

## **Climate Resilience Zoning Task Force**

### **Potential Range of Zoning Recommendations**

The potential recommendations on the following pages were assembled by CDD staff based on Task Force discussions thus far and follow from the “Resilience Objectives” that were articulated at past meetings (see summary in the Appendix). These conceptual approaches present a range of ways that the Task Force Objectives could be “plugged in” to the current structure of the Zoning Ordinance. Some of these approaches would work in concert with each other, but in other cases it would be advisable to not recommend some approaches if others are chosen. Staff will help to provide insight to the Task Force’s discussion at the next meeting.

The approaches are grouped into five categories, starting with how standards are defined, and then ranging from more permissive approaches to stricter requirements. With each potential recommendation is some commentary by staff on how the Task Force’s stated “Principles and Factors” relate to that approach (also summarized in the Appendix).

#### **Category 1: Define Standards for Flood Resilience and Heat Resilience**

The technical standards that would form the basis for any zoning requirements.

#### **Category 2: Incentivize Improvement by Reducing Impediments in Current Zoning**

Amending provisions in the Zoning Ordinance that present obstacles to achieving flood resilience and heat resilience.

#### **Category 3: Apply Standards through Project Review Special Permit**

Incorporating resilience-related criteria for large-scale projects reviewed by the Planning Board (generally, 50,000+ square feet).

#### **Category 4: Apply Standards through Building and Site Plan Requirements**

Incorporating resilience standards (performance and/or prescriptive) for development subject to higher-level administrative review (generally, 25,000+ square feet).

#### **Category 5: Apply Standards through Base Zoning**

Incorporating resilience standards (performance and/or prescriptive) to base-level zoning requirements applicable to all development.

The goal of the next discussion is for the Task Force to reach some initial consensus on which approaches are preferred, which are not preferred, and why. Through iterative discussion over the next two meetings, the approaches that are not preferred can be eliminated and the approaches that are preferred can be discussed and spelled out in more detail.

Ultimately, the goal is to come to consensus around a final set of recommendations that would describe, with as much specificity as possible, which zoning approaches are preferred by the Task Force. Based on these recommendations, staff would develop proposed zoning language, which would then be circulated back to the group for comment and discussion at a future time.

**Category 1: Define Standards for Flood Resilience and Heat Resilience**

	Potential Zoning Recommendation	Notes re: Task Force Principles
<b>1A</b>	<p>Define “<b>10%-Probability Long-Term Flood Elevation</b>” (10%-LTFE) and “<b>1%-Probability Long-Term Flood Elevation</b>” (1%-LTFE) based on 2070 (approx. 50-year) projections of annual flood risk due to precipitation, storm surge, or sea level rise, whichever is higher (see FloodViewer), subject to periodic review and updating.</p>	<ul style="list-style-type: none"> <li>▪ Standards based on best available data and science</li> <li>▪ Accounts for changing circumstances</li> <li>▪ 50-year projection is an effective timeframe for new buildings</li> </ul>
<b>1B</b>	<p>“<b>Flood Resilient</b>” means a building is entirely at or above both the 10%-LTFE and the 1%-LTFE, or if:</p> <p>(a) All building spaces are elevated above the 10%-LTFE or are protected such that flood waters cannot penetrate, except for shared lobbies and similar entry spaces designed to recover from flooding without permanent damage, AND</p> <p>(b) All residential sleeping areas and critical building facilities are elevated above the 1%-LTFE or are protected such that flood waters cannot penetrate.</p> <p><i>Alternative formulations:</i></p> <ul style="list-style-type: none"> <li>▪ What other types of uses/spaces could fall under the “protect under 10%-probability flood scenario” and “protect under 1%-probability flood scenario”?</li> </ul>	<ul style="list-style-type: none"> <li>▪ Standards based on best available data and science</li> <li>▪ Accounts for changing circumstances</li> <li>▪ Choice of using elevation or protection (“dry floodproofing”) to meet standard</li> </ul>
<b>1C</b>	<p>“<b>Heat Resilient</b>” means a site achieves its “Cool Target” using the “Cool Factor” system, which calculates a weighted score based on site features including preservation of mature trees, planting of new trees, ground-level vegetation, green roofs (or white roofs, at minimum), canopy shading, and use of high-solar-reflectivity paving materials.</p> <p><i>Alternative formulations:</i></p> <ul style="list-style-type: none"> <li>▪ “Cool Target” is determined based on the Open Space requirement in the zoning district, with a baseline minimum of 15%.</li> <li>▪ “Cool Target” is uniform across all zoning districts, but is greater for larger lots or development parcels.</li> <li>▪ “Cool Target” is uniform across all zoning districts, but varies by land use (e.g., higher target for residential vs. non-residential uses).</li> <li>▪ “Cool Target” is uniform across all zoning districts and all sites.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Standards based on best available data and science</li> <li>▪ Weighting system can be revisited to account for new knowledge and changing circumstances</li> <li>▪ Choice of using different approaches in different circumstances</li> <li>▪ Will require an effective system to ensure maintenance</li> <li>▪ Encourages co-benefits, including stormwater management and greening (which are subject to other regulations/standards), while focusing on heat mitigation</li> <li>▪ Establishes a performance-based standard that complements prescriptive standards</li> </ul>

