Pilot Credit 55: Bird Collision Deterrence

Applicable Rating Systems

This credit is available for pilot testing by the following LEED project types:

- New Construction
- Core & Shell
- Schools
- Retail: New Construction
- Healthcare
- Existing Buildings: Operations & Maintenance

Intent

Reduce bird injury and mortality from in-flight collisions with buildings.

Requirements

NC, CS, SCHOOLS, RETAIL, HEALTHCARE

Comply with one of the Building Façade options, one of the Interior Lighting options, one of the Exterior Lighting options, and the Post-Construction Monitoring Plan requirements below.

Building Façade Requirements

Develop a building façade design strategy to make the building visible as a physical barrier and eliminate conditions that create confusing reflections to birds.

If all materials on the building façade have a Threat Factor[1] of 15 or below, the project is exempt from the building façade requirements and the following Bird Collision Threat Rating calculations are not required.

Bird Collision Threat Rating
If any material on the building façade has a Threat Factor above 15, then the Bird Collision Threat Rating calculations are required. First separate the building into Façade Zone

1 or Façade Zone 2. Façade Zone 1 includes the first 3 floors above ground level, as well as 1 floor above any green roofs. Façade Zone 2 includes all façade areas above the 3rd floor. Then identify the Material Types present on the building façade and the Threat Factor of each type (for detailed material types and associated threat factors, see the *Bird Collision Deterrence: Summary of Material Threat Factors* table developed by the American Bird Conservancy). Determine the total area of each Material Type.

No more than 15% of the glazed area in Façade Zone 1 can have a Threat Factor higher than 75. However, more than 15% of the glazed area in Zone 2 may have a Factor higher than 75. All glazed corners or fly-through conditions[2] must have a Threat Factor less than or equal to 25.

Table 1: General Material Types: Threat Potential

Material Type	
Greatest Threat Potential	Glass: Highly reflective and/or completely transparent surface
	Glass: Reflective or transparent surface interrupted by a visible pattern based on the 2 x 4 Rule*.
	Glass: Reflective or transparent surface shielded by screens, shutters, or louvers where the resultant exposed glass satisfies the 2 x 4 Rule*.
	Glass: Translucent with matte or textured surface.
Least Threat Potential	Opaque surface
*The 2 x 4 Rule is defined as a collision deterrence module based upon the physical profile of a bird in flight. Current research has established maximum module dimensions of 2” high x 4” wide.	

Using the formulas below, achieve a maximum total building Bird Collision Threat Rating (BCTR)[3] of 15 or less.

First, for each Façade Zone, perform the following calculation:

[((Material Type 1 Threat Factor) x (Material Type Area)) + ((Material Type 2 Threat Factor) x (Material Type Area))…] / [Total Façade Zone Area] = Façade Zone BCTR

Then determine the total building Bird Collision Threat Rating by performing the following calculation with the Zone 1 and Zone 2 BCTRs:

[((Zone 1 BCTR) x 2) + (Zone 2 BCTR)] / 3 = Total Building BCTR

AND

Interior Lighting Requirements

Develop a lighting design strategy to effectively eliminate or reduce light trespass from the building. The lighting in all spaces with a direct line of sight to exterior fenestration shall meet at least one of these two options:

Option 1. Nighttime Personnel

Include a requirement in any building operations guidelines stating that all interior lighting must be turned off by the appropriate nighttime personnel after hours when the space is unoccupied, or at a minimum from midnight until 6 a.m.

OR

Option 2. Automatic Shutoff

The lighting shall be controlled such that all lighting in the space will be automatically shut off after being vacant for a period of no longer than 30 minutes.

There are two exceptions to *both* options:

- lighting specifically required to be operated 24-7 for health and safety; and
- lighting that is exempted under ANSI/ASHRAE/IESNA Standard 90.1–2010, Section 9.1.1.

