

# 國內外窗殺防治及原理

台灣猛禽研究會

## 一、窗殺原理

窗殺是撞玻璃導致傷亡的簡稱，以鳥類為大宗犧牲者，英文常稱為 glass collisions, bird window strike 或 bird window collision，不只是鳥類，動物甚至是當人類也會撞擊玻璃。

撞擊原因來自於玻璃產生的兩種特性，透明穿透特性或是反射出鏡像的假影。玻璃過於清澈透明時，常讓視覺上忽略玻璃的存在，人有時候也會因分神忽略玻璃存在而撞上，而鳥類或野生動物更不知道玻璃特性，因此於飛行通過時受到撞擊反作用力而導致頭骨破裂、脊椎骨折、內臟出血等重傷、甚至死亡。另一種情況是玻璃反射周圍景象在玻璃上反映出倒影，動物無法分辨玻璃上的景色為假影像，在欲飛行穿越時撞擊而受傷。因此鳥類甚至是猛禽，雖然視覺普遍比人類還要好、辨色能力佳、視野也通常較廣，但卻因無法認知到玻璃為一個隔離物，再加上鳥類具有不受空間限制的飛行能力，使得鳥類成為窗殺的最大受害者。玻璃是最大宗使用的建材，但舉凡具有透明特性或是高反射特性的建材，如：透明壓克力、鏡面不鏽鋼等，也會形成鳥類或動物撞擊的條件，都具有窗殺的風險。

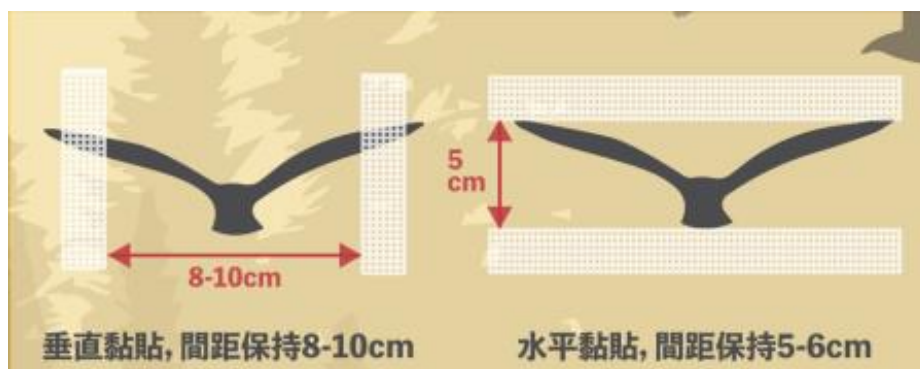
另外，許多遷移性候鳥會選擇夜間遷徙，遷徙需要依靠星光、月光與經驗來辨識方位，但若遇到陰天、濃霧或霧霾的夜晚，可能因此迷失方向而趨光進入燈火通明的城市裡，稱之為燈塔效應（beacon effect），候鳥因此成群撞上高樓建物或在夜晚街道亂竄車禍，導致嚴重傷亡。美洲位於北美南美遷徙線（Neotropical migrants）的大都市如紐約與芝加哥等，過去常發生候鳥遷徙季節一晚即發生大規模的野鳥窗殺事件。

## 二、窗殺防範原理

北美以通道試驗（tunnel testing）如何布置才能有效預防野鳥窗殺，結果呈現間距 2x4 吋(換算公制單位約為 5x10cm，約一張悠遊卡或信用卡大小)內進行玻璃上的鏡像或通透視覺分割布置便能有效達

到窗殺防治，換算為台灣常用的公分，稱為 5x10 公分原則。

美國鳥類保護協會(American Bird Conservancy)出版友善鳥類建物指南(Bird-Friendly Building Design)建議，準則在撞擊面處以黏貼、繪製等方式布置，物件之間上下間隔 5 公分、左右間距 10 公分內，降低鳥類通過的意圖，能減少鳥擊事件的發生。操作方式有許多形式，可以選擇點陣圖、線條或是線性畫作等方式，同時兼顧園內動物展示面的設計與參觀感。



