

# Climate Resilience Zoning Task Force

## Draft Recommendations

### February 3, 2021

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#### Overview

The following set of draft recommendations was assembled by City staff based on the discussion of the Task Force over the past several months on how to amend the Cambridge Zoning Ordinance to make the city more resilient to climate change impacts. These draft recommendations are presented in a way to make it clear how the Zoning Ordinance would change and what types of development would be affected. For each recommendation, staff has identified how the change would relate to other provisions in the Zoning Ordinance and summarized the outcome if that recommendation were not pursued.

The recommendations are grouped in the following categories:

**Category 1: New or Amended Standards**

New concepts that would need to be defined or existing standards that would need to be re-defined in order to implement the other recommendations.

**Category 2: Large Project Review**

Addition of new standards that are applicable to major new development regulated by Article 19.000 (including Green Building Requirements in Section 22.20), generally developments of 25,000+ square feet.

**Category 3: Remove Impediments in Base Development Standards**

Adjustments to current zoning standards that prevent or discourage resilience measures that are recommended in the City's Climate Change Preparedness and Resilience planning.

**Category 4: Strengthen Base Development Standards**

More stringent requirements applied to all development, affecting both large and small new construction, and having some effects on alterations to existing development.

**Category 5: Future Study**

Other initiatives that could directly or indirectly advance resilience planning, and efforts to undertake as new zoning is implemented.

These recommendations would need more detailed work to become specific text changes to the Zoning Ordinance. These summarized recommendations would provide clear guidance to staff in drafting future zoning text amendments, which would be supplemented by other technical information that the Task Force has reviewed, such as the Climate Change Vulnerability Assessment (CCVA) projections and "Cool Factor" scoring system.

**Category 1: New or Amended Standards**

	<b>Topic</b>	<b>Recommendation</b>	<b>What would be affected?</b>	<b>How does this fit with other zoning?</b>	<b>What if this is not recommended?</b>
<b>1a</b>	Projected Flood Elevation Reference Standards	Establish 10% and 1% probability “long-term flood elevations” based on approximately 50-year climate projections. Update at regular intervals as science evolves with advance publication before they become effective.	New provisions in zoning that refer back to these standards.	Provides clear flood standards based on scientifically derived future projections, applicable to all sites based on elevation rather than maps.	Continue to use current FEMA flood risk maps as the main reference standard for the Flood Plain Overlay District and other requirements. These maps provide some level of protection in areas that experience riverine flooding, but do not account for localized flooding nor future conditions.
<b>1b</b>	Definitions and Minimum Standards for Cooling Strategies	Establish definitions and minimum standards for cooling strategies, e.g. a Cool Factor, such as soil volume for shade tree planting (by tree size), other plantings by size/intensity, depth/planting standards for green roofs (amending current definition), definition of high-SRI surface. Supplement with guidance documents.	New provisions in zoning that refer back to these standards.	Supplements current environmental-based development standards such as permeable open space and green area open space with other standards that have significant cooling impact; updates green roof standards.	Clarifying these standards is necessary if heat mitigation strategies are recommended since the City does not currently have specific standards for things such as tree soil area, different type of vegetation, and solar reflectivity.

**Category 2: Large Project Review**

	<b>Topic</b>	<b>Recommendation</b>	<b>What would be affected?</b>	<b>How does this fit with other zoning?</b>	<b>What if this is not recommended?</b>
<b>2a</b>	Resilience Narrative for Planning Board Review	Require a Resilience Narrative in Section 19.20 (Project Review Special Permit) to include projections for flood risk and heat risk and description of mitigation strategies, including flood protection, heat island mitigation, passive resilience measures, and operational preparedness.	50,000+ SF new construction, addition, or change of use (20,000+ in some districts)	Parallels and supplements other information required for Planning Board review, including Transportation Impact Study, urban design narratives, and utility narratives.	Rely only on administratively applied development standards (see 2c), exclude resilience issues from Planning Board review.
<b>2b</b>	Resilience Criteria for Project Approval	Add to Section 19.30 a Resilience Objective that development is planned to respond to anticipated effects of climate change, with indicators related to flood protection, heat island mitigation, passive resilience measures, and operational preparedness.	Any application for a special permit from the Planning Board or Board of Zoning Appeal.	Parallels and supplements other urban design objectives that address responsiveness to patterns of development, pedestrian/bicycle friendliness, environmental impacts, infrastructure service, urban context, housing, and open space.	Rely only on administratively applied development standards (see 2d), exclude resilience issues from Planning Board review.

