

THE NATIONAL GLASS ASSOCIATION PRESENTS

BEC

CONFERENCE™

25TH
Anniversary

WHERE WE'VE BEEN & WHERE WE'RE GOING

MARCH 5-7, 2023 | LAS VEGAS | GLASS.ORG

CODES & REGULATIONS THAT IMPACT YOUR WORLD



Urmilla Sowell
NGA Vice President,
Technical Services & Advocacy

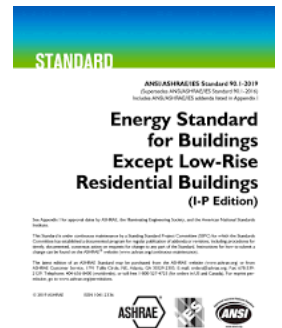


Dr. Thomas Culp
Birch Point
Consulting

KATY TOLD ME NO TABLES WITH NUMBERS ... SO ...

ASHRAE NINETY POINT ONE – TWO THOUSAND TWENTY TWO

Climate Zone	Zero	One	Two	Three	Four	Five	Six	Seven	Eight
Fixed	Zero. five zero	Zero. five zero	Zero. four five	Zero. four two	Zero. three six	Zero. three six	Zero. three four	Zero. two nine	Zero. two six
Operable	Zero. six two	Zero. six two	Zero. six zero	Zero. five four	Zero. four five	Zero. four five	Zero. four two	Zero. three six	Zero. three two
Entrance Door	Zero. eight three	Zero. eight three	Zero. seven seven	Zero. six eight	Zero. six three	Zero. six three	Zero. six three	Zero. six three	Zero. six three



Any Questions?

MORE SERIOUSLY, WE'RE GOING TO DISCUSS OTHER ISSUES TODAY, BUT ASK ME FOR ANY NITTY GRITTY CODE DETAILS ON ...

- **ASHRAE 90.1-2022** (newly published)
- **2024 IECC** (to be finished this fall)
- **California 2025 Title 24** (just starting to look at proposals)
- **2023 New York Stretch Code**
- **2023 Massachusetts Stretch Code** (starts July 1)

INFLATION REDUCTION ACT OF 2022, ENERGY CODES, EMBODIED CARBON, AND EPDS

One Hundred Seventeenth Congress of the United States of America

AT THE SECOND SESSION

*Begun and held at the City of Washington on Monday,
the third day of January, two thousand and twenty-two*

An Act

To provide for reconciliation pursuant to title II of S. Con. Res. 14.

*Be it enacted by the Senate and House of Representatives of
the United States of America in Congress assembled,*

