



## **Committee of 100 Report: Proposed bird-friendly changes to the DC Green Building Code**

May 11, 2016

### Introduction

DC Department of Environment and Energy (DOEE) has requested that the Committee of 100 offer suggestions to make the DC Building Code more bird-friendly.

In a few months (DOEE), DC Department of Transportation (DDOT), DC Department of Consumer and Regulatory Affairs (DCRA) and other agencies will begin the three-year cycle of reviewing the DC Building Code (regulations, not a statute) for possible changes. This is an opportunity to improve the building code by adopting architectural and lighting standards to improve bird safety as part of the city's commitment to energy conservation and green building. Changes to the DC Green Building Code to make buildings more bird-friendly will reduce bird collisions with buildings, save lives of birds, and save energy. Other cities have changed their building codes to mandate standards for bird-safe buildings.

We recommend that the LEED Pilot Credit 55: Bird Collision Deterrence (2015) be incorporated in the DC Green Building Code, which applies to buildings over 50,000 square feet. Advantages of LEED Pilot Credit 55 are:

- it is based on sound science
- it sets out an objective test for bird-friendly building design, and
- it has been well-received by architects and developers, the General Services Administration, and DOEE.

This paper will outline the problem with bird collisions in DC, discuss why birds collide with buildings, and suggest solutions

### Bird-collision studies at 5 DC buildings

*Lights Out DC* is a citizen science project run by City Wildlife that monitors downtown buildings in the District of Columbia and collects victims of bird strikes. Over the past six years, *Lights Out DC* has collected more than 1,500 bird victims in just a small area of downtown. See table below. Five of the buildings monitored are responsible for more than half of these bird strikes. These five buildings present several types of threats to birds; some have transparent or reflective glass skyways, others have transparent glass areas illuminated at night. As discussed below, three of these building owners have acted to reduce bird collisions and save energy.

Buildings monitored by *Lights Out DC* showing the number of bird strikes 2010-2015

Building & type of bird hazard	2010 <sup>1</sup>	2011	2012	2013	2014	2015	Total	% Released	% Dead
<b>Thurgood Marshall Federal Judiciary Building,</b> 1 Columbus Circle, NE									
Transparent glass, plant-filled atrium, angled walls, reflections	36	23	31	39	48	32	209	43%	57%
<b>DC Court of Appeals</b> 430 E Street, NW									
Transparent glass entry pavilion	11	29	19	18	49	36	162	2%	98%
<b>300 New Jersey Avenue, NW</b>									
Transparent glass, angled walls, expressed structural elements inside, red exit lights	8	35	16	22	44	28	153	9%	91%

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<sup>1</sup> In 2010, *Lights Out DC* volunteers walked their routes only 2 days per week. In all other years, volunteers monitored 7 days per week. Thus, calculations of bird strike reductions have been based on 2010 figures that were extrapolated from the 2010 data shown here.

## 800 K Street, NW<sup>2</sup>

Reflective glass skyway	20	16	32	16	33	13	130	12%	88%
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### Convention Center<sup>3</sup>

Transparent glass skyway	7	17	20	13	32	22	111	11%	89%
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<b>Total from 5 Buildings</b>	<b>82</b>	<b>120</b>	<b>118</b>	<b>108</b>	<b>206</b>	<b>131</b>	<b>765</b>	<b>18%</b>	<b>82%</b>
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Data from additional buildings studied

42	92	92	98	250	175	749
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<b>Total from all buildings:</b>	<b>124</b>	<b>212</b>	<b>210</b>	<b>206</b>	<b>456</b>	<b>306</b>	<b>1514</b>
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The number of collisions is likely higher than the figures above because researchers probably did not find 100% of birds killed. The birds killed by collisions at these buildings include dozens of species, both resident and migrating birds, and many birds classified by DOEE as "Species of Greatest Conservation Need" (SGCN). SGCN bird species are those "that are indicative of the diversity and health of the District's wildlife, including low and declining populations. ... The District's resident and breeding species keep the nation's capital high in biodiversity and ecologically healthy."<sup>4</sup> In other words, birds dying from collisions with buildings include a wide range of species, not just birds that we may think of as common. For example, volunteers found ovenbirds, indigo buntings, black-throated blue warblers, ruby-throated hummingbirds, and woodcocks. The owners of three of the five buildings studied, the Thurgood Marshall Federal Judiciary Building, the DC Court of Appeals, and the Convention Center, have acted to reduce bird collisions.

### Thurgood Marshall Federal Judiciary Building, 1 Columbus Circle, NE

The glass atrium in this building has been the source of many bird collisions, in part because there are live trees in the atrium. The Architect of the Capitol, which manages this building, reduced nighttime lighting immediately upon learning of the problem in 2011. Between 2011 and 2014, the atrium lighting was reduced between 11 pm and 6 am during migration seasons, and bird collisions were reduced by 2/3. Now the atrium lighting is reduced from 11 pm and 6 am all year round. (Collision statistics are pending.) The energy savings of this reduced lighting are significant, from an atrium load of 77 kW to 4.25 kW during the night. Over a period of a year, energy use has been reduced by 28%.

