

Embodied CARBON draft language

zoning & Planning public hearing

April 24, 2023

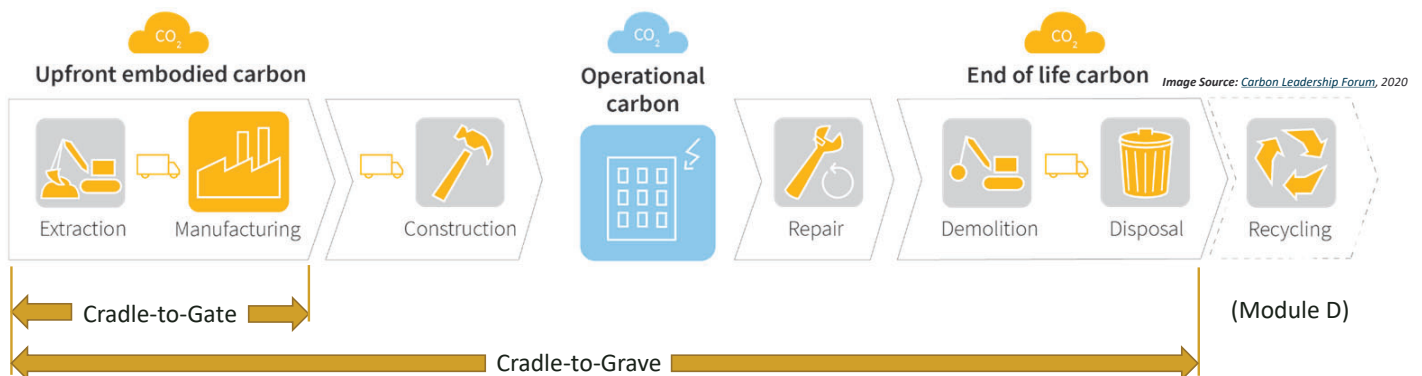
Climate & Sustainability Team

Embodied Carbon Working Group



What is embodied carbon in the built environment?

Embodied carbon refers to the greenhouse gas (GHG) emissions associated with the manufacturing, transportation, installation, maintenance, and disposal of building materials. **Upfront embodied carbon** focuses on the GHG emissions released before a building is constructed. These can also be thought of as supply chain emissions.



Note: some content courtesy of Rebecca Esau of RMI

Embodied carbon is significant and urgent

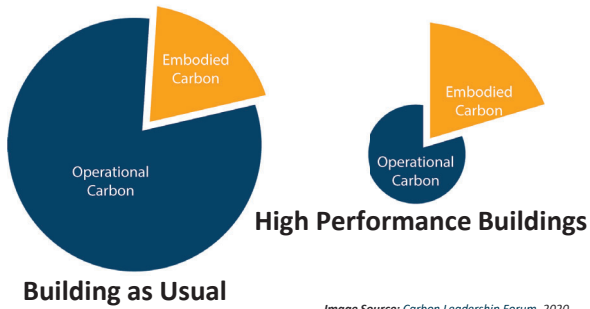
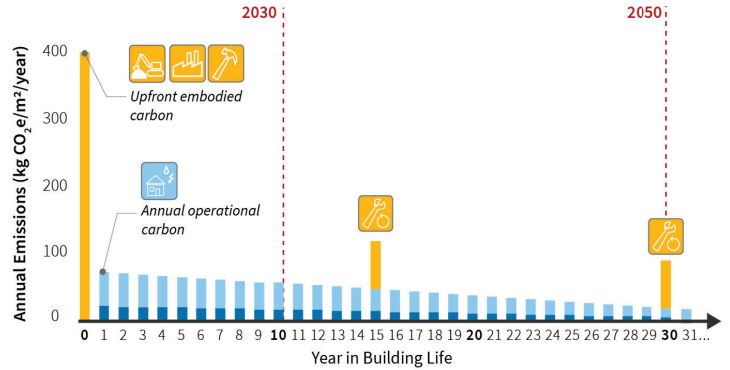


Image Source: Carbon Leadership Forum, 2020



We are already reducing operational carbon. Embodied carbon contributes a higher proportion of life cycle emissions in more energy efficient buildings.

