Zero Net Carbon Building Zoning

A Better City – Membership Feedback

boston planning & development agency

October 17, 2022

WELCOME

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Article 37 & ZNC Policy - Overview

Covered Buildings:

- New construction buildings that are 20,000 SF or larger (excluing parking) or add 15 or more new housing units.

Building Requirements:

- Reduce or mitigate adverse impacts including achieving LEED Gold.
- Include low carbon building practices and use renewable energy sufficent to annually achieve net zero carbon emissions.
- Annually report ZNC building performance using the BERDO portal.

Brief Attendee Poll on discussion topics

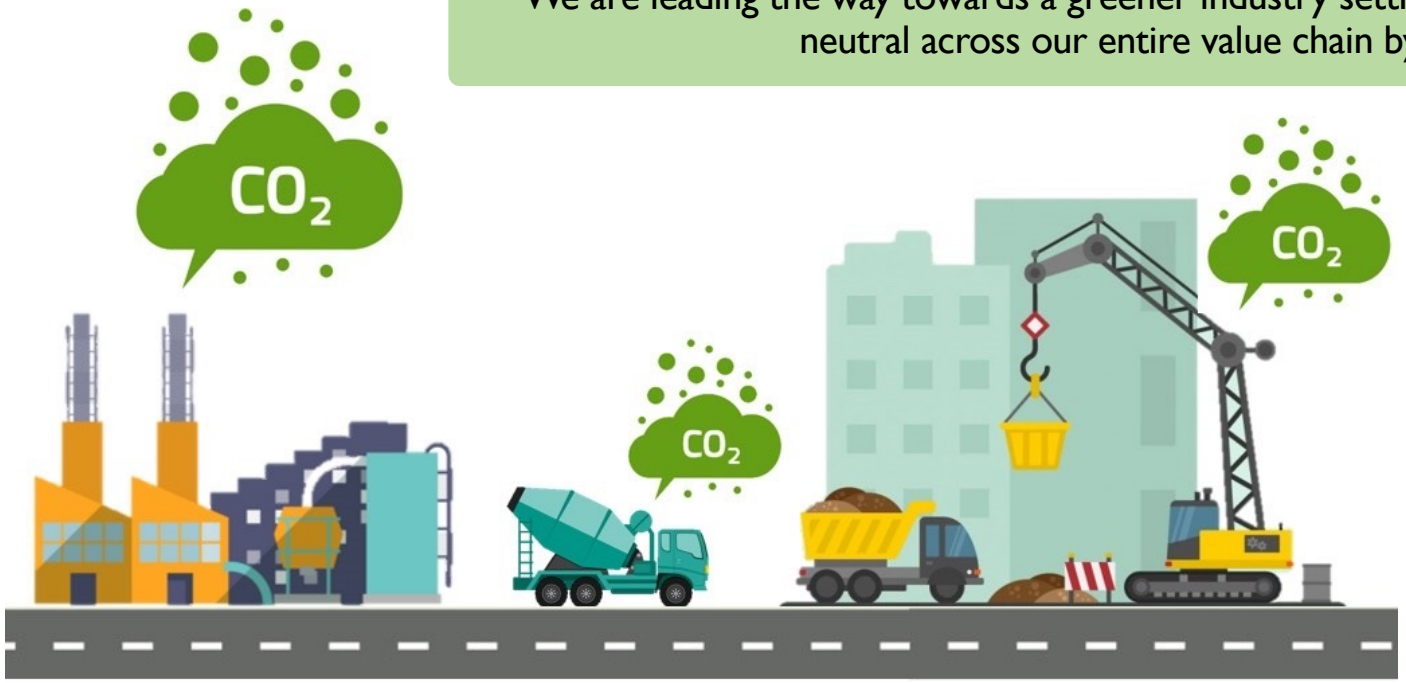
LEADERSHIP IN PRACTICE

- Three Eighty Stuart
  Skanska USA
- The Kenzi, Bartlett Station
  POAH, DREAM Collaborative (architects)
- Landmark Center Phase III Lab
  Samuels and Associates

SKANSKA

Skanska is a 135-year-old global real estate development and construction company founded in Stockholm, Sweden.

