



U.S. General Services Administration

Embodied Carbon in Federal Building Materials

ISWG

April 14, 2022

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Why is Embodied Carbon Important?

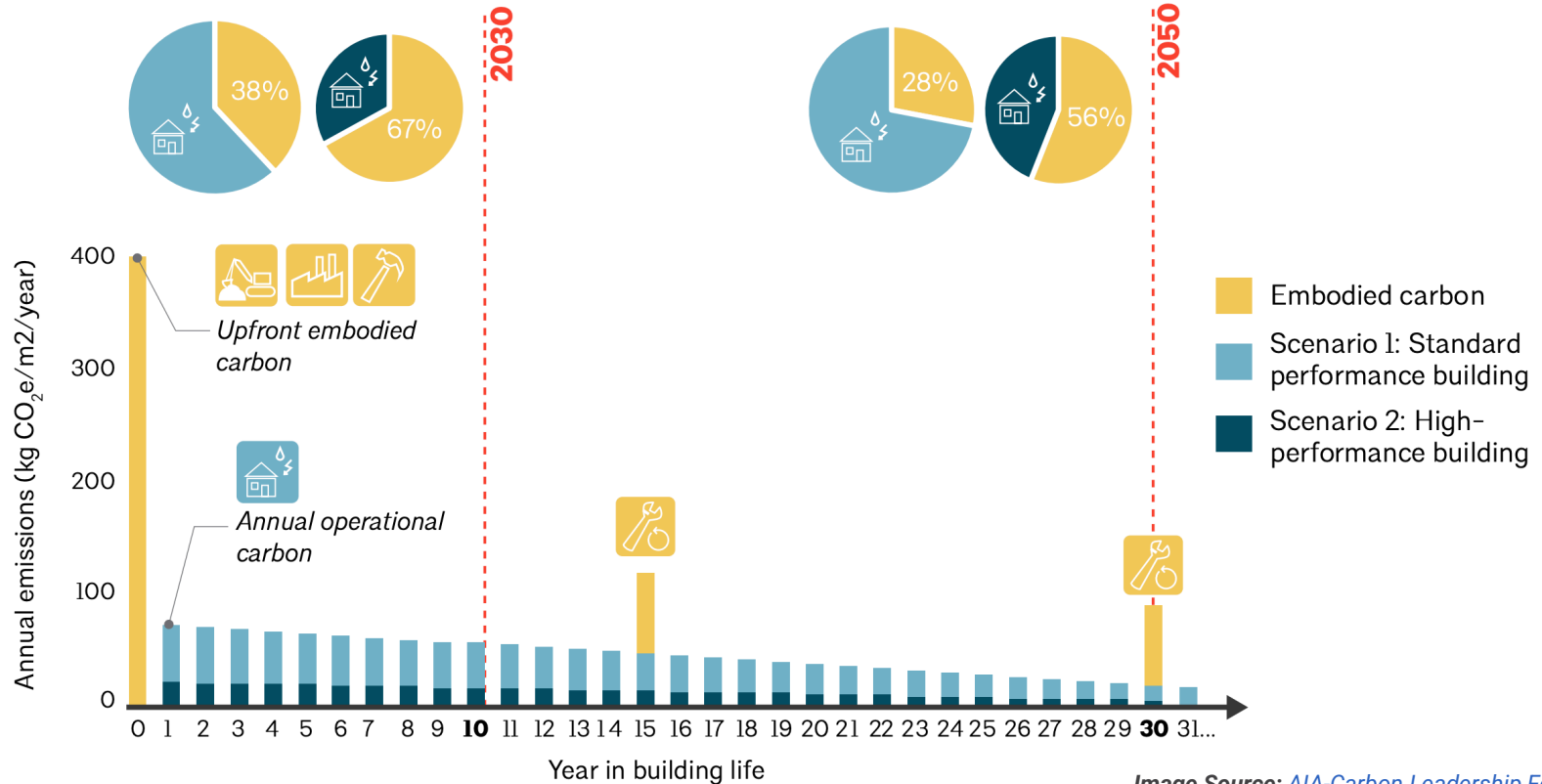


Image Source: [AIA-Carbon Leadership Forum Embodied Carbon Toolkit for Architects, 2021](#)

GSA Embodied Carbon Timeline

GSA Green Building Advisory Committee (GBAC) policy recommendations:

- 1) All projects (small & large) should apply a **material approach**, and require environmental product declarations (EPDs) for 75% of products; and
- 2) Large projects should use a **whole building life cycle assessment approach** to target a 20% carbon reduction, compared to a project-specific baseline building.