	Topic	Recommendation	What would be affected?	How does this fit with other zoning?	What if this is not recommended?
2c	Performance Standards for Flood Resilience	<p>Add Flood Resilience Requirement to Section 19.50:</p> <ul style="list-style-type: none"> <li>• Below 1%-probability long-term flood elevations:                             <ul style="list-style-type: none"> <li>○ Protect vulnerable residential living space and critical building systems;</li> <li>○ Design other built spaces to recover without irreparable damage.</li> </ul> </li> <li>• Below 10%-probability long-term flood elevations:                             <ul style="list-style-type: none"> <li>○ Protect principal-use spaces intended for regular active use;</li> <li>○ Design other accessory spaces (e.g., storage) to recover without irreparable damage.</li> </ul> </li> </ul>	<p>25,000+ SF new construction or addition, or any alteration to a 25,000+ SF building that would make it less conforming. Modification by Planning Board Special Permit.</p>	<p>Parallels and supplements performance-based Green Building Requirements.</p>	<p>Rely on more prescriptive based zoning standards applicable to all development rather than performance-based standards tied to specific review thresholds; or, rely on Planning Board review process (applicable to larger development and/or special permits).</p>
2d	Performance Standards for Cooling	<p>Add Cool Factor Requirement to Section 19.50, calculating the score based on a weighted combination of cooling strategies on a site, with 20% minimum target.</p>	<p>25,000+ SF new construction or addition, or any alteration to a 25,000+ SF building that would make it less conforming. Modification by Planning Board Special Permit.</p>	<p>Parallels and supplements performance-based Green Building Requirements.</p>	<p>Set different minimum standard; or, rely on prescriptive standards (minimum open space, vegetated area, tree planting, high-SRI materials, &amp;c.) instead of weighted average.</p>

**Category 3: Remove Impediments in Base Development Standards**

	Topic	Recommendation	What would be affected?	How does this fit with other zoning?	What if this is not recommended?
3a	Shade Canopies	Exempt outdoor shade canopies from GFA, height, setback, and open space limitations, provided the canopy surface is either solar, vegetated, or high-SRI.	New construction or alterations where shade canopies are proposed.	Removes limitations that would discourage or prevent shade canopies where feasible.	No change – shade canopies remain limited by zoning standards.
3b	Site Flood Protection	Exempt exterior flood-resilience measures including elevated stairs/ramps and flood barriers (up to the 1%-probability long-term flood elevation, but no more than 4’ above grade) from GFA, setback, and open space limitations.	New construction or alterations where site flood protection measures are proposed.	Removes limitations that would discourage or prevent site flood protection measures where feasible.	No change – site flood resilience measures remain limited by zoning standards.
3c	Green Roofs	Exempt usable green roof areas and rooftop access headhouses from GFA and height limitations as-of-right, requiring a maintenance/upkeep plan to ensure ongoing functionality.	New construction or alterations where green roofs are proposed.	Removes limitations that would discourage or prevent usable green roofs where feasible.	No change – green roofs remain limited by current zoning standards.
3d	Elevating for Flood Protection	Allow a compensating increase in height limit if the ground story is elevated up to the 1%-probability long-term flood elevation, but no more than 4 feet, and all space below grade is protected or recoverable (depending on use).	New construction or alterations where site flood protection measures are proposed.	Provides modest relief so that existing height limits do not discourage design that accounts for future flood projections.	No change – height remains limited by zoning standards even if buildings are elevated.

	<b>Topic</b>	<b>Recommendation</b>	<b>What would be affected?</b>	<b>How does this fit with other zoning?</b>	<b>What if this is not recommended?</b>
<b>3e</b>	Basement Flood Protection	Exempt basement area (stories below grade) from GFA limitations as-of-right, if protected from flooding below 1%-probability long-term flood elevation.	New construction or alterations where site flood protection measures are proposed.	Retains and expands current exemptions that encourage more intensive use of basement space but applies new standards to promote greater flood resilience.	No change – basements remain exempt as-of-right for single-family and two-family homes or by special permit for other uses without requirements for flood protection; or, change zoning to make usable basement space not exempt from GFA (as in pre-2016 zoning).

