NGA Updates

What Your Association is Doing For You

Urmilla Sowell

Vice President, Advocacy & Technical Services
National Glass Association

Dr. Thomas Culp, PhD

Owner
Birch Point Consulting LLC
NGA and GICC Energy and Green Codes Consultant

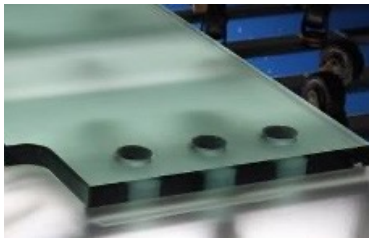
OUTLINE

1) Overview of NGA Advocacy
2) Bird-Friendly Glazing
3) School Security & Daylighting
4) Energy Code Trends
5) Environmental Product Declarations (EPDs)

National Glass Association

NGA is a not-for-profit trade association, and the only national trade association serving the entire glass and glazing industry.

PRIMARY GLASS MANUFACTURERS



FABRICATORS

GLAZING CONTRACTORS & FULL-SERVICE GLASS COMPANIES

SUPPLIERS

NGA's Vision

We envision a future in which glass is the material of choice to enhance spaces where people live, play, learn and work.

Balancing the Many Functions of Glazing

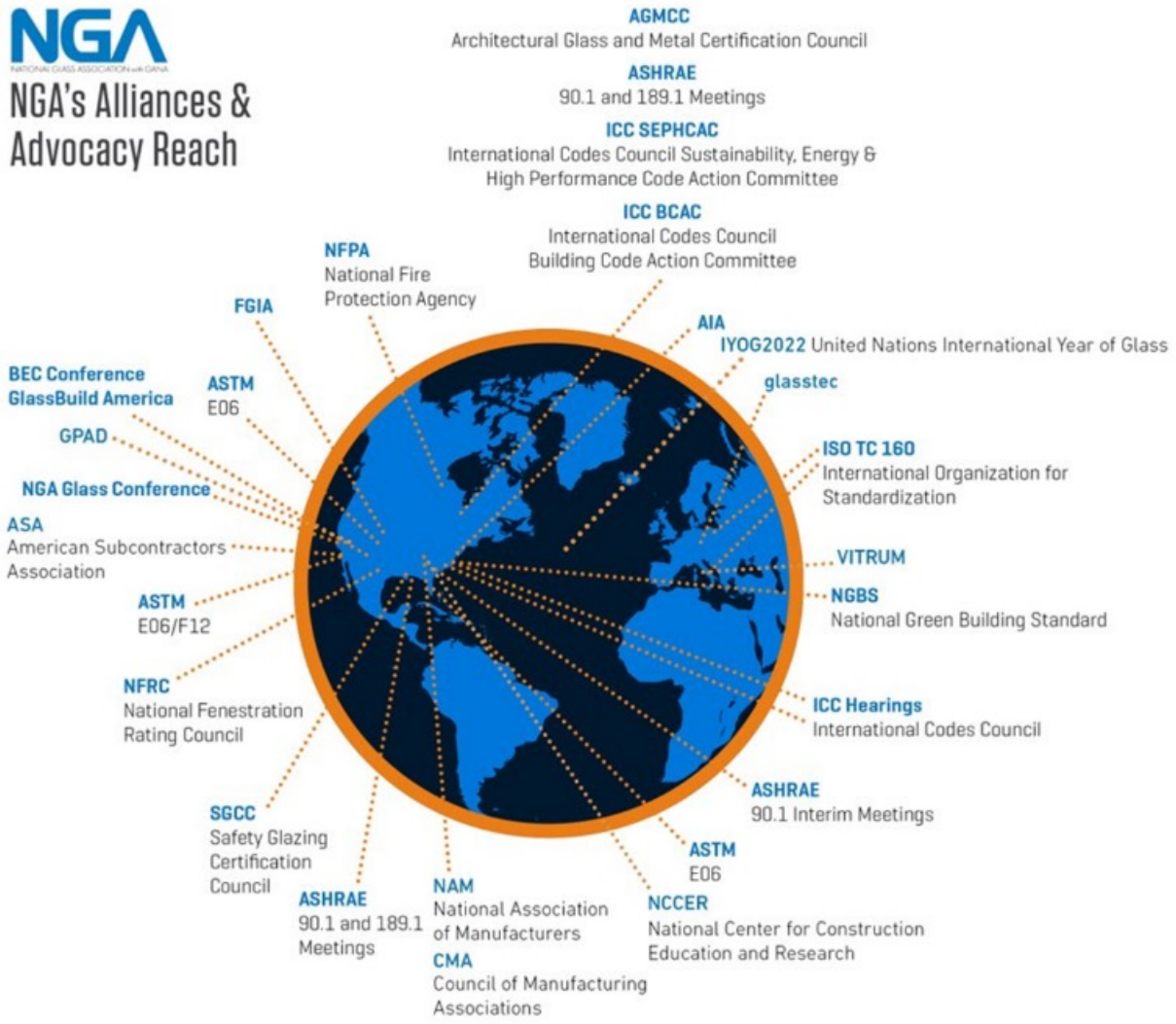
Controlled Environment

- Weather protection
- Ventilation
- View
- Daylighting
- Fade resistance
- Energy efficiency
- Thermal comfort
- Solar gain
- Acoustics
- Privacy
- Human health
- Safety
- Structural protection
- Security
- Fire
- Egress

Many Types

- Clear, low-iron, tint
- Low-e
- Heat treated
- Laminated
- Insulating
- Vacuum Insulated Glazing
- Thin glass
- Electrochromic, thermochromic
- Photovoltaic
- Decorative
- Patterned, fritted, etched
- Applied films

NGA's Alliances & Advocacy Reach



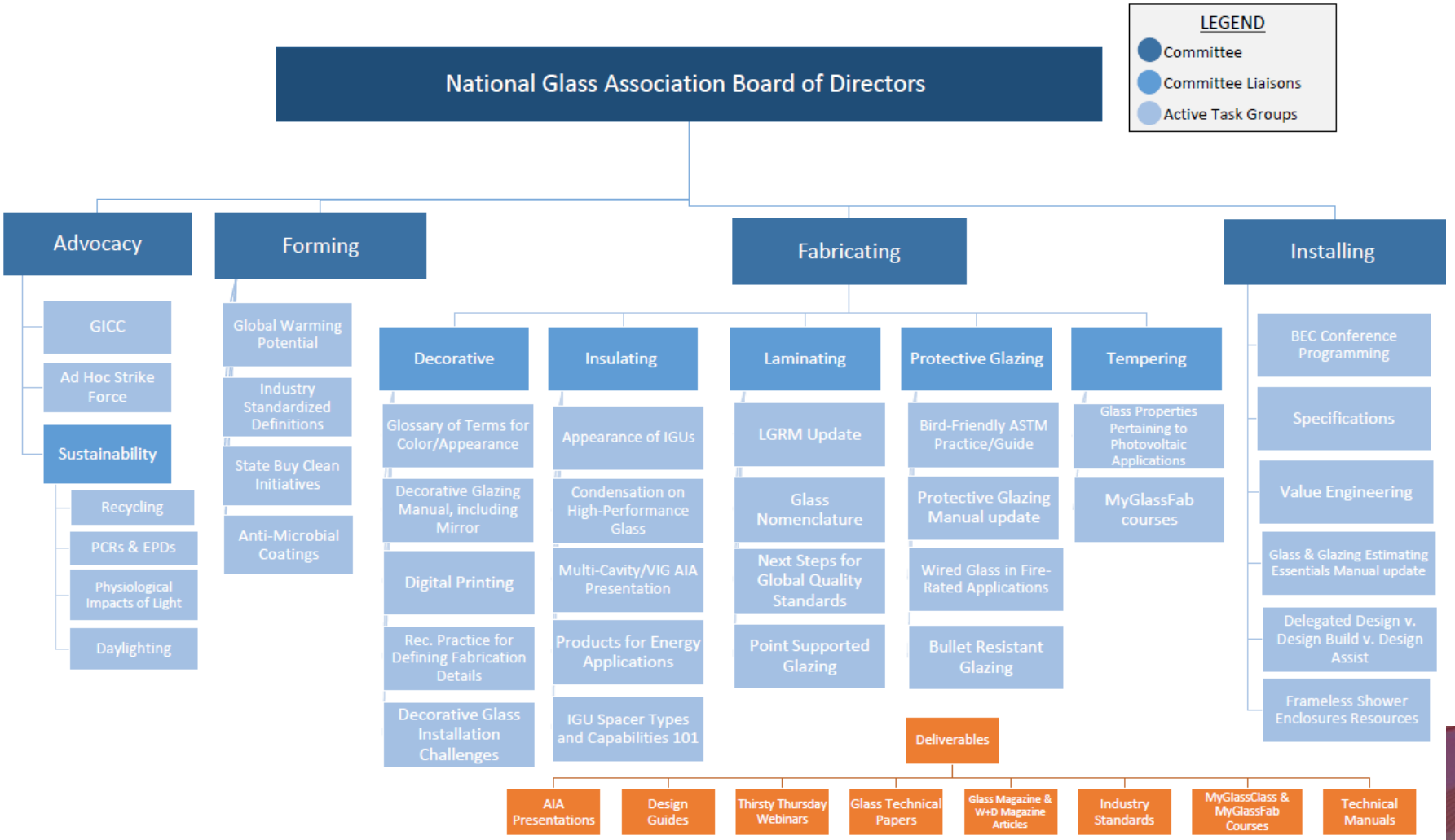
NGA's Advocacy & Technical Services Team