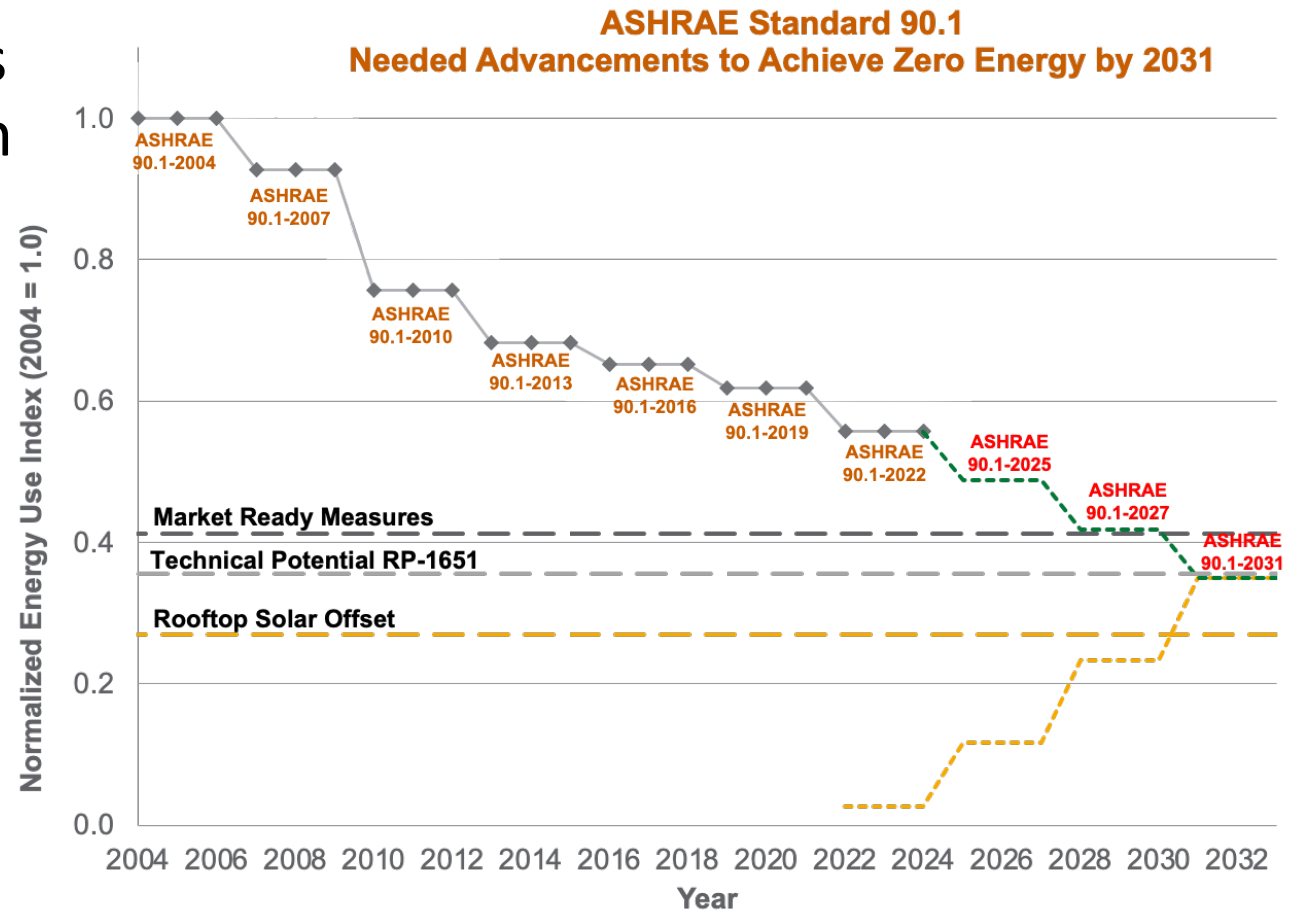
CODE TREND – INCREASED STRINGENCY MOVING TOWARDS NET ZERO

- IECC and ASHRAE 90.1 now have goals to achieve net-zero energy and carbon emissions by 2030-31.

- Will see significant increases in **efficiency requirements** (prescriptive and new energy credits)

AND

renewable energy requirements (including BIPV)



INFLATION REDUCTION ACT – ENERGY CODE ADOPTION

- **\$1 billion** appropriated to DOE for state and local governmental grants aimed at **accelerating adoption of building energy codes**:
- \$330 million to assist in adopting the **latest energy codes**.
 - 2021 IECC for residential, ASHRAE 90.1-2019 for commercial
- \$670 million to assist in adopting a **zero energy code**.
- Includes training and enforcement to achieve full compliance.
- Money is available through 2029.

(c) **ZERO ENERGY CODE**.—The Secretary shall use funds made available under subsection (a)(2) for grants to assist States, and units of local government that have authority to adopt building codes—

(1) to adopt a building energy code (or codes) for residential and commercial buildings that meets or exceeds the zero energy provisions in the 2021 International Energy Conservation Code or an equivalent stretch code; and

(2) to implement a plan for the jurisdiction to achieve full compliance with any building energy code adopted under paragraph (1) in new and renovated residential and commercial buildings, which plan shall include active training and enforcement programs and measurement of the rate of compliance each year.

INFLATION REDUCTION ACT – TAX INCENTIVES

- Sec. 48 Investment Tax Credits for Electrochromic Glazing, and for Solar and Building Integrated Photovoltaics (BIPV)
 - Baseline credit **6%** of total installed cost.
 - Multiply by **5x** to **30%** if meet prevailing wage and apprenticeship requirements.
 - May also be able to add **2-10%** for meeting domestic content minimums.
 - **Electrochromic:** very short timeline, construction must begin before Jan 1, 2025
 - **Solar and BIPV:** covered to beyond 2032.
May also earn additional credit if located in a low income community or ‘energy community’ (affected by closed coal mines or power plants).
- For both, we believe IRS will interpret that the credit applies to the entire installed assembly (*i.e. the full curtain wall and installation labor, not just the glass*) which greatly increases the value of the credit.