**Category 2: Incentivize Improvement by Reducing Impediments in Current Zoning**

	Potential Zoning Recommendation	Notes re: Task Force Principles
<b>2A</b>	<p><b>Open areas (parking, entryways, porches) covered by shade canopy:</b> Exclude from Gross Floor Area and yard (setback) limitations.</p> <ul style="list-style-type: none"> <li>▪ <i>Alternative:</i> Also exclude from height limitations, when placed on a roof.</li> <li>▪ <i>Alternative:</i> Possibly require high-SRI or solar panel surface.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Can apply to both new and existing development</li> <li>▪ Incentive approach gives flexibility and choice</li> <li>▪ Supports conformance with performance-based standards</li> <li>▪ Potential co-benefit of encouraging solar</li> </ul>
<b>2B</b>	<p><b>Elevated access:</b> Ensure that stairs/ramps in front setbacks can be allowed as-of-right for Flood Resilient buildings.</p>	<ul style="list-style-type: none"> <li>▪ Supports accessibility/safety for people</li> <li>▪ Can apply to both new and existing development</li> <li>▪ Incentive approach gives flexibility and choice</li> <li>▪ Supports conformance with performance-based standards</li> </ul>
<b>2C</b>	<p><b>Functional Green Roof Area:</b> Exclude from Gross Floor Area and height limitations as-of-right in all cases. (Currently requires a special permit if it is intended for use and enjoyment of occupants, to ensure ongoing viability.)</p> <ul style="list-style-type: none"> <li>▪ Possibly require administrative review of a planting/maintenance plan.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Can apply to both new and existing development</li> <li>▪ Incentive approach gives flexibility and choice</li> <li>▪ Supports conformance with performance-based standards</li> <li>▪ Cooling benefit for building occupants and public</li> <li>▪ Will require an effective system to ensure maintenance</li> </ul>
<b>2D</b>	<p><b>Headhouses for accessing usable roof space:</b> Exclude from height limitations (with limitations on total area).</p> <ul style="list-style-type: none"> <li>▪ <i>Alternative:</i> Allow relief only where a functional green roof is provided.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Supports accessibility/safety for people</li> <li>▪ Can apply to both new and existing development</li> <li>▪ Incentive approach gives flexibility and choice</li> <li>▪ Cooling benefit for building occupants and public</li> </ul>
<b>2E</b>	<p><b>Basements:</b> Allow exclusion from Gross Floor Area limitations if the building is certified to be Flood Resilient. (Currently, this exclusion requires a special permit in multifamily and non-residential buildings; no flood resilience standards apply.)</p>	<ul style="list-style-type: none"> <li>▪ Can apply to both new and existing development</li> <li>▪ Incentive approach gives flexibility and choice</li> <li>▪ Supports conformance with performance-based standards</li> <li>▪ Co-benefit of living space for homeowners/occupants</li> </ul>
<b>2F</b>	<p><b>Height:</b> Allow a compensating building height increase (within limitations) where the ground floor of the building is raised to meet Flood Resilience standards.</p>	<ul style="list-style-type: none"> <li>▪ Can apply to both new and existing development</li> <li>▪ Incentive approach gives flexibility and choice</li> <li>▪ Supports conformance with performance-based standards</li> </ul>