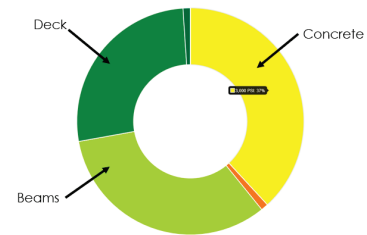
Embodied carbon is expended early in a building's lifecycle, adding carbon to the atmosphere as we're working to reduce emissions to meet 2050 goals.

Note: some content courtesy of Rebecca Esau of RMI

Embodied carbon estimation Tools



SE 2050 – ECOM



reducing embodied carbon in structural design

Design vs. Procurement Strategies

Design strategies relate to the form of the building:

- Renovation vs. New Construction
- Form: how tall, how deep into the ground, how many irregularities such as column offsets
- Bay Size: widely spaced columns increase structural framing sizes significantly
- Choice of Materials (e.g. steel vs. concrete vs. timber framing)
- Designers can use embodied carbon tools to optimize these options

Procurement strategies relate to how the materials are specified after design:

- Cement limits for concrete
- Embodied carbon limits for materials
- Certified wood

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Local Policy

- **Town of Brookline**: Town must use low carbon concrete (10% less than average owned projects and encourage developers to do the same.
- **City of Cambridge**: On path to require measurement and reduction of embodied through Zoning Ordinance.
- **City of Boston**: Including embodied carbon as part of proposed Zero Net Carbon Zoning Initiative. Draft proposal includes both measurement and reduction.
- Municipalities share goal of coordinating efforts.

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Newton Background

Climate Action Plan, 2019

- “Neither this Climate Action Plan nor the NCCE Plan directly addresses embodied energy. Embodied energy will need to be addressed in the future, as accounting methodologies and mitigation strategies continue to be developed.”

Formation of Working Group, Fall 2021

- Mark Webster
Structural Engineer, SGH
- Russel Feldman
Architect, President of AIA Massachusetts
- Beverly Craig
Project Manager, MassCEC

Sustainable Development Design, 2019

- Section 5.13 of the Zoning Ordinance adopted
- 5.13.4. Embodied Carbon [reserved]

Presentations with ZAP, EDC, Chamber Real Estate Group, Planning Board, Spring/Summer 2022

Draft ordinance Language: 5.13.4 Sustainable development requirements

D. Embodied Carbon Green building project must provide an analysis that estimates the embodied carbon of a project. The type of analysis is determined based on gross square footage of the green building project:

1. For projects under 50,000 sf, only structural materials must be evaluated using Life Cycle Analysis tools or Environmental Product Declarations.
2. For projects over 50,000 sf, the design team must use a Whole Building Life-Cycle Assessment tool to estimate the embodied carbon of both structural and enclosure materials, and the CO₂e per square foot of the project compared to an average CO₂e intensity (kg CO₂e/unit floor area) for projects of comparable use, and provide justification for the building materials and systems chosen. This requirement may be met by using one of the following methods:
 1. LEED Credit for Whole Building Life-Cycle Assessment
 2. Green Building Initiative’s (GBI) Green Globes for New Construction (NC) Credit for Whole Building Life-Cycle Assessment
 3. International Living Future Institute’s (ILFI) Zero Carbon Standard.
 4. Another method approved by the Planning Director.
3. Projects where at least 50% of the floor area comprises re-use of a pre-existing structure are not subject to these provisions.

Draft ordinance Language: embodied carbon document submission

- As part of the **special permit submission** Specified procedure that will be used to analyze embodied carbon as part of the sustainability narrative.
- As part of the **building permit submission** Embodied carbon analysis as required by section 5.13.4.D and affidavit signed by a Registered Design Professional confirming the embodied carbon analysis follows the requirements committed to in the special permit submittal documents.