**Category 4: Strengthen Base Development Standards**

	Topic	Recommendation	What would be affected?	How does this fit with other zoning?	What if this is not recommended?
4a	Flood Protection Requirements	Require flood protection for all new construction if below 10% probability long-term flood elevations.	All new construction occurring on sites below the projected flood elevations. Alterations to non-conforming buildings would be allowed per Article 8.000, but some cases would require a special permit or variance.	Applied along with base zoning standards such as height, yard setbacks, and open space.	Retain current base zoning standards; or focus new standards on larger new construction and specific issues such as basements (see 2c, 3e); or remove zoning impediments (see Category 3) and use non-zoning approaches to encourage improvement on smaller lots.
4b	Cooling in Open Space	Amend Open Space standards (Section 5.22) to include prescriptive requirements (e.g., minimum vegetation, high-SRI paving) or minimum Cool Factor Score. Broaden Open Space requirements to non-residential zoning districts and/or use types.	All new construction. Alterations to non-conforming lots would be allowed per the provisions of Article 8.000, but some cases would require a special permit or variance.	Adjustments to current base zoning standards.	Retain current base zoning standards; or focus new standards on larger new construction and specific issues such as parking lots (see 4c); or remove zoning impediments (see Category 3) and use non-zoning approaches to encourage improvement on smaller lots.
4c	Cooling in Parking Lots	Amend parking lot landscaping standards (Section 6.48.1) to increase minimum landscaping and tree planting, require SRI paving, and/or require minimum Cool Factor Score.	All new or altered surface parking lots with 5 spaces or more.	Applied along with base zoning standards for surface parking lots.	Apply standards to development on all lots, not just surface parking (see 2d and 4b).

**Category 5: Future Study**

	<b>Topic</b>	<b>Recommendation</b>	<b>What would be affected?</b>	<b>How does this fit with CRZTF recommendations?</b>	<b>Considerations</b>
<b>5a</b>	Parking Requirements	Study removing minimum parking requirements to promote multiple environmental goals.	All development subject to Article 6.000.	Reducing the amount of required parking would free up lot area to be used for planted/permeable open space, tree planting, shade structures, and other resilient features.	Needs consideration of broader impacts on transportation and public resources.
<b>5b</b>	Revise with New Information	Revisit climate projections and recommendations from CCPR to determine if additional approaches should be considered.	Zoning amendments adopted from CRZTF recommendations.	Ensures that recommendations are consistent with the best available science.	Timeframe for revisions, e.g. approximately two years.
<b>5c</b>	Evaluate Impact of Zoning Changes	Study success in meeting Task Force principles/objectives, with a focus on climate resilience effects as well as impacts on housing production, historic preservation, and small business viability.	Zoning amendments adopted from CRZTF recommendations.	Ensures that recommendations are consistent with the best available science.	Timeframe for revisions, e.g. approximately five years.



## Appendix

### Principles and Factors to Guide Zoning Strategies

Principle	Factors
<p><b>1. Focus on people, communities, and equity</b></p>	<ul style="list-style-type: none"> <li>• Consider human needs in relation to the physical environment;</li> <li>• For residential development, focus on health, safety, and livability of people’s homes;</li> <li>• For commercial development, focus on economic impacts that broadly affect people’s lives;</li> <li>• Acknowledge the differing capacities for risk of people across the income spectrum;</li> <li>• Foster greater social connectiveness and mutual support.</li> </ul>
<p><b>2. Account for differentiation and choice</b></p>	<ul style="list-style-type: none"> <li>• <i>Differentiation</i>: Apply different strategies to different land use scenarios (e.g., new buildings can be elevated while elevating existing buildings or systems is more difficult; open space and tree plantings will have different effects in areas with different prevailing patterns of development);</li> <li>• <i>Choice</i>: Provide options to allow for economic choices (e.g., cost of floodproofing to withstand damage vs. cost of replacement; installation of structural sun-shading devices vs. green infrastructure).</li> </ul>
<p><b>3. Balance strategies to address new construction and existing development</b></p>	<ul style="list-style-type: none"> <li>• Target policies to new construction or existing development depending on how much of the population will be affected;</li> <li>• Evaluate what changes to existing buildings can reasonably be expected if they are incentivized and what changes are less likely to be feasible;</li> <li>• Assess implications of the recent trend toward more intensive use of basement space in existing buildings.</li> </ul>
<p><b>4. Use performance-based standards as well as prescriptive standards</b></p>	<ul style="list-style-type: none"> <li>• Adopt standards that allow for a range of possible solutions;</li> <li>• Set performance standards for larger development that undergoes a higher level of review;</li> <li>• Set prescriptive standards where they can be applied universally across a broad range of land use and development scenarios;</li> <li>• Use tested and established frameworks where possible (e.g., LEED resilience credits as a starting point);</li> <li>• Incorporate programmatic approaches (e.g., emergency preparedness plans) where practical.</li> </ul>