New **P100** Decarbonization section:

“careful consideration must be given to the use of high embodied carbon items like concrete and steel. See the Carbon Smart Materials Palette.” (§ 1.9.2.9)

Issued standards for **low embodied carbon concrete** and **environmentally preferable asphalt**



Embodied Carbon **Roundtable** gathered ideas and insights from more than 50 experts.

GSA's new Embodied Carbon Task Force selected **three priority actions**:
1) Smaller projects will use EPDs for a material approach;
2) Larger projects will implement whole building life cycle assessment early; and
3) Asset planning must factor in embodied carbon.

Sustainable Acquisition Initiative promotes sustainability (including embodied carbon reduction) in high-dollar, high-risk, or high-opportunity contracts.

Executive Order 14057: “promote use of construction materials with lower embodied emissions”.

Issued **requests for information** from the concrete and asphalt manufacturing industries

CEQ started hosting weekly interagency **Buy Clean** Technical Advisory Group meetings

First projects awarded with new standards. Pilots continue on whole building embodied carbon reduction **measure**

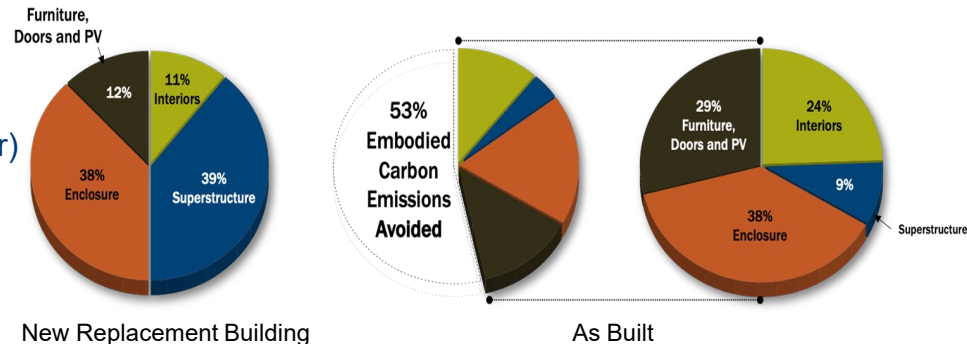
Whole Building Life Cycle Assessment Approach

Embodied Carbon Reduction Measure: GSA's new construction and major modernization designs must **target a 20% reduction in their buildings' embodied carbon**, compared to a project-specific standard baseline designs, as determined by the architect. Active FY22 measure.

- Compare embodied carbon footprints for at least the structure and enclosure of a comparable standard baseline design, and the proposed facility, using a GSA-approved estimation tool.
- Earn the LEED *Building Life-Cycle Impact Reduction* credit using the *Whole-Building Life-Cycle Assessment* option.

Embodied carbon estimation tools include:

- (a) [Tally](#) (from Building Transparency)
- (b) [EC3](#) (Embodied Carbon in Construction Calculator)
- (c) [One Click LCA](#)
- (d) Athena's [Impact Estimator for Buildings](#)
- (e) Autodesk's [Insight 360](#)



Concrete and Asphalt RFIs

In February 2022, GSA released two requests for information (RFIs) to gather current marketplace insights from industry, including small businesses, on the national availability of concrete and asphalt materials with environmental product declarations, low embodied carbon, or superior environmental attributes.