窗殺改善布置相當容易，人手可及的玻璃皆可自行處理，布置材料並不侷限，只要掌握撞擊面以 5x10cm 間隔布置原則，用顏料、貼紙、膠帶、繩索、或商業量產的玻璃窗貼等都能使用，只要讓鳥因為布置物（障礙物）而認為無法飛越即可達到效果。目前國內有兩家廠商販售野鳥窗殺防治專用產品，分別為博威鳥控的防鳥撞窗貼與欣昭實業進口的 Saflex® FlySafe™ 3D 玻璃。此外，在美國鳥類保護協會

(American Bird Conservancy) 官網則有針對各種布置方法與玻璃建材的窗殺風險評比，可作為窗殺改善或預防的選擇參考。

### 三、國外法規與指南

窗殺導致野鳥死傷已在許多國家受到重視。新式建築以大面積玻璃為建材，主打高透明、視野遼闊與採光良好節電。但善飛的鳥類無法辨識玻璃屏障，不知閃避而高速撞向玻璃導致死傷，美國估計每年平均有 5 億隻野鳥因撞玻璃死亡，居人為因素導致野鳥死亡之首。部分歐美地區為了保護野生鳥類，早已將友善鳥類玻璃列入綠建築法規，甚至建築法內成為建物設計中必要考量的概念。美國伊利諾州庫克縣於 2008 年就有使用鳥類安全建材的政策，加州舊金山於 2011 年開始有相關政策，而紐約市議會到 2020 年通過建築規定的法案(Local Law 15)，要求紐約市無論公私新建建築或翻新建築，都必須依美國鳥類保護協會所提供的友善鳥類建物設計與建材措施，若有玻璃窗、玻璃遮陽棚、玻璃護欄等會造成鳥類安危的裝置或與綠化屋頂相鄰的建築物，都應加裝或採用友善鳥類的材料，例如使用具有花紋的玻璃等。除了美國，加拿大、波蘭、韓國等也都積極推動鳥類安全建物，出版指南、立法等。美國各州鳥類安全建物相關法令列表詳見附件

### 四、台灣友善鳥類建物研究推動現況

台灣每年的窗殺數量不明，但若以同屬於亞洲的韓國窗殺研究結果來推測，韓國發現其國內平均每棟建物每年約窗殺 1 隻鳥，可推測國內每年窗殺數量應至少有數百萬隻。國內的野鳥窗殺事件大多發生於清晨，私領域有野鳥窗殺若未主動通報幾乎無法調查或取得資訊，而公共區域的清潔效率很高，窗殺死傷野鳥通常在半小時內即被移除，故目前難以用田野調查方式來統計國內每年窗殺情況。

因此，台灣大學生態學與演化生物學研究所研究生謝季恆利用公民科學的力量，使用網路平台蒐集全台(含離島)民眾回報的窗殺案例，並建立資料庫已探討國內野鳥窗殺情形，資料來源為下列兩平台「臺灣動物路死觀察網 (Taiwan Roadkill Observation Network)」網站

和本會所創的「野鳥撞玻璃回報 (Reports on Bird-Glass Collisions)」臉書社團。截至 2022 年，共累積有 3,630 筆窗殺案例，有 175 種鳥類 3,763 隻個體受害，其中有 30 種 II 級保育類，13 種 III 級保育類，特有種鳥類 16 種、特有亞種 32 種，更有在 IUCN 紅皮書上被列為易危 (Vulnerable) 的八色鳥 (*Pitta nympha*)，傷鳥案例更是遍布全台各地包含離島。窗殺種類前 14 名，大部分為都市或淺山常見鳥種，其中排行第一名的屬於台灣特有種五色鳥 (*Psilopogon nuchalis*)，占 17% 以上，可歸於超易撞窗物種(super collider)，然而其他國家同屬於鬚鴛科 (Megalaaimidae) 的種類並不常見於窗殺案例中。猛禽作為高階掠食者在自然界數量原本就相對較少，但在台灣的鳳頭蒼鷹 (*Accipiter trivirgatus*) 卻有不成比例的高撞擊量 (第五名)，急需留意窗殺對牠們以及生態系穩定性可能造成的威脅。