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<sup>2</sup> The elevated glass walkway between buildings is responsible for most bird collisions at this site. We understand that the building owner plans a renovation and may agree to incorporating bird-friendly measures.

<sup>3</sup> The Convention Center is studying installing solar and bird-friendly film on the windows.

<sup>4</sup> Wildlife Action Plan, Appendix A, and p. 14.

### DC Court of Appeals, 430 E Street, NW

An all-glass atrium was added to this classical building in 2009. Since then, the atrium has been the site of many fatal bird collisions. In 2015, the Court began turning off most of the lights in the atrium from dusk until dawn (7:30 pm - 6 am) during migration seasons (April, May, September, and October). Bird strikes were lower in 2015, and over a period of a year, the energy use in this atrium has been reduced by 15%.

### The Washington Convention Center

The transparent glass skyway over L Street is the primary source for bird collisions in this building. The building manager began dimming the night lighting in the skyway in 2015, and fewer birds were found at the skyway. However, birds are still being found along the 9<sup>th</sup> Street façade where the lighting has not been dimmed. (Energy savings have not been calculated for this building.)

### Estimated annual bird collisions in the city as a whole: at least 120,196

DOEE requested that C100 estimate the number of bird collisions in the city per year, a complex task because vegetation (e.g., the many oak trees near the 5-building study area) and other factors affect the rate of collisions. Focusing on commercial buildings, scientists estimate that for a building between four and 11 stories tall, annual bird mortality from collisions is 21.7 birds. This number may be low. Between 2011 and 2015 there were an average of 27.3 collisions per year at the 5 buildings studied ((683 total collisions for all buildings studied between 2011 and 2015 ÷ 5) ÷ 5 years)) Focusing on the 5,539 commercial office buildings and apartment buildings, a conservative estimate of annual bird collisions is 120,196. (5,539 x 21.7) This is likely an undercount, because it omits higher collision rates at problem buildings, and omits government, university, and religious-use buildings.<sup>5</sup>

### Review of scientific literature

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<sup>5</sup>Scott R. Loss, Tom Will, and Peter P. Marra, "Direct human-caused mortality of birds: improving quantification of magnitude and assessment of population impact." Frontiers in Ecology and the Environment 10: (No. 7, Sept. 2012) 357-364. In the District of Columbia as of 2015, there are 330 Class A office buildings of 50,000 square feet or more, and 2,306 total commercial buildings. There are 174 Class A apartment buildings with 50 units or more, and 3,233 total apartment buildings. DC Office of Revenue Analysis Briefing Document 2015-10 (Oct. 2015), "Tangible markers of DC's recovery from the Great Recession: ninety-one new buildings." <http://cfo.dc.gov>. Internet; accessed 12 Mar. 2016.

Birds have a vital role in maintaining a healthy environment. They consume vast quantities of insects (including mosquitoes), control rodent populations, and regenerate habitats by spreading seeds.<sup>6</sup>

We think of DC as an urban area. But in fact, DC is home to an average of 230 bird species year-round. DC is also on the Atlantic flyway, and attracts thousands of migrating birds every spring and fall, that stop here to rest and feed before continuing their journey. (Figure 1). More than 60 species breed in the District, and its rivers are wintering locations for thousands of waterfowl.<sup>7</sup> The US Fish and Wildlife Service recognizes that "cities can become effective sanctuaries for birds and other wildlife." The District joined other US cities to become a US Fish and Wildlife Service Urban Bird Treaty City in 2011.<sup>8</sup>

Collisions with structures may account for between 100 million and one billion bird deaths per year, as estimated by the US Fish and Wildlife Service (2002). DOEE's Wildlife Action Plan (2015) concurs with these findings.<sup>9</sup> Bird deaths from collisions can also affect the viability of bird populations. Of all the bird species in the US, nearly one-third have been documented to be victims of collisions with buildings. Deaths of migrating birds include some of the strongest healthiest birds, who otherwise would have survived to breed.<sup>10</sup>

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<sup>6</sup> American Bird Conservancy, Bird-Friendly Building Design (2015), The Plains, Va., p. 7.

<sup>7</sup> Wildlife Action Plan, p. 12, 13.