- Urmilla Sowell – MSCE, PE – 24 years
- Karen Wegert – MS ChE – 23 years
- Georgia Scalfano – BSCE, EIT – 7 years
- Amber Johnson – B.A.Com. – 9 years
- Tom Culp – PhD ChE – 27 years
- Thom Zaremba – JD/Litigation Attorney – 47 years glass/glazing codes
- Nick Resetar – JD/Litigation Attorney – 15 years
- Nicole Harris – Board Member, Council of Manufacturing Associations/NAM – 34 years

*William Koffel – P.E., FSFPE – 44 years

Top row: Urmilla Sowell, Karen Wegert, Georgia Scalfano, Amber Johnson
Bottom row: Tom Culp, Thom Zaremba, Nick Resetar, Nicole Harris

NGA Committee Structure



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NGA Advocacy Priorities 2025

NATIONAL GLASS ASSOCIATION with GANA | ADVOCACY

Expanding IRC Section 48 for High-Performance Windows

The request:

- Section 48 of the Internal Revenue Code includes an **investment tax credit for electrochromic glass.**
  - **Extend the expiration** of the tax credit for construction that starts before 2033.
  - **Expand the definition** to include other high-performance window options:
    Modify Section 48(a)(3)(A)(ii) as follows:
    " (ii) equipment which uses solar energy to illuminate the inside of a structure using fiber-optic distributed sunlight, or ~~electrochromic glass which uses electricity to change its light transmittance properties~~ dynamic glazing as defined by the National Fenestration Rating Council (NFRC), or fenestration assemblies which have a thermal transmittance (U-Factor) of 0.27 BTU/°F.hr.ft² or less as rated in accordance with NFRC 100, in order to reduce energy consumption required to heat or cool a structure, but only with respect to property the construction of which begins before January 1, ~~2025~~ 2033."

https://www.glass.org/sites/default/files/2024-05/High-Performance%20Windows%20One%20Pager%202024_FINAL.pdf

NGA Advocacy Priorities 2025

NATIONAL GLASS ASSOCIATION with GANA | ADVOCACY

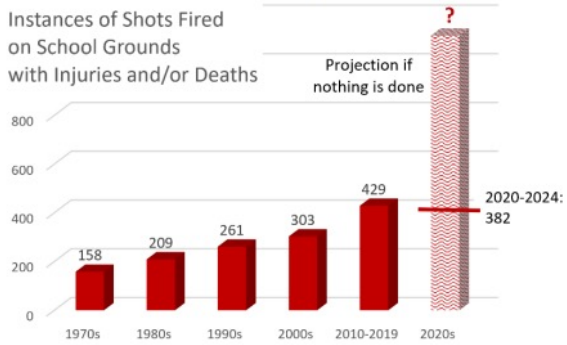
School Security: Windows and Doors Respond First

The request:

Support **H.R. 887: Securing Our Students Act** and **H.R. 2491/S. 1107: Securing Aid for Every School Act, (SAFE School Act)** allocating funds for school safety and security. The glass industry is prepared to make schools safer with security windows and doors.

The issue:

Active shooter events are becoming more frequent.



Time is critical.

The average length of active shooter events is 8 minutes; the shortest is 90 seconds. Response times for first responders average 3 minutes, so some active shooter events are over even before first responders arrive.

The strategy:

Make schools safer with security, ballistic, and attack resistant windows and doors.

In active shooter events, windows and doors can be the first line of defense. Security glazing resistant to forced entry can be used to slow down an attacker, allowing more time for schools to enact emergency plans and for first responders to arrive.

High risk areas of school buildings include entrance areas, exterior window and door access points, and classroom window and door access points.

Third-party tested products are available.

ASTM F3561 *Standard Test Method for Forced-Entry-Resistance of Systems after Simulated Active Shooter Attack* serves as the industry-accepted standard for minimum criteria for security windows and doors for schools.

Window and door solutions:

- Serve as first lines of defense while allowing school personnel and first responders to see impending danger.
- Provide privacy and allow diffuse light in while selectively

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NGA Advocacy Priorities 2025

NGA NATIONAL GLASS ASSOCIATION with GANA | ADVOCACY

Training and Upskilling Workers to Meet Labor Demand

The request:

Pass Senate legislation similar to **H.R. 6655: A Stronger Workforce for America Act** to increase funding to train and upskill workers and create long-term career paths.

The issue:

U.S. companies face labor shortages.
The glass and glazing industry continues to face a labor shortage, with glaziers—companies that install glass—and fabricators—companies that make glass products—reporting the lack of skilled workers as their biggest challenge.

Financial support of training programs can help workers learn new skills, fill jobs and build careers.
This shortage is particularly felt among entry-level personnel. With proper training, entry-level positions could be filled by youth, individuals released by the nation's prisons, and other jobseekers with no industry experience. Financially supporting company training programs via legislation like H.R.

The strategy:

Online training makes learning new skills accessible.
The National Glass Association (NGA) has developed *MyGlassClass.com*, which provides training for new glass installers that includes more than 100 courses designed to teach new hires about job responsibilities and tasks, products, and installation techniques on their phone, tablet or computer. Online, on-demand courses are available in English and Spanish and include OSHA safety training.

For glass fabricators, NGA offers *MyGlassFAB*, core training for production personnel that they can access on their smartphone to learn about job responsibilities, safety, products, and fabrication techniques.

MYglassclass.com™ An initiative of the NGA MYglassFAB™ powered by MyGlassClass.com

Apprenticeships are available nationwide.
The NGA has also partnered with the National Center for Construction Education & Research (NCCER), the Associated Builders & Contractors, the Associated General Contractors of America, and other training providers to create Registered Apprenticeship Programs for glass installers using the NGA Glazier Apprentice Curriculum.

BEC CONFERENCE™

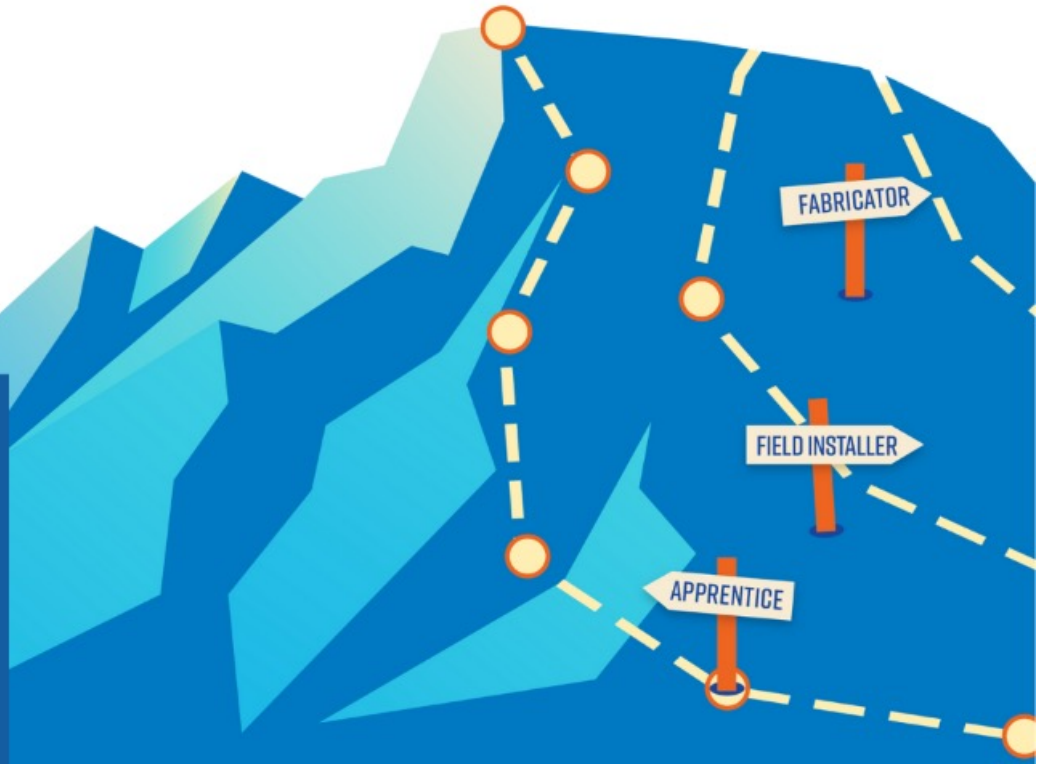
MYglassclass.com™
An initiative of the NGA

MYglassFAB™
powered by MyGlassClass.com

Available in English & Spanish

MYGLASSCLASS COURSES NOW FREE TO NGA MEMBERS!