Principle	Factors
<p><b>5. Allow flexibility in changing circumstances</b></p>	<ul style="list-style-type: none"> <li>• <i>Incrementalism</i>: Promote present actions that can lead to future improvements (e.g., designing roofs to anticipate the future installation of green infrastructure), mindful of the balance of risks and costs;</li> <li>• <i>Ratcheting</i>: Modify standards to become more or less strenuous as climate projections and associated risks change over time;</li> <li>• <i>Learning</i>: Periodically review what strategies have worked, if desired outcomes are being achieved, and if changes are needed to achieve outcomes or adjust to new data;</li> <li>• <i>Patience</i>: Recognize that the built environment changes slowly so evaluating the effectiveness of zoning interventions requires time to see impacts and benefits unfold.</li> </ul>
<p><b>6. Support actions with co-benefits</b></p>	<ul style="list-style-type: none"> <li>• Implement strategies that mitigate both flooding and heat;</li> <li>• Prioritize strategies that have other benefits such as reduced energy demand (e.g., passive livability), improved water quality (e.g. increased pervious surface), air quality, open space, habitat, or recreation when possible;</li> <li>• Balance strategies that improve flooding and heat resilience with other city priorities.</li> </ul>
<p><b>7. Seek effectiveness</b></p>	<ul style="list-style-type: none"> <li>• Choose strategies that are the best suited to address the issue or impact;</li> <li>• Use zoning to complement non-zoning tools and other actions the City is undertaking (e.g. CCPR);</li> <li>• Affect enough sustainable development to have a meaningful impact on residents and the built environment;</li> <li>• Aim for benefits at the individual property, abutter, neighborhood and city scale that will exceed costs over the life of a structure.</li> </ul>
<p><b>8. Make decisions based on best available data and science</b></p>	<ul style="list-style-type: none"> <li>• Build a base of knowledge for future decision-making by continuing to collect and evaluate information about climate change and its impacts;</li> <li>• Plan for climate science to evolve and our understanding of impacts to become clearer with time;</li> <li>• Use forward-looking data, acknowledging uncertainties while anticipating that future climate conditions will be warmer and wetter.</li> </ul>

## Land Use and Development Objectives to Mitigate Flooding and Heat Impacts

### 1. Elevate and Floodproof

*Protect flood-sensitive uses such as residential units and critical building systems by elevating above future design flood elevations or dry floodproofing where below future design flood elevations*

### 2. Design to Recover

*Design buildings to withstand or recover from projected flooding (e.g. wet floodproofing, temporary barriers, water-resistant or replaceable materials)*

### 3. Green Infrastructure

*Use green infrastructure (e.g., swales, wetlands, green roofs) in addition to gray infrastructure (e.g. storage tanks) to manage stormwater on-site*

### 4. Preserve Vegetation

*Preserve existing vegetation (e.g. trees, ground cover, planted roofs)*

### 5. Create Vegetation

*Create new vegetated areas (e.g. trees, ground cover, planted roofs) and design so that plantings can thrive over time*

### 6. Limit Paved Areas

*Limit amount of paved area, increase permeable area*

### 7. Provide Shading

*Provide shade with trees or structural shading where trees are infeasible, especially over paved areas*

### 8. Use Reflective Surfaces

*Use solar-reflective surface materials for roofs, buildings, and paved surfaces to the extent possible*

### 9. Promote Passive Resilience

*Incorporate “passive resilience” features including high performance building envelope, shading, natural ventilation, and limit air leakage*

### 10. Shelter in Emergencies

*Provide spaces for sheltering and services during extreme events*

### 11. Create Emergency Plans

*Create emergency plans with protocols to implement during an extreme weather event, where practical*

### 12. Implement Area-Wide Strategies

*Achieve the above results across larger areas (e.g., protective berms, elevated infrastructure, larger-scale green infrastructure, pooled open space, neighborhood preparedness plans)*

### 13. Produce Co-Benefits

*Promote objectives with other environmental benefits, such as reducing energy demand, greenhouse gas emissions, and auto trip generation; and increasing renewable energy production*