AND

Exterior Lighting Requirements

Develop a lighting design strategy to effectively reduce or eliminate light trespass from exterior fixtures. Meet the exterior and garage lighting power density and controls requirements in sections 9.4.1.3, 9.4.1.7, 9.4.3, of the ANSI/ASHRAE/IES Standard 90.1-2010 (with errata but without addenda).

OPTION 1. Fixture Shielding and Automatic Shutoff

Shield all exterior fixtures such that the installed fixture does not directly emit any light at a vertical angle more than 90 degrees from straight down. Exterior building fixtures that are not necessary for safety, building entrances, and circulation shall be automatically shut off from midnight until 6 a.m.

OR

OPTION 2. New Construction SS Credit, Light Pollution Reduction

Demonstrate that the project complies with the exterior lighting requirements of the latest published LEED for New Construction SS Credit, Light Pollution Reduction.

AND

Post-Construction Monitoring Plan Requirements

Develop a three-year post-construction monitoring plan to routinely monitor the effectiveness of the building design in preventing bird collisions. Include methods to identify and document locations of the building where repeated bird strikes occur, the number of collisions, the date, the approximate time (if known), and features that may be contributing to collisions. The plan should also provide a process for corrective action.

EXISTING BUILDINGS: OPERATIONS & MAINTENANCE

Establishment

Comply with the Facade Monitoring Plan requirements, one of the Interior Lighting options, and one of the Exterior Lighting options below.

Façade Monitoring Plan Requirements

Develop a three-year building facade monitoring plan to routinely monitor the effectiveness of the building design in preventing bird collisions. Include methods to identify and document locations of the building where repeated bird strikes occur, the number of collisions, the date, the approximate time (if known), and features that may be contributing to collisions. The plan should also provide a process for corrective action. Use the monitoring plan as the baseline for the measures implemented during the performance period.

AND

Interior Lighting Requirements

Develop a lighting design strategy to effectively eliminate or reduce light trespass from the building. The lighting in all spaces with a direct line of sight to exterior fenestration shall meet at least one of these two options:

Option 1. Nighttime Personnel

Include a requirement in any building operations guidelines stating that all interior lighting must be turned off by the appropriate nighttime personnel after hours when the space is unoccupied, or at a minimum from midnight until 6 a.m.

OR

Option 2. Automatic Shutoff

The lighting shall be controlled such that all lighting in the space will be automatically shut off after being vacant for a period of no longer than 30 minutes.

There are two exceptions to *both* options:

- lighting specifically required to be operated 24-7 for health and safety; and

- lighting that is exempted under ANSI/ASHRAE/IESNA Standard 90.1–2010, Section 9.1.1.

AND

Exterior Lighting Requirements
Develop a lighting design strategy to effectively reduce or eliminate light trespass from exterior fixtures. Meet the exterior and garage lighting power density and controls requirements in sections 9.4.1.3, 9.4.1.7, 9.4.3, of the ANSI/ASHRAE/IES Standard 90.1-2010 (with errata but without addenda).

OPTION 1. Fixture Shielding and Automatic Shutoff

Shield all exterior fixtures such that the installed fixture does not directly emit any light at a vertical angle more than 90 degrees from straight down. Exterior building fixtures that are not necessary for safety, building entrances, and circulation shall be automatically shut off from midnight until 6 a.m.

OR

OPTION 2. New Construction SS Credit, Light Pollution Reduction

Demonstrate that the project complies with the exterior lighting requirements of the latest published LEED for New Construction SS Credit, Light Pollution Reduction.

Performance

Implement the façade monitoring plan for a period of three years. If results of the monitoring plan indicate that areas of the building receive multiple collisions, consider implementing temporary and/or permanent retrofits to the building façade.

[1] The **Threat Factor** of a Material Type refers to the material's level of danger posed to birds based on birds' ability to perceive the surface as an obstruction, as tested using a "tunnel" protocol. The higher the Threat Factor, the greater the risk that collisions will occur.