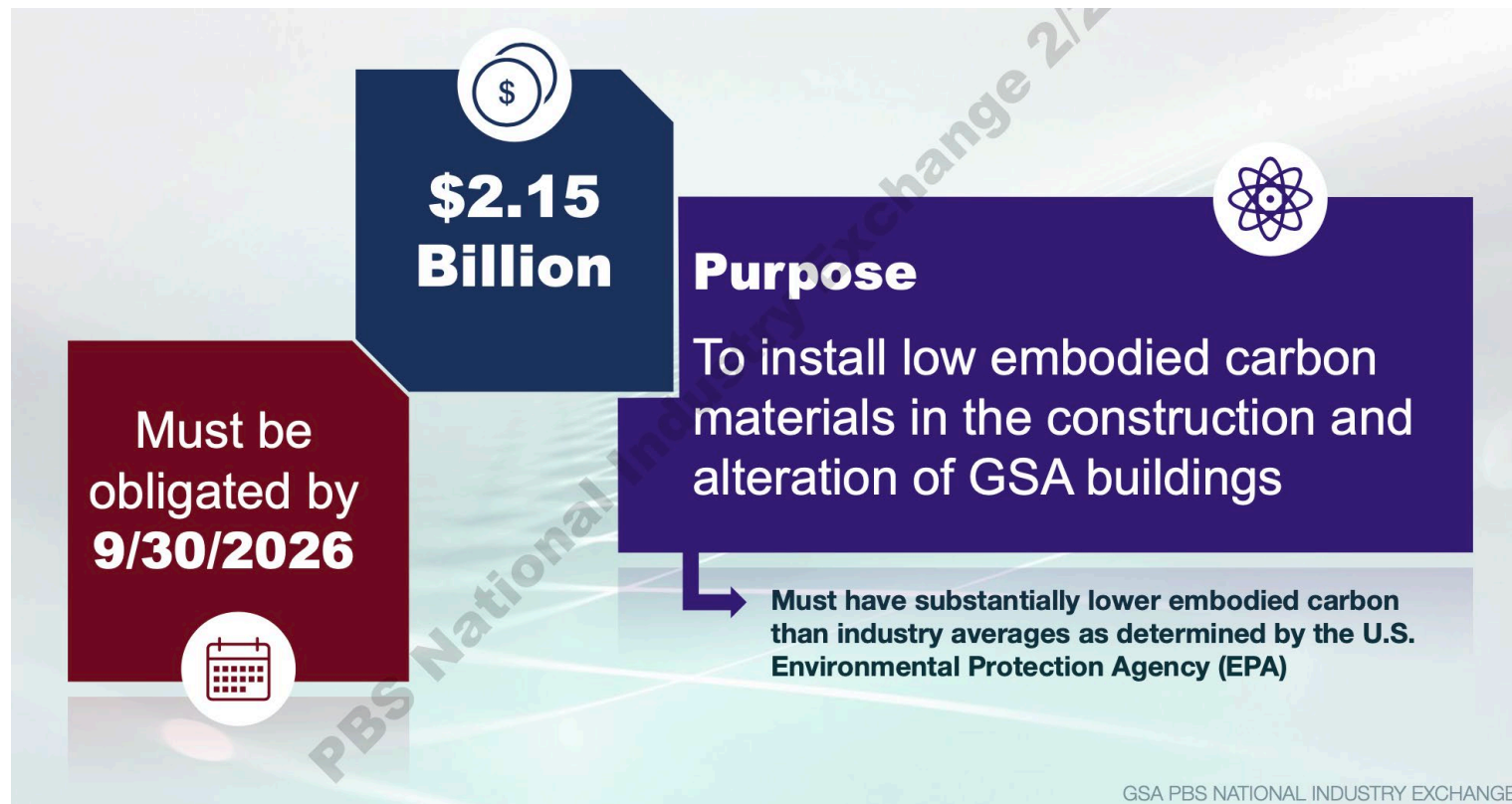
INFLATION REDUCTION ACT – TAX INCENTIVES

179D Energy Efficient Commercial Buildings Tax Deduction

- Incentive for going 25-50% beyond ASHRAE 90.1-2019: **\$0.50 to \$1.00 / ft²** as the baseline; increase by **5x** to **\$2.50 to \$5.00 / ft²** if prevailing wage and registered apprenticeship requirements are met. *Floor area, not window area!*
- Difficult to earn with HVAC or lighting alone – also need an efficient envelope.
- Previously, **tax-exempt entities** like schools could not take advantage of the 179D tax deduction. Now, deduction allowed to be allocated to the *designer* of the property instead of the owner for tax-exempt properties.
- **Existing buildings** also included, if reduce energy use by > 25%.
Will support further expansion of Building Performance Standards.