**Category 3: Apply Standards through Project Review Special Permit (50,000+ SF, Planning Board approval)**

	Potential Zoning Recommendation	Notes re: Task Force Principles
<b>3A</b>	<p><b>Require Resilience Narrative</b> in Section 19.20 Project Review Special Permit Requirements:</p> <ul style="list-style-type: none"> <li>▪ Analysis of long-term flood and heat projections based on CCVA (as it may be updated with new data). Specifically include 10%-LTFE and 1%-LTFE projections as well as temperature projections.</li> <li>▪ Detailed description of mitigating measures, including flood-protective design features, passive survivability, shading and other design features to reduce heat inside and outside of the building (including on public realm), recovery plans, emergency management plans.</li> <li>▪ Cool Factor materials.</li> <li>▪ <i>OTHER?</i></li> </ul>	<ul style="list-style-type: none"> <li>▪ Would cover most new development (by square footage), but little existing development</li> <li>▪ Maximum flexibility to account for site-by-site differentiation and choice in approaches</li> <li>▪ Requires significant work from developer, which is more burdensome on smaller projects and less well-funded developers</li> <li>▪ Limited number of cases allows for more effective application/enforcement</li> <li>▪ Narrative would be based on most up-to-date science</li> </ul>
<b>3B</b>	<p><b>Include Resilience Objectives</b> in Section 19.30 Citywide Urban Design Objectives:</p> <ul style="list-style-type: none"> <li>▪ Create a new “Objective” (i.e., component of Planning Board review criteria): “Buildings and sites are designed to be resilient to increased risks from flooding and heat.”</li> <li>▪ Indicators would include: <ul style="list-style-type: none"> <li>○ Meeting “Flood Resilient” standard by applying flood-resistant design approaches</li> <li>○ Meeting “Heat Resilient” standard through shading and other design features to reduce heat inside and outside of the building (Cool Factor system applied as a guideline)</li> <li>○ Passive survivability</li> <li>○ Recovery plans</li> <li>○ Emergency management plans</li> <li>○ <i>OTHER?</i></li> </ul> </li> <li>▪ <i>Alternatives:</i> Differentiate among different land uses (residential, commercial, other).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Would cover most new development (by square footage), but little existing development</li> <li>▪ Maximum flexibility to account for site-by-site differentiation and choice in approaches</li> <li>▪ Allows for effective, holistic consideration of both zoning-related issues (site design, building design) and programmatic issues (recovery planning, emergency response)</li> <li>▪ Limited number of cases allows for more effective application/enforcement</li> <li>▪ Co-benefits and tradeoffs (e.g., greenhouse gas emission goals, urban design goals) can be evaluated through site-specific review</li> </ul>

**Category 4: Apply Standards through Building and Site Plan Requirements (25,000+ SF, administrative review, modification by special permit)**

	Potential Zoning Recommendation	Notes re: Task Force Principles
<b>4A</b>	<p><b>Include Flood Resilience Performance Requirement (Section 19.50):</b></p> <ul style="list-style-type: none"> <li>▪ New development would be subject to administrative review/certification for conformance with Flood Resilient standard.</li> <li>▪ Existing buildings could not be altered to make them less conforming to standards than existing conditions.</li> <li>▪ Planning Board may approve modifications by special permit.</li> <li>▪ <i>Alternatives:</i> Differentiate among different land uses (residential, commercial, other).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Would cover most new development (by square footage), but little existing development</li> <li>▪ Performance-based (but more standardized than Project Review Special Permit)</li> <li>▪ Modifications allow flexibility for some site-specific differentiation</li> <li>▪ Limited number of cases allows for more effective application/enforcement</li> </ul>
<b>4B</b>	<p><b>Include Heat Resilience Performance Requirement (Section 19.50):</b></p> <ul style="list-style-type: none"> <li>▪ New development would be subject to administrative review/certification for meeting Heat Resilient standard.</li> <li>▪ Existing sites could not be altered to make them less conforming to standards than existing conditions.</li> <li>▪ Planning Board may approve modifications by special permit.</li> <li>▪ <i>Alternative:</i> Provisions could be included to meet the requirement across multiple lots (i.e., “transfer of Cool Factor Score”) to provide more contiguous planted area and/or provide greater cooling in priority areas; possibly with special permit review.</li> <li>▪ <i>Alternative:</i> In cases of substantial alteration/change of use, consider a “Cool Score Improvement” requirement.</li> <li>▪ <i>Alternatives:</i> Differentiate among different land uses (residential, commercial, other).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Would cover most new development (by square footage), but little existing development</li> <li>▪ Performance-based (but more standardized than Project Review Special Permit)</li> <li>▪ Modifications allow flexibility for some site-specific differentiation</li> <li>▪ Limited number of cases allows for more effective application/enforcement</li> <li>▪ Co-benefits with open space, urban design, stormwater management (which are subject to other regulations)</li> </ul>
<b>4C</b>	<p><b>Include Prescriptive Heat Resilience Requirements:</b> Possibilities include:</p> <ul style="list-style-type: none"> <li>▪ Adding minimum tree planting to front yard landscaping requirements (Section 19.55)</li> <li>▪ Increasing vegetation standards in open space requirements (Section 19.59 – current requirement is 15% minimum lot area devoted to Green Area or Permeable open space)</li> <li>▪ Requiring shading of paved areas and/or high-SRI materials.</li> <li>▪ Planning Board may approve modifications by special permit.</li> <li>▪ <i>Alternatives:</i> Differentiate among different land uses (residential, commercial, other).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Would cover most new development (by square footage), but little existing development</li> <li>▪ Prescriptive, standardized approach</li> <li>▪ Modifications allow flexibility for some site-specific differentiation</li> <li>▪ Limited number of cases allows for more effective application/enforcement</li> <li>▪ Co-benefits with stormwater management (which are subject to other regulations)</li> <li>▪ Would need to align with other prescriptive standards for open space, landscaping, urban design</li> </ul>