CHOOSE YOUR PATH



Codes & Standards Updates

Our mantra: *Defend and Promote*

- ***Defend*** against changes harmful to the industry
- ***Promote*** the positive attributes of glazing in the B&C sector

Codes & Standards

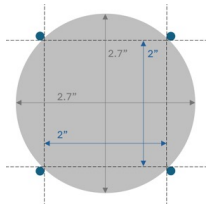
- Energy: IECC, ASHRAE 90.1, Energy Star, Canada NECB, PAWS
- Green: IgCC, ASHRAE 189.1, NGBS
- Building code: IBC, IRC, Canada NBC
- Fire: NFPA, IFC, IWUIC
- Testing and Ratings: ASTM, ISO, NFRC, AERC

#2 Bird-Friendly Glazing

- Bird-Friendly Glazing requirements continue to expand.
  - Local ordinances (e.g. NYC LL15)
  - State-owned buildings (e.g. IL, WI, MN)
  - GSA P100
- Advocating for Federal Bird Safe Building Act
- Introduced bird-friendly glazing requirements as jurisdictional option for the green code: ASHRAE 189.1 / IgCC

Bird-Friendly Glazing

- Specify where required
  - 90% of vertical fenestration, glass spandrel, skylights below 75 ft
  - glazed corners, skywalks, glass railings, vegetated roofs, etc.
- Prescriptive criteria for glazing
  - Essentially 2x2 rule but written to provide flexibility for dots, lines, random patterns, new products.
- Testing threat factors *not* included
- Includes reference to NGA Best Practices for Bird-Friendly Glazing Design
- Proposed language unanimously approved by committee 25-0-0 and will now go out for public review.



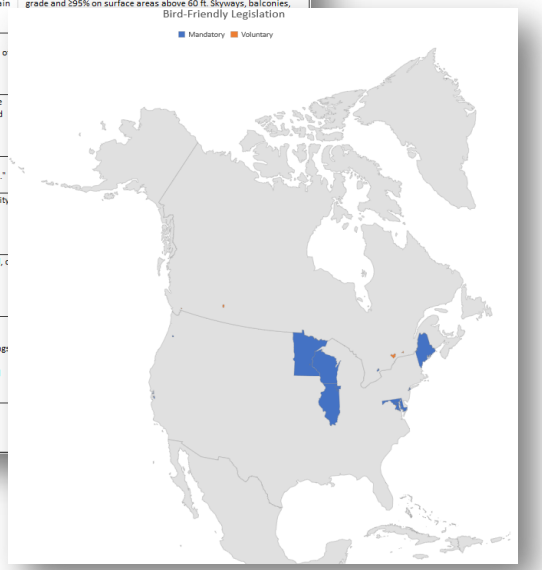
Example of largest circle that will fit between markers in a 2 x 2 inch grid.

Bird-Friendly Legislation

- NGA member resource for bird-friendly policy tracking
- State, date, voluntary/mandatory status, summary of policy, etc.

US & CAN Bird-Friendly Building Policies

Jurisdiction	City	Year	Name	Mandatory or Voluntary	What structures does the policy apply to	What portion of each structure must be "bird-friendly"?
California, USA	Emeryville, CA	2020	Emeryville Municipal Code, 9-4.8 Bird-Safe Buildings	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,	>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.
California, USA	Cupertino, CA	2021	Chapter 19.102 Glass and Lighting Standards	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,
District of Columbia, USA	Washington DC	2017	2017 District of Columbia Green Construction Code	Voluntary	Projects ≥ 10,000 sq. ft. that are either new construction or classified as specific levels o alteration by the city's building code.	
District of Columbia, USA	Washington DC	2023	D.C. Law 24-337 Migratory Local Wildlife Protection Act of 2022	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	
Illinois, USA	Forest Preserve District of Cook County, IL	2008	Forest Preserve District Code 1-16-3, "Bird-Safe Building Materials"	Mandatory	New construction and major renovation projects; existing buildings "when practical."	
Illinois, USA	Highland Park, IL	2020	Highland Park Code of Ordinances, Sec. 170.126 Bird-Friendly Construction Requirements	Mandatory	New buildings to be used primarily by the City	
Illinois, USA	State of Illinois	2021	Public Act 102-0119 (HB0247)	Mandatory	State buildings newly constructed, acquired, o for which more than 50% of the facade is substantially altered.	
Illinois, USA	Evanston, IL	2022	**Bird-Friendly Building Design Guide**	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.	
Illinois, USA	Lake County, IL	2024	Bird Friendly Building Design Policy for Lake County Facilities	Mandatory	All Lake County government facilities over which the Lake County Board has authority.	



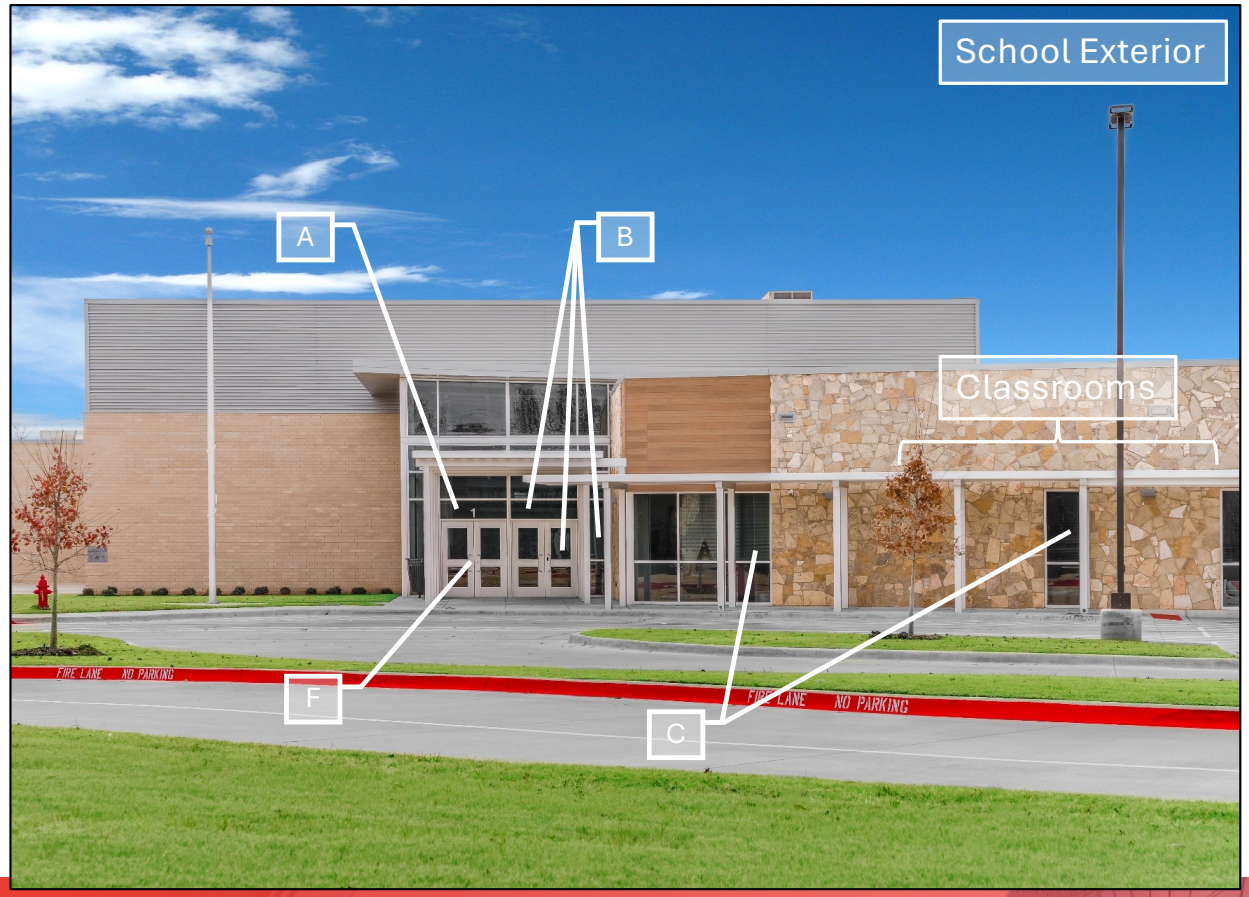
3 GICC School Security and Daylighting Proposals

Glazing Industry Code Committee:

School Security Proposal

- **Standards – ASTM F3561 – Assembly Test**
- **Building Codes – Chapter 4 new section 429 EDUCATIONAL OCCUPANCIES - FORCED ENTRY RESISTANCE**
- **Legislation – National and States**