INFLATION REDUCTION ACT – GSA AND LOW EMBODIED CARBON MATERIALS

- Federal procurement under both Federal Buy Clean Initiative and the IRA



- EPA also provided \$250 million to assist industry in EPD development.

INFLATION REDUCTION ACT – GSA AND LOW EMBODIED CARBON MATERIALS

- Initial targets are concrete, steel, **glass**, and asphalt, but also gathering data on aluminum.
- Set GWP CO₂eq limits for procured materials in governmental projects, including flat glass, ~~processed glass, and IGUs.~~



Initial GSA Draft 1/25/23

	GSA IRA Limits for Low Embodied Carbon Glass - Jan. 2023 <small>(Uncertainty-Adjusted GWPs, in kilograms of carbon dioxide equivalent per metric ton or square meter - kgCO₂e kg/ t or kgCO₂e kg/ m²)</small>		
Glass Product Category	Top 20% Limit	Top 40% Limit	Average or Better Limit
Flat Glass (per metric ton)	1,310	1,470	1,510
Processed Glass (per square meter)	24.94	32.78	43.24
Insulated Glazing Units (per square meter)	75.64	101.66	200.00

Breaking News!
We just found out that GSA will focus only on flat glass, not processed glass and IGUs

INFLATION REDUCTION ACT – GSA AND LOW EMBODIED CARBON MATERIALS

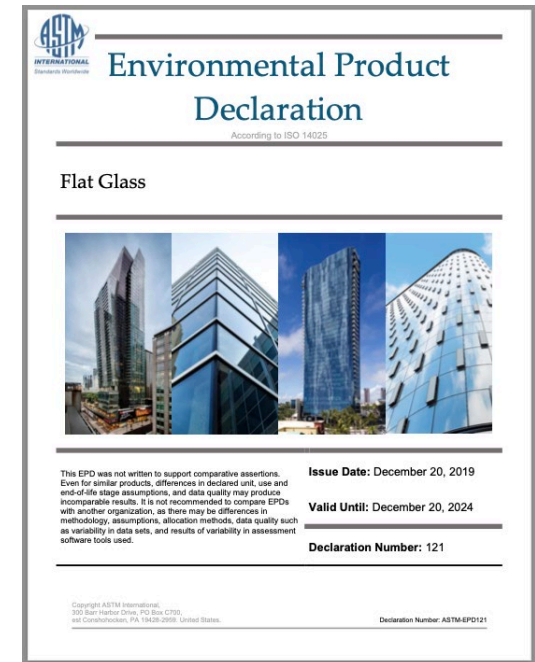
Expect revised
rules March 10-ish

- Draft rules 1/25/23:
 - Must have **product-specific** and **facility-specific EPD**
 - Flat glass plant must be registered with EPA Energy Star Plants program.
 - Allow assemblies to qualify if 80% of component materials qualify (by weight or cost)
- NGA filed comments with several concerns
 - *Lack of product specific EPDs*
 - ✓ • Should allow use of just flat glass EPD, which is bulk of GWP impact
 - Problems with facility-specific and Energy Star Plants requirements
 - Issues with using square meter instead of mass basis
 - Variability in EC3 data?
 - Consider operational carbon benefits in addition to embodied carbon
- It's not all negative – GSA are some of our biggest supporters for the value of daylighting and views in high performance buildings.



EMBODIED CARBON AND EPDS IN THE GREEN CODES

- Working on ASHRAE 189.1-2023 which becomes the 2024 International Green Construction Code
- Two proposals greatly increasing use of EPDs
- One on EPD submissions:
 - Increases number of EPDs required on a project to at least 20 products and 25% of total building product cost.
 - Still allows industry-wide EPDs in addition to company-specific EPDs.
 - Does not require facility-specific EPDs.
 - Allow EPDs for components to be submitted for assemblies if cover > 80% of product weight or cost.
 - For example, in curtain wall, just submit EPDs for the glass and framing; not fasteners, sealants, hardware, spacer, desiccant, etc.