[2] **Fly-through conditions** are created when windows meet perpendicularly on a corner, or when windows are installed parallel in close proximity such that a clear line of sight is created through the building.

[3] The **Bird Collision Threat Rating** (BCTR) is an index of the total building's level of danger posed to birds based on the relative amounts of different materials on the external envelope, and the Threat Factor of those materials. The higher the BCTR, the greater the risk that collisions will occur.

Credit Submittals

General:

1. Register for Pilot Credit(s) here.
2. Register a username at LEEDuser.com, and participate in online forum

3. Submit feedback survey; supply PDF of your survey/confirmation of completion with credit documentation

Credit Specific:

NC, CS, Schools, Retail, Healthcare

Building Façade

- If all materials on the building have a Threat Factor of 15 or below and the project did not perform the calculations, submit a narrative describing why the materials, and building in general, are "bird-friendly." This includes a material list and supporting data.
- A completed *Bird Collision Threat Rating* spreadsheet.
- Plan(s) and/or elevation(s) depicting the location of all materials and shading/screening devices used to comply with this credit
- Applicable specification details on all materials and shading/screening devices used to comply with this credit

Interior Lighting

Option 1:

- A copy of the building operations guidelines text that stipulates that all interior lighting must be turned off by the appropriate nighttime personnel after hours when the space is unoccupied.

Option 2:

- Narrative, and drawings showing control locations, describing the lighting controls used on the interior lighting, the sequence of operation and how these controls comply with this credit and section 9 of the ANSI/ASHRAE/IES Standard 90.1-2010

Exterior Lighting

Option 1:

- A photometric report of those luminaires demonstrating that no light is emitted above 90 degrees from straight down in their final installed position(s).
- Narrative, and drawings showing control locations, describing the lighting controls used on the exterior lighting, the sequence of operation and how these controls comply with this credit.

Option 2:

- All submittals required for the LEED for New Construction SS Credit, Light Pollution Reduction.

Post-Construction Monitoring Plan

- A copy of the post-construction monitoring plan

EBOM

Interior Lighting

Option 1:

- Provide all Submittals listed under Interior Lighting in NC, CS, Schools, Retail, Healthcare above.

Option 2:

- Provide all Submittals listed under Interior Lighting in NC, CS, Schools, Retail, Healthcare above.

Exterior Lighting

Option 1:

- Provide all Submittals listed under Exterior Lighting, Option 1 in NC, CS, Schools, Retail, Healthcare above.

Option 2:

- Provide all Submittals listed under Exterior Lighting, Option 2 in NC, CS, Schools, Retail, Healthcare above.

Post-Construction Monitoring Plan

- Provide all Submittals listed under Post-Construction Monitoring Plan in NC, CS, Schools, Retail, Healthcare above.
- Provide records of all collisions during the Performance Period. Include the location, date, and approximate time of day for each collision.
- Plan(s) and/or elevation(s) depicting the location of all temporary and permanent materials and shading/screening devices used to retrofit the building façade in response to the results of the monitoring plan.
- Applicable specification details on all temporary and permanent materials and shading/screening devices used to retrofit the building façade in response to the results of the monitoring plan.

Additional Questions

1. The goal is to prevent, as much as possible, bird collisions with building glazing and therefore reduce bird mortality or injury. Do you believe that these requirements achieve this goal? Why or why not?

2. What obstacles make bird-safe building difficult? Obstacles may or may not be specific to the proposed credit requirements.

3. Do you feel that the Total Building BCTR thresholds are appropriate? If not, should they be lower or higher?

4. Was the Monitoring Plan easy to develop and implement? Who was involved in collecting the data for the plan? What trends were noted?