<sup>8</sup> The Urban Bird Treaty program is a unique, collaborative effort between the U.S. Fish and Wildlife Service and participating U.S. cities bringing together private citizens, Federal, State, and municipal agencies, and non-governmental organizations. Cities can become effective sanctuaries for birds and other wildlife, with an environmentally aware citizenry dedicated to conserving and enhancing natural resources. This is not only good for the birds, but also for the quality of life of people living in and visiting our cities. By restoring and conserving green-space, Urban Bird Treaty cities enhance urban areas for migratory birds that nest, overwinter, or pass through municipal and urban/suburban neighborhoods as well as for citizens. The Urban Bird Treaty program has an emphasis on education and outreach programs and includes resources for constructing schoolyard habitat sites, creating backyard habitats, and resources for educating citizens about birds and their conservation in an urban environment. Key features of the program also includes suggestions for reducing hazards to birds during migration; restoring, enhancing, and protecting avian habitats; providing education and outreach opportunities in urban and suburban communities; monitoring bird populations when appropriate; and creating and building career awareness and career development opportunities for young people." [www.fws.gov/birds](http://www.fws.gov/birds). Internet; accessed 13 Mar. 2016.

<sup>9</sup> DOEE's Wildlife Action Plan states: "**Collisions with Glass and Buildings** – An estimated 300 million to 1 billion birds are killed annually from collisions with glass on buildings and homes The urban character of the District creates a dangerous gambit for migratory and residential species." Wildlife Action Plan, p. 100, citing C. L. Seewagen and C. Sheppard. 2014. Bird collisions with windows: An annotated bibliography. American Bird Conservancy, Washington, DC, 23 pages.

<sup>10</sup> US Fish and Wildlife Service, Migratory Bird Mortality: Many Human-Caused Threats Afflict Our Bird Populations. (2002). Lesley J. Ogden, Collision Course: The Hazards of Lighted Structures and Windows to Migrating Birds, special report to the World Wildlife Fund Canada and the Fatal Light Awareness Program. Stephen B. Hager, Heidi Trudell, Kelly J. McKay, Stephanie M. Crandall and Lance Mayer "Bird Density and Mortality at Windows," The Wilson Journal of Ornithology 120(3): 550-470 (2008). Yigal Gelb and Nicole Delacretaz, "Windows and Vegetation: Primary Factors in Manhattan Bird Collisions," Northeastern Naturalist. 16(3):550-564. Christopher J. Klem, Jr., Nicole Delacretaz, Yigal Gelb, Peter Saenger, "Architectural and Landscape Risk Factors Associated with Bird-Glass Collisions in an Urban Environment," The Wilson Journal of Ornithology 121(1): 126-134 (2009), cited in San Francisco Department of Planning, "Standards for Bird-Safe

### How birds see and navigate

Most bird species have eyes on the side of the head, providing excellent peripheral vision and the ability to judge their speed and rate of progress through the air, but have poor depth perception. Thus, when flying toward a transparent panel of glass, birds simply may not see it. But birds have an important advantage that we can use to reduce collisions - they can see ultraviolet light, which humans cannot. Most new glass products being developed to reduce bird collisions rely on patterns (usually stripes or dots) that make glass visible to birds, and some of these patterns are UV reflective, so that birds can see them but people can't. At night, birds navigate by sensing the Earth's electromagnetic field and by observing the location of stars in the night sky. An experiment with birds in a planetarium proved that birds identify the North Star and orient themselves in relation to it.

### Dangers to birds from the built environment: daytime and nighttime

Most bird collisions occur during the day. To birds, reflective glass looks like real space. Transparent glass does not look like a barrier. As a result, they fail to recognize either as a deadly barrier and will try to fly through these types of glass and collide. The amount of glass on a building is the best predictor of the number of bird collisions.<sup>11</sup> One of the two most dangerous zones on a building during daytime is the area from grade up to 36 feet, because this zone is more likely to reflect vegetation, and birds are attracted to vegetation.<sup>12</sup> Thus, low-and midrise buildings in DC present dangers. While green roofs offer functional ecosystems, food and sometimes nest sites for birds, and attract birds, they are often adjacent to glass. For this reason, the other of the two most dangerous zones on a building are the 12 feet above a green roof or rooftop garden.

Many migrating birds, especially songbirds, fly at night when there is less wind and fewer predators. Birds take off at dusk, flying at an average 30 mph and covering up to 200 miles per night. Because birds respond to light in the night sky, man-made nighttime lighting produces an urban glow and attracts them to cities, and then to the lights on individual buildings. As a result, they can become confused and fly towards brightly-lit buildings. Steady (non-blinking) red lights are especially disorienting to birds; blue and green lights are less disorienting. Reducing nighttime lighting to that needed for safety and security, and eliminating uplighting helps birds to navigate, and also reduces energy costs.<sup>13</sup> See LEED Pilot Credit 55 and Figure 3.