台灣大學地理環境資源學系研究生甘佳昀選擇臺北捷運的 16 個高架車站實施鳩鴿科鳥類撞玻璃調查與研究，針對站體樣式、高度、站體周遭綠度等進行窗殺風險關聯性分析，除了檢視捷運站體特徵是否影響鳩鴿科撞玻璃的機率，也希望了解捷運站周邊土地利用空間分布與鳩鴿撞玻璃的關聯。從 2022 年 4 月初至 2023 年 1 月初，共記錄 82 筆鳩鴿撞玻璃案例，好發於月台較無旅客且與戶外連通之處，以及玻璃空橋等結構。16 站中，動物園站累積 21 筆案例，為鳥擊最頻繁的站點，其次則為麟光站、劍南路站。各站之間的撞擊頻率在季節上的變化並不一致，初步分析顯示，撞窗頻率與捷運站 500 公尺範圍內的綠度有顯著正相關，但與捷運站高度、樣式較無關係。後續應著重於周邊地景因子，以預防窗殺發生。

台灣為海島國家，地理位置特殊位於東亞澳洲候鳥遷徙線 (世界九大候鳥遷徙線之一) 的中央，人與自然鑲嵌的獨特地景，加上高度的都市化，比起其他國家更容易有鳥類與建物接觸的機會，鳥類撞擊的事件遠比我們已知的更多。加上近 20 年來新建或危老重建的建築物多採大面積玻璃帷幕或窗戶設計，建物形式走向節能高採光與周邊綠意需求增加，鳥類遇到玻璃建材的機率隨著提升，更可預期窗殺事件會較以往頻繁。如何在建物與鳥類福祉中尋求平衡，玻璃得以大量使用，鳥類生命也能得以獲得保障，積極推動友善鳥類建物設計與法規規範刻不容緩。近年國際間提倡永續發展目標 (Sustainable

Development Goals, SDGs)，推動野鳥窗殺防治不僅可以保育野鳥（符合 SDG 15 保育陸域生態），友善鳥類玻璃也比光滑、完全透明玻璃具有部分隔絕熱輻射的功能而達到節能功效（符合 SDG 11 永續城市與 SDG 13 氣候行動），以及將窗殺防治發展成如已在北美形成的新興產業（符合 SDG 8 合適的工作及經濟成長、SDG 9 工業化、創新及基礎建設）等。



## 五、參考資料

### 1. 美國鳥類保護協會於 2015 年版友善鳥類建物設計一書

原文：Birding-Friendly Building Design. 2015. American Bird Conservancy

<https://abcbirds.org/glass-collisions/>

### 2. 加拿大光害計畫於 2019 年出版友善鳥類建物設計

Canadian Standards Association's 2019 A460 Bird-Friendly Building Design. 2019. Fatal Light Awareness Program Canada

<https://birdsafe.ca/design-standards/>

### 3. 加拿大光害計畫於 2022 年出版鳥類安全窗戶標示指引

Bird-Safe Window Marker Guidelines. 2022. Fatal Light Awareness Program Canada

[https://flap.org/stop-birds-from-hitting-windows/?fbclid=IwAR1k-loXdPiuY-J3n9f42mJ\\_c8vFGkE1YQ7f08SCfk1LgJoMcLf1e2pQE3E](https://flap.org/stop-birds-from-hitting-windows/?fbclid=IwAR1k-loXdPiuY-J3n9f42mJ_c8vFGkE1YQ7f08SCfk1LgJoMcLf1e2pQE3E)

### 4. 紐約州友善鳥類建築法案與指南（buildings 2020-022 bulletin technical）

Bird Friendly Building Design & Construction Requirements Guidance Document. 2020. NYC Buildings

[https://www.nyc.gov/assets/buildings/bldgs\\_bulletins/bird\\_friendly\\_guidance\\_document.pdf](https://www.nyc.gov/assets/buildings/bldgs_bulletins/bird_friendly_guidance_document.pdf)

### 5. 波蘭窗殺防治指南

原文：A Guide to Bird Protection against Collisions with Glazed Buildings. Practical and Efficient Solutions. 2021. Stowarzyszenie Wspierania Inwestycji Przyjaznych

[https://swip-pta.com/wp-content/uploads/2021/10/Poradnik\\_Ochrona\\_ptakow\\_ENG.pdf](https://swip-pta.com/wp-content/uploads/2021/10/Poradnik_Ochrona_ptakow_ENG.pdf)

### 6. 韓國探討野鳥窗殺防治有助於經濟發展的論文

Economic benefits of preventing bird collisions in South Korea: findings from a choice experiment survey