Background

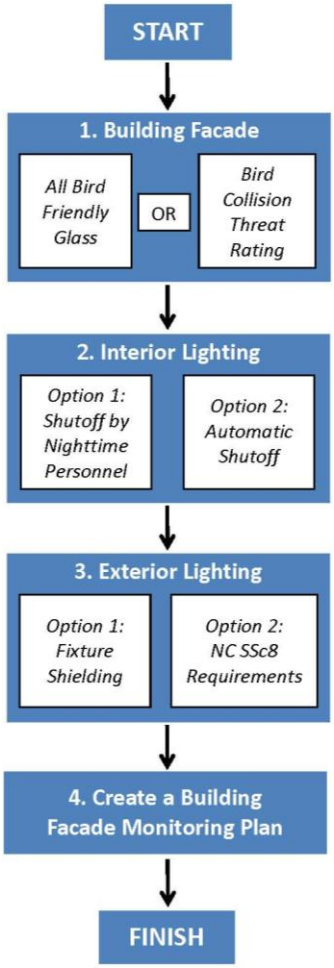
An estimated 1 billion birds die annually in the United States as a result of striking buildings, bridges, and other manmade structures. Many factors play a role, including lights, vegetation, and water. But glass is the main culprit, according to bird-safe design guidelines released in 2007 by the New York City Audubon Society, the Chicago Birds & Buildings Forum, and the City of Toronto. Because birds do not perceive conventionally formulated glass as a solid barrier, they fly into it. They may mistake reflections as continuous space and be attracted to trees or other objects in, or visible through, a glassed-in space.

This credit is largely an appeal to enlightened self-interest, saving birds while reaping the financial benefits of green building. A number of cities are pushing “bird-safe” design, although mostly as a recommendation. Toronto may adopt green building requirements that include bird safety criteria, and in Manhattan the environmental impact statement for the reconstruction of the World Trade Center addresses bird safety. A handful of top designers have made it a priority, but advocates note that it’s far from a mainstream design consideration.

The credit emphasizes creating “visual noise”- i.e., patterns that birds can register. Strategies to create patterns on glass include using color, texture, opacity, or ultraviolet materials that are visible to birds. Keeping openings small and reducing the quantity of glass on each façade will correspondingly lower the incidence of bird strikes.

Additional Information

The following flowchart gives a visual explanation of the credit requirements for New Construction, Core & Shell, Schools, Retail: New Construction, and Healthcare projects pursuing this credit:



A building design that deters bird collisions will allow for most any type of site landscape design. Although the proximity and height of landscape material have shown to influence the number of bird collisions, if the building façade is designed to be “bird-friendly”, the landscape material will not reflect and cause confusion to birds.

Atria lighting is addressed in the Interior Lighting requirements, and should follow the same shutoff procedures as other interior spaces with a direct line of sight to the exterior fenestration. Lighted building atria are major causes of nighttime bird collisions, so it is important that larger lit spaces are shutoff during the specified times. This is *especially* important during migration seasons in the spring and fall.

The monitoring should include a plan to routinely monitor the effectiveness of the building design in preventing bird collisions. Monitoring (which includes walking the perimeter before normal business hours or at night, geotagging photographs of dead or injured birds, or other similar strategies) should occur twice a week at minimum. It is advisable that the monitoring be done prior to 8 or 9 am, and that it occurs daily during peak migration seasons. Monitoring works best if the building is divided into easily identifiable segments, facades, or portions of facades so that the relevant location of the collision can be easily identified. Monitoring should be linked to standard building maintenance as much as

possible, thereby becoming routine and requiring minimal extra effort and cost. The more data collected, the better the resulting retrofits (if any) will be. Teams can use their own monitoring plan, or an "out-of-the-box" solution, whichever is more appropriate. See the Resources section for more information on developing a monitoring plan.

For a general outline of applicable building materials and their threat factors, see the *Bird Collision Deterrence: Summary of Material Threat Factors* table. Teams can find the necessary, detailed data (materials that comply with the requirements) from ABC's website and the Resources section of this document. Below is an example Bird Collision Threat Rating calculation that meets the Building Façade Requirements.