### Leadership in Energy and Environmental Design (LEED) Pilot Credit 55: Bird Collision Deterrence

In 2011, the U.S. Green Building Council (USGBC) introduced the bird collision deterrence pilot credit and revised the credit in 2015, making it available to all LEED rating systems except "neighborhoods." See attachment. The credit was drafted by the American Bird Conservancy, the Bird-Safe Glass Foundation, and the USGBC. The goal of this credit is to develop a design and site

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Buildings,) (2011). C. L. Seewagen, C. Sheppard. 2014. Bird collisions with windows: An annotated bibliography. American Bird Conservancy, Washington, DC. 23 pages, cited in Wildlife Action Plan, p. 100.

<sup>11</sup> Bird-Friendly Building Design, p. 9.

<sup>12</sup> Bird-Friendly Building Design, p. 50.

<sup>13</sup> Bird-Friendly Building Design, p. 44.

strategy for a building to make the building visible as a physical barrier to birds. American Bird Conservancy has developed and published quantitative threat levels for many building materials, using scientific testing. The lower the rating, the safer the material. A score of zero is safest; a score of 100 is the most dangerous. Some examples:

<b>Material</b>	<b>Score</b>	<b>Comments</b>
Opaque	0	The safest material
Medium gray ceramic frit <sup>14</sup> 1/8 inch vertical lines spaced 1/2 inch apart (Viracon V-948 or similar)		
Translucent channel glass with cast "orange peel" (Pilkington Proflit or similar)	10	Low threat factor
Fritted glass	10	Low threat factor
Reflective or transparent glass interrupted by a visible pattern based on the 2x4 rule	20	Low threat factor
Adhesive film: matte perforated vinyl signage film applied to outer surface (Scotchgard or similar)	2	Low threat factor

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<sup>14</sup> A frit is a ceramic dot other type of material screened, printed or otherwise applied to glass surfaces.

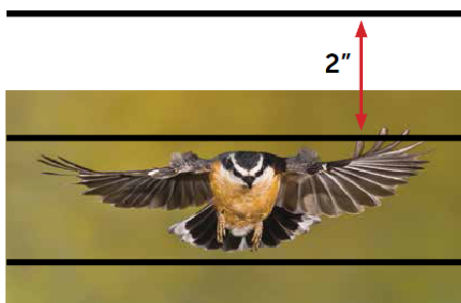
Expanded metal or perforated screens having elements with maximum spacing of 2 inches x 4 inches horizontal or vertical <sup>15</sup>	10	Low threat factor
Transparent glass	100	Very dangerous; birds see no physical barrier
Reflective glass	100	Very dangerous; birds see no physical barrier

Because the first 36 feet above grade and 12 feet above a green roof are the most dangerous collision zones, in order to earn the credit, architects planning a building must first divide the

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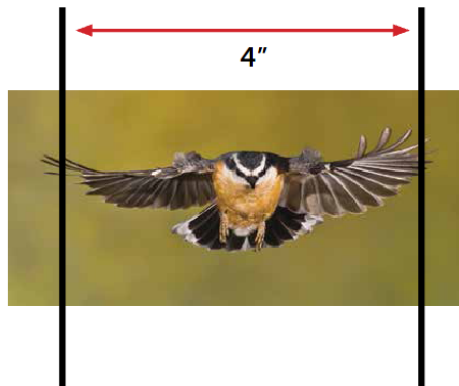
<sup>15</sup> The 2 x 4 rule: deterring bird collisions - vertical lines less than four inches apart, horizontal lines less than 2 inches apart. Bird-Friendly Building Design, p. 47.

Horizontal lines with a maximum spacing of 2 inches



Red-breasted Nuthatch. Photo by Roy Hancliff

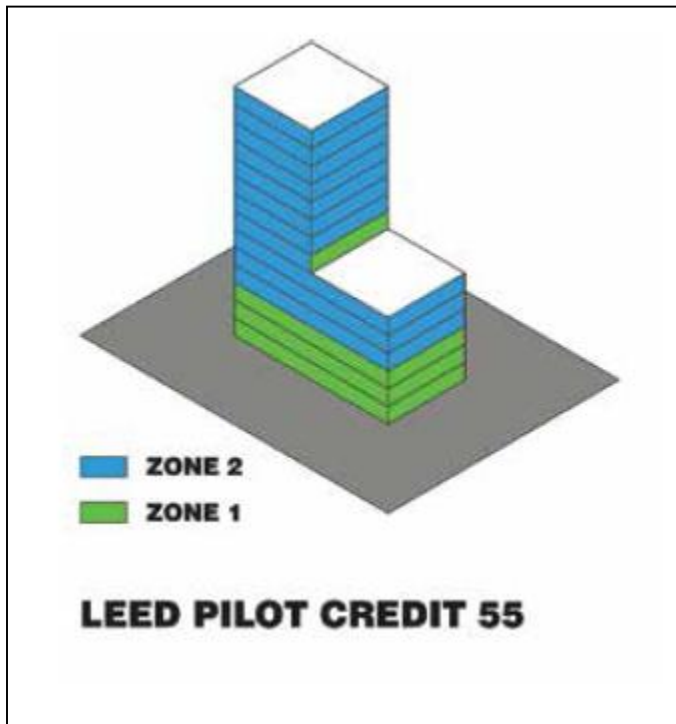
Vertical lines with a maximum spacing of 4 inches




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The 2 x 4 Rule





building's facade into facade zone 1 (the first 36 feet above grade at all points and 12 feet above a green roof) and facade zone 2 (the remaining area of the facade).