EMBODIED CARBON AND EPDS IN THE GREEN CODES

- Second proposal is more controversial, getting into actual GWP limits.
- Must submit at least 10 *product-specific* EPDs representing > 10-15% of the total building product cost with **GWP within 125% of the industry-wide average**.
 - The CO₂eq limit is not a problem, and potentially even beneficial for identifying cleaner domestic products versus other globally sourced products.
 - However, must be *product specific EPD* – can't just use industry wide EPD – which some companies have and others do not.
 - Also allows EPDs for components to be submitted for assemblies if cover > 80% of product weight or cost.

**BOTTOM LINE ... increased use of EPDs ... moving to product-specific EPDs ...
focus on decarbonization / lower carbon materials**

BUY CLEAN CALIFORNIA ACT

GWP LIMITS



Table 1: GWP limits for eligible materials

Eligible material	Maximum acceptable GWP limit (unfabricated)*
Hot-rolled structural steel sections	1,010 kg CO ₂ eq. or 1.01E+03 kg CO ₂ eq. for one metric ton of structural steel.
Hollow structural sections	1,710 kg CO ₂ eq. or 1.71E+03 kg CO ₂ eq. for one metric ton of structural steel.
Steel plate	1,490 kg CO ₂ eq. or 1.49E+03 kg CO ₂ eq. for one metric ton of structural steel.
Concrete reinforcing steel	890 kg CO ₂ eq. or 8.90E+02 kg CO ₂ eq. for one metric ton of bar.
Flat glass	1,430 kg CO ₂ eq. or 1.43E+03 kg CO ₂ eq. for one metric ton of flat glass.
Light-density mineral wool board insulation	3.33 kg CO ₂ eq. for 1 m ² of mineral wool board insulation at RSI-1.
Heavy-density mineral wool board insulation	8.16 kg CO ₂ eq. for 1 m ² of mineral wool board insulation at RSI-1.

NGA's Flat Glass EPD average

*GWP limit is based on a 100-year lifetime impact.

DGS leveraged current industrywide EPDs to determine the industry average and set the final limit above.

2.0 Eligible Materials:

2.1 What construction materials are affected?

Structural steel, concrete reinforcing steel, flat glass and mineral wool board insulation. Table 2 below describes the types of eligible materials that can apply to the established GWP limits. Awarding authorities should be contacted for specific BCCA material requirements.

Table 2: Description of eligible materials

Eligible material	Description
Structural steel	Hot-rolled sections consisting of wide flange beams (W-shape and HP-shape used in structural applications), standard beams (S-shape), misc. beams (M-shape), channels, angles, and tees. Hollow structural sections with round, square, or rectangular cross-section. Plate material.
Concrete reinforcing steel	ASTM A615/A615M ASTM A706/A706M ASTM A767/A767M ASTM A775/A775M
Flat glass	Float or rolled glass that is clear or tinted either installed by itself or as a part of a window assembly. Processed glass (e.g., tempered, coated, or laminated) is out of scope of the BCCA.
Mineral wool board insulation	Board insulation made of rock or slag in light- and heavy-density types. Light-density: 2.5 lbs/ft ³ – 4.3 lbs/ft ³ Heavy-density: 4.4 lbs/ft ³ – 8 lbs/ft ³ lbs/ft ³ is pounds per cubic foot.

ABOUT BUILDING TRANSPARENCY

Washington State 501c(3) nonprofit dedicated to sustainability in construction.

Building Transparency's core mission is to provide open access data and tools necessary to enable **broad and swift action** across the building industry in addressing embodied carbon's role in **climate change**.

Embodied Carbon in Construction Calculator

Free to use | Open access



Find & Compare Materials

Simple sorting and visualization of supply chain specific EPD data, with the ability to see material category baselines and set material category targets.



Plan & Compare Buildings

Simple visualization of a project's potential and realized upfront embodied carbon emissions, with the ability to see conservative baselines and set achievable reduction targets.