<https://link.springer.com/article/10.1007/s11356-022-22343-y>

## 六、附件、美國各州鳥類安全建物相關法令

|                           |                                                                                                     |           |                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------|-----------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State of Minnesota (2013) | <a href="#">Minnesota B3 Guidelines, S.9: Bird-Safe Building</a>                                    | Mandatory | New state-owned buildings and major renovations of existing state-owned buildings. Includes hazardous building features.                                                                                                                                                                                                          | The standard relies on a "Whole Building Threat Factor" (WBTF) calculation, which is similar to the weighted average calculation for LEED Pilot Credit #5 for bird-window collisions. The guidelines require that the WBTF score be $\leq 15$ for sites deemed critical and $\leq 45$ for other sites. | Bird-safe materials are defined according to American Bird Conservancy's Material Threat Factor rating system. Areas of buildings considered high risk are required to use materials with different maximum Threat Factor ratings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Richmond, CA (2016)       | <a href="#">Richmond Municipal Code 15.04.608.030, "Performance Standards: Bird-Safe Buildings"</a> | Mandatory | New buildings that have >10,000 sq. ft. of floor area, are >2 stories, and are within or adjacent to green spaces or bodies of water of >2 acres. Exempts almost all residential buildings and almost all non-residential buildings (since few buildings meet the applicability standards). Includes hazardous building features. | Only the facade facing open space and deemed most likely to result in collisions is required to be bird-friendly. >80% bird-friendly treatment is required on that facade. Hazardous building structures are required to be 100% bird safe.                                                            | "Bird-safe glazing treatment may include fritting, netting, permanent stencils, frosted glass, exterior screens, physical grids placed on the exterior of glazing, or UV patterns visible to birds. To qualify as Bird-Safe Glazing Treatment, vertical elements of the window patterns shall be at least one-quarter inch wide at a minimum spacing of four inches, and horizontal elements at least one-eighth inch wide at a maximum spacing of two inches. No glazing proposed as having a bird-safe treatment shall have a visible light reflectance exceeding 10 percent. Exceptions on the reflectance may be granted by the Zoning Administrator if a surface frit, louvers or nets are used."                                                                                                                                                                                                                                      |
| Minneapolis, MN (2016)    | <a href="#">Minneapolis Code of Ordinances, Chapter 535, Article XIII "Skyways"</a>                 | Mandatory | New skyways.                                                                                                                                                                                                                                                                                                                      | >85% of all glazing on new skyways should be bird-friendly.                                                                                                                                                                                                                                            | "Bird-safe glazing" is defined as including facade materials that meet one of the following: materials with Material Threat Factors less than or equal to 25; physical structures or glass patterns that are visible from the outside with patterns following by the 2" by 4" rule; glass patterns that are white to medium gray, visible from the outside, and meet one of these standards: "Horizontal line patterns shall be one-eighth ( $\frac{1}{8}$ ) inch wide with two (2) inch on-center spacing; or Vertical line patterns shall be one-eighth ( $\frac{1}{8}$ ) inch wide with four (4) inches on-center spacing; or Dot patterns with dots one-quarter ( $\frac{1}{4}$ ) inch wide with two (2) inch on-center spacing each way; or Dot patterns with dots three-eighths ( $\frac{3}{8}$ ) inch wide arranged in horizontal lines with two (2) inch on-center spacing or vertical lines with four (4) inch on-center spacing." |