The architects next compute the total square feet of the building's facade by zone, quantify the collision threat for each type of material proposed to be used on the exterior from a table of threat levels, and then calculate an index (weighted average) which must be below a standard value. For facade zone 1, no more than 15% of the area may have a threat level over 75, allowing for example, transparent glass (threat level 100) to be used for an entrance area. For a sample calculation, see Figure 2. LEED Pilot Credit 55 requires that the building also satisfy standards for

exterior and interior lighting. "Exterior lighting features not necessary for safety, building entrances, and circulation shall be automatically shut off from midnight until 6 a.m. Manual override capability may be provided for occasional after-hours use." For examples of acceptable and unacceptable lighting fixtures, see Figure 3.

DOEE's Wildlife Action Plan (2015) suggests changes in building design to make buildings more bird-friendly:

#### **6.4.6 Collisions with Glass and Buildings**

Urban habitats are full of buildings with glass windows and other structures that are threats to migratory and resident wildlife; however, a number of strategies can reduce collisions. Long-term solutions include smart design and use of bird-safe, fritted glass. Less expensive actions include removing vegetation from window areas and installing window decals, tempera paint, bird tape, and other window-marking films. The American Bird Conservancy's Bird Friendly Building Design guide offers additional solutions [C. Sheppard, 2011. Bird-Friendly Building Design. American Bird Conservancy, The Plains, VA, 58 pages.] Wildlife Action Plan, Chapter 6 Conservation Actions, p. 148

Adopting the LEED Pilot Credit 55 furthers DOEE's recommendation.

#### **H.R. 2280 Federal Bird-Safe Buildings Act of 2015**

H.R. 2280, Federal Bird-Safe Buildings Act of 2015, was introduced by Congressman Mike Quigley (D-Ill.); it has 22 sponsors. The bill was referred to the Subcommittee on Economic Development, Public Buildings and Emergency Management on May 13, 2015. The bill would require the General Services Administration (GSA) to meet bird-friendly standards for each public building constructed, substantially altered or acquired. The standards closely track LEED Pilot

Credit 55. The act would require that each public building constructed, substantially altered, or acquired by GSA meet the following standards:

(1) At least 90% of the exposed facade material from ground level to 40 feet shall not be composed of glass or shall be composed of glass employing elements that preclude bird collisions without completely obscuring vision, ultraviolet (UV) patterned glass that contains UV-reflective or contrasting patterns that are visible to birds, patterns on glass designed in accordance with a rule that restricts horizontal spaces to less than 2 inches high and vertical spaces to less than 4 inches wide, opaque, etched, stained, frosted, or translucent glass, or any combination of these methods (modified glass);

(2) At least 60% of the exposed facade material above 40 feet shall meet such glass standard; there shall not be any transparent passageways or corners; all glass adjacent to atria or courtyards containing water features, plants, and other materials attractive to birds shall meet the modified glass standard; and outside lighting shall be appropriately shielded and minimized.

The act would direct GSA to:

- (1) ensure that actual bird mortality is monitored at each public building; and
- (2) reduce exterior building and site lighting for each public building, where practicable.

The act exempts historic buildings of national significance, the White House and its grounds, the Supreme Court building and its grounds, or the U.S. Capitol and its related buildings and grounds. GSA supports H.R. 2280.

#### Historic preservation

Historic preservation also helps to protect birds; the exteriors of many historic buildings have high percentage of masonry and punched windows, which birds see as a solid wall.

#### Recommendation

The Green Construction Code *DCMR 6-1451* should be amended to add mandatory compliance with the standards and requirements of LEED Pilot Credit 55: Bird Collision Deterrence (2015) in *6-1451.02* (Publicly-owned, leased, and financed buildings and projects), and *6-1451.03* (Privately-owned buildings and projects), which would be applicable to all privately-owned buildings and projects with at least 50,000 square feet of gross floor area).

