

# CELT Wrap-Up

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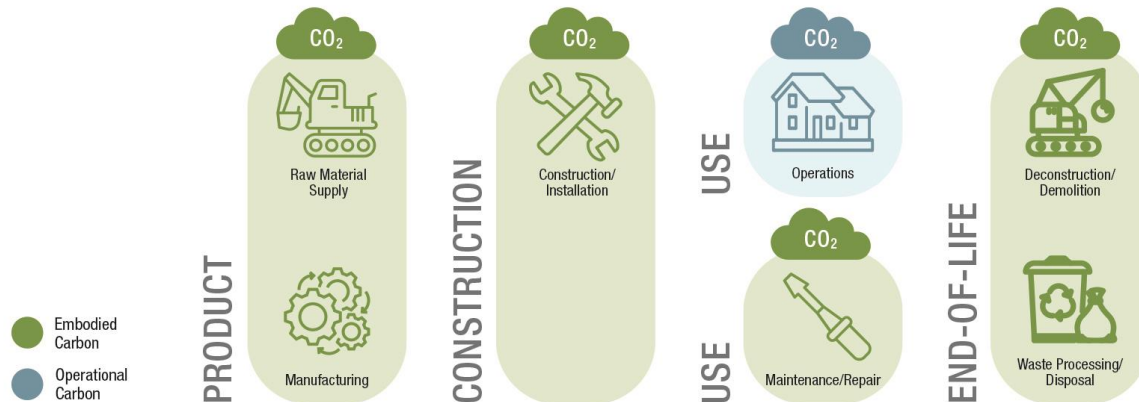
UMass Boston:

Environmental Studies and Sustainability  
Needham



# Municipal Embodied Carbon Policies

Growing interest in embodied carbon in public and private construction



| Goal BU.1 Buildings in Needham are designed, constructed, and maintained to be energy efficient and minimize greenhouse gas emissions. |                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>NET ZERO BUILDINGS                              | <b>BU.1.1</b> Implement high-efficiency and carbon neutrality standards for new construction and significant renovations.                                              |
|                                                                                                                                        | ✓ BU.1.1.A Adopt Specialized Energy Code ("Net-Zero") for all new construction including municipal buildings, residential, and commercial developments.                |
|                                                                                                                                        | * BU.1.1.B Enable Commercial Property Assessed Clean Energy (PACE) by opting into MassDevelopment Program and develop supporting programs to drive participation.      |
|                                                                                                                                        | BU.1.1.C Require municipal building construction and renovations to calculate embodied carbon and life cycle costs and encourage reductions where feasible.            |
|                                                                                                                                        | ⚙️ BU.1.1.D Partner with Needham Housing Authority to identify funding opportunities for sustainability upgrades in existing affordable housing units.                 |
|                                                                                                                                        | <b>BU.1.2</b> Pursue deep energy efficiency through retrofits and electrification in existing buildings.                                                               |
|                                                                                                                                        | ⚙️ BU.1.2.A Pursue upgrades to existing municipal facilities to achieve net zero energy performance and publish energy use data to increase transparency.              |
|                                                                                                                                        | * BU.1.2.B Develop educational materials and conduct a targeted outreach campaign around MassSave incentives to residential and commercial property owners.            |
|                                                                                                                                        | BU.1.2.C Establish a local energy coaching program where trained coaches can engage directly with residents and businesses on electrification and efficiency upgrades. |

# Reporting Requirements

## Cambridge and Boston

### Cambridge Zoning Ordinance

#### CITY OF CAMBRIDGE EMBODIED CARBON REPORTING TEMPLATE

[City of Cambridge Zoning Ordinance Amendment to Section 22.25.1\(c\) of Article 22, entitled Sustainable Design and Development \(Ordinance No. 2022-20\), Section 7. Embodied Emissions:](#)

“A whole building lifecycle analysis of the estimated emissions generated by the construction of the Green Building Project. The Assistant City Manager for Community Development shall promulgate regulations for how these estimated emissions are to be reported.

Such regulations shall include at minimum the required reporting of estimated lifecycle emissions generated by the use of major building materials, including but not limited to wood, concrete, steel, aluminum and glass, using embodied emissions modeling software and industry standards acceptable to CDD staff. This paragraph will become effective on the date of final promulgation of the regulations for Green Building Projects that have not yet completed the initial stage of administrative review by such date, and shall not impose a requirement on any building project that does not meet the standard threshold for project review special permit of 50,000 square feet or includes housing units.”