[:tails](#)

EC3 – EXAMPLE OF SEARCHING FOR PRODUCT EPDS

The screenshot displays the EC3 software interface. At the top left is the EC3 logo. The user is identified as 'Vaclav Hasik ADMIN USER'. The interface is divided into a left sidebar and a main content area. The sidebar, titled 'Find & Compare Materials', lists various material categories such as Concrete, Masonry, Aluminium, Steel, Wood, Thermal/Moisture Prot., Cladding, Openings, Finishes, Data Cabling, Asphalt, Manufacturing Inputs, Bulk Materials, and OtherMaterials. The main content area shows a search process. Step 1 is 'Category', where 'Concrete' is selected. Step 2 is 'Performance Specs', where 'READYMIX' is selected. A search bar labeled 'Search category' is present. Below it, a tree diagram shows 'AllMaterials' branching into various categories, with 'Concrete' expanded to show sub-categories like 'ReadyMix', 'Shotcrete', 'Slurry', 'Paving', 'Precast Concrete', 'Cast Decks and Underla...', and 'Grouting'. A 'NEXT' button is visible at the bottom right, along with a 'Report Bugs & Feedback' button.

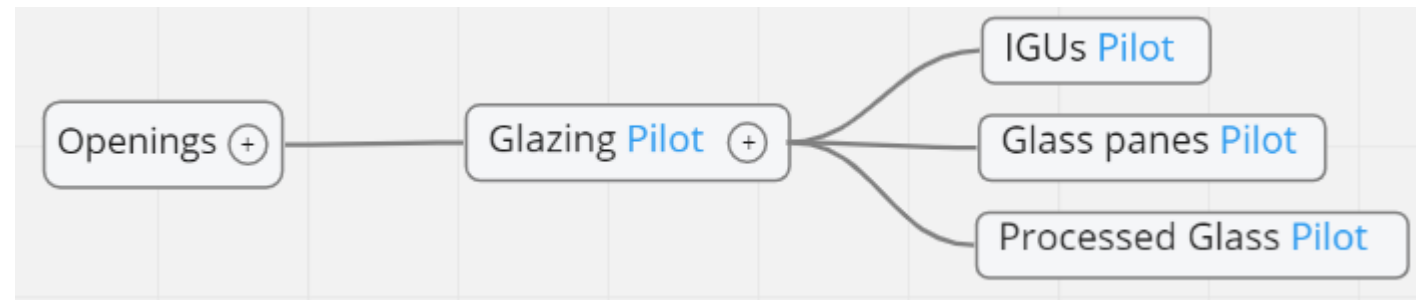
EC3 – SEARCHING FOR PRODUCT EPDS

The screenshot shows the EC3 web application interface. At the top left is the EC3 logo. The top navigation bar includes a back arrow, a 'Building Transparency' icon, a user profile for 'Vaclav Hasik ADMIN USER', and tabs for 'Category' and 'Performance Specs'. A sidebar on the left lists navigation options: 'Find & Compare Materials' (with sub-items like Concrete, Masonry, Aluminium, Steel, Wood, Thermal/Moisture Prot., Cladding, Openings, Finishes, Data Cabling, Asphalt, Manufacturing Inputs, Bulk Materials, OtherMaterials), 'Plan & Compare Buildings', 'Import EPDs', 'Manage Data', 'Manufacturing', 'User Groups', 'Organizations', and 'Users'. The main content area is titled 'SEARCH BY PROPERTIES: 03 30 00 CAST-IN-PLACE CONCRETE'. It features several filter sections: 'PERFORMANCE SPECIFICATIONS' with fields for 'Compressive Strength' (highlighted), '@ Curing Time' (set to 28d), 'Compressive Strength Other', and 'Curing Time'; 'Slump (min)', 'Options', 'W/C Ratio', 'SCM', and 'EC3 / Declared unit'; and radio buttons for 'Standardweight' (highlighted) and 'Lightweight'. The 'GEOGRAPHIC' section includes 'Filter by Region', 'Filter by Country/State/Province' (highlighted), and 'Max Distance from Project Site'. An 'ADVANCED' section is partially visible. A blue 'Search' button is located at the bottom right. A status bar at the bottom left indicates 'Valid after : 2020-10-09 X'.