Daylighting Proposal

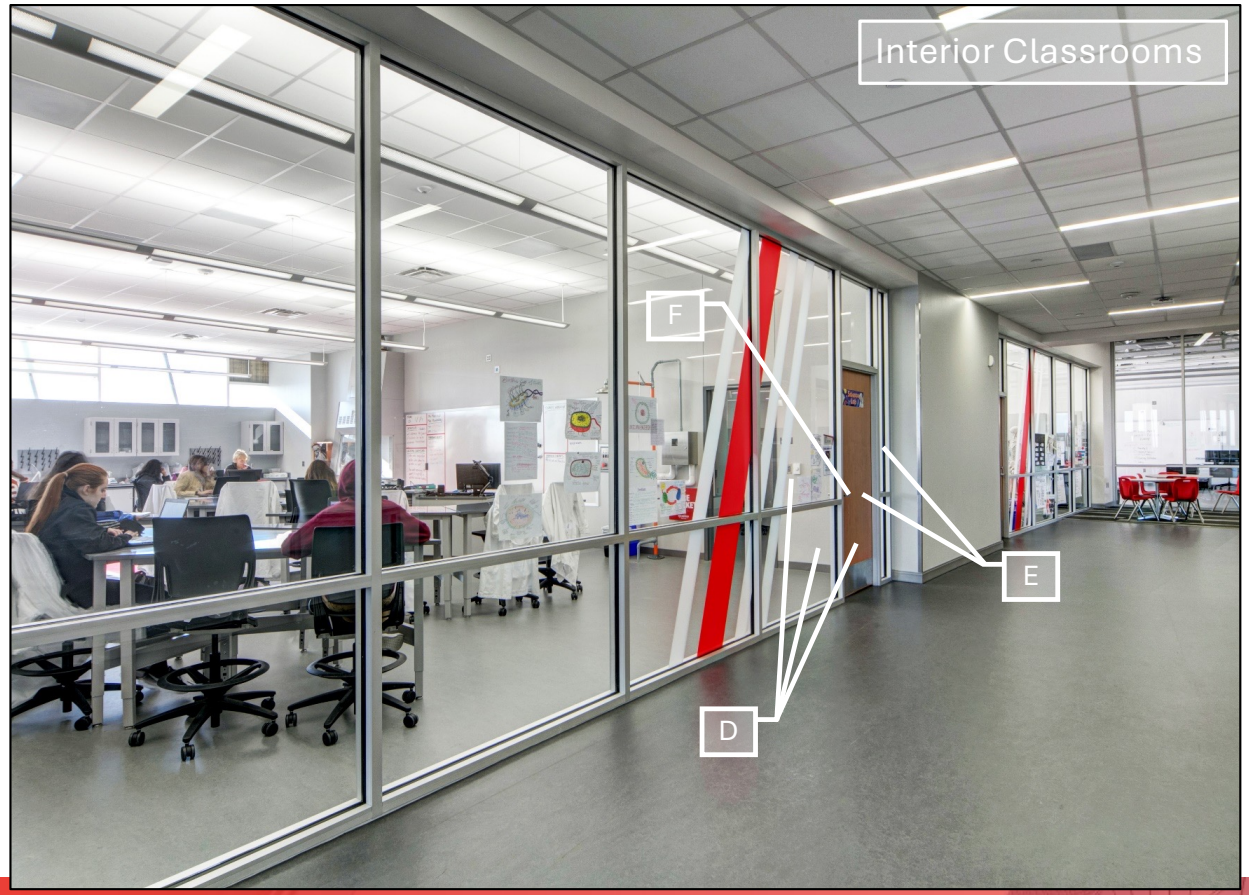


A. Main entrances shall be constructed and designed to provide those inside the building with a **view** to areas where pedestrians and vehicles approach the entrance.

B. Windows, doors, and sidelights in main entrances...shall be rated assemblies in accordance with ASTM F3561-23. Other glazed areas in the main entrance with an exposed area equal to or greater than 5 ft2 (0.46 m2) and a bottom edge less than 72 in (1828.8 mm) above the finished ground level shall be rated assemblies in accordance with ASTM F3561-23.

C. If warranted by a design professional's assessment of forced entry risk**, ground floor windows, doors, and sidelights in exterior walls** shall be rated assemblies in accordance with ASTM F3561-23.

F. Locking arrangements in doors shall comply with applicable provisions of Section 1010.2.7.



D. Interior classroom windows and doors shall be designed and constructed to provide a view from the classroom into corridor or other areas used to approach the classroom.

E. If warranted by a registered design professional's assessment of forced entry risk, interior classroom windows, doors and sidelights shall be rated assemblies in accordance with ASTM F3561-23.

F. Locking arrangements in doors shall comply with applicable provisions of Section 1010.2.7.

Egress doors in educational occupancies. The doors shall be capable of being locked from inside the room with a key or any other approved means; the doors shall be openable from within the room in accordance with Section 1010.2; modifications shall not be made to listed panic hardware, fire door hardware or door closers; modifications to fire door assemblies shall be in accordance with NFPA 80

Exterior entry doors. Exterior doors which provide entry into the building shall be provided with locking arrangements designed to keep intruders from entering the building, and shall comply with all of the following: the doors shall be lockable from the egress side of the door; a minimum of one door on each building face shall be capable of being unlocked from outside the building with a key or other approved means; each egress door shall be openable from within the building in accordance with Section 1010.2.

State Laws/Bills

- K-12 public/private school
- Security glazing/film
- MUST be tested to ASTM F3561 – Assembly test

- Utah
- Texas
- Tennessee

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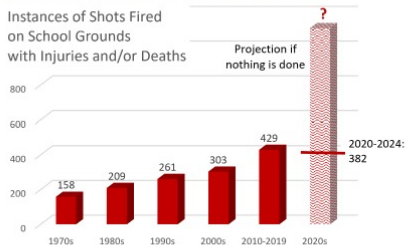
School Security: Windows and Doors Respond First

The issue:

Active shooter events are becoming more frequent.



Time is critical.
The average length of active shooter events is 8 minutes; the shortest is 90 seconds. Response times for first responders average 3 minutes, so some active shooter events are over even before first responders arrive.

No building codes or mandates for school security exist.
In comparison, every building is subject to fire codes and regulations because of (relatively smaller numbers of) historic deaths in building fires. Since the adoption and enforcement of the fire codes, the number of deaths from fires has dramatically decreased.

The strategy:

Make schools safer with security, ballistic, and attack resistant windows and doors.
In active shooter events, windows and doors can be the first line of defense. Security glazing resistant to forced entry can be used to slow down an attacker, allowing more time for schools to enact emergency plans and for first responders to arrive.

High risk areas of school buildings include entrance areas, exterior window and door access points, and classroom window and door access points.

Third-party tested products are available.
ASTM F3561 *Standard Test Method for Forced-Entry-Resistance of Systems after Simulated Active Shooter Attack* serves as the industry-accepted standard for minimum criteria for security windows and doors for schools.

Window and door solutions:

- Serve as first lines of defense while allowing school personnel and first responders to see impending danger.
- Provide privacy and allow diffuse light in while selectively blocking attacker's line-of-sight when translucent or reflective glass is utilized.
- Can be designed for forced entry resistance and bullet-resistance.
- Are available at various protection levels as retrofit options.
- Create a secure environment for teachers and students without imposing visible barriers.
- Provide passive protection, even during power outages.

Glass can be part of the school's security plan as the "first element of surprise."

References:

- ASTM F3561 *Standard Test Method for Forced-Entry-Resistance of Systems after Simulated Active Shooter Attack*. astm.org
- https://everytownresearch.org/maps/gunfire-on-school-grounds/
- First responders' average response time: https://leb.fbi.gov/image-repository/police-response-time-to-active-shooter-attacks.jpg/view
- FEMA Primer to Design Safe School Projects in Case of Terrorist Attacks and School Shootings (December 2012): https://www.dhs.gov/xlibrary/assets/st/bips07_428_schools.pdf

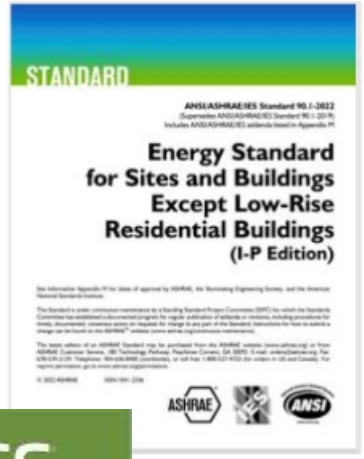
National Glass Association (NGA) combined with the Glass Association of North America (GANA) in 2018 to create the largest trade association serving our industry. We develop standards, create technical resources, promote and advocate for glass in the built environment, and advance the industry as a viable, thriving and exciting career path. Learn more at glass.org/advocacy. For further information on windows and doors for school security, please email NGA Technical Staff at technicalsvcs@glass.org.