#### Applicability: For Projects after date of final promulgation of regulations (01/01/2024)

|                                                                                         |                                                          |
|-----------------------------------------------------------------------------------------|----------------------------------------------------------|
| Is this project subject to Green Building Requirements (Section 22.20)?                 | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Does this project meet the threshold for Project Review special permit (Section 19.23)? | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Is the gross floor area of this project 50,000 square feet or more?                     | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Does this project <u>exclude</u> dwelling units?                                        | <input type="checkbox"/> Yes <input type="checkbox"/> No |

Complete this reporting template if the answer is “Yes” to ALL of the above.

### Boston Net Zero Carbon Ordinance

## BUILDING LCA REPORTING TEMPLATE

For Projects reporting Embodied Carbon Values



City of Boston  
Planning Department

For any issues with the file,  
contact [igbc@boston.gov](mailto:igbc@boston.gov)

**Important Links:**

- [LCA Reporting Guidance Link](#)
- [Embodied Carbon Practitioner's Toolkit](#)
- [Article 37 Submittal Requirements](#)

LEGEND:

-  Editable fields
-  Select from dropdown
-  Results

## Enter Building Name Here, Boston

This section captures data on the proposed building, team, and modelling tools and assumptions.

| Project Definition                     | User input | Instructions                                                                                                          |
|----------------------------------------|------------|-----------------------------------------------------------------------------------------------------------------------|
| Project Name                           |            | Short name to identify project                                                                                        |
| Project Address                        |            | Street address, city, state, postal code                                                                              |
| LCA Compliance Procedure               |            | See "Table 2. LCA compliance procedures" in <i>City of Boston Life Cycle Assessment (LCA) Guidance for Buildings</i>  |
| Building Typology (CBECS)              |            | See the Commercial Buildings Energy Consumption Survey (CBECS) [1] for more information on building type definitions. |
| IBC Primary Construction Type          |            | Select the IBC construction type for the majority of the building gross floor area.                                   |
| Seismic Design Category                |            | Refer to definitions from ASCE 7-16.                                                                                  |
| Primary Horizontal Gravity System      |            | See descriptions of relevant systems in Appendix A.9 in source [2].                                                   |
| Primary Vertical Gravity System        |            | See descriptions of relevant systems in Appendix A.10 in source [2].                                                  |
| Primary Lateral System                 |            | See descriptions of relevant systems in Appendix A.11 in source [2].                                                  |
| Podium                                 |            | See descriptions of relevant systems in Appendix A.12 in source [2].                                                  |
| Foundation Type                        |            | See descriptions of relevant systems in Appendix A.13 in source [2].                                                  |
| Project Gross Floor Area (ft²)         |            | Gross floor area consistent with Boston Zoning Code definition.                                                       |
| Project Gross Floor Area (m²)          | 0          | Autoconverted from ft² to m²                                                                                          |
| Project Above-Grade Parking Area (ft²) |            | Area of above-grade parking facilities included in Boston Zoning Code GFA.                                            |
| Project Above-Grade Parking Area (m²)  | 0          | Autoconverted from ft² to m²                                                                                          |
| Project Adjusted GFA (ft²)             |            | Gross floor area minus above-grade parking area, to be used for embodied carbon compliance.                           |
| Project Adjusted GFA (m²)              | 0          | Autoconverted from ft² to m²                                                                                          |

# Material “Requirements”

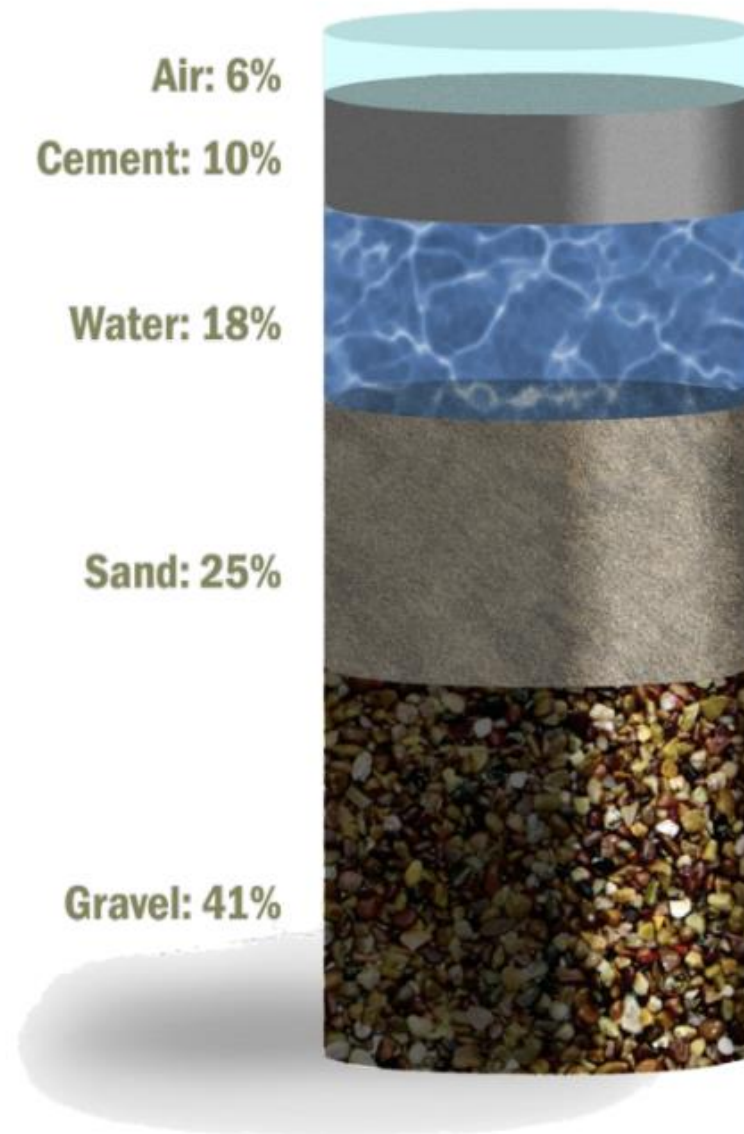
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## Brookline