GLAZING/FENESTRATION CATEGORY DEVELOPMENT PROJECT

- Iterative process to decide category layout, correct nomenclature, critical specifications that affect embodied carbon
- ‘Calculators’ for quantifying embodied carbon of assembly products (IGU, curtain walls, windows)
- Participants from NGA, FGIA, company representatives
- 20 working group meetings from July 2021 to present

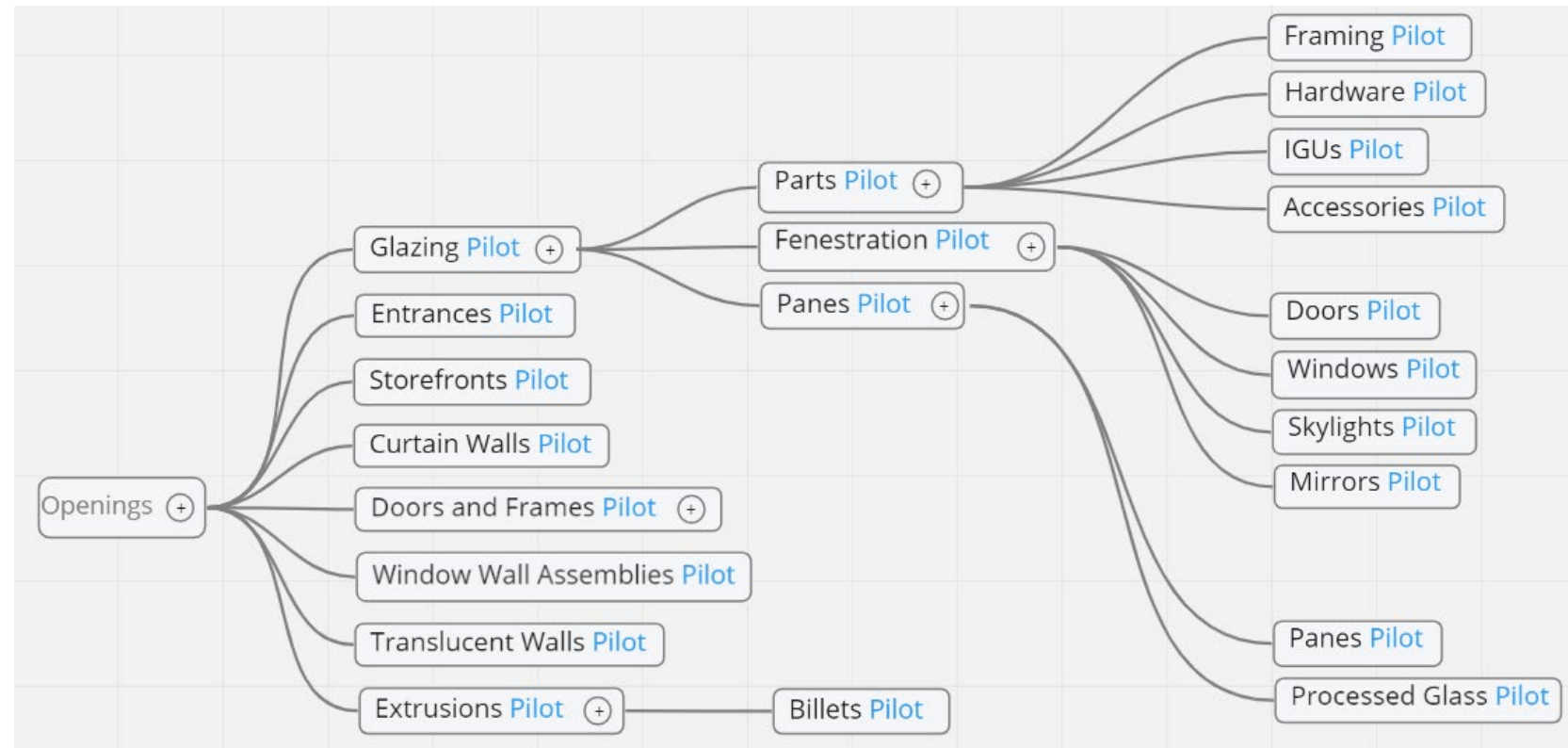
Previous EC3 Categorization (Simple)



GLAZING/FENESTRATION CATEGORY DEVELOPMENT PROJECT

- Iterative process to decide category layout, correct nomenclature, critical specifications that affect embodied carbon
- ‘Calculators’ for quantifying embodied carbon of assembly products (IGU, curtain walls, windows)
- Participants from NGA, FGIA, company representatives
- 20 working group meetings from July 2021 to present

New EC3 Categories and Calculators



***Does not show all child categories**

PERFORMANCE PARAMETERS FOR EACH CATEGORY

Searchable performance properties for processed glass (example)

Home AllMaterials / Openings / Glazing / Panes / Processed Glass

SEARCH BY PROPERTIES: 08 81 00 GLASS GLAZING

▼ PERFORMANCE SPECIFICATIONS

▼ GEOGRAPHIC

Geography

► MORE...

