Pre-decisional discussion DRAFT -- January 25, 2023

GSA Inflation Reduction Act Low Embodied Carbon Material Standards

Background:

- Section 60503 of the Inflation Reduction Act of 2022 (IRA) appropriates funding to GSA for construction materials and products with "substantially lower levels of embodied greenhouse gas emissions [also known as 'embodied carbon'] . . . as compared to estimated industry averages of similar materials or products, as determined by the Administrator of the Environmental Protection Agency" (EPA).
- EPA's Interim Determination issued December 22, 2022 ("EPA's Determination") interprets "substantially lower" to mean that "materials/products qualify if their product-specific GWP [global warming potential] is in the best performing 20 percent (Top 20 percent or lowest 20 percent in embodied greenhouse gas [GHG] emissions), when compared to similar materials/products (for example, materials/products within the same product category that meet the same functional requirements)."[1]
    - GSA developed the following minimum requirements for IRA-funded purchases of materials and products with substantially lower embodied carbon based on, and in accordance with, EPA's Determination. These standards list maximum embodied carbon limits for the best-performing 20% ("Top 20%", or lowest 20% in embodied GHG emissions) materials in the same product category that meet the same functional requirements (e.g. strength class, longevity, or end use).
        - These standards also include Top 40% Limits, which may only be used where Top 20% materials are unavailable in a project's location[2], and industry Average or Better Limits, which may only be used where Top 20% and Top 40% materials are unavailable.
    - Where a material with a GWP that meets the Top 20% Limit is currently unavailable at project's location, the project delivery team must submit a written explanation of how they researched materials[3] to determine that Top 40% or Average or Better was the best-available GWP level, and how the selected material was validated to meet applicable GSA IRA Limits.
        - Any unavailability documentation must be approved in writing by regional management (implementation team executive oversight, such as Project Executive) and central office (national technical subject matter experts in or supporting GSA's IRA Program Management Office [PMO]).
- GSA's goal is to procure materials and products available today and in the near future with the lowest levels of embodied carbon. GSA's procurement actions and demand signals will help grow the United States market for even lower-carbon construction materials, and will spur ongoing industry innovation.

[1] EPA's Determination also states "If materials/products in the Top 20 percent are not available in a project's location, then a material/product qualifies per this determination if its GWP is in the Top 40 percent (lowest 40 percent in embodied greenhouse gas emissions). If materials/products in the Top 40 percent are not available in a project's location, then a material/product qualifies per this determination if its GWP is better than the estimated industry average."

[2] "Available in a project's location" excludes materials manufactured outside of North America, or outside of the applicable PCR's geographic region (e.g. North America, or United States). If a material meeting the Top 20% Limit is not available in a project's location -- but: *is* available elsewhere; is compatible with the project's needs; and could be transported to the project's location from an unusual distance for its product category -- e.g. concrete from a different region of the continent -- GSA will analyze the construction stage transportation emissions for two or more of the options with the lowest Uncertainty-Adjusted GWPs, including the lowest-carbon option that is more locally-available. GSA will then select the option that minimizes total "cradle to gate + transport" GHG emissions (i.e. life cycle assessment stages A1-A4). This will ensure any embodied carbon savings would outweigh the difference in transportation GHG emissions among competing materials.

[3] Potential market research resources to determine availability of qualifying materials include Building Transparency's Embodied Carbon in Construction Calculator (EC3) database and the National Asphalt Paving Association's Emerald Eco-Label EPD Tool.

Coverage:

- Per EPA's Determination and the Federal Buy Clean Initiative, these initial *GSA IRA Low Embodied Carbon Material Standards* apply to IRA-funded purchases of four key construction materials for GSA projects: concrete (and cement), asphalt, steel, and glass.
- These standards focus on the GWP impact category on environmental product declarations (EPDs) that meet GSA's Compliance Documentation criteria below.
- Construction product assemblies (such as window assemblies or rebar-reinforced concrete) qualify for IRA funding if at least 80% of the assembly's total cost or total weight comprises materials that meet these standards.