We are leading the way towards a greener industry setting the goal to be carbon neutral across our entire value chain by 2045.



Embodied Carbon

Use Embodied Carbon in Construction Calculator (EC3) tool to inform material supply decisions to reduce embodied carbon

Operational Carbon

Design our buildings to minimize energy consumption and achieve meaningful reductions in carbon emissions.

THREE EIGHTY STUART

BY THE NUMBERS

- 625,000 SF Office Building
- 22 Terraces + 1 Roof Deck
- 100% Outside Air with High Efficiency Filtration
- Modeled CEI: 1.35 kgCO2e/ft2
- Modeled EUI: 25 kBTU/ft2-yr
- Zero Net Carbon from Operations

THE APPROACH

- Reduce energy consumption by maximizing envelopment performance and efficiency of systems
- Utilize heat pumps as the tool to electrify the HVAC system
- Purchase green power directly or through the purchase of RECs

DESIGN FEATURES

- High-performance envelope with triple pane glazing
- Heat recovery chiller
- Air source heat pumps
- DOAS with highly efficient energy recovery wheel
- Backup electric resistance boiler
- Chilled beams in lieu of VAVs

THE CHALLENGES

- Cost
- Systems implementation & limitations
- Green power purchase

RESIDENTIAL

Bartlett Station - The Kenzi

Bartlett Station Drive, Roxbury

Team:
Developer: POAH (Preservation of Affordable Housing)
Architect: DREAM Collaborative
MEP Engineer: Petersen Engineering Inc.
Civil Engineer: Develllis Zrein Inc.
Structural Engineer: RJ Farah
Landscape Architect: Deborah Myers Landscape Architects
Passive House Consultant: Building Evolution Corporation
Contractor: NEI General Contracting