Over 130 responses received

34% of concrete manufacturers were small businesses

62% of asphalt manufacturers were small businesses

- Concrete
 - Over 80% already produce or supply low embodied carbon concrete, and over 60% have developed a product-specific environmental product declaration (EPD)
 - Over 55% say low-embodied-carbon concrete costs about the same
 - Over 55% use carbon-reducing supplementary cementitious materials, and 34% have suppliers with EPDs
- Asphalt
 - Over 80% use recycled asphalt in their products, and over 60% use warm mix technology to reduce asphalt's environmental impact
 - Over 50% say environmentally preferable asphalt costs the same or less than conventional equivalents



Low Embodied Carbon Concrete Standards for all GSA Projects

- 1) The [prime contractor] shall provide a product-specific cradle-to-gate Type III environmental product declaration (EPD) for each concrete mix design specified in the contract and used at the project, using NSF International's product category rule for concrete. Please send EPD(s) with each concrete mix batch design (including type [e.g. standard or lightweight mix] and volume) to embodiedcarbon@gsa.gov, and upload the submittals into GSA's project management information system.
- 2) The [prime contractor] shall provide low embodied carbon concrete that meets the global warming potential (GWP) limits of the table below, for concrete of the mix type and strength class.

	Maximum Global Warming Potential Limits for GSA Low Embodied Carbon Concrete <small>(kilograms of carbon dioxide equivalent per cubic meter - CO₂e kg/m³)</small>		
Specified compressive strength (f _c in PSI)	Standard Mix	High Early Strength	Lightweight
up to 2499	242	326	462
2500-3499	306	413	462
3500-4499	346	466	501
4500-5499	385	519	540
5500-6499	404	546	N/A
6500 and up	414	544	N/A

These numbers reflect a 20% reduction from GWP (CO₂e) limits in proposed code language: ["Lifecycle GHG Impacts in Building Codes"](#) by the New Buildings Institute, January 2022.

Low Embodied Carbon Concrete Standards for all GSA Projects

- 3) These requirements apply to all GSA projects that use at least ten (10) cubic yards of concrete.
- 4) If it is not feasible to meet GSA's EPD requirement or GWP limits, the [prime contractor] shall ask the GSA project manager to request a [P100 waiver](#).
 - a) The [prime contractor] shall outline and provide evidence of the specific circumstances that make compliance infeasible. For example, the only concrete suppliers within the maximum transport range for the mix design:
 - i. are small businesses that have not yet invested in EPDs; or
 - ii. do not yet offer mixes that meet GSA's GWP limits, e.g. because lower-carbon materials are unavailable, or do not meet specific client-driven performance requirements.
 - b) Any requests for waivers from the GWP limits must include the strategies, if any, that will be used to reduce GWP to the extent feasible. Such strategies include, but are not limited to, the use of alternative cements, supplementary cementitious materials, or alternative aggregates.
 - c) For each concrete mix for which GSA has granted a waiver from the EPD requirement, the [prime contractor] shall send a GWP estimate generated with a tool such as [ZGF's LCA Tool](#), [Athena IE](#) or the Federal Highway Administration's [LCA Pave Tool](#) to embodiedcarbon@gsa.gov.
 - d) GSA will respond to each complete P100 waiver request with a decision or a request for more detail within ten (10) business days. A complete waiver request is deemed granted if no response is provided within that time.

Environmentally Preferable Asphalt Standards for all GSA Projects

- 1) The [prime contractor] shall provide a product-specific cradle-to-gate Type III environmental product declaration (EPD) for each asphalt mix specified in the design and used at the project, using version 2 of the National Asphalt Paving Association's [product category rule](#) for asphalt mixtures. Please send EPD(s) to embodiedcarbon@gsa.gov, and upload EPD(s) into GSA's project management information system.

- 2) The [prime contractor] shall provide **environmentally preferable asphalt**, which is defined in this context as material manufactured or installed using at least two (2) of the following techniques. Please send each asphalt mix batch design (including type, volume, and a description of the proposed techniques) to embodiedcarbon@gsa.gov, and upload the submittals into GSA's project management information system.
 - a) Greater than 20% reclaimed asphalt pavement (RAP) content (specify percentage, and whether in-place or central plant recycling is used);
 - b) Warm mix technology (reduced onsite mix temperature);
 - c) Non-pavement recycled content (e.g. roof shingles, rubber, or plastic);
 - d) Bio-based or other alternative binders;
 - e) Improved energy/ carbon efficiency of manufacturing plants or equipment (e.g. using natural gas or electric for heating materials); or
 - f) Other environmentally preferable features or techniques (please specify).