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Details and next steps

- Full draft language provided with meeting materials
- FAQ document available
- For discussion and, with council interest, schedule a public hearing

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Sec. 5.13. Sustainable Development Design

5.13.1. Intent and Purpose

The intent of this section is to reduce the use of energy, water, and other natural resources in Newton's building stock and minimize adverse environmental impacts from buildings and development in both construction and long-term operation by:

- A. Increasing the use of renewable energy sources for electricity, transportation, heat/cooling, and hot water;
- B. Increasing the use of efficient electricity technology for transportation and buildings;
- C. Increasing the number of buildings built to Passive House, net zero, or similar standards;
- D. Minimizing the environmental impacts of construction materials and methods, including waste reduction;
- ~~D.E.~~ E. Encouraging sustainable material selection and the responsible reuse of existing structures.

5.13.2. Definitions

- A. **Green Commissioning.** The process of verifying and documenting that a building and all of its systems and assemblies are installed, tested, operated, and maintained to meet specified levels of environmentally sustainable performance in accordance with the provisions of Section 5.13 of this Zoning Ordinance.
- B. **Green Commissioning Agent.** An entity or person with documented experience on at least 2 building projects with a scope of work similar to the proposed project extending from early design phase through at least 10 months of occupancy.
- C. **Green Building Professional.** A professional who holds a credential from a Green Building Rating Program indicating advanced knowledge and experience in environmentally sustainable development in general as well as specific Green Building Rating Systems or otherwise possesses comparable experience in environmentally sustainable development. In instances where a Green Building Rating Program that does not offer such a credential is being applied to meet the provisions of Section 5.13, the designated Green Building Professional must have demonstrated experience as a project architect or engineer, or as a consultant providing third-party review, on at least 3 projects that have been certified using the applicable Green Building Rating Program.
- D. **Green Building Project.** Any development project that meets the provisions of Section 5.13.4.
- E. **Green Building Rating Program.** A collection of activities and services directed by an organization to promote environmentally sustainable development and to recognize projects that achieve defined environmentally sustainable development objectives, including the establishment and oversight of one or more Green Building Rating Systems.
- F. **Green Building Rating System.** A specific set of design standards for environmentally sustainable performance established under the auspices of a Green Building Rating Program against which a project or building design may be evaluated.

- G. **Embodied Carbon.** The sum of greenhouse gas emissions associated with the building materials throughout multiple stages of the materials' lifecycle. Greenhouse gas emissions are calculated relative to the impact of one molecule of carbon dioxide and reported as carbon dioxide equivalent (CO₂e) with units of mass. In Life Cycle Assessment reports and Environmental Product Declarations (EPDs), embodied carbon is equivalent to Global Warming Potential (GWP).
- H. **Whole Building Life- Cycle Assessment.** A method for estimating the potential environmental impacts of a whole building throughout its life cycle.
- F.I. **Environmental Product Declaration (EPD).** A standardized report of the environmental impacts of a product, process, or service based on a life-cycle assessment.

5.13.3. *Application of the Sustainable Development Requirements*

- A. These sustainable development requirements apply to any proposed development in any zoning district that includes the construction or substantial reconstruction of one or more buildings totaling 20,000 sf or more of gross floor area that also requires issuance of a special permit under any provision of this Zoning Ordinance.
- B. No Segmentation. The zoning provisions of this Section apply to projects at one site or two or more adjoining sites in common ownership or under common control within a period of five years from the first date of application for any special permit for construction on the lot or lots, or for the 12 months immediately preceding the date of application for any special permit. An applicant for development may not segment or divide or subdivide or establish surrogate or subsidiary entities to avoid the requirements of Section 5.13. Where the City Council determines that this provision has been violated, a special permit will be denied. However, nothing in Section 5.13 prohibits the phased development of a property.

