CAMBRIDGE GREEN BUILDING/ZONING TASK FORCE

RECOMMENDATIONS

November 2009

SUBMITTED TO:

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Richard C. Rossi, Deputy City Manager

GREEN BUILDING/ZONING TASK FORCE

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1. MISSION & GOALS

The Green Building/Zoning Task Force was appointed by the City Manager in April 2008 to work with City staff and analyze various approaches and to encourage energy efficient building practices. Key issues studied include adopting green building requirements such as LEED criteria for large scale developments, approach to green roofs, wind turbines, solar access, and identifying and addressing any impediments to building green in the zoning ordinance.

Task Force members represent diverse perspectives and include architects, residential owners, developers, solar installers, and representatives of advocacy groups, local universities, the Cambridge Planning Board, and City staff. The Task Force, which met monthly from April 2008 – May 2009, adopted the following mission and goals to guide their work:

"The Green Building/Zoning Task Force will develop recommendations for the City Manager on regulations and policies to encourage sustainable design in construction and sustainable practices that are integrated into our community, with the goal of reducing greenhouse gas emissions from buildings and furthering the goals established in the Cambridge Climate Action Plan. The Task Force will encourage the City to maintain its position as a leader in such practices and to serve as a model to other communities."

This mission translates into the following broad goals:

1. Propose a green building policy that significantly reduces the carbon footprint/greenhouse gas contribution from new development and significant rehab of existing buildings in Cambridge.
2. Promote development that creates healthy indoor environments and designs for energy efficiency and water efficiency as well as efficient site planning and resource efficient building materials, that result in financial benefits for owners and tenants in addition to the helping the broader environment.
3. Advance measures that improve the waste stream through reduction of construction waste and appropriate recycling of construction waste materials.
4. Create green standards that are sensitive to cost considerations and are fairly and equitably applied.
5. Identify non-regulatory tools and resources to encourage and support green design and construction in smaller projects.
6. Evaluate measures to encourage and protect solar and other renewable on-site energy systems; evaluate innovations that address the urban heat island effect such as green roofs, cool roofs, and rain gardens.
7. Formulate an education strategy to provide information about city, state, and federal programs to encourage green design and energy efficiency.
8. Investigate resources to achieve the mission described above.

This report is a compilation of the recommendations of the Green Building/Zoning Task Force addressing their principal charge. The Task Force is interested in reconvening in Winter 2009/2010 to think further about non-zoning recommendations that would support and provide incentives for sustainable building design and energy efficiency, particularly in buildings not subject to the recommended green building standards.

2. RECOMMENDATIONS

The Green Building Zoning/Task Force is forwarding the following recommendation to the City Manager to address the charge assigned to the Task Force by the City Manager and the City Council in April 2008: to propose green building requirements, such as LEED criteria for large scale developments, approach to green roofs, wind turbines, solar access, and identifying and addressing any impediments to building green in the zoning ordinance.

In instances where environmental goals have an impact on other zoning goals such as managing heights and bulk of buildings, and maintaining trees open space, the Task Force has attempted to retain a broad perspective and find the appropriate balance among competing goals. We urge consideration of the recommendations identified in the following pages to strengthen Cambridge's green building and climate protection endeavors and to affect change that is urgently needed.

I. GREEN BUILDING STANDARDS FOR LARGE DEVELOPMENT /LEED

Buildings are responsible for over 80% of the energy use and greenhouse gas emissions in Cambridge. The Task Force recommends use of LEED criteria for greening the design of large development. The topic of appropriate criteria to reference was discussed at a number of meetings. Leadership in Energy and Environmental Design (LEED) green building was selected by the majority of the Task Force members due to its wide acceptance in the marketplace and expertise in applying LEED criteria among design, engineering, and construction professionals.

RECOMMENDATION:
The proposed provision would do the following:

- Apply to new construction and rehab projects that require a special permit or development consultation.
- Require that projects meet the LEED certification criteria at the level noted. Formal certification from US Green Building Council (USGBC)/ Green Building Certification Institute (GBCI) would not be required.
- Reference the most current version of the appropriate LEED building rating system, with a twelve month phase-in period for new versions of LEED from the time of adoption by USGBC.
- Provide for review of the Ordinance after 4 years with a staff report to Planning Board every two years. Review may include a look at adopting an alternative rating system/standard in place of, or in addition to, LEED, if warranted.