Data Source:

- GSA IRA Limits are based on distributions of "Uncertainty-Adjusted GWP" data reported from the free, publicly-available EC3 database of EPDs for the North America region as of January 17, 2023.[4]
    - A material/ product complies with this standard if its Uncertainty-Adjusted GWP is equal to or lower than the GSA IRA Limit.
    - Compliance is determined based on Uncertainty-Adjusted GWPs, instead of unadjusted GWPs reported on EPDs. The Uncertainty-Adjusted GWP for a material or product's EPD may be viewed in EC3[5], or calculated from the EPD's reported GWP using this downloadable EPD Uncertainty Worksheet.
    - A product's GWP is calculated from generic data, and data from the product's actual supply chain. Increased usage of facility- and supply chain-specific data reduces the Uncertainty Factor[6] of a product's GWP. The Uncertainty-Adjusted GWP combines each EPD's reported GWP with a statistically-calculated Uncertainty Factor based on the specificity of the EPD's source data -- such as whether supply chain-specific (as opposed to industry average or generic) data was used for "upstream" embodied emissions of process inputs ("associated unit processes").
    - Using Uncertainty-Adjusted GWPs to determine compliance: (a) allows more fair and accurate comparison of materials, given varying levels of EPD data specificity within product categories; (b) provides GSA greater certainty that the procured products or materials are within the prescribed thresholds; (c) promotes product-specific transparency, in line with EPA's Determination that EPDs must be "facility-specific, material/product-specific", and "based on supply chain-specific data for the associated unit processes, where feasible"; and (d) advances Federal Buy Clean goals of catalyzing markets and accelerating innovation.
- GSA may periodically update these IRA material standards based on changing industry averages, additional published EPDs, lessons learned from initial projects' implementation, and updated EPA IRA Section 60503 Determination(s). Any revisions will only apply prospectively to contracts awarded after GSA's standards are issued, and will not retroactively change active projects' terms, conditions, or standards.

[4] EC3 statistics are generated using actual product-specific EPDs, industry average EPDs, and statistical uncertainty methodology. All GWP figures are calculated using EPA's TRACI 2.1 environmental impact assessment method.

[5] EC3> Find & Compare Materials> Search> "PRODUCT EPDs" table listing Uncertainty-Adjusted GWPs> Details> "80% confidence GWP"

[6] EC3 automatically parses the inputs that feed into Uncertainty Factors and Uncertainty-Adjusted GWPs from EPDs. PCR Program Operators can change the values, or manufacturers can provide evidence to change the results.

Measurement & Verification for all GSA IRA material standards			
Who	**What**	**When**	**Where**
Project delivery team: designer of record (including design-builder)	Develop specifications for IRA-qualified materials and include in design document submittals. Report estimated quantities and costs of concrete, asphalt, steel, and glass that are anticipated to qualify under these GSA IRA Low Embodied Carbon standards.	Design Phase	Submit to Government project manager
Project delivery team: Design-builder, general construction contractor (GC), or construction manager as constructor (CMc)	Provide product information submittals. For each IRA-qualified material furnished under the contract, upload or link EPD (see "Compliance Documentation"), and report: (a) Uncertainty-Adjusted GWP, in kilograms of carbon dioxide equivalent [$kgCO_2e$] per unit of material; (b) product category rule (PCR) from the EPD; (c) GSA IRA Limit and Industry Average specified in the contract; (d) total quantity being installed (e.g. from bill of materials); and (e) for concrete, cement, steel, and glass: (i) the ENERGY STAR Energy Performance Score(s) for plants producing "upstream" supply chain materials: cement, steel from integrated steel mills, or flat glass; (ii) the manufacturing plant name(s) and location(s); and (iii) the data period of the Energy Performance Score(s) at the time of purchase. Please see "How to Request an ENERGY STAR Energy Performance Score" at bottom for more information.	Construction Phase	GSA's Kahua Sustainability App
Government project manager; commissioning provider (CxP); and/or construction manager as advisor (CMa)	Verify: (a) submitted EPDs comply with design specifications for IRA-qualifying materials; (b) accuracy of reported quantity; and (c) reported IRA-qualifying materials were actually installed.	Design & Construction Phases	GSA's Kahua Sustainability App; GSA's IRA PMO will review

Concrete

- **Material Type**:
  - Concrete is a composite material consisting of a mixture of hydraulic "e.g. portland" cement, aggregates, and water, with or without admixtures, fibers, or other cementitious materials.
    - Concrete can be mixed at a job site, or "ready mixed" and batched for delivery from a central plant.[7] Its wide-ranging applications include foundations, floors, walls, and roadways.
- **GSA IRA Standard**:
  - Require concrete mixes with Uncertainty-Adjusted GWPs equal to or lower than the applicable Top 20% Limits in this table.
    - Where Top 20% is unavailable in a project's location, require Top 40%.
    - Where Top 40% is unavailable in a project's location, require Average or Better.