| Mountain View, CA (2017)  | <a href="#">North Bayshore Area Precise Plan, "Bird Safe Design"</a>                                | Mandatory | All North Bayshore Area new buildings, additions, and alterations north of Highway 101. Includes hazardous building features.                                                                                                                                                                                                     | >90% of facades up to 60 ft. above grade must meet bird-safe design standards.                                                                                                                                                                                                                         | Examples of bird-friendly glazing treatments include "the use of opaque glass, the covering of clear glass surface with patterns, the use of paned glass with fenestration patterns, and the use of external screens over non-reflective glass." "Bird-friendly glazing treatments must include vertical elements of the window patterns that are at least 1/4 inch wide at a maximum spacing of 4 inches, or have horizontal elements at least 1/8 inch wide at a maximum spacing of 2 inches."                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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| Alameda, CA (2018)    | <a href="#">Code of Ordinances, 30-5.16b, "Performance Standards: Bird-Safe Buildings"</a>     | Mandatory | New construction and window replacements on buildings that are >35 ft. in height and that have ≥1 facade with ≥50% glass. For these buildings, bird-safe glazing is only required on windows or unbroken glazed segments of ≥12 sq ft. Includes large hazardous building features, such as glass walls, but only those that include a contiguous glazed segment of ≥24 sq ft. Excludes commercial storefronts. | >90% of the glass of must be bird friendly.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | "Bird-friendly" treatments include external screens, light-colored blinds or curtains (note: this is not an effective strategy), opaque glass or window film, paned glass with mullions, patterned glass following the 2" by 4" rule, UV-patterned glass, or other treatments approved by the planning director.                                                                                                                                                                                                                             |
| Santa Cruz, CA (2019) | <a href="#">City of Santa Cruz Bird-Safe Building Design Standards</a>                         | Mandatory | Projects that require design review and are adjacent to or within 300 ft. of a natural area or waterway.                                                                                                                                                                                                                                                                                                       | Requires that >90% of all glazing must be bird friendly in the first 40 ft. above grade.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Glazing treatment shall follow the 2" x 4" rule, with pattern elements at least 1/8" thick. Glazing treatment must include one of the following: bird safe glass or products approved for us by the American Bird Conservancy, fritted or patterned windows, UV patterned window films, window nets, window screens, or alternative measured subject to the discretion of the zoning administrator.                                                                                                                                          |
| San Jose, CA (2019)   | <a href="#">San Jose Downtown Design Guidelines and Standards, Section 4.4.2.b Bird Safety</a> | Mandatory | Buildings that are north of Highway 237 with >50% glazing and that are within 300 ft. of a riparian corridor.                                                                                                                                                                                                                                                                                                  | Glass facades that are visible from the riparian corridor must be treated. The policy does not specify percentage treatment requirements. For projects within 300 ft. of a riparian corridor, all glass that is visible from a riparian corridor must receive a bird safety treatment. Bird-safety treatments are also required on the facade of any floor of a building within 15 vertical ft. of the level of and visible from a green roof, including a green roof on an adjacent building within 20 horizontal ft., if the facade has 50% or more glazed surface, as well on areas of glass through which sky or foliage is visible on the other side of parallel planes of glass less than 30 ft. apart (e.g. glass skyways). | A bird-safe pattern is defined as "a pattern on glass intended to reduce bird collisions. The pattern must have circular or square markers at least 0.25" in diameter, spaced at most 4" apart horizontally and 2" apart vertically." Bird safety "treatments may include exterior screens, louvers, grilles, shutters, sunshades, bird-safe patterns, or other methods to reduce the likelihood of bird collisions as suggested by the American Bird Conservancy." Mirrored glass, defined as glass with >30% reflectivity, is not allowed. |