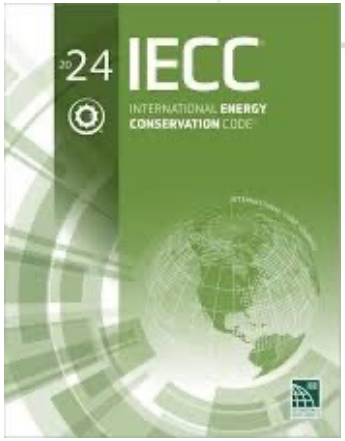
Daylighting and Views in School Classrooms

- GICC also submitted an IBC proposal that requires natural light be provided in classrooms.
- Studies show that spaces with daylight and views provide faster learning, higher test scores, decreased absenteeism.

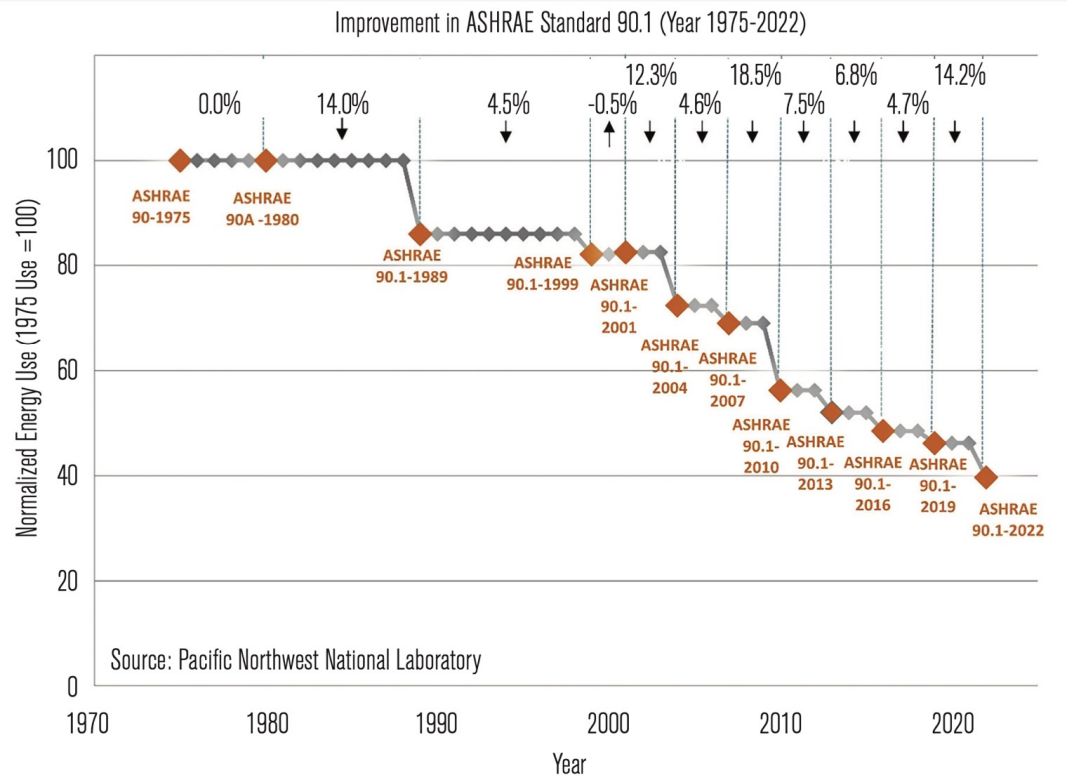
Energy Code Trends

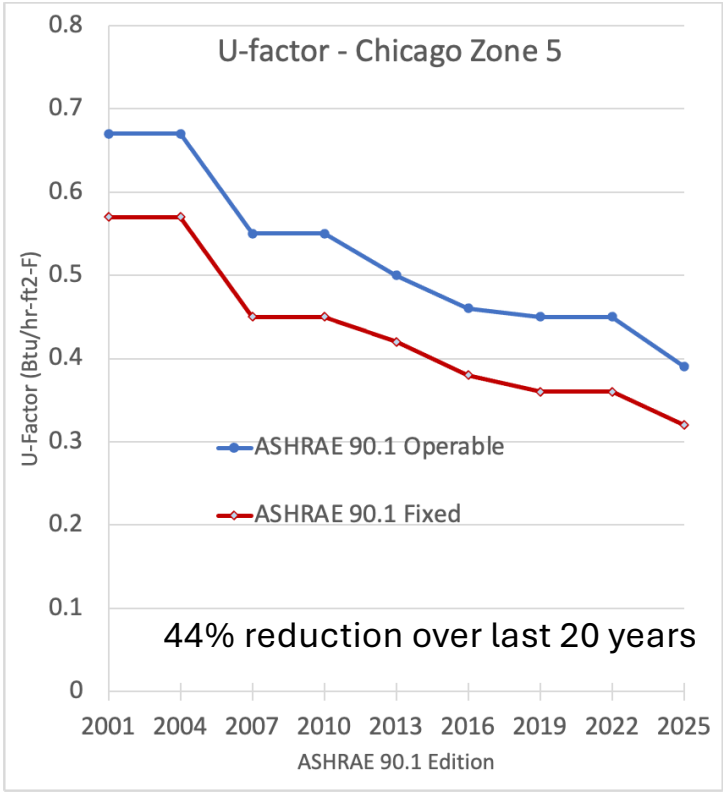
- Where are the energy codes headed?
- What does Trump 2.0 mean for energy codes and glazing products?





Energy Code Progression – ASHRAE 90.1





- Steady progression over last 20 years, regardless of politics

But what might change? Implementation

- National model codes like ASHRAE 90.1 and IECC continue same trend to push higher efficiency products.
- But codes are **implemented at the state and local level** when they adopt the model code … or create their own.
- Uncertain how energy code adoption and funds supporting states may be impacted.

Local vs. National Action

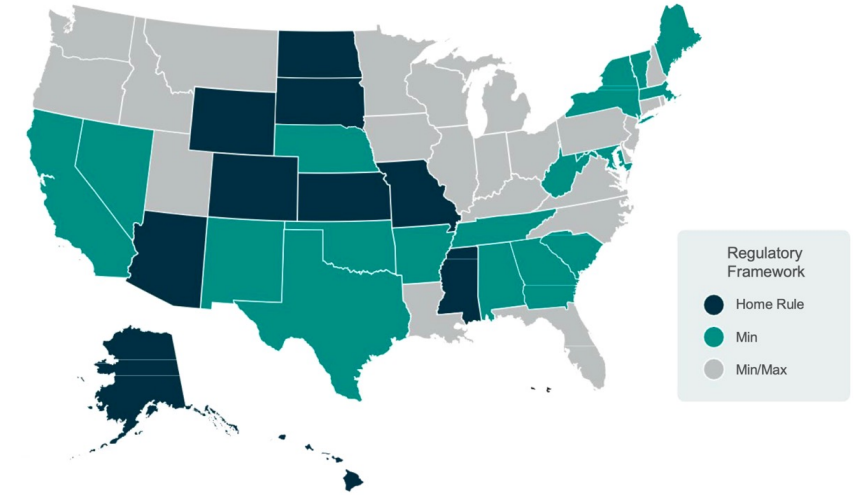
- I expect we will see the same reaction that we saw during Trump 1.0 – where the federal government steps out, states and cities may fill in.
- Remember last time? Trump left Paris Climate Agreement, and cities and states like New York, Massachusetts, and large cities set their own targets, then started to develop their own codes.

← Slide from 6 years ago

- Chaotic, messy, a little scary, but also created new opportunities.

Local adoption

- Some (not all) states allow local adoption of higher efficiency codes … and it happened, especially in cities.