BUILDING DATA	
Number of Stories	12
Building height	145'-2"
Total Façade Area	44170 sf
Façade Zone 1 Area	13316 sf
Façade Zone 2 Area	30854 sf

	Zone 1 (Z1) CALCULATION			**HGF**	**Zone 2 (Z2) CALCULATION**		
Material Type	**Threat Factor**	**Material Area (A)**	**Factored Area (FA)**	**Hazardous Glass Area (HGA)**	**Threat Factor**	**Material Area (A)**	**Factored Area (FA)**
Clear glass	100	560	56000	560	100	0	0
Glass: exterior frit 4" x 8"	20	816	16320	0	20	7209	144180
Opaque	0	11940	0	0	0	23645	0
	Z1 Area Totals=	13316 sf	72320 sf	**HGA Totals=** 560 sf	**Z2 Area Totals=**	30854 sf	144180 sf
		Z1 BCTR =	**5.43**	**Z1 HGF = 4.2%** (HGA/A)<15%		**Z2 BCTR =**	**4.67**

Total Building BCTR =	**5.18**

Façade Zone 1
3 floors

Calculate the Façade Zone 1 BCTR
[((Material Type 1 Threat Factor) x (Material Type Area)) + ((Material Type 2 Threat Factor) x (Material Type Area))…] / [Total Façade Zone Area] = Façade Zone BCTR

[100 x 560) + (20 x 816) + (0 x 11940)] / 13316 = **5.43 (Façade Zone 1 BCTR)**

Façade Zone 2

9 floors

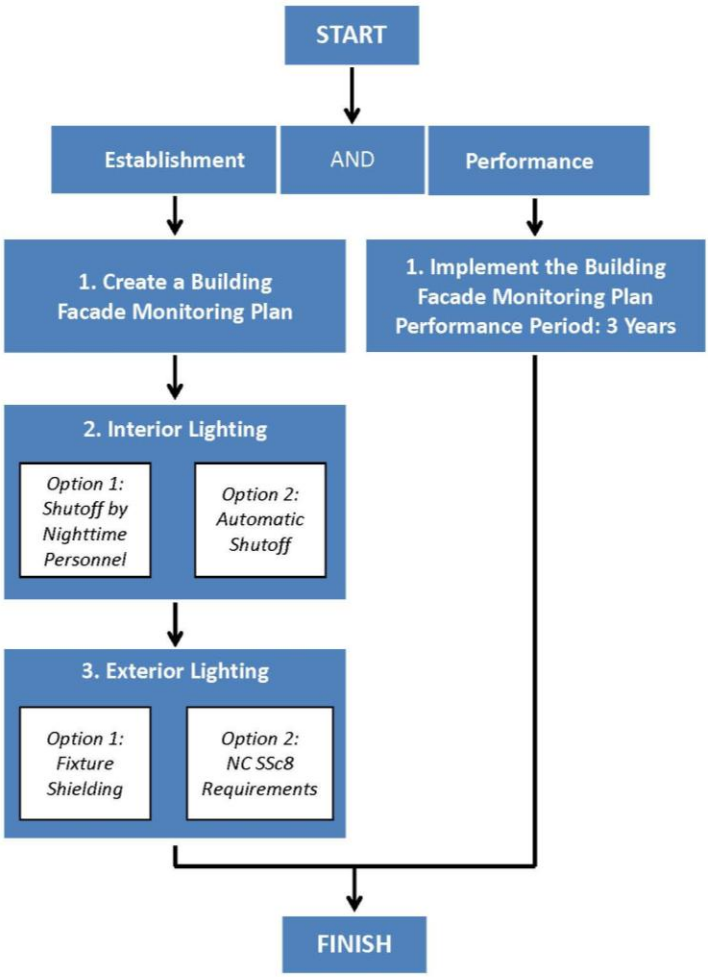
Calculate the Façade Zone 2 BCTR
[((Material Type 1 Threat Factor) x (Material Type Area)) + ((Material Type 2 Threat Factor) x (Material Type Area))…] / [Total Façade Zone Area] = Façade Zone BCTR