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| New York City, NY (2019) | <a href="#">Local Law 15 of 2020: Bird-Friendly Building Design</a>                                    | Mandatory | All new buildings in the City of New York, from houses to skyscrapers. Includes auxiliary structures and includes requirements for hazardous features.                                                                                                                         | "Must use ≥90% bird-friendly materials in the first 75 ft. above grade. Materials other than bird friendly materials shall not exceed an aggregate of 10 sq. ft. feet within any 10 ft. by 10 ft. square area of exterior wall below 75 ft. above grade. " | "A material or assembly that has, or has been treated to have a maximum threat factor of 25 in accordance with the American Bird Conservancy Bird Collision Deterrence Material Threat Factor Reference Standard, or with the American Bird Conservancy Bird-friendly Materials Evaluation Program at Carnegie Museum's Avian Research Center test protocol, or with a relevant ASTM standard." (Note: There is currently no such ASTM standard.) There are two exceptions to the maximum of threat factor of 25. Where ground floor transparency is required, a maximum threat factor of 27 is acceptable. In areas of special flood hazard and shaded X-Zones where flood resistant glazing is proposed and ground floor transparency is required, a maximum threat factor of 36 is acceptable.                                                                                                                                                                                                                                                                |
| Emeryville, CA (2020)    | <a href="#">Emeryville Municipal Code, 9-4.8 Bird-Safe Buildings</a>                                   | Mandatory | Projects that require a building permit and that are new construction involving new glass or other rigid transparent materials, replacements of any window, glass door or other rigid transparent materials, or glass structures (e.g., greenhouses, wind barriers, skywalks). | >90% of glazing must be bird-friendly on any window or contiguous glazed segment (area within mullions and/or frames) with an area of ≥12 sq. ft.                                                                                                          | "(a) External screens installed permanently over glass such that the glass does not appear reflective. (b) Translucent or opaque glass, or transparent or opaque film applied to glass. (c) Glass covered with patterns such as dots, stripes, images, art, or abstract patterns. Such patterns may be etched, fritted, stenciled, silk-screened, or applied to the glass as films or decals, or another method of permanently incorporating the patterns into or onto the glass. Elements of the patterns must be either at least one-eighth inch (1/8") tall and separated by no more than two inches (2") vertically, or at least one-quarter inch (1/4") wide and separated by no more than four inches (4") horizontally, or both (the two (2) by four (4) rule). (d) Weatherproof grates, netting or cords mounted outside of the glass, near but not touching the glass, meeting the two (2) by four (4) rule. (e) Grooved glass block. (f) Other glazing treatments providing an equivalent level of bird safety and approved by the Planning Director." |
| Highland Park, IL (2020) | <a href="#">Highland Park Code of Ordinances, Sec. 170.126 Bird-Friendly Construction Requirements</a> | Mandatory | New buildings to be used primarily by the City.                                                                                                                                                                                                                                | Not specified. Bird-safe building materials should be used "to the greatest extent practical."                                                                                                                                                             | Rather than defining bird-safe building materials, the policy references materials described by: (1)The City of Chicago's "Bird-Safe Building Design Guide for New Construction and Renovation;"(2)The City of Toronto's "Bird-Friendly Development Guidelines;" and (3) New York City Audubon's "Bird-Safe Building Guidelines."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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| Madison, WI<br>(2020)       | <a href="#">Madison General Ordinance § 28.129</a>       | Mandatory | 1) all buildings or structures >10,000 sq. ft. (measured in total floor area on above-grade stories); 2) sky-bridges (elevated pedestrian pathways connecting buildings); and 3) at-grade glass features, such as sound walls and glass screens. The law also applies to the expansion of these same existing structures. | For buildings of >10,000 sq. ft., the area of glass requiring bird-friendly treatment depends on the percentage of glass on the building facade. Buildings with facades comprising 50% or more glass on the first 60 ft. above grade must use bird-friendly treatments on at least 85% of the glass. Additionally, all glass within 15 ft. of a building corner must be treated "when see-through or fly-through conditions exist." For buildings >10,000 sq. ft. with <50% glass on the first 60 ft. above grade, bird-friendly treatments must be installed on at least 85% of continuous or closely placed "glass areas" that are 50 sq. ft. or larger and on all such "glass areas" over 50 sq. ft. within 15 ft. of a building corner. ("Glass areas" are defined as "one continuous panel of glass or other transparent material, or a set of two or more such panels divided by mullions of six inches in width or narrower.") Additionally, all "glass railings" on buildings >10,000 sq. ft. must be treated, along with all glass on "enclosed building connections" from grade to 60 ft. | The policy offers a suite of possible collision mitigation methods. For example, to meet city requirements, owners may treat qualifying glass with "a pattern of visual markers that are either: a) dots or other isolated shapes that are ¼" in diameter or larger and spaced at no more than a two-inch (2") by two-inch (2") pattern; or b) lines that are 1/8" in width or greater and spaced no more than 2" apart." Certain structural features that cover glass such as fixed solar shading and exterior insect screens may also qualify. Other mitigation strategies may be approved by the city's zoning administrator on a case-by-case basis, including new technologies as they become available. |