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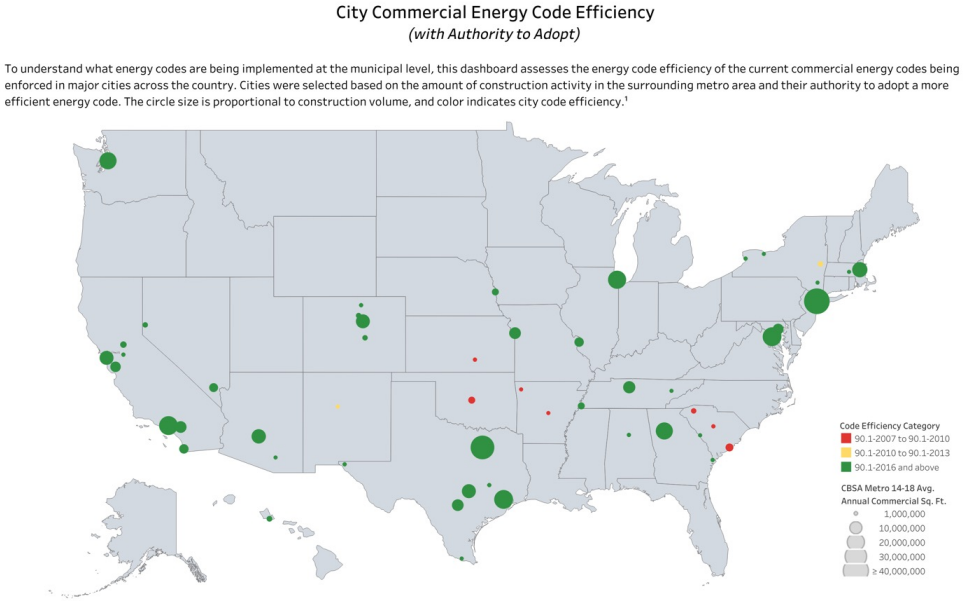
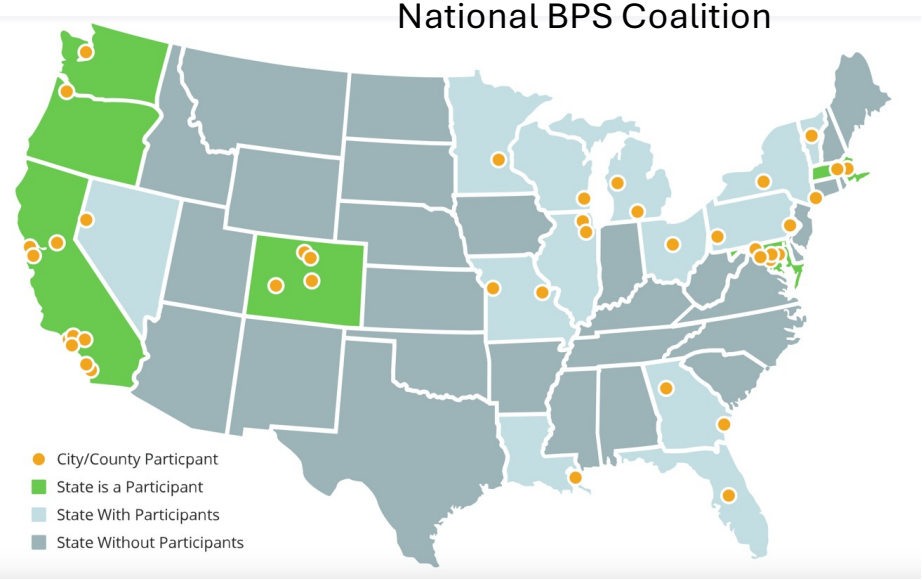


Building Performance Standards

- This also led to significant increase in adoption of ***building performance standards***, which push retrofits in existing buildings.
- Again, most activity at city level.

National BPS Coalition



So what do I see for the coming years?

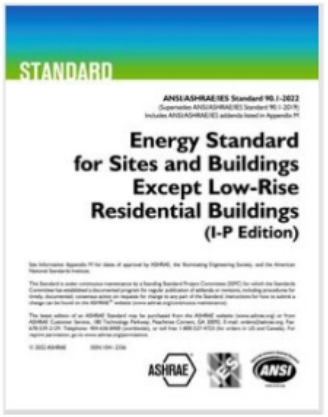
- Continued small incremental changes in the energy codes

+

- I expect a similar increase in regional activity, with political split
  - Less in red states
  - More in blue states and cities (including blue cities in red states)

- This will be hard to track, manage. Threats and opportunities
  - Have to watch for attacks on window area like before, but we are ready.
  - Creates opportunity for high performance products (VIG, triple glazing, 4th surface low-e, advanced spacers, advanced frames).
  - Creates opportunities for retrofit and replacement products in existing buildings.

Example of the steady incremental changes: ASHRAE 90.1-2025 Fenestration Criteria



- Comprehensive changes in fixed windows, ope… …ws, skylights/sloped glazing. No change… …rs.
- Cost effective, practica…
- **No reduct…**
- ~ 3-13…
- SHGC … …23 SHGC up to Zo…
- Increase… …acers, gas-fill in…
- 4th surfac… …mance thermal breaks in northern zones
- Triple glazi… …orth zones (Zones 7-8)

Expect similar incremental advancement for 2027 IECC, which is being developed right now.

Examples of Regional Actions

- New "**Colorado Model Low Energy and Carbon Code**"
  - Based on 2024 IECC but with extra solar, EV, electrification.
  - Local jurisdictions updating their code required to use this.

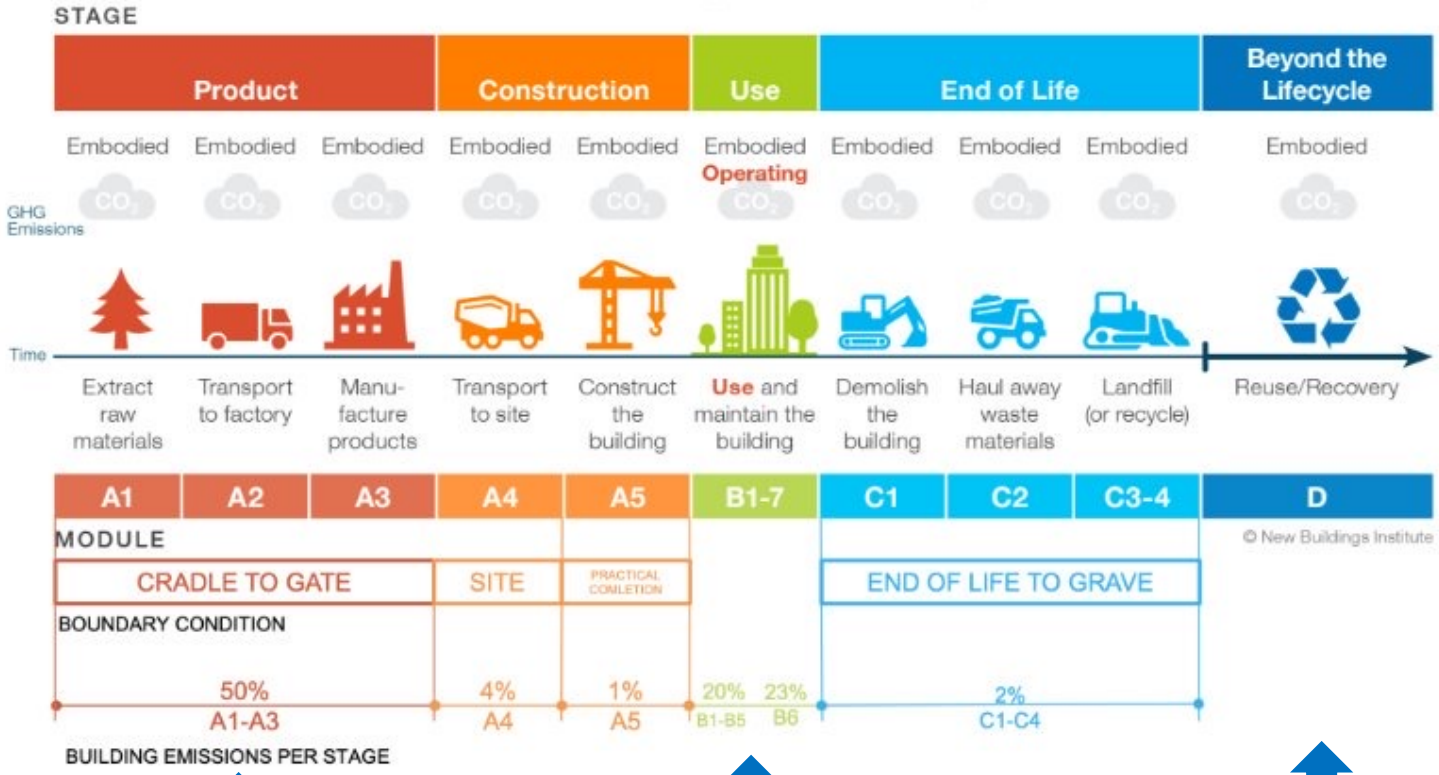
- **Boston** has new "**Net Zero Carbon Zoning policy**"
  - *Starting July 1*, new building projects must demonstrate net zero carbon emissions during permitting.
  - Aggressive MA stretch energy code + renewable energy
  - Report embodied carbon (EPDs). Large projects must do whole building life cycle assessment.
  - New buildings > 20,000 ft^2, multifamily with 15 units or more.
  - Additions, renovations > 50,000 ft^2

Environmental Product Declarations (EPDs) and NGA's EPA Grant

What is an EPD?

- Standardized and transparent way to understand environmental impact of products.
- Most important metric or "impact category" is **global warming potential (GWP)**, also called **embodied carbon** (measured in kg or tons of CO2eq)
- Other impact categories include primary energy use (renewable/non-renewable), acidification potential, eutrophication potential, ozone depletion potential, smog formation potential, etc.

Embodied Carbon Lifecycle Stages



Most EPDs are **cradle to gate ...**

but we are also interested in **operational carbon** (energy efficiency) ...

and **recycling**

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Who is asking for EPDs?

