City of Cambridge
Getting to Net Zero Action Plan
Zoning Amendments

Presentation to the Planning Board
October 29, 2019
Agenda

• Net Zero Action Plan Background
• Green Building Requirements Background
• Green Building Requirements Zoning Proposal Overview
• Exterior Insulation Background
• Exterior Insulation Zoning Proposal Overview
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• **Net Zero Action Plan Background**
• **Green Building Requirements Background**
• **Green Building Requirements Zoning Proposal Overview**
• **Exterior Insulation Background**
• **Exterior Insulation Zoning Proposal Overview**
Significant construction activity in the city and concern that new development makes reducing GHGs harder, unless Net Zero

Net Zero Task Force including residents, businesses, developers, building experts, and other affected stakeholder established 2013 to develop recommendations for a long-term GHG reduction plan from all buildings in Cambridge

Actions proposed for new buildings, existing buildings, and renewable energy supply
Net Zero Action Plan Background

The Climate Imperative

Climate change poses a growing set of risks and challenges to cities.

Combating climate change needs to start locally.

Buildings generate over 80% of Cambridge’s total greenhouse gas emissions.

That is why it is Cambridge’s aim to achieve Net Zero Emissions from buildings.

Residents, universities, businesses and the City are collaborating to address the immediacy of the climate imperative.
Cambridge GHG Inventory

2012 Inventory

- Residential Buildings, 15.1%
- Commercial & Institutional Buildings, 57.9%
- Energy Industries, 13.4%
- Manufacturing Industries & Construction, 3.6%
- On-road, 6.9%
- Railways, 0.5%
- Solid Waste Disposal, 2.3%
- Incineration and Open Burning, 0.1%
- Wastewater Treatment and Discharge, 0.1%
Commitment: Carbon Neutrality by 2050
**Recommended Actions from the Net Zero Action Plan**

**Action 2.3: Increase Green Building Requirements**
- Require higher levels of green building design and energy efficiency for new construction and major renovations for projects over 25,000 square feet that require a special permit
- Shift to LEED Gold citywide
- Require projects to pursue a prescribed number of LEED energy efficiency points, and enhanced commissioning requirements

**Action 2.5: Removal of Barriers to Increased Insulation**
- Enable the addition of exterior insulation
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History of Green Building Requirements

- 2008-2009 **Green Building/Zoning Task Force**
- 2010 **Article 22.000 zoning adopted** by City Council
- Projects 25,000 SF or more must be **LEED “certifiable”**
  - Silver Level: 50,000+ SF
  - Certified Level: 25,000-50,000 SF
- **Also addressed**: Green Roofs, Insulation, Sun Shading, Solar Energy Systems, Wind Turbine Systems
“To promote **environmentally sustainable** and **energy-efficient** design and development practices in both **new construction** and **renovation** projects.”
• **92 projects** have been subject to Section 22.20
• approx. **17 million square feet** of development
• **77 new construction, 14 major rehabilitation**
Project Stats*

LEED Certification levels:

• Platinum
• Gold
• Silver
• Certified

N.B. Graphic reflects rating levels submitted at the permitting phase and does not indicate actual LEED Certification.

*since August 2010
Primary Project Use*

*since August 2010
Project Locations
LEED Categories

- Awareness & Education
- Indoor Environmental Quality
- Materials & Resources
- Energy & Atmosphere
- Innovation & Design
- Location & Linkages
- Sustainable Sites
- Water Efficiency
“To achieve increasing levels of energy performance beyond the prerequisite standard to reduce environmental and economic harms associated with excessive energy use.”
Percent of Points Achieved per LEED Category*

*since August 2010
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- Net Zero Action Plan Background
- Green Building Requirements Background
- Green Building Requirements Zoning Proposal
- Overview
  - Exterior Insulation Background
  - Exterior Insulation Zoning Proposal Overview
Key Zoning Changes

- **LEED Gold** minimum (vs. LEED Silver) for 50,000+ SF
- **Enhanced Commissioning**
- **Enterprise Green Communities** and **Passive House** (optional compliance pathways)
- **Net Zero Narrative**
- **Process clarifications**
## Current v. Proposed Zoning

<table>
<thead>
<tr>
<th></th>
<th>Current Zoning</th>
<th>Proposed Zoning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Applicable Development</strong></td>
<td>25,000+ SF projects subject to review under Article 19.000</td>
<td>25,000+ SF projects subject to review under Article 19.000</td>
</tr>
<tr>
<td><strong>Applicable Rating System</strong></td>
<td>USGBC “LEED” system only</td>
<td>LEED, Passive House (PH), or Enterprise Green Communities (EGC)</td>
</tr>
</tbody>
</table>
| **Minimum Rating Level**  | LEED Silver for 50,000+ SF  
LEED Certified for <50,000 SF                                                   | LEED Gold for 50,000+ SF  
LEED Silver for <50,000 SF  
Certifiable under PH and EGC                                                 |
| **Commissioning**         | No requirement (except LEED prerequisite)                                       | Enhanced commissioning program required                                         |
Procedural Changes and Clarifications

Special Permit Required Submission
Checklist and Narrative
+ “Net Zero” Narrative

Building Permit Required Submission
Updated Checklist and Narrative
+ Energy Simulation Tool Results
+ Rater/verifier (Passive House)

Certificate of Occupancy Required Submission
Updated Checklist and Narrative
+ Commissioning Plan
+ Testing report (Passive House)
Procedural Changes and Clarifications

Certification
Affidavit by **Green Building Professional who is a registered architect or engineer**
(program certification not required)

Timing of Review
Submit documents prior to completing application
**CDD review/feedback within 30 days**
Questions?
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Importance of Exterior Insulation

Continuous insulation is a proven energy efficiency measure that leads to significant energy savings by reducing “thermal bridging”

Thermal bridging in a wood-framed house

Reduced thermal bridging with continuous exterior insulation
What is Exterior Insulation?
Example of Exterior Insulation
Exterior Insulation Benefits

Energy Star estimates that approximately **20% reductions in energy used for heating and cooling needs** could be realized if existing structures were to perform continuous insulation retrofits.