| Howard County, MD<br>(2020) | <a href="#">CB11-2020 Bird Friendly Design Standards</a> | Mandatory | New public and commercial buildings that require building permits.                                                                                                                                                                                                                                                        | Not specified. Documentation submitted with the building permit must show that the design meets the bird-friendly design standards of the 2011 edition of the LEED pilot credit #55 or meets bird-friendly design standards that the director of the county's Department of Inspections, Licenses and Permits adopts and that are equivalent to LEED pilot credit #55.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Not specified. The policy refers instead to the LEED pilot credit #55 standards.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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| Cupertino, CA (2021)      | <a href="#">Chapter 19.102 Glass and Lighting Standards</a>                                     | Mandatory | New construction and renovations involving glass or transparent features. Exempts certain properties in residential zones, first-floor storefronts, and historic buildings.                                                                                                                      | Must use ≥90% "treated glass" on surface areas on first 60 ft. above grade and ≥95% on surface areas above 60 ft. Skyways, balconies, freestanding walls, and building corners must use bird-safe treatments.                                                                                                                                                                                                                                   | "The Planning Division may maintain a list of acceptable bird-safe treatments that may be updated from time to time. The list may include, but not be limited to, permanent treatments such as opaque glass, window muntins, exterior insect screens, exterior netting, or special glass treatments such as fritting to provide visual cues and reduce the likelihood of bird collisions. Glass treatments must have high color contrast with the glass and be applied to the outermost surface." Alternatively, property owners/ applicants may comply by proposing an alternative compliance method recommended by a qualified biologist to meet the policy's intent. The alternative compliance method "shall be peer-reviewed by a third-party consultant, paid for by the applicant, and subject to the approval of the Director of Community Development." |
| State of Illinois (2021)  | <a href="#">Public Act 102-0119 (HB0247)</a>                                                    | Mandatory | State buildings newly constructed, acquired, or for which more than 50% of the facade is substantially altered.                                                                                                                                                                                  | ≥90% of the exposed facade material from ground level to 40 ft., ≥60% of the exposed facade material above 40 ft., and all glass adjacent to atria or courtyards containing attractive bird habitat either must not be composed of glass or must be composed with bird-friendly design/ materials. Transparent passageways and corners are not allowed.                                                                                         | Bird-friendly is defined as either not being composed of glass or being composed of glass employing: "(i) elements that preclude bird collisions without completely obscuring vision, such as secondary facades, netting, screens, shutters, and exterior shades; (ii) ultraviolet (UV) patterned glass that contains UV-reflective or contrasting patterns that are visible to birds; (iii) 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; (iv) opaque, etched, stained, frosted, or translucent glass; or (v) any combination of the methods described in this subparagraph."                                                                                                                                                                |
| State of Wisconsin (2021) | <a href="#">DFD Sustainability Guidelines for Capital Projects, "Bird Collision Deterrence"</a> | Mandatory | State-owned new construction projects and major renovations with facades composed of ≥ 20% glazing.                                                                                                                                                                                              | First two stories above grade or the tree canopy height, whichever is greater, and the glazing of stories level with green roofs.                                                                                                                                                                                                                                                                                                               | Bird-deterrent strategies -- "such as properly designed scrim, glazing frit, or specialized coating" -- must be incorporated to reduce non-treated glazing to a maximum of 20% of the first two stories above grade. The guidelines reference American Bird Conservancy's publications for additional potential strategies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Evanston, IL (2022)       | <a href="#">Bird-Friendly Building Design Guide</a>                                             | Mandatory | Planned developments, new commercial, multifamily and industrial construction projects and renovations of existing buildings that include the replacement of 100% of the exterior glazing. Excludes detached one- and two-family dwellings, townhouses, and residential buildings of ≤3 stories. | Different specified sections of buildings must meet different bird-safe criteria. "High risk" zones such as skywalks and see-through glass corners must use a material with a Threat Factor rating of ≤30. Facade areas up to 60 feet above grade and facades up to 16 feet above a green roof must have a Building Collision Threat Factor score of ≤15. Facade areas above 60 feet must have a Building Collision Threat Factor score of ≤30. | The Building Collision Threat Factor is a calculated threat rating of a facade zone based on the material threat factor (MTF) of each of its component materials proportional to the amount of area of each material in a given facade zone. A lower threat rating indicates a lower risk of collision. Alternatively, projects that satisfy the LEED Pilot Credit 55: Bird Collision Deterrence are deemed to have met the city's requirements.                                                                                                                                                                                                                                                                                                                                                                                                                 |