	GSA IRA Limits for Low Embodied Carbon Concrete - Jan. 2023 (Uncertainty-Adjusted GWPs, in kilograms of carbon dioxide equivalent per cubic meter - $kgCO_2e/ m^3$)		
Specified concrete strength class (compressive strength [f'c] in pounds per square inch [PSI])	**Top 20% Limit**	**Top 40% Limit**	**Average or Better Limit**
≤2499	**240**	**291**	**334**
3000	**274**	**318**	**352**
4000	**305**	**351**	**385**
5000	**326**	**376**	**408**
6000	**315**	**375**	**414**
≥7200	**277**	**331**	**378**
Add 30% to these numbers for GWP limits where high early strength[8] concrete mixes are required for technical reasons.			

- **Compliance Documentation**:
  - A product-specific, facility-specific Type III (third-party verified) Environmental Product Declaration (EPD) that: (i) is based on a PCR for the applicable product category that was active when the EPD was issued, such as NSF International's Product Category Rule for Concrete (8/2021, version 2.1); and (ii) conforms with ISO 14025 and ISO 21930.
    - Where feasible, EPDs must also rely on facility-specific data, including for the supply chain's associated unit processes, such as concrete's upstream cement plant, rather

[7] Concrete can also be used to manufacture precast products such as concrete masonry units. GSA may release an updated version of these standards that includes GSA IRA Limits for additional product categories if/when industry average GWP data becomes available from EPDs developed under additional PCRs.

[8] "High early strength" is concrete that, through the use of additional cement, high-early-strength cement, or admixtures, has accelerated early-age strength development. High early strength concrete produced using additional cement should be avoided where possible, due to its higher levels of embodied carbon. An affected project delivery team must document why high early strength concrete was necessary for technical reasons, and obtain written approval from GSA's IRA PMO.

than industry average data. If an EPD containing facility-specific data for the material's most greenhouse-gas intensive processes is unavailable, an EPD without such data that meets Compliance Documentation criteria (i) and (ii) is sufficient.

- ENERGY STAR Energy Performance Score for supplying cement plant, the manufacturing plant name(s) and location(s), and the data period of the Energy Performance Score(s) at the time of purchase. Please see "ENERGY STAR Energy Performance Score Explained" at bottom for more information.

Asphalt

- **Material Type**:
  - Asphalt concrete is a mixture mainly composed of mineral aggregates, asphalt binder, and additives.
    - Aggregates and asphalt binder are typically heated at an asphalt plant, mixed according to precise formulas, and loaded into trucks for transport to paving sites.
- **GSA IRA Standard**:
  - Require asphalt mixes with Uncertainty-Adjusted GWPs equal to or lower than the Top 20% Limits in this table.
    - Where Top 20% is unavailable in a project's location, require Top 40%.
    - Where Top 40% is unavailable in a project's location, require Average or Better.

GSA IRA Limits for Low Embodied Carbon Asphalt - Jan. 2023 (Uncertainty-Adjusted GWPs, in kilograms of carbon dioxide equivalent per metric ton - $kgCO_2e/ t$)		
Top 20% Limit	**Top 40% Limit**	**Average or Better Limit**
62.8	**74.0**	**85.0**

- **Compliance Documentation**:
  - A product-specific, facility-specific Type III (third-party verified) EPD that: (i) is based on a PCR for the applicable product category that was active when the EPD was issued, such as the National Asphalt Paving Association's Product Category Rule for Asphalt Mixtures, (4/2022, version 2.0); and (ii) conforms with ISO 14025 and ISO 21930.
    - Where feasible, EPDs must also rely on facility-specific data, including for the supply chain's associated unit processes, such as asphalt binder production, rather than industry average data. If an EPD containing facility-specific data for the material's most greenhouse-gas intensive processes is unavailable, an EPD without such data that meets Compliance Documentation criteria (i) and (ii) is sufficient.