Project	Requirement
GFA of 50,000 sq. ft. and greater and requiring a special permit	LEED Certifiable at the 'Silver' level
GFA of 25,000 – 50,000 sq. ft. and requiring a special permit or building and site plan review	LEED Certifiable
Less than 25,000 sq. ft.	Education/information on sustainable planning, design, and construction techniques, appropriate materials, and incentives available through state, city, utilities, and other sources

Submission Requirements:

- **At Special Permit or Development Consultation application:** A completed LEED checklist for appropriate current LEED building standard with a brief narrative on mechanisms proposed to achieve each of the credits and prerequisites. Signoff by either a LEED-AP project manager or appropriate consultants saying that to the best of their knowledge, the project has been designed to achieve the credit requirement.
- **At Building permit application:** Updated LEED checklist, narrative, and signoff. Highlight design changes, if any, and further detail where appropriate.
- **At Certificate of Occupancy application:** Final LEED checklist with updated narrative and signoff saying that to the best of their knowledge, the project has been designed and constructed to achieve the credit requirement.

NON-ZONING RECOMMENDATIONS:

In addition to the LEED requirements for large buildings, the Task Force also recommends that:

- The City provide **information on the Cambridge Energy Alliance** to all proponents along with building permit and special permit application materials.
- The City work to provide **public information on available sources of funding and technical assistance** for energy efficiency and green building.
- The City work towards **adoption of the 'Stretch' Energy Code**. The 'Stretch' Code, Appendix 120.AA of 780 CMR, was adopted by the Massachusetts Board of Building Regulations and Standards in April 2009 and provides an alternative, stronger energy code that cities may choose to adopt instead of the 'base' code.
- The City work on ways to **recognize exemplary green buildings.**

II. GREEN ROOFS

Green roofs can provide many environmental benefits, such as reducing stormwater runoff, mitigating the urban heat island effect, and reducing cooling needs. In the current zoning ordinance, roofs with access (including green roofs) are considered usable gross floor area (GFA).

RECOMMENDATION:

- **Create zoning definition for *Functional Green Roof Area***: Rooftop space that is surfaced with soil and plant materials to retain rainwater and is not usable for recreational access. **Exclude Functional Green Roof Area from the calculation of GFA** even when access to the rooftop is provided (access to a rooftop currently triggers the roof area being included in the GFA calculation above the third floor).
- Functional Green Roof Area that is designed to be usable may be exempted from the calculation of GFA by a Special Permit from the Planning Board.
- When a roof contains Functional Green Roof Area, **allow additional accessible and usable rooftop space, such as a roof deck, to be exempt from the calculation of GFA by special permit in low density residential districts** (A-1, A-2, B, C, C-1) and **as-of-right in non-residential and high-density residential districts** (C-1A, C-2, C-2A, C-2B, C-3, C-3A, C-3B).
  The exempted usable rooftop space must meet the following conditions:
  - The area of exempted usable rooftop space must be no more than 15% of the Functional Green Roof Area in size, and
  - The usable space must be set back at least 10 feet from the roof edge.

III. IMPEDIMENTS TO BUILDING GREEN IN THE ZONING ORDINANCE

The Task Force reviewed issues in the Zoning Ordinance that may inadvertently discourage incorporation of sustainable elements in building design. These are discussed below.

A. DOUBLE-SKIN FAÇADES

Double-skin façades can reduce a building's energy consumption and improve indoor environmental quality. Under the current zoning ordinance, the space between the inner and outer layers of such a façade counts as usable gross floor area (GFA).

RECOMMENDATION:

- **Create a zoning definition for *Double-Skin Façade***: A multilayer exterior wall system comprising a solid external wall, a solid internal wall, and a ventilated intermediate air space, intended to improve insulation and reduce solar heat gain.
- **Exclude the air space between solid wall segments of a Double-Skin Façade** from the calculation of GFA, provided that the space is no more than 1 foot in depth and is not intended to be accessible by building occupants except for maintenance purposes.

- In instances where a double skin façade is designed to be accessible by building occupants and the space between solid wall segments is greater than 1 foot, a special permit may be granted to permit 1 foot of the space between the wall segments to be exempt from the calculation of GFA.
- The building must still **conform to the district setback regulations.**

B. ADDITIONAL EXTERIOR WALL INSULATION

Adding insulation to the exterior of an existing building and using a greater thickness of insulation in new buildings can reduce a building's energy usage, but also adds to the calculated gross floor area (GFA) of a building without increasing the amount of usable floor space.