Options

- Electrochromic
- Fire Protection
- Fire resistant**
- Laminated
- Low-E
- Pyrolytic Coated
- Sputter Coat
- Tempered
- Toughened

Select functional performance options (e.g. Fire resistant)

Performance properties determined for:

- Flat glass
- Processed glass
- IGUs
- Glazed doors
- Windows
- Unit skylights
- Hardware
- Framing
- Accessories

BUILDERS (CALCULATORS) FOR ASSEMBLIES

GLAZING, CURTAIN WALL BUILDER

INPUTS

Repeats

Vertical: 3 X Horizontal: 1

Spandrel

Spandrel: Yes RSI-Value: 2.1 RSI

Shadow Box

Thickness: 3 mm Density: 2700 kg / m³

Constant

Glass Bite: 12.7 mm

Openings Grid

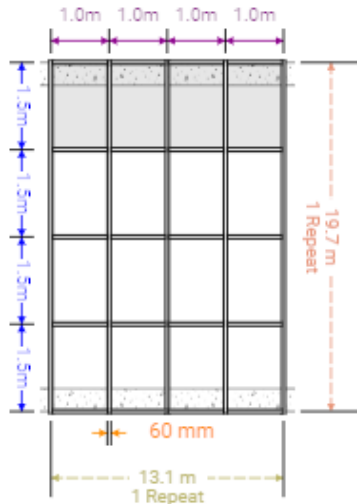
Rows: 3 X Col.: 4

Widths

x1: 1.0 m x2: 1.0 m x3: 1.0 m x4: 1.0 m

Heights

Spandrel: 1.5 m
y1: 1.5 m
y2: 1.5 m
y3: 1.5 m



Frame

Width: 63.5 mm Vertical Mass: 3 kg / m Horizontal Mass: 4.2 kg / m

OUTPUTS = quantities and estimate of embodied carbon

Intermediate Calculations

Vertical Frame Length: 90.3 m Horizontal Frame Length: 48.7 m Total Curtain Wall Area: 73.4 m²

Element Name	Formula per 1 m ²	Quantity / 1 m ²	Conservative
Vision Glass	$(1.5 + 1.5 + 1.5 + 1.5 + 1.5 + 1.5 + 1.5 + 1.5 + 1.5 + 1.5 + 1.5 \dots)$	0.74 m ²	169 kgCO ₂ e
Framing	$(90.3 * 3 + 48.7 * 4.2) / 73.4$	6.5 kg	91.2 kgCO ₂ e
Steel Reinforcement	0	0 kg	
Spandrel Glass	$(1.5 + 1.5 + 1.5 + 1.5) * 1 * 3 / 73.4$	0.25 m ²	56.3 kgCO ₂ e
Spandrel Insulation	$(1.5 + 1.5 + 1.5 + 1.5) * 2.1 / 73.4$	0.17 m ² RSI	1.4 kgCO ₂ e
Shadow Box	$(1.5 + 1.5 + 1.5 + 1.5) * 1 * 3 * 3 / 1000 * 2700 / 73.4$	2 kg	26.5 kgCO ₂ e
Sun Shading	0	0 kg	

PROJECT STATUS

- Categories and performance parameters have been implemented in EC3 tool
- Assembly builders have been implemented and are being tested
- The group sees value in developing a EPD generator for closer to “real-time” generation of fenestration and glazing EPDs.
 - Determining possible sources of funding



Building Transparency

BuildingTransparency.org

- [Video tutorials](#)
- [Sign up for EC3](#)



Get involved!
www.glass.org

CODES & REGULATIONS THAT IMPACT YOUR WORLD



Urmilla Sowell
NGA Vice President,
Technical Services & Advocacy
usowell@glass.org



Dr. Thomas Culp
Birch Point Consulting
culp@birchpointconsulting.com