- **Being added to specifications or last-minute request from architect or GC.**
- **Green programs and "Buy Clean" policies** setting requirements for certain number of EPDs, and some setting **embodied carbon limits** for construction materials (mostly concrete, steel, flat glass, steel)
  - GSA/Federal Buy Clean Initiative for certain federal projects
  - Buy Clean California and CALGreen for state-funded projects, large offices, schools
  - Buy Clean Colorado for state-funded projects, tax credits for private projects
  - IgCC / ASHRAE 189.1 / ESGBC / LEED
  - New York State looking at new requirements ←*made a presentation to them in Oct.*
- **Marketing/Promotion –** support architect's ability to design for sustainability

Environmental Product Declarations (EPDs)

***For now,* what can you do when you receive an EPD request?**

- All programs either…
  - Only require EPD for primary flat glass, not processed/fabricated glass,
  - Allow EPDs covering 80% of the assembly cost or weight to be submitted for construction assemblies (such as a window or curtain wall),
  - Or ignore minor parts (sealants, hardware, fasteners, spacers, etc).
- **So, the architect can currently often just hand in one EPD for the glass from primary glass supplier and one EPD for the aluminum framing.**
- *Note: Industry-wide EPD for flat glass expired in Dec 2024*

Environmental Product Declarations (EPDs)

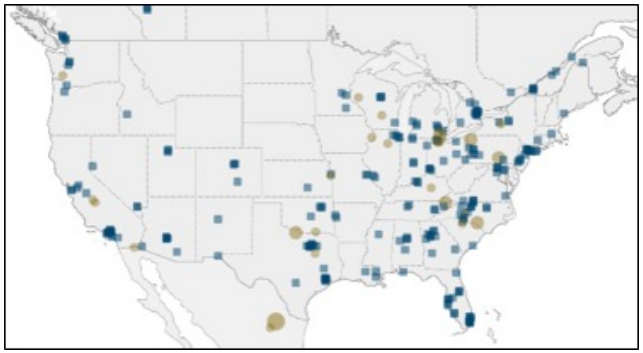
But can you get away with that *in the future?*

- Increased demand for **more granular EPDs**
  - Company and product-specific, and facility-specific "where available"
  - Not just ***primary glass***, but ***processed glass***: tempered, coated, laminated, insulating, etc.
  - This gets complex fast, nearly infinite combinations…
- *NGA is trying to prepare for this - proactive rather than reactive*
  - Applied - and was successfully selected - for a 5 year $2.1M grant "Architectural Glass EPD Development to Reduce Embodied Greenhouse Gas Emissions for Construction Materials and Products"

EPA Grant

- EPA Grants = 160M
- NGA - $2.1M
- 38 grantees selected
- 14 material types
- NGA is the ONLY glass representative

EPA Grant



Four subprojects:

- **Primary Flat Glass LCI Data Aggregation**
  - Provide support to improve granularity of primary flat glass LCI data as well as PCR update.
- **EPD Generator Tool for Processed Glass**
  - Develop robust generator tool capable of producing both LCA data reports and full 3rd party reviewed EPDs for processed glass products in conformance with ISO standards.
- **EPD Development Assistance for Glass Fabricators**
  - Provide technical, educational, and financial assistance to glass fabricator members for EPD development
- **End-of-Life LCA data collection on architectural glass recycling**
  - To improve understanding about glass end-of-life and quality of LCA part D data, quantify glass recovery rates and track end-use outcomes for recycled glass on 1-3 deconstruction projects

EPA Grant for Flat Glass EPD Development

Status?

- Under 90 day pause from executive order to “pause the disbursement of funds appropriated through the Inflation Reduction Act of 2022 or the Infrastructure Investment and Jobs Act” until internal policy review is completed.
- Does *not* rescind funding, which would require act of Congress, but does create delay.
- Multiple US based industries (steel, concrete, glass, asphalt, aluminum) have expressed concern to administration about continuing this program, so we are hopeful, and are currently reviewing LCA partner bids to be ready to roll.

https://www.glass.org/advocacy

Communications


NGA
NATIONAL GLASS ASSOCIATION with GANA
ADVOCACY & TECHNICAL SERVICES

AN UPDATE ON IMPORTANT TECHNICAL AND CODES WORK BY NGA'S ADVOCACY AND TECHNICAL SERVICES TEAM

July 2023

Current Activities

30-Day Public Review of ASHRAE 90.1 Addendum

The first Public Review of BSR/ASHRAE/IES Addendum k to ANSI/ASHRAE/IES Standard 90.1-2022, *Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings* is now open for comment online. The deadline is August 6, 2023. This addendum expands the renewable energy provisions of Standard 90.1 to allow the use of off-site renewable energy to meet the requirements, as specified for each climate zone. These changes include additional information about how off-site renewable energy procurement is to be documented.

Event News

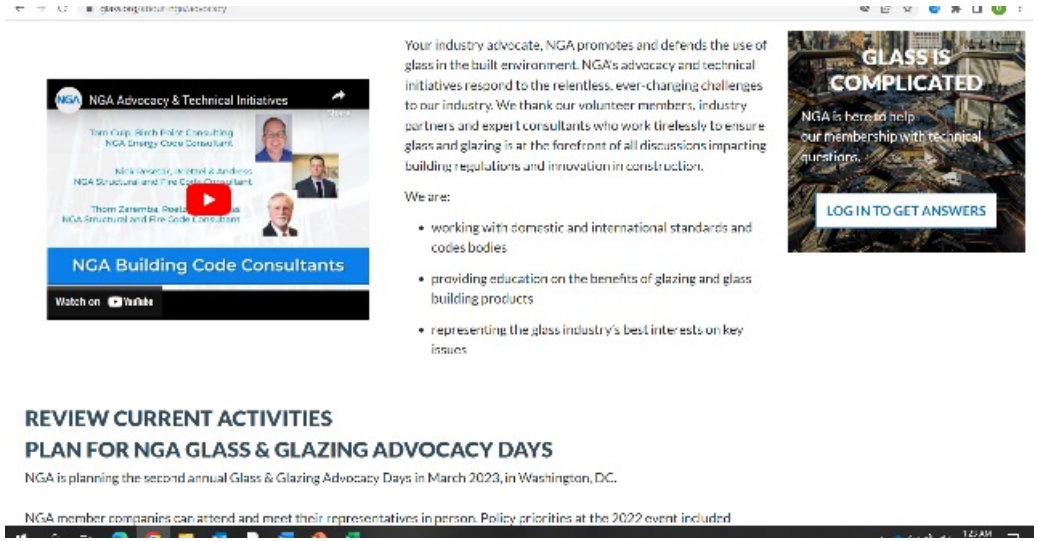
Fabricating Committee Sessions at NGA Glass Conference: Tacoma

Join us at NGA Glass Conference: Tacoma, July 25-27, to participate in discussions that impact the glass and glazing industry. The NGA Fabricating Committee will meet all three days of the conference.

Session Spotlight: Protective Glazing

On Wednesday morning, July 26, the NGA Fabricating Committee's Protective Glazing segment will focus on bird-friendly glazing and school security glazing.

NGA's Code Consultant, Nick Resetar of Roetzel & Andress will present an update on the existing legislation and voluntary ordinances to help



BUILDING CODES

Energy, ICC, IECC

CODES

INDUSTRY STANDARDS

ASHRAE, ASTM, DOE

STANDARDS

LEGISLATION

Buy Clean, Building Resilience

LEGISLATION

PRIORITY ISSUES

School security, bird-friendly, RAP, recyclability

PRIORITIES

SUSTAINABILITY

PCRs, EPDs, triple glazing, recycling

SUSTAINABILITY

GET INVOLVED

Volunteer for our committee task groups

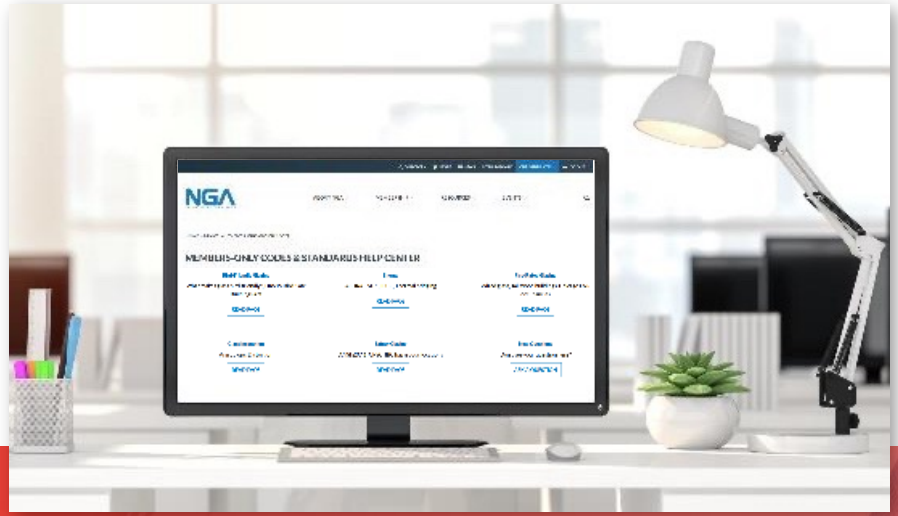
COMMITTEES

ADVOCACY NEWS

CONFERENCE™

HAVE QUESTIONS? GET ANSWERS!

Members-Only Codes & Standards Help Center



Glass is complicated—NGA is here to help.