RECOMMENDATION:

- Refine the zoning definition of GFA to include **only the first 6 inches** of the thickness of an exterior wall (a typical thickness for an exterior wall with minimal insulation).
- Where insulation is being added to an **existing building**, the new wall **may protrude up to 4 inches into the required setback.** New buildings must conform to the district setback regulations. Fire code requirements for setback would still apply.
- Provide information to property owners of historical buildings on ways to improve energy efficiency while maintaining historical character such as siding and windows. Projects in designated Historic Districts and Neighborhood Conservation Districts would continue to require approval from the Cambridge Historical Commission or Neighborhood Conservation District Commission, as appropriate.

C. PERGOLAS

As an outdoor feature adjacent to a building or in a yard, a pergola can provide environmental benefits through shade, greenery, and improving the livability of the outdoor environment. When built over an existing paved parking area, a pergola can help reduce the heat island effect. Pergolas are not clearly defined in the zoning ordinance, and as a result the area underneath them is in some cases counted as usable gross floor area (GFA).

RECOMMENDATION:

- **Create a zoning definition for *Pergola***: A permeable outdoor structure comprising a series of unroofed beams and lattices open to the sky on which planted material may grow, which is at least 50% open across any horizontal or vertical surface. Primary parallel members of a pergola lattice must be at least 36" apart. Intervening secondary members (no larger than 1 inch x 2 inches) may be allowed.
- **Exclude** area underneath a Pergola **from the calculation of GFA**.

D. OVERHANGS, EAVES AND AWNINGS

Overhanging elements that shade the side of a building can provide passive solar cooling, reducing the demand for mechanical cooling within the building. In some cases, the space under these overhangs is counted as gross floor area (GFA).

RECOMMENDATION:
Exclude the area underneath a temporary or permanent exterior overhang or awning **from the calculation of GFA**, provided that:

- The overhang or awning must not extend more than 3 feet from the face of the exterior wall above which it is located.
- Area under the overhang or awning must be permeable, except for pathways providing access to a building entrance.

E. "NON-TRADITIONAL" MECHANICAL SYSTEMS

The Zoning Ordinance currently excludes basement, attic and rooftop mechanical spaces that are necessary for a building's operation from the definition of gross floor area (GFA). These include rooms for heating and cooling equipment, electrical and telephone facilities, and fuel storage. While most sustainable mechanical systems would also be excluded from a building's GFA, in some cases where equipment is not considered necessary for a building's operation, the zoning ordinance may not specify whether such equipment should be excluded.

RECOMMENDATION:
Clarify in the zoning ordinance that sustainable mechanical systems and related equipment and chases for systems including, but not limited to, solar energy systems, geothermal systems and heat pumps, solar hot water systems and related tubes and tanks, equipment related to radiant heating, hydronic cooling, heat recovery ventilators, energy recovery ventilators, and should be treated as mechanical systems and be excluded from the calculation of GFA. Space that continues to be usable after the inclusion of these systems will still count towards GFA.

IV. SOLAR ENERGY SYSTEMS

Protection of access to sunlight for solar energy systems is needed once they are installed.

RECOMMENDATION:
FOR ALL DEVELOPMENT PROJECTS
As-of-right Projects

Projects are encouraged to minimize negative shadow impacts from proposed development and tree planting on neighboring solar energy systems through good site planning and building design.

Special Permits and Variances

Special permit and variance considerations would include consideration of a project's impacts on neighboring solar energy systems that are:

- located 5 feet below the district height limit or higher ; and
- are on a list of solar energy systems (to be created at the Inspectional Services Department) as having received a building permit for solar energy system a year or more prior to the time of application

Projects would be asked to refer to the City's list of renewable energy systems and describe new shadow impacts, if any, that would be created as a result of the proposed development (both building and landscaping). Shadow impacts would be evaluated for December 21 during the hours of 10:00 am – 2:00 pm.

FOR PROJECTS PROPOSING SOLAR ENERGY SYSTEMS

- Building mounted solar energy systems would be included as mechanical equipment in the zoning ordinance and would not be subject to FAR and height restrictions. This includes solar photovoltaics, solar thermal systems, and solar hot water systems.
- Installation of all solar systems would require a building permit and information of address and date of permit will be noted on a list of solar energy system permits.
- Solar systems should be located and designed keeping in mind existing and potential future as-of-right development on adjacent parcels.