NOW THEREFORE BE IT RESOLVED that the Town of Brookline use currently available low-carbon concrete products wherever feasible and encourage developers to do the same for any new construction. For this proposal, low-carbon products are defined as those that produce at least 10 percent less carbon dioxide emissions in their production and use, than the average mixture used for a given application. The town will also provide a low-carbon fact sheet to potential bidders.

# Why Low-Carbon Concrete?

- 8% of global emissions come from concrete
  - Cement is the largest carbon-emitting component of concrete
  - Roughly 30 billion tons of concrete are produced annually
  - Demand for concrete is expected to increase by over 5 billion tons



# San Jose: Low-Carbon Concrete

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- Department of Transportation (DOT) maintenance team
- Explored 3 mix designs
  - Supplementary materials:
    - Fly ash
    - Slag
  - Carbon Cure
    - Recycled CO2 injected permanently into concrete
    - CO2 mineralizes, strengthening the concrete



# San Jose SPEC Sheet Comparison

| Material Code    | Description            | Source Supplier                   | Design Quantity (lbs/cy) | Volume |
|------------------|------------------------|-----------------------------------|--------------------------|--------|
| Cement           | ASTM C150              | Calportland-PORT OF STOCKTON      | 564 lb                   | 2.87   |
| Coarse Aggregate | ASTM C 33 #67          | Vulcan -Pleasanton                | 1750 lb                  | 10.51  |
| Fine Aggregate   | ASTM C 33 Fine Agg     | Vulcan -Pleasanton                | 1409 lb                  | 8.54   |
| Admixture        | C260: Master Air AE 90 | BASF -Cleveland                   | - -                      | -      |
| Admixture        | C 494 TYPE A : 322     | BASF -Cleveland                   | - -                      | -      |
| Water            | ASTM C1602             | Central Concrete-Central Concrete | 34.0 gal                 | 4.55   |



Traditional Mix

| Material Code    | Description         | Source Supplier                   | Design Quantity (lbs/cy) | Volume |
|------------------|---------------------|-----------------------------------|--------------------------|--------|
| Cement           | ASTM C150           | Calportland-PORT OF STOCKTON      | 329 lb                   | 1.67   |
| Slag             | ASTM C989           | Lehigh-Stockton                   | 141 lb                   | 0.77   |
| Coarse Aggregate | ASTM C 33 #67       | Vulcan -Pleasanton                | 1200 lb                  | 7.21   |
| Coarse Aggregate | ASTM C 33 #8        | Vulcan -Pleasanton                | 300 lb                   | 1.81   |
| Fine Aggregate   | ASTM C 33 Fine Agg  | Hanson-Pier 94 - Orca             | 893 lb                   | 5.09   |
| Fine Aggregate   | ASTM C 33 Fine Agg  | Vulcan -Pleasanton                | 840 lb                   | 5.09   |
| Water            | ASTM C1602          | Central Concrete-Central Concrete | 36.0 gal                 | 4.81   |
| Admixture        | CARBON CURE         | CARBONCURE-EL SEGUNDO             | - -                      | -      |
| Admixture        | MASTER GLENIUM 7920 | BASF -Cleveland                   | - -                      | -      |



Sustainable Mix

38% reduction in CO2

# Project Outcomes & Takeaways



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# Reflection



# Questions?

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