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| Washington DC (2023)        | <a href="#">D.C. Law 24-337. Migratory Local Wildlife Protection Act of 2022</a>                                   | Mandatory | New construction, renovations involving the replacement of >75% of exterior glazing, and bird-hazard installations for commercial buildings, multi-unit residential buildings, institutional facilities, or District-owned or operated buildings. | Each façade of the exterior wall envelope and any exterior fenestration must be constructed with bird friendly materials up to 100 ft. above grade. Other materials may be used to the extent that they do not exceed an aggregate of 10 sq. ft. within any 10 ft. by 10 ft. sq. area of exterior wall below 100 ft. above grade.                                                                                                                                                                                                                                                                                                              | A "bird friendly material" is defined as a material or assembly that has been designed or treated to have a maximum material threat factor of 30 in accordance with American Bird Conservancy's Bird Collision Deterrence Material Threat Factor Reference Standard.                                                    |
| State of Maryland (2023)    | <a href="#">Maryland Sustainable Buildings Act of 2023</a>                                                         | Mandatory | State-owned buildings (defined as buildings for which 50% of the money for acquisition, construction, or renovation came from state funds) for which the public work contract is ≥\$500,000.                                                      | TBD. The Department of General Services will develop standards consistent with the LEED Innovation Credit #55 for reducing bird collisions and with the American Bird Conservancy bird-friendly building design recommendations.                                                                                                                                                                                                                                                                                                                                                                                                               | TBD                                                                                                                                                                                                                                                                                                                     |
| State of Maine (2023)       | <a href="#">LD670: An Act to Protect Birds in the Construction, Renovation and Maintenance of Public Buildings</a> | Mandatory | Public buildings, excluding public buildings that are eligible for inclusion in the National Register of Historic Places.                                                                                                                         | TBD. This bill requires the Maine Department of Administrative and Financial Services, Bureau of General Services, to develop guidelines for bird-safe buildings for public buildings by December 31, 2024.                                                                                                                                                                                                                                                                                                                                                                                                                                    | TBD                                                                                                                                                                                                                                                                                                                     |
| Sunnyvale, CA (2014)        | <a href="#">Bird Safe Building Design Requirements</a>                                                             | Voluntary | Buildings located within 300 ft. of a body of water of >1 acre or located immediately adjacent to a landscaped area, open space or park of >1 acre. Includes general, less rigorous recommendations for all other buildings.                      | Not specified.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Not specified. The guidelines include only broad advice on bird-safe design strategies, such as to minimize the use of expansive glass on the first 60 ft. of buildings, to use glass with reflectivity levels of 25% or less, and to avoid glass skywalks and freestanding glass walls.                                |
| Washington DC (2017)        | <a href="#">2017 District of Columbia Green Construction Code</a>                                                  | Voluntary | Projects ≥ 10,000 sq. ft. that are either new construction or classified as specific levels of alteration by the city's building code.                                                                                                            | Projects that fall under the DC Green Construction Code must achieve a specified number of "site project electives." To receive an elective credit for bird collision deterrence, buildings must be built to LEED Credit SSpc55 Bird Collision Deterrence, including post-construction bird collision monitoring.                                                                                                                                                                                                                                                                                                                              | Bird-friendly materials are defined according to the referenced LEED pilot credit, which provides a general outline of acceptable building materials and their threat potential.                                                                                                                                        |
| Arlington County, VA (2020) | <a href="#">2020 Updates to the Green Building Incentive Policy for Site Plan Projects</a>                         | Voluntary | All site proposals seeking bonus density through the county's Green Building Incentive Program must meet bird-friendly building standards.                                                                                                        | Exterior wall envelope, and any associated openings, between 8 and 36 ft. above grade must use bird-friendly materials. Alternatively, a developer may follow the bird-friendly building methodology in the U.S. Green Building Council's LEED Bird Collision Deterrence innovation credit, for which the calculated weighted average of all the Threat Factors of materials on the façade, including non-glass materials, must equal a Threat Factor of 15 or less. Further, materials that are not bird-friendly cannot exceed an "aggregate of 10 sq. ft. within any 10 ft. by ft. square area of exterior wall" in these designated areas. | The policy defines "bird-friendly material" as one that has, or has been treated to have, a maximum threat factor of 30 in accordance with American Bird Conservancy's Bird Collision Deterrence Material Threat Factor Reference Standard or a relevant ASTM standard. (There is currently no relevant ASTM standard.) |