Status: Under Construction

RESILIENCY
Extreme Temps

SUSTAINABILITY
Green Building, Carbon Reduction

RESIDENTIAL

Bartlett Station - The Kenzi

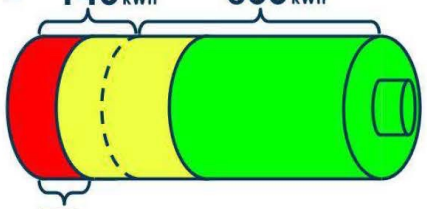
Bartlett Station Drive, Roxbury

Battery backup

System designed and permitted for emergency use and grid peak demand offset

TOTAL SYSTEM 100% **440** kWh

GRID BUY BACK 68% **140** kWh **300** kWh

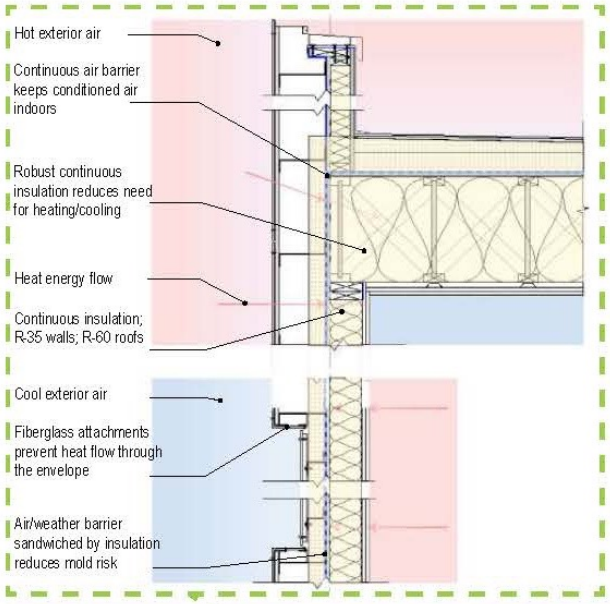


2 HR LOAD 16% **70** kWh

Glavel

Foam glass gravel used under PH boundary slabs

RESIDENTIAL

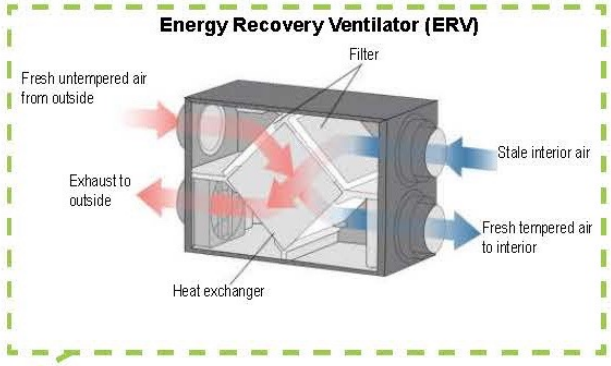


Resilient Infrastructure

- Generator/battery power on roof of building
- Passive House envelope slows any heat loss/ gain in the event of a utility outage, allowing the generator/battery to be downsized
- ~90kW of solar PV array on roof to minimize dependence on external utilities for power
- Rear of site features a bioswale to collect and filter water runoff from adjacent site above

Extreme Temps

- Passive House enclosure mitigates extreme temperature swings and will provide a healthy, efficiently conditioned interior environment.
- Habitable landscaped garage roof mitigates heat island effect, producing an oasis of cooled area on a southern exposure.