5.13.4. *Sustainable Development Requirements*

- A. A green building project must be designed to meet the standards of one of the authorized green building rating systems identified in Section 5.13.5 according to the requirements listed below.
 1. **LEED Green Building Rating Program.** A green building project being designed according to the LEED Green Building Rating Program must be designed to achieve a minimum 'Silver' level standard. Projects of greater than 50,000 sf of gross floor area must be designed to meet a minimum 'Gold' level standard. Certification by the LEED Green Building Rating Program is not required.
 2. **Passive House Green Building Rating Program.** A green building project being designed according to the Passive House Green Building Rating program must be designed to achieve certification. Certification by the Passive House Green Building Rating Program is required.
 3. **Enterprise Green Communities Green Building Rating System.** A green building project being designed according to the Enterprise Green Communities Green Building Rating program must be designed to achieve the minimum criteria for certification. Certification by the Enterprise Green Communities Green Building Rating Program is not required.

B. Electric Vehicle Charging Stations. A green building project must provide that a minimum of 10% of parking spaces have access to electric vehicle charging stations up to a maximum of 40 spaces. An additional 10% of parking spaces must be electric vehicle charging station ready, meaning that electrical systems and conduit are prepared to expand the number of charging stations as demand increases. This Section 5.13.4.B only applies to new or rebuilt parking facilities; those projects using existing parking lots are exempt.

C. Solar Panels. [reserved]

D. Embodied Carbon A green building project must provide an analysis that estimates the embodied carbon of a project. The type of analysis is determined based on gross square footage of the green building project:~~[reserved]~~

1. For projects under 50,000 sf, only structural materials must be evaluated using Life Cycle Analysis tools or Environmental Product Declarations.

2. For projects over 50,000 sf, the design team must use a Whole Building Life-Cycle Assessment tool to estimate the embodied carbon of both structural and enclosure materials, and the CO₂e per square foot of the project compared to an average CO₂e intensity (kg CO₂e/unit floor area) for projects of comparable use, and provide explanation why the building materials and systems were chosen. This requirement may be met by using one of the following methods:

a. LEED Credit for Whole Building Life-Cycle Assessment

b. Green Building Initiative's (GBI) Green Globes for New Construction (NC) Credit for Whole Building Life-Cycle Assessment

c. International Living Future Institute's (ILFI) Zero Carbon Standard.

d. Another method approved by the Planning Director.

3. Projects where at least 50% of the floor area comprises re-use of a pre-existing structure are not subject to these provisions.

E. Electrification of heating/cooling and residential cooking, domestic water heating, and laundry [reserved]

5.13.5. Authorized Green Building Rating Programs

~~A. Any of the following green building rating programs may be used to meet the requirements of this Section 5.13.~~

~~1. The Leadership in Energy and Environmental Design ("LEED") Green Building Rating Program developed and overseen by the United States Green Building Council;~~

~~2. The Passive House Green Building Rating Program developed and overseen by either Passive House Institute US, Inc. or the Passive House Institute; or~~

~~3. The Enterprise Green Communities Green Building Rating Program developed and overseen by Enterprise Community Partners, Inc.~~

B.A. Applicability of Rating Systems.

1. If a green building rating program offers different green building rating systems, a green building project must use the system that is most directly applicable to the project or building type, as ~~determined~~ approved by the Planning Director.

2. The green building rating system must address the design and construction of buildings, not building operations or neighborhood development.

3. A green building project must use the most current version of the applicable green building rating system at the time of the special permit application.
4. The green building rating system, including the applicable version, must be specified at the time of special permit application.