Steel, including structural, cold-formed, and rebar

- **Material Type**:
  - Steel is an alloy of iron and carbon. It often contains small quantities of silicon, phosphorus, sulfur, and oxygen. Steel can be repeatedly recycled without losing its properties, and may contain high recycled content. Steel products are often plated or coated, e.g. zinc-galvanized.
    - Steel can be made into product categories including hot rolled structural steel, fabricated steel plate, fabricated hollow steel structural sections (cold-formed welded steel tubing produced in round, square, and rectangular shapes), steel reinforcing bars (rebar), and cold-formed steel framing.
- **GSA IRA Standard**:
  - Require steel products with Uncertainty-Adjusted GWPs equal to or lower than the applicable Top 20% Limits in this table.
    - Where Top 20% is unavailable in a project's location, require Top 40%.
    - Where Top 40% is unavailable in a project's location, require Average or Better.

	GSA IRA Limits for Low Embodied Carbon Steel - Jan. 2023 (Uncertainty-Adjusted GWPs, in kilograms of carbon dioxide equivalent per metric ton - $kgCO_2e/t$)		
Steel Product Category	**Top 20% Limit**	**Top 40% Limit**	**Average or Better Limit**
Rebar (fabricated)	**770**	**887**	**1,030**
Hollow Structural Sections (fabricated)	**1,427**	**1,711**	**1,950**
Fabricated Steel Plate	**1,102**	**1,382**	**1,641**
Hot-Rolled Sections (fabricated)	**605**	**792**	**993**
Cold-Formed and Galvanized (stud, track, framing, etc.)	**1,817**	**2,218**	**2,553**

- **Compliance Documentation**:
  - A product-specific, facility-specific Type III (third-party verified) EPD that: (i) is based on a PCR for the applicable product category that was active when the EPD was issued, such as UL's PCR Guidance for Building-Related Products and Services, Part B: Designated Steel Construction Product EPD Requirements (8/26/2020, version 2.0); and (ii) conforms with ISO 14025 and ISO 21930.
    - Where feasible, EPDs must also rely on facility-specific data, including for the supply chain's associated unit processes, such as fabricated steel's upstream steel mill(s), rather than industry average data. If an EPD containing facility-specific data for the material's most greenhouse-gas intensive processes is unavailable, an EPD without such data that meets Compliance Documentation criteria (i) and (ii) is sufficient.
  - If steel originates from an integrated steel mill: ENERGY STAR Energy Performance Score for supplying steel mill, the manufacturing plant name(s) and location(s), and the data period of the Energy Performance Score(s) at the time of purchase. Please see "ENERGY STAR Energy Performance Score Explained" at bottom for more information.

Glass and Glazing Assemblies

- **Material Type:**
  - Flat glass is made from molten material consisting of a combination of silica sand, limestone, soda ash, dolomite and glass cullet spread onto sheets on a plane to produce flat, float, rolled, plate or sheet glass. Flat glass is sometimes bent after production of the plane sheet. The general term "flat glass" describes all glass produced in a flat form, such as float glass, sheet glass, plate glass and rolled glass.
    - Flat glass can be heat- or surface-treated to make processed glass, or built into assemblies such as insulated glazing units (IGUs), laminated glazing units, and vacuum insulated glazing. Flat glass assemblies are often part of curtain walls, storefronts, transparent walls, window units, skylights, canopies, doors, and solar panels.
- **GSA IRA Standard:**
  - Require glass and assemblies with Uncertainty-Adjusted GWPs equal to or lower than the applicable Top 20% Limits in this table.
    - Where Top 20% is unavailable in a project's location, require Top 40%.
    - Where Top 40% is unavailable in a project's location, require Average or Better.

	GSA IRA Limits for Low Embodied Carbon Glass - Jan. 2023 (Uncertainty-Adjusted GWPs, in kilograms of carbon dioxide equivalent per metric ton or square meter - $kgCO_2e$ kg/ t or $kgCO_2e$ kg/ m^2)		
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**