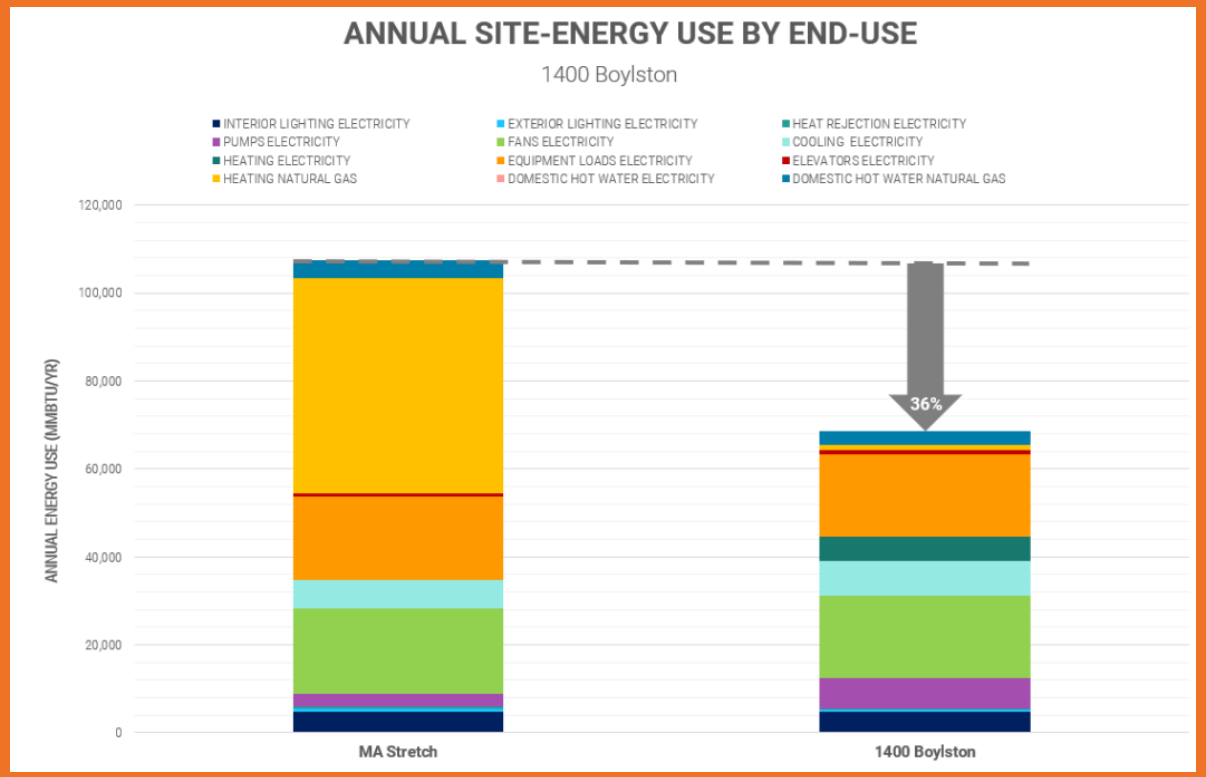
Carbon Reduction

- Aim toward lower embodied carbon materials, and much less Greenhouse Gas (GHG) emitting materials
- Operational carbon reduced via renewables on the roof and energy efficient Passive House enclosure
- High efficiency ERVs paired with air source heat pumps take advantage of existing energy in the air to control interior air and domestic water temperatures.
- Predicted EUI: 14.07 kBtu/SF/yr (75% reduction from baseline code)

Net Zero Carbon BPDA Case Study

Samuels & Associates

Net Zero Carbon - Life Science Approach



Several Hybrid Electric Projects Under Development

Highlights:

- 95%+ reduction in fossil fuels; shift energy use to electric
- Carbon emissions reduction of up to 40+%
- Renewable sources/RECs
- Thermal envelope; high performance systems

Considerations for future implementation:

- Cost
- Implications for penthouse size/height

Samuels & Associates

OVERVIEW
ZONING, POLICY & STANDARDS

John Dalzell, BPDA

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Article 37 Updates and ZNC Policy & Standards

Proposed Zoning & Policy Changes:

- Lower Applicability Threshold to > 20k SF
- Increase LEED Outcome to LEED Gold
- Establish a ZNC Building Emissions Performance Standard for New Construction
- Align with BERDO Standards & Reporting
- Convene an Advisory Committee to assist with updates & advancing practices
- Update Review Process and Add Small Project Application & Review Standards

ZNC Framework

Prioritized Practices:

1. **Low Carbon Building**
   Embodied Carbon - Identify actions & advance standards & practices
   Operational Emissions - Establish building emission targets
2. **On-site Renewable Energy**
   Set Minimum Generation Standards
3. **Renewable Energy Procurement**
   Define Acceptable Options

Bunker Hill Housing – Building F

Proposed design modeled performance (271,844 SF, EUI 19.1, Solar PV 81.9 kW = 104,500 kWh/yr)
Building CO2e = 1.48 (kg/sf/yr) emission
Solar CO2e = 0.12 (kg/sf/yr) reduction

Building	445. tons / yr
On-site RE	36. tons / yr (less)
RE Procure	409. tons / yr (less)
ZNCarbon	0.

Article 37 Zoning Updates & ZNC Policy

Proposes Two Regulations: Zoning and Policy

Proposed Zoning Changes – Key Requirements:

- Applicability Threshold
- LEED Gold
- Removes “Boston Green Building Credits”
- Establishes annual net Emissions performance standard of zero kg of Carbon Dioxide Equivalent (CO2e) / sf-yr.

Article 37 Zoning Updates

Proposed Zoning Changes – Measures:

- Construction Emissions Minimization Measures
  - Construction site activities
  - Building construction materials, products, and waste
- Operational Emissions Minimization Measures
- Operational Emissions Mitigation Measures
  - Generate on-site renewable energy

  AND POST OCCUPANCY
  - Purchase renewable electricity
  - Alternative Compliance Payments for on-site fossil fuel emissions

ZNC Policy & Standards

Proposed Zoning Changes – Related Amendments:

- Modifies building height to exclude solar PV panels from building height (up to 48” above roof) and parking structures (up to 10’ plus 48” above parking deck).
- Updates the Article 80E Small Project Application & Review Standards
  - Adds Sustainability Component and references to Article 37

ZNC Policy & Standards

Minimization Building Operational Carbon Emissions

Allows two approaches and sets building carbon emission “targets”:

Approach 1 - Predictive Performance Comparative Analysis

Projects attain a 40% carbon emissions reduction compared to modeled performance of the Stretch Code (ASHRAE 90.1-2013 with MA amendments) or LEED baseline (ASHRAE 90.1 version used for LEED credit determination).