#### Contact information

This report was prepared by the Parks & Environment Subcommittee of the Committee of 100. Subcommittee members: Chair, Beth Purcell, Roberta Faul-Zeitler, Mary Pat Rowan, and Kent

Boese. For additional information, or questions please contact Byron W. Adams, Administrator, Committee of 100, 202.681.0225 or email: [info@committeeof100.net](mailto:info@committeeof100.net)

Attachment:

LEED Pilot Credit 55: Bird Collision Deterrence (2015)

Figure 1. Atlantic Flyway: Bird migration route (in red)

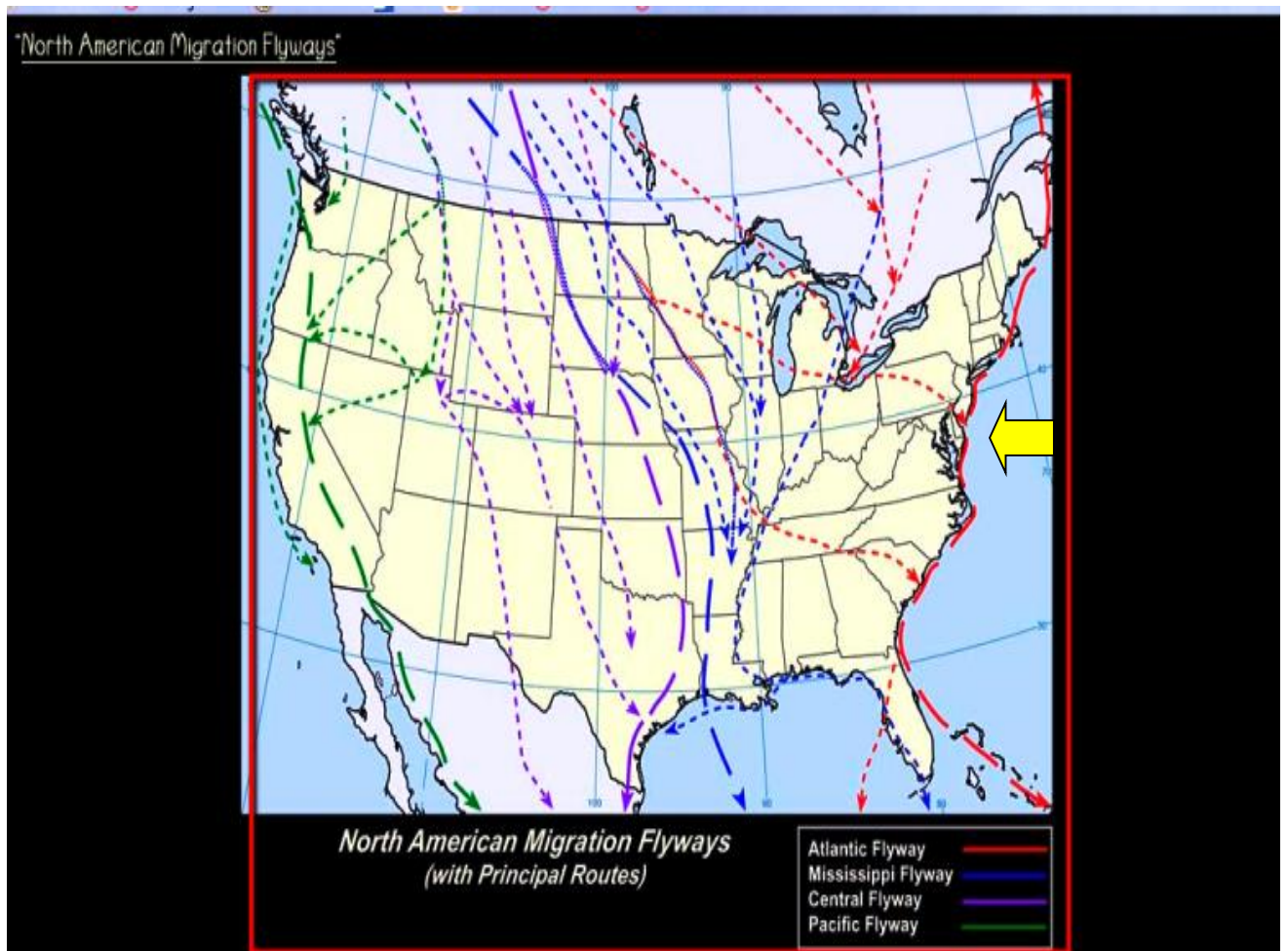


Figure 2. LEED Pilot Credit 55 sample calculation

# LEED Pilot Credit Library

## Pilot Credit 55: Bird Collision Deterrence

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.

