit or ink) pattern on the second surface, Viracon’s VE-2M low emissivity coating applied over the pattern, a 1/2” space and a 1/4” clear glass inboard.

**Scenario 1: Threat Factor 6**
Color: V901 Dark Gray Viraspan
Pattern: 1/8” horizontal lines alternating with 1/2” spaces (screen 2256); 20% coverage

**Scenario 2: Threat Factor 10**
Color: V948 Medium Gray Viraspan
Pattern: 1/8” horizontal lines alternating with 1/2” spaces (screen 2256); 20% coverage

**Scenario 3: Threat Factor 41**
Color: V175 High Opacity White
Pattern: 1/8” dots, 1/4” on center (screen 5065); 20% coverage

**Scenario 4: Threat Factor 24**
Color: V175 High Opacity White
Pattern: 1/8” dots (screen 5006); 40% coverage

**Scenario 5: Threat Factor 17**
Color: Digital White and Digital Etch (every other line switches between the colors)
Pattern: 1/8” horizontal lines 2” on center; 6% coverage

**Scenario 6: Threat Factor 29**
Color: Digital White and Digital Etch (1/8” lines were etch and 1/16” lines were white)
Pattern: alternating 1/8” and 1/16” horizontal lines all 2” on center; 5% coverage

**Alternate Products**

In addition to testing glass with Viracon’s ceramic enamel, ABC has tested products with alternate methods of creating a pattern such as ultraviolet reflective coatings and acid etched glass. Ultraviolet reflective coatings are intended to be visible to birds, because they can see in the ultraviolet spectrum, however are less visible to humans. Acid-etched patterns offer a potential solution for fabricators who are unable to apply simulated etch ceramic enamel through a silk-screen or digital print process.

In testing, neither the ultraviolet reflective products nor the acid etch patterns have achieved threat factors as low as the best performing ceramic enamel. The ultraviolet reflective coatings have a threat
factor range of 23 to 36. The full range of acid etch patterns are not included in the USGBC threat factor summary; however, a fully etched surface is listed with a threat factor of 25 (U.S. Green Building Council 2016).

UNTESTED PRODUCTS
Bird collision researchers acknowledge that additional product testing will continue to develop our understanding of which patterns are the most effective. At the same time, researchers acknowledge it isn’t practical to test every pattern. To address this practicality, researchers have used existing research to develop a guideline commonly referred to as the 2x4 Rule.

2x4 Rule
The 2x4 Rule is referred to in multiple bird friendly design guidelines and indicates that developing patterns with horizontal lines spaced no more than 2” apart or vertical lines spaced no more than 4” apart can deter collisions (Sheppard and Phillips 2015; The University of British Columbia 2016; U.S. Fish and Wildlife Service 2016).

Viracon offers a variety of standard patterns that comply with the 2x4 Rule. The patterns range in coverage from 20% to 70% and can be applied to the same surface as any of our standard coatings. Please see the printing section of our website (www.viracon.com) for the available standard patterns and colors.

The 2x4 Rule can also be utilized to develop a custom pattern. For example, to meet the 2x4 Rule, Springbrook Nature Center’s designers developed a pattern that consisted of 1/8” vertical lines, 4” on center using V175 High Opacity White. This pattern was printed on the same configuration used to test Viracon’s other patterns—1” insulating units with VE-2M and the pattern on the second surface.

Patterns with Dual-Sided Color
Digital printing technology allows Viracon to print patterns where the color of the pattern from the exterior of the building differs from the color of the pattern from the interior of the building. This technology can be especially useful in bird friendly applications because the exterior color can match what was tested while the interior color can be altered without changing the threat factor.

CONCLUSION
While on-going testing is necessary to further understand patterns and coatings, including those with low, medium and high levels of reflectivity, it is evident based on the testing done thus far, that ceramic enamel patterns, especially those applied to the 2nd surface of an insulating unit, can be an effective way to reduce bird collisions with glass.
REFERENCES


https://www.usgbc.org/node/12224962?return=/pilotcredits/New-Construction/v4.1

https://www.usgbc.org/resources/bird-collision-deterrence-summary-threat-factors

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