Exclusively for NGA members, we have compiled answers to **75** tough technical codes and standards questions in an easy-to-use, online help center.

NEW: Security Glazing added!

Available now (member login required).

Get started: glass.org/members-only-resources

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AIA Continuing Education Provider

AIA Presentations

https://www.glass.org/architect

AIA CONTINUING EDUCATION & RESOURCES FOR ARCHITECTS

NGA's resources for architects include on-demand AIA-accredited courses, the Glass & Glazing Design Academy, NGA's Glass Technical Papers, and All about Glass and Metal: A Guide for Architects & Specifiers. NGA is an AIA-approved provider of CES credits for architects.

AIA Continuing Education Provider

GLASS & GLAZING DESIGN ACADEMY

NGA's accredited AIA presentations are now available in an on-demand, multimedia format through the Glass & Glazing Design Academy. Available to architects and industry professionals through a new partnership with Architectural Record, the online academy helps architects understand the performance, design considerations and benefits of the many glazing and glass building products available today.

Read our article on Occupant Comfort, featured in Architectural Record.

Earn 1.0 LU/HSW when you read the full article and take the accompanying quiz in our academy.

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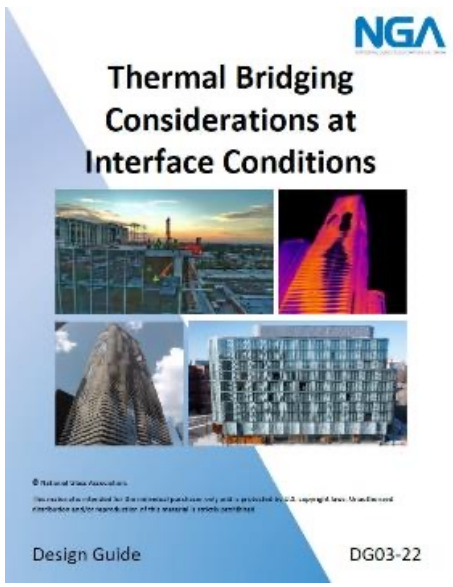

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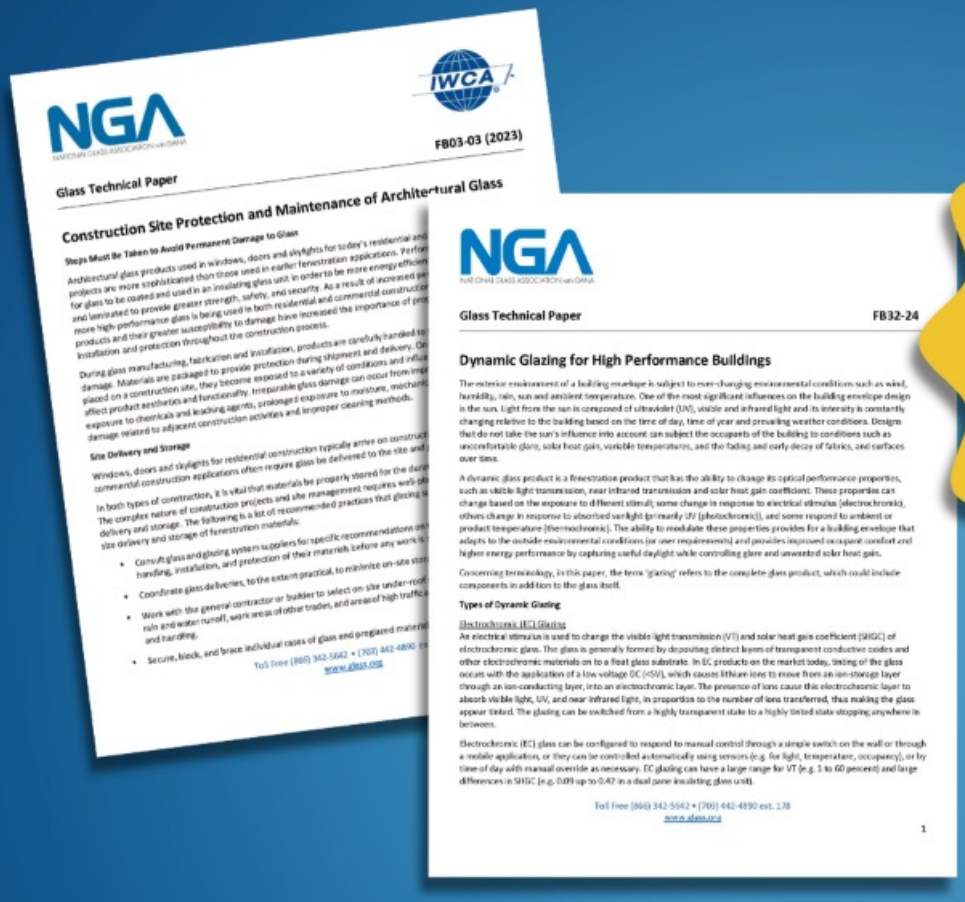

Glass Technical Paper

FB03-03 (2023)

Construction Site Protection and Maintenance of Architectural Glass

Steps Must Be Taken to Avoid Permanent Damage to Glass

Architectural glass products used in windows, doors and skylights for today's residential and
projects are more sophisticated than those used in earlier fenestration applications. Perfor
for glass to be coated and used in an insulating glass unit in order to be more energy efficien
and laminated to provide greater strength, safety, and security. As a result of increased pe
more high-performance glass is being used in both residential and commercial construction
products and their greater susceptibility to damage have increased the importance of proc
installation and protection throughout the construction process.

During glass manufacturing, fabrication and installation, products are carefully handled to
damage. Materials are packaged to provide protection during shipment and delivery. On
placed on a construction site, they become exposed to a variety of conditions and influe
affect product aesthetics and functionality. Irreparable glass damage can occur from impa
exposure to chemicals and leaching agents, prolonged exposure to moisture, mechanic
damage related to adjacent construction activities and improper cleaning methods.

Site Delivery and Storage

Windows, doors and skylights for residential construction typically arrive on construct
commercial construction applications often require glass be delivered to the site and
In both types of construction, it is vital that materials be properly stored for the dura
The complex nature of construction projects and site management requires well-pla
delivery and storage. The following is a list of recommended practices that glazing s
site delivery and storage of fenestration materials:

- Consult glass and glazing system suppliers for specific recommendations on
handling, installation, and protection of their materials before any work is
- Coordinate glass deliveries, to the extent practical, to minimize on-site stor
- Work with the general contractor or builder to select on-site under-roof
rain and water runoff, work areas of other trades, and areas of high traffic
and handling.
- Secure, block, and brace individual cases of glass and preglazed material

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Glass Technical Paper

FB32-24

Dynamic Glazing for High Performance Buildings

The exterior environment of a building envelope is subject to ever-changing environmental conditions such as wind, humidity, rain, sun and ambient temperature. One of the most significant influences on the building envelope design is the sun. Light from the sun is composed of ultraviolet (UV), visible and infrared light and its intensity is constantly changing relative to the building based on the time of day, time of year and prevailing weather conditions. Designs that do not take the sun's influence into account can subject the occupants of the building to conditions such as uncomfortable glare, solar heat gain, variable temperatures, and the fading and early decay of fabrics, and surfaces over time.

A dynamic glass product is a fenestration product that has the ability to change its optical performance properties, such as visible light transmission, near infrared transmission and solar heat gain coefficient. These properties can change based on the exposure to different stimuli; some change in response to electrical stimulus (electrochromic), others change in response to absorbed sunlight (primarily UV (photochromic)), and some respond to ambient or product temperature (thermochromic). The ability to modulate these properties provides for a building envelope that adapts to the outside environmental conditions (or user requirements) and provides improved occupant comfort and higher energy performance by capturing useful daylight while controlling glare and unwanted solar heat gain.

Concerning terminology, in this paper, the term 'glazing' refers to the complete glass product, which could include components in addition to the glass itself.

Types of Dynamic Glazing

Electrochromic (EC) Glazing

An electrical stimulus is used to change the visible light transmission (VT) and solar heat gain coefficient (SHGC) of electrochromic glass. The glass is generally formed by depositing distinct layers of transparent conductive oxides and other electrochromic materials on to a float glass substrate. In EC products on the market today, tinting of the glass occurs with the application of a low voltage DC (<5V), which causes lithium ions to move from an ion-storage layer through an ion-conducting layer, into an electrochromic layer. The presence of ions cause this electrochromic layer to absorb visible light, UV, and near infrared light, in proportion to the number of ions transferred, thus making the glass appear tinted. The glazing can be switched from a highly transparent state to a highly tinted state stopping anywhere in between.

Electrochromic (EC) glass can be configured to respond to manual control through a simple switch on the wall or through a mobile application, or they can be controlled automatically using sensors (e.g. for light, temperature, occupancy), or by time of day with manual override as necessary. EC glazing can have a large range for VT (e.g. 1 to 60 percent) and large differences in SHGC (e.g. 0.09 up to 0.47 in a dual pane insulating glass unit).

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