**Category 5: Apply Standards through Base Zoning**

	Potential Zoning Recommendation	Notes re: Task Force Principles
<p><b>5A</b></p>	<p><b>Add Flood Resilience Requirement to Base Zoning (Article 5.000):</b></p> <ul style="list-style-type: none"> <li>▪ All new construction required to be Flood Resilient with administrative certification.</li> <li>▪ Existing buildings could not be altered to make them less conforming to standards than existing conditions.</li> <li>▪ <i>Alternatives:</i> Establish an overlay district similar to Flood Plain Overlay District, with specific boundaries subject to periodic change. Consider what areas to include. (Note that 1%-LTFE currently covers many non-contiguous parts of the city in most neighborhoods, not only Alewife.)</li> <li>▪ <i>Alternatives:</i> Differentiate among different land uses (residential, commercial, other).</li> <li>▪ <i>Alternatives:</i> Modifications could be allowed by special permit, otherwise would require a variance.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Would (potentially) cover all new development and significant alterations to existing development</li> <li>▪ Performance-based, standardized with less flexibility</li> <li>▪ Differentiation more difficult across broader range of sites, development types, and zoning districts</li> <li>▪ Possible conflict with other development standards, unless there are modifications (e.g., height, setbacks)</li> <li>▪ Large number of cases limits effectiveness of application/enforcement</li> <li>▪ May be more burdensome on smaller property owners</li> </ul>
<p><b>5B</b></p>	<p><b>Incorporate Heat Resilience Performance Standards (Cool Factor) in Base Zoning:</b></p> <ul style="list-style-type: none"> <li>▪ In addition to current open space requirements in Section 5.22 (e.g., 50% usable, 50% permeable), open space would be required to meet Cool Factor performance standard.</li> <li>▪ Standards for parking lot landscaping (Section 6.48.1) could also incorporate Cool Factor standard.</li> <li>▪ <i>Alternatives:</i> Only apply in selected areas of the city.</li> <li>▪ <i>Alternatives:</i> Differentiate among different land uses (residential, commercial, other).</li> <li>▪ <i>Alternatives:</i> Modifications could be allowed by special permit, otherwise would require a variance.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Would (potentially) cover all new development and significant alterations to existing development</li> <li>▪ Performance-based, standardized with less flexibility</li> <li>▪ Differentiation more difficult across broader range of sites, development types, and zoning districts</li> <li>▪ Possible conflict with other development standards, unless there are modifications (e.g., FAR, setbacks, minimum parking)</li> <li>▪ Large number of cases limits effectiveness of application/enforcement</li> <li>▪ May be more burdensome on smaller property owners</li> </ul>

*Category 5 recommendations continue on the next page*

**Category 5: Apply Standards through Base Zoning (continued)**

	Potential Zoning Recommendation	Notes re: Task Force Principles
5C	<p><b>Incorporate Heat Resilience Prescriptive Standards in Base Zoning:</b></p> <ul style="list-style-type: none"> <li>▪ In addition to current open space requirements in Section 5.22 (e.g., 50% usable, 50% permeable), open space would be required to meet other prescriptive standards such as minimum tree planting, vegetation, shading of paved area and/or high-SRI surface.</li> <li>▪ Standards for parking lot landscaping (Section 6.48.1) could be modified to increase planting requirements, shade canopies, &amp;c.</li> <li>▪ <i>Alternatives:</i> Modifications could be allowed by special permit, otherwise would require a variance.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Would (potentially) cover all new development and significant alterations to existing development</li> <li>▪ Prescriptive and standardized with less flexibility</li> <li>▪ Differentiation more difficult across broader range of sites, development types, and zoning districts</li> <li>▪ Possible conflict with other development standards, unless there are modifications (e.g., FAR, setbacks, minimum parking)</li> <li>▪ Large number of cases limits effectiveness of application/enforcement</li> <li>▪ May be more burdensome on smaller property owners</li> </ul>

## 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>
<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>

## Appendix

### 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*