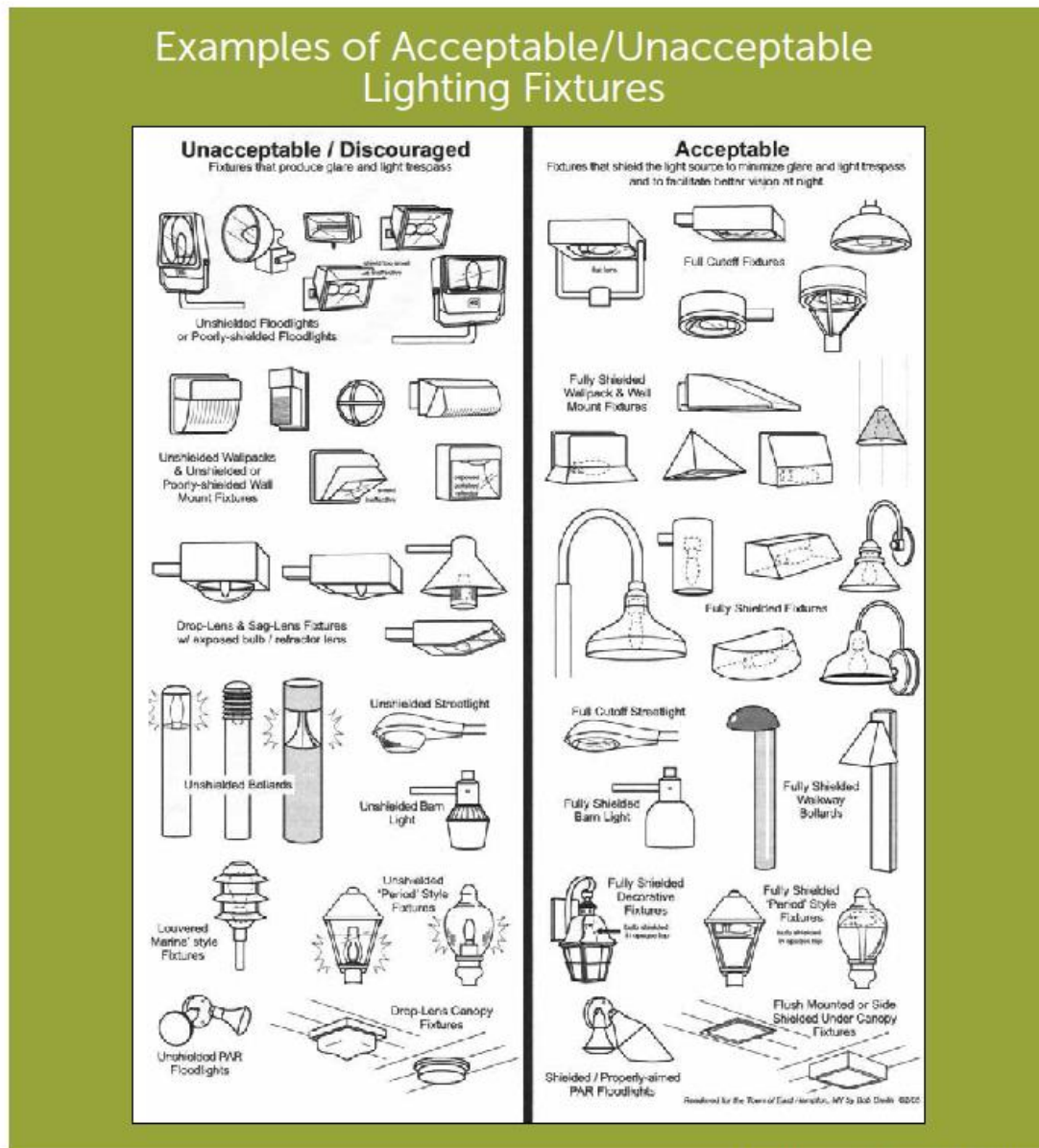
BUILDING DATA	
Number of Stories	12
Building height	145'-2"
Total Façade Area	44170 sf
Façade Zone 1 Area	13316 sf
Façade Zone 2 Area	30854 sf

Material Type	Zone 1 (Z1) CALCULATION			HGF	Zone 2 (Z2) CALCULATION		
	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
	<b>Z1 Area Totals=</b>			<b>HGA Totals=</b>	<b>Z2 Area Totals=</b>		
	13316 sf		72320 sf	560 sf	30854 sf		144180 sf
	<b>Z1 BCTR =</b>			<b>Z1 HGF = 4.2% (HGA/A)&lt;15%</b>	<b>Z2 BCTR =</b>		
	5.43				4.67		

<b>Total Building BCTR =</b>						<b>5.18</b>
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The building passes the test because the score, 5.18, is less than 15.

Figure 3. Acceptable and unacceptable lighting fixtures for bird safety



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**Bird collision deterrence**

Possible 1 point

Language

Guide

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**Intent**

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

**Requirements**

Comply with the "Building façade and site structures," "Exterior lighting," and "Performance monitoring plan" requirements below.

**Building façade and site structures**

Develop a building façade and site design strategy to make the building and site structures visible as physical barriers to birds.