Except:

1. Licensed healthcare facilities that are not medical office buildings, which should meet a 30% carbon emissions reduction target.
2. Residential buildings that do NOT trigger stretch code AND the total area of any non-residential program is less than 40,000 GSF and does not exceed 50% of total GSF - these building must meet a HERS score 38 or lower.
3. Buildings committed to achieving Passive House certification via PHIUS+ or PHI.

ZNC Policy & Standards

Approach 2 - Use Specific Best Practice Performance

Projects attain the Best Practice pCEI for specific building uses. Buildings with multiple uses should calculate a blended pCEI target.

Primary Building Use Type	kg CO2e/sf-yr	Notes
Multifamily (low density)	1.1	Average Occupancy Density ≥ 500 SF/Person
Multifamily (high density)	1.6	Average Occupancy Density btw 220 to 500 SF/Person
Residence Hall	1.6	
Hotel	1.9	
K-12 School	1.3	
Office - College or University	1.6	
Office - Commercial	1.8	
Retail & Service	1.6	
Dry Lab	4.3	
Wet Lab	6.4	
Hospital	7.4	Not including medical office uses

ZNC Policy & Standards

Operational Mitigation Measures

1. Mitigation of electricity emissions: On-site production of Renewable Energy
   If needed as a mitigation measure, the minimum area cumulatively equals:
   - 50% of the building roof area(s)
   - 90% of the area of any uncovered parking structure deck(s); and
   - 5% of unoccupied paved or hardscaped site areas.

   With exceptions and exclusions for:
   - Building mechanical and structural systems
   - Areas are shaded for more than 30 percent of daylight hours annually.
   - Uses and/or mature trees of environmental or aesthetic value
   - Historic preservation, building, fire, or environmental requirements
   - Grid interconnection standards.

   And an Installation Time Extension for equipment supply, and changes in incentives, and interconnection standards.

ZNC Policy & Standards

Operational Mitigation Measures

2. Mitigation of electricity use emissions: Renewable Electricity Purchases
   If needed as a mitigation of electricity-use Emissions, projects shall: (a) purchasing renewable electricity, (b) purchasing Renewable Energy Certificates, (c) entering into a Power Purchase Agreement, or (d) any other Compliance Mechanism identified in BERDO.

3. Mitigation of non-electricity use emissions: Alternative Compliance Payments
   If needed as mitigation measure for non- electricity emissions, projects shall make then Alternative Compliance Payments pursuant to BERDO.

ZNC Policy & Standards

CONSTRUCTION EMISSIONS MINIMIZATION MEASURES

Reduce Construction Operation Carbon Emissions

Include best practices for mitigation measures, including:

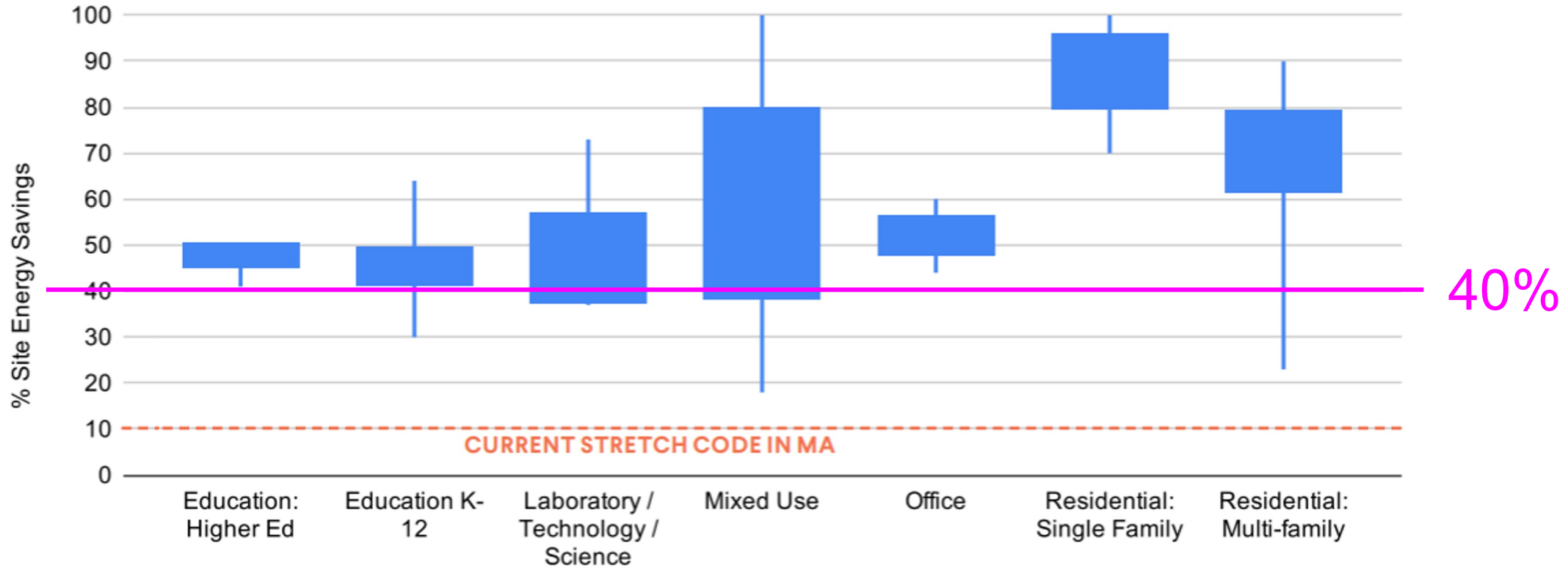
- Temporary Lighting
- Renewable Electricity - procure 100% renewable electricity.
- Low and no-carbon emission vehicles / equipment and sequencing

Minimize Demolition, Construction & Building Materials Embodied Carbon

Recognizing the emerging status of industry and practice standards, include best practices and LEED Materials & Resources prerequisites and credits:

- Construction and Demolition Waste Management;
- Building Refrigerant Management;
- Building Life-Cycle Impact Reduction;
- Building Product Disclosure and Optimization; and
- Low embodied carbon structural designs, materials, and systems.

Percent Carbon Reduction



Source: Built Environment Plus - Massachusetts is Ready for Net Zero 2021 report

Recommended Pathway

Low Carbon Emitting Building - Carbon Emission Intensity (CEI) Targets

The following building typologies must aim to meet CEI targets below:

Building Typology	CEI Targets [kg CO2e/sf] Recommended	All electric site EUI [kBtu/sf-yr] (for reference only)
Office	1.6	30
College / University Office	1.6	30
K-12 School	1.3	25
Hotel	1.9	35
Residence Hall	1.6	30
Low Density Multifamily	1.1	20
High Density Multifamily	1.6	30
Dry Lab	4.3	80
Wet Lab	6.4	120
Hospital	7.4	139

- Targets are calculated using predicted 2035 carbon emission factors for electricity of 52 kg/MMBtu and current carbon emission factors as published by BERDO.
- Projects that are composed of more than one listed building typology should use a target based on area weighted average.
- Projects with unique conditions (e.g. schedules, loads, etc.) meeting the 40% carbon emissions reduction but not meeting the CEI target should have an opportunity to make a case for an adjusted value.

QUESTIONS & ANSWERS DISCUSSION

City and BPDA Staff

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PUBLIC ENGAGEMENT & FEEDBACK

- Initial Public Comment Period
  30 Days - Comments Due October 28th
- Public Office Hours
  October 11th at 6pm and
  October 12th at 2pm
- Public Feedback Meeting
  October 19th at 6pm
- Posting of Comments, Updates, and Next Steps
  November 2022

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ZNC Building Programs

BOSTON MASS TIMBER ACCELERATOR

MTA Round Two Now Open!

Second and Final Funding Round

- Buildings 9 to 18+ Stories Tall
- Info Session – 2pm October 4th
- Funding & TA to assess benefits of Mass Timber practices

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THANK YOU!

- Tonight's presentation and chat notes will be posted to Zero Net Carbon Building Zoning Initiative
- Stop in during our Office Hours & Feedback Meeting
- Submit submit online comments
- Email: John.Dalzell@boston.gov

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