- **Compliance Documentation:**
  - A product-specific, facility-specific Type III (third-party verified) EPD that: (1) is based on a PCR for the applicable product category that was active when the EPD was issued, such as the National Glass Association's Flat Glass PCR (9/2020, version 2.0) or Earthsure's Cradle to Gate Window PCR (9/10/2015, version 1.02); and (2) conforms with ISO 14025 and ISO 21930.
    - Where feasible, EPDs must also be based on supply chain-specific data for associated unit processes, such as facility-specific data for processed glass's upstream glass plants, rather than industry average data. If an EPD containing facility-specific data for the material's most greenhouse-gas intensive processes is unavailable, an EPD without such data that meets the other Compliance Documentation criteria above is sufficient.
  - ENERGY STAR Energy Performance Score for supplying flat/float glass plant, the manufacturing plant name(s) and location(s), and the data period of the Energy Performance Score(s) at the time of purchase. Please see "ENERGY STAR Energy Performance Score Explained" at bottom for more information.

Cement

- **Material Type**:
  - Cement is the basic ingredient of concrete. Cement (including portland and portland-limestone cement) is manufactured through the chemical combination of ingredients including calcium, silicon, aluminum, and iron. When heated at high temperatures in kilns, some elements are driven off in the form of gases, while others unite to form a new substance called clinker. Clinker is cooled, ground, and mixed with small amounts of gypsum and limestone to make cement.
    - When cement creates a paste with water that binds with sand and rock "aggregates" to harden, it forms concrete. Cement is transported to ready-mix concrete companies to be used in concrete for a wide variety of construction purposes.
- **GSA IRA Standard:**
  - Applicability note: if a concrete EPD is provided to demonstrate compliance, a cement EPD doesn't need to be submitted to GSA. Cement is an input to concrete mixes, and its GWP is accounted for in the concrete EPD.
    - This cement standard may be useful where qualifying concrete is not available in a project's location, but qualifying cement *is* available in the project's location, and is compatible with the project's needs.
    - Construction product assemblies can also qualify for IRA funding where at least 80% of the assembly's total cost or total weight comprises IRA-qualifying material such as low embodied carbon cement.
  - Require cement materials with Uncertainty-Adjusted GWPs equal to or lower than the applicable Top 20% Limits in this table.
    - Where Top 20% is unavailable in a project's location, require Top 40%.
    - Where Top 40% is unavailable in a project's location, require Average or Better.

GSA IRA Limits for Low Embodied Carbon Cement - Jan. 2023 (Uncertainty-Adjusted GWPs, in kilograms of carbon dioxide equivalent per metric ton - $kgCO_2e/t$)		
Top 20% Limit	**Top 40% Limit**	**Average or Better Limit**
679	**883**	**1,122**

- **Compliance Documentation**:
  - A product-specific, facility-specific Type III (third-party verified) Environmental Product Declaration (EPD) that: (i) is based on a PCR for the applicable product category that was active when the EPD was issued, such as NSF International's Product Category Rule for Portland, Blended, Masonry, Mortar, and Plastic (Stucco) Cements (2/2020, version 2); and (ii) conforms with ISO 14025 and ISO 21930.
    - Where feasible, EPDs must also rely on facility-specific data, including for the supply chain's associated unit processes, rather than industry average data. If an EPD containing facility-specific data for the material's most greenhouse-gas intensive processes is unavailable, an EPD without such data that meets Compliance Documentation criteria (i) and (ii) is sufficient.
  - ENERGY STAR Energy Performance Score for the cement plant, the manufacturing plant name(s) and location(s), and the data period of the Energy Performance Score(s) at the time of purchase. Please see "ENERGY STAR Energy Performance Score Explained" at bottom for more information.

ENERGY STAR Energy Performance Score Explained

ENERGY STAR Energy Performance Scores (EPS) show how efficiently a manufacturing plant uses energy on a 100-point scale. A score of 50 reflects average performance, 1 shows poor performance, and 100 reflects highest performance.

Contractors obtain Energy Performance Scores by requesting producers of cement, glass, asphalt mix, and steel (from integrated mills only) to provide the score. Or, contractors may request it from material suppliers (e.g. concrete producers).

Manufacturers of cement, glass and steel produce a plant's score by inputting 12 months of energy and production data in the industry-specific Energy Performance Indicator (EPI) tool available at www.energystar.gov/epis. The score will show on the Statement of Energy Performance section of the EPI.

Energy Performance Scores can currently be produced for cement, flat glass, and integrated steel mills. An EPS for asphalt mix plants is expected to be available by September 2023. EPA will notify GSA when to begin requesting asphalt mix plant scores.