As approximately 60% of Cambridge’s building energy consumption is attributed to heating and cooling, these potential savings could make **significant reductions in the City’s carbon emissions** across the building sector.

For existing buildings, **exterior insulation is often the least disruptive way to improve the energy performance** without requiring extensive renovations which interrupt use of the interior space.
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2010 Zoning Amendment

Yard Exceptions for Added Exterior Insulation (22.43.2)

Existing buildings can encroach into required setback to add external insulation if:

- Thickness of exterior wall not increased more than 4” compared to existing
- Resulting wall plane no closer than 7’-2” to nearest property line (unless district setbacks are less)
Article 22.43.2 Illustrated (not to scale)

Up to 4” added thickness

at least 7’2”
2015 Net Zero Action Plan recommended revisiting

2017 technical study evaluated:

• Performance and compatibility of potential insulation approaches within current ordinance

• Technical options to achieve increased exterior insulation during retrofits to residential buildings in Cambridge
Question 1: Is 4” of additional insulation enough?

Yes for some building types, no for others
# Residential Buildings in Cambridge by Cladding Type

<table>
<thead>
<tr>
<th>Exterior Wall Type</th>
<th># of Properties</th>
<th>% of Total Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clapboard</td>
<td>2,876</td>
<td>33.8%</td>
</tr>
<tr>
<td>Wood shingle/shake</td>
<td>2,249</td>
<td>26.4%</td>
</tr>
<tr>
<td>Aluminum vinyl</td>
<td>1,841</td>
<td>21.6%</td>
</tr>
<tr>
<td>Brick</td>
<td>526</td>
<td>6.2%</td>
</tr>
<tr>
<td>Asbestos shingle</td>
<td>483</td>
<td>5.7%</td>
</tr>
<tr>
<td>Stucco</td>
<td>168</td>
<td>2.0%</td>
</tr>
<tr>
<td>Asphalt shingle</td>
<td>145</td>
<td>1.7%</td>
</tr>
<tr>
<td>Brick veneer</td>
<td>98</td>
<td>1.2%</td>
</tr>
<tr>
<td>Concrete block</td>
<td>31</td>
<td>0.4%</td>
</tr>
<tr>
<td>Stone veneer</td>
<td>14</td>
<td>0.2%</td>
</tr>
<tr>
<td>Metal/glass</td>
<td>12</td>
<td>0.1%</td>
</tr>
<tr>
<td>Stone</td>
<td>4</td>
<td>0.05%</td>
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# Range of Increase in Wall Thickness by Type

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8”
Question 1: Is 4” of additional insulation enough?

RECOMMENDATION

Most wall assembly types could include continuous exterior insulation with increased thickness of 8” or less.
Question 2: Is 7’2” a reasonable setback requirement?
# Setbacks of Existing Residential Buildings in Cambridge

<table>
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<th>Distance to Nearest Property Line (approx.)</th>
<th>% of Existing Residential Buildings (approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 1’</td>
<td>63%</td>
</tr>
<tr>
<td>More than 2’</td>
<td>51%</td>
</tr>
<tr>
<td><strong>More than 3’</strong></td>
<td><strong>41%</strong></td>
</tr>
<tr>
<td>More than 4’</td>
<td>33%</td>
</tr>
<tr>
<td>More than 5’</td>
<td>27%</td>
</tr>
<tr>
<td>More than 6’</td>
<td>22%</td>
</tr>
<tr>
<td><strong>More than 7’</strong></td>
<td><strong>18%</strong></td>
</tr>
<tr>
<td>More than 8’</td>
<td>15%</td>
</tr>
<tr>
<td>More than 9’</td>
<td>12%</td>
</tr>
<tr>
<td>More than 10’</td>
<td>10%</td>
</tr>
</tbody>
</table>

Source: CDD analysis using Cambridge GIS data, 2017. ALL FIGURES APPROXIMATE
Question 2: Is 7’2” a reasonable setback requirement?

RECOMMENDATION

Changing the minimum buffer from 7’-2” to 3 feet would allow many more buildings to comply, while maintaining setbacks typical of existing neighborhoods.
Question 2: Is 7’2” a reasonable setback requirement?
## Current v. Proposed Zoning

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<tbody>
<tr>
<td>Maximum reduction in existing setback (as-of-right)</td>
<td>4 inches</td>
<td>8 inches</td>
</tr>
<tr>
<td>Minimum resulting distance from property line (as-of-right)</td>
<td>7 feet 2 inches, or required setback if less</td>
<td>3 feet, or required setback if less</td>
</tr>
<tr>
<td>Allowed variations (special permit)</td>
<td>None</td>
<td>Variations allowed with BZA special permit approval</td>
</tr>
</tbody>
</table>
Current Rules Illustrated (not to scale)

- Up to 4” added thickness
- at least 7’2”
Proposed Rules Illustrated (not to scale)

- Up to 8" added thickness
- at least 3'

PROPERTY LINE
Considerations

- Many existing buildings **do not conform** to setback standards in zoning.
- Alterations often require **variances**, which can be costly and time-consuming for small property owners.
- **Greater zoning flexibility** is one way the City can help encourage positive change.
- Limitations should be set to provide **case-by-case review** where necessary, but not so limiting that it discourages improvements.
Questions?