[(100 x 0) + (20 x 7209) + (0 x 23645)] / 30854 = **4.67 (Façade Zone 2 BCTR)**

Determine the total building BCTR
[((Zone 1 BCTR) x 2) + (Zone 2 BCTR)] / 3 = Total Building BCTR

[(5.43 x 2) + 4.67] / 3 = **5.18 (Total Building BCTR)**

The following flowchart gives a visual explanation of the credit requirements for Existing Buildings: Operations & Maintenance projects pursuing this credit:



EB: O&M projects differ from new construction projects in that the building façade characteristics are already in place when projects begin. Therefore, there are fewer opportuni-

ties to design new building façade elements that deter bird collisions. The EB: O&M requirements recognize the unique nature of existing buildings, and stipulate that a monitoring plan should be created to first observe and document bird collisions, then take corrective action to mitigate any collisions that occur. Along with the monitoring plan, interior and exterior lighting requirements should be met.

Resources

American Bird Conservancy
www.abcbirds.org
(202) 234-7181
A national leader in reducing human impacts on birds and wildlife. ABC's bird collision program supports national efforts to reduce bird mortality through education and advocacy.

American Bird Conservancy: *Bird-Friendly Building Design*
http://www.abcbirds.org/newsandreports/BirdFriendlyBuildingDesign.pdf
(202) 234-7181
A database with photographs that provide visual guides to designing "bird-friendly" buildings and building features, and choosing appropriate materials. It will be periodically updated.

American Bird Conservancy: Post Construction Monitoring Plan
www.abcbirds.org
(202) 234-7181
This website includes an example of a post-construction monitoring plan to monitor the effectiveness of the building design in preventing bird collisions.

American Bird Conservancy: *Tunnel Testing Table* and Tunnel Testing Protocol
Link here and on ABC's website: www.abcbirds.org
(202) 234-7181
The PDF and website provide a table that lists detailed material/pattern types and associated characteristics for use in calculating the Bird Collision Threat Rating. The Tunnel Testing Protocol describes the process used to test each surface pattern.

Birds & Buildings Forum
www.birdsandbuildings.org
(312) 202-0667
This Chicago-based non-profit supports more "bird-friendly" design through education and advocacy. Their website maintains lists of organizations and resources.

City of Chicago, Department of Environment
www.cityofchicago.org/Environment/BirdMigration/sub/main.html
One of the first cities to implement a mandatory lights-out program, Chicago's Department of Environment has many resources for "bird-friendly" design.

CyberTracker Conservation: GPS Field Data Collection
http://cybertracker.org/
CyberTracker is a free, GPS-based application for collecting and recording field data. It can be used to track species, locations, photographs, and other observations.

Fatal Light Awareness Program (FLAP)
www.flap.org
(416) 366-FLAP
Initiated the *Bird-Friendly Building Development Program* for the City of Toronto, conducts monitoring and promotes "bird-friendly" design.

Florida Fish & Wildlife Conservation Commission
http://www.floridaconservation.org/
Supports efforts to reduce the impact of light pollution on sea turtles.

New York City Audubon *Bird-safe Building Guidelines.*
www.nycaudubon.org
(212) 691-7483
This Audubon chapter takes a leadership role in reducing bird collisions with buildings. Publishes Bird-Safe Building Guidelines, conducts monitoring and promotes "bird-friendly" design, through its Project Safe Flight.

Changes

Changes made on 12/1/2011:

- Clarified that "bird-friendly" means materials with a Threat Factor of 15 or below
- Revised Table 1
- Updated Performance requirements for EB:O&M projects
- A new link to the updated *Bird Collision Deterrence: Summary of Material Threat Factors* table
- Updated references to the *Bird-Friendly Building Design* document and the *Tunnel Testing Table* spreadsheet and Protocol