If all materials on the building façade have a Threat Factor of 15 or below, the project is exempt from the building façade requirements and the following Bird Collision Threat Rating calculations are not required. If any material on the building façade has a Threat Factor above 15, then the Bird Collision Threat Factor Rating calculations are required.

All other structures on the site, including, but not limited to handrails, guardrails, windscreens, noise barriers, gazebos, pool safety fencing, bus shelters, band shells, etc. must be constructed entirely of materials with a threat score value of 15 or less.

**Steps for calculating the Bird Collision Threat Rating (BCTR)**

First separate each building facade into Façade Zone 1 and Façade Zone 2. Façade Zone 1 includes the first 36 feet above grade, measured from grade at all points, as well as 12 feet above any green roof. Façade Zone 2 includes all façade areas above 36 feet. Establish total areas for Façade Zone 1, Façade Zone 2 and for the Adjusted Building Façade Area. Then identify the Material Types present on each façade, the corresponding Threat Factor of each material (for detailed types and associated threat factors, see the Bird Collision Deterrence Material Threat Factors developed by the American Bird Conservancy), and the total area of each Material Type. Lastly, establish the Factored Area for each Zone.

No more than 15% of the facade area in Façade Zone 1 can have a Threat Factor higher than 75. This area is quantified separately as the Hazardous Glazing Factor (HGF) in the calculator. 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 must have a Threat Factor less than or equal to 25.

Table 1: General material types: threat potential

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**Glossary**

View LEED v4 terms and definitions

	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) of 15 or less.

For each Façade Zone, calculate the Factored Area:

$$[(\text{Material Type 1 Threat Factor}) \times (\text{Material Type Area})] + [(\text{Material Type 2 Threat Factor}) \times (\text{Material Type Area})] \dots = \text{Façade Zone Factored Area}$$

Determine the Adjusted Building Façade Area:

$$[(2 \times \text{Zone 1 Area}) + \text{Zone 2 Area}] = \text{Adjusted Building Façade Area}$$

Calculate the total building Bird Collision Threat Rating by dividing the sum of Zone 1 and Zone 2 Factored Areas by the Adjusted Building Façade Area:

$$(\text{Zone 1 Factored Area} + \text{Zone 2 Factored Area}) / \text{Adjusted Building Façade Area} = \text{Total Building BCTR}$$

## AND

### Exterior lighting

Exterior building fixtures that are not necessary for safety, building entrances, and circulation shall be automatically shut off from midnight until 6 a.m. Manual override capability may be provided for occasional after-hours use.

In addition, meet these requirements for all exterior luminaires located inside the project boundary (except those listed under "Exemptions"), based on the following:

- The photometric characteristics of each luminaire when mounted in the same orientation and tilt as specified in the project design; and
- The lighting zone of the project property (at the time construction begins). Classify the project under one lighting zone using the lighting zones definitions provided in the Illuminating Engineering Society and International Dark Sky Association (IES/IDA) Model Lighting Ordinance (MLO) User Guide.

Do not exceed the following luminaire uplight ratings, based on the specific light source installed in the luminaire, as defined in IES TM-15-11, Addendum A.

Table 2. Maximum uplight ratings for luminaires

MLO lighting zone	Luminaire uplight rating
LZ0	U0
LZ1	U1
LZ2	U2
LZ3	U3
LZ4	U4

### Exemptions from the exterior lighting requirements



The following exterior lighting is exempt from the requirements, provided it is controlled separately from the nonexempt lighting:

- specialized signal, directional, and marker lighting for transportation;
- government-mandated roadway lighting;
- hospital emergency departments, including associated helipads; and
- lighting for the national flag in MLO lighting zones 2, 3, or 4.

**AND**

**Performance monitoring plan**

Develop a three-year post-construction monitoring plan to routinely monitor the effectiveness of the building and site design in preventing bird collisions. Include methods to identify and document locations where repeated bird strikes occur, the number of collisions, the date, the approximate time, and features that may be contributing to collisions. List potential design solutions and provide a process for voluntary corrective action.

**General Pilot Documentation Requirements**

**REGISTER FOR THE PILOT CREDIT**

- Participate in the LEEDuser pilot credit forum
- Complete the feedback survey:

**CREDITS 1-14**

**CREDITS 15-27**

**CREDITS 28-42**

**CREDITS 43-56**

**CREDITS 57-67**

**CREDITS 68-82**

**CREDITS 83-105**

**Credit Specific: BD+C**

**Building façade and site features**

- For materials on the building and site with a Threat Factor of 15 or below, submit a narrative describing why the materials, and building in general, are "bird-friendly." Include 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

**Exterior lighting**

- Site lighting plan with boundaries, elements, location of fixtures, lighting zone, and applicable measurements
- Luminaire schedule showing uplight ratings, nighttime off-time durations for a typical day, and manual override capability

**Performance monitoring plan**

- A copy of the post-construction monitoring plan

**Changes:**