5.13.6. *Sustainable Development Review Procedures*

A. **Special Permit Submittal Requirements.** The following must be submitted with the special permit application:

1. **Rating System Checklist.** A document enumerating the criteria set forth in the applicable green building rating system and indicating which technical and design requirements will be met in the green building project design and the resulting rating level of the green building project.
2. **Rating System Narrative.** A written description of the technical and design elements of the green building project that will be utilized to achieve compliance with the applicable green building rating system.
3. **Energy Sustainability Narrative.** A written description of the energy efficiency, renewable energy, and other technical and design elements of the green building project that serve to minimize energy use, make use of renewable energy sources, and otherwise demonstrate how close the project is to achieving net zero energy use status. This narrative should include the following, referencing how the requirements listed in Section 5.13.4 are achieved:
 - A. ~~Descriptions of building envelope performance, anticipated energy loads, mechanical systems, and site planning strategies;~~ mechanical systems and
 - B. Description of on-site and off-site renewable energy systems;
 - C. Description of ~~the narrative must also describe~~ how the building could be made to achieve net zero status in the future;
 - D. Specified commitment to electric vehicle charging infrastructure; and
 - E. Specified procedure that will be used to analyze embodied carbon.
4. **Credentials.** A document demonstrating the credentials of the green building project's designated green building professional, which must include a credential from the green building rating program indicating advanced knowledge in the specific green building rating system being applied to the green building project.
5. **Affidavit.** An affidavit signed by the green building professional stating that ~~he/she~~ the Professional has reviewed all relevant documents and that to the best of ~~their~~ the Professional's knowledge, the documents provided indicate that the green building project is being designed to achieve the requirements of this Section 5.13.

B. **Building Permit Submittal Requirements.** When applying for a building permit for a Green Building Project, the documentation listed in Section 5.13.6.A above, updated from any previous version to reflect the current Green Building Project design, and the additional documentation listed below must be submitted to the Department of Planning and Development.

1. Credentials of the Green Building Project's Green Commissioning Agent.

2. For a Green Building Project using the Passive House Green Building Rating Program, the following set of documents is required:
 - a. Credentials of the Passive House rater/ verifier who will perform testing and verification and letter of intent stating he/ she has been hired to complete the on-site verification process;
 - b. Credentials of the Certified Passive House Consultant who has provided design, planning, or consulting services;

3. Embodied carbon analysis as required by section 5.13.4.D and affidavit signed by a Registered Design Professional or Green Building Professional confirming the embodied carbon analysis follows the requirements of 5.13.4.D.

- C. **Certificate of Occupancy Submittal Requirements.** When applying for a temporary certificate of occupancy for a Green Building Project, the documentation listed in Sections 5.13.6.A and 5.13.6.B above, updated from any previous version to reflect the current Green Building Project design, must be submitted to the Department of Planning and Development. The additional documentation listed below must be submitted prior to issuance of a final certificate of occupancy.

1. An affidavit signed by the Green Commissioning Agent, certifying that the pre-construction commissioning process requirements of the applicable Green Building Rating Program have been met and that the post-construction commissioning process requirements of this Section were included in the scope of work and will be met, including a schedule of when each commissioning requirement was or will be met.
2. For Green Building Projects using the Passive House Green Building Rating Program, the final testing and verification report completed by the Passive House rater/verifier.
3. Credentials of the Green Building Project's accredited Green Building Professional and an affidavit signed by that professional stating that he/she/the Professional has reviewed all relevant documents and that to the best of his/her/the Professional's knowledge, the documents provided indicate that the Green Building Project was built to achieve the requirements of Section 5.12.

5.13.7. *Exceptions*

A special permit may be granted to allow for exceptions to this Section 5.13 if an applicant can demonstrate that the same or better environmental outcomes can be achieved through a different approach or project design. An exception may also be granted where literal compliance is impracticable due to the nature of the use or that such exceptions would be in the public interest.

City of Newton



Village Center Rezoning Phase 4: Version 2.0 Zoning Map

ZAP - April 24, 2023
Docket #38-22

Agenda

1. **How We Got Here**
 - a. Community Vision: Village Center Framework
 - b. Timeline: Where We Are

2. **Version 2.0 Updates**
 - a. Input Received: Public Comment and ZAP Workshops
 - b. Key Updates: Zoning Map and Framework

3. **MBTA Communities Compliance**
 - a. Key Updates: Parking and Contiguity
 - b. Version Comparisons: 1.0 vs. 2.0

4. **Next Steps**