V. WIND TURBINES (Adopted by City Council, September 2009)

Currently, wind turbines are not explicitly allowed in the ordinance, so any wind turbine installation requires a zoning variance.

PROPOSAL:

In crafting this recommendation the Task Force has attempted to balance allowing wind turbines in the city, for their potential energy and environmental benefits, with potential impacts such as noise, shadow, and visual impacts in the neighborhood.

A two pronged approach is proposed:

1) **Wind turbines, both building mounted and free standing, would be allowed throughout the city by special permit.** A special permit approach, with case by case review by the Planning Board, is recommended, as opposed to an as-of-right approach, since the viability and impacts of small wind turbines in urban contexts have not been studied in much detail and urban wind technology is evolving at a quick pace. The special permit criteria would require proponents to describe shadow, noise, vibration, visual impacts to ensure there are not undue consequences for the neighborhood.

2) **Small building-mounted wind turbines would be allowed <u>as of right</u> in limited circumstances, when utilized for educational and research purposes and when located well removed from residential abutters.** It is expected that this provision would allow local institutions (such as Harvard, MIT, Museum of Science) to study the efficacy and impacts of wind turbines and advance the technology, particularly to cater to urban settings.

SPECIAL PERMIT

Applicability	• Building-mounted and free-standing wind turbines • Citywide
Special Permit Criteria	• Visual impacts on neighboring properties should be considered in wind turbine siting and selection. Turbines should not detract from neighborhood character. *Considerations*: Size, scale, and bulk of turbines in relation to the scale of the neighborhood; impact on significant viewsheds; adjacent land use; sensitivity and character of abutting buildings, particularly historical structures. • Turbines should be sited to minimize constant and intermittent shadow impacts on neighboring uses. *Considerations*: extent of shadow; frequency and duration of intermittent shadow. • Proposals in Open Space districts should receive special attention to minimize detrimental impact on the natural environment and recreational use. • Equipment should be selected, sited, and mounted to minimize noise and vibration impacts on neighboring uses. • The Planning Board may establish time limits on special permits.
Application Materials	• Plans and elevations; number, type, and size of wind turbines. • Images to demonstrate how the proposed turbines would fit in the surrounding context. • Narrative and visuals to describe equipment selection; noise rating; measures to minimize impacts on adjacent properties, if any. • Description of how laydown for maintenance is accommodated within the site and demonstration of how the wind turbine is secured if a parapet mounted turbine overhangs the public way. • Planning Board may request a shadow study and/or flicker (intermittent shadow) study.
Requirements	• Equipment shall comply with building setbacks on the parcel unless waived by the Planning Board. In districts with formula setbacks, the height of a building-mounted turbine shall not be considered when computing the setback. Height of a ground-mounted turbine shall be used to compute the setback for the turbine in these districts. • Only instrumentation related to the turbine, energy generation, and wind energy monitoring are permitted. Wind turbines may not be used to mount cellular/mobile phone equipment. • Wind turbines may not be used for signage or for display of advertising except for standard, unobtrusive identification of the manufacturer. • Wind turbines may be lighted only if required for safety by local, state, or federal regulation. Any lighting shall be shielded from abutting residential properties.

	• Brightly colored turbines are generally not encouraged unless permitted by the Planning Board or required by Federal Aviation Administration or safety considerations. • Installations on a site must be rated to meet the requirements of the Cambridge Noise Ordinance, cumulatively, for all turbines and mechanical equipment on the site. • Turbines must be sited so that laydown for maintenance occurs within the property, not on adjacent lots or on the public way.
Power capacity	• Commercial power generation facilities will not be permitted in residential districts. Turbines in residential districts must be of residential scale capacity. • A cooperative facility serving multiple adjacent properties may be permitted. • Turbines may send excess power to the grid consistent with netmetering provisions.
Safety	• Turbines should be located and designed to prevent unauthorized access. • Equipment that is non-functioning or abandoned for two years or more must be removed. If not removed by the owner, the City has the right to remove abandoned equipment at the owner's expense.

AS OF RIGHT

Applicability	• Building-mounted wind turbines only. • In Res C 3, C 3-A, C 3-B, and SD-6 zoning districts. • For research and educational purpose and accessory to educational uses only. • Equipment may be placed as of right on existing, non-conforming buildings as long as the placement meets height, setback, and other requirements noted below. • Temporary installations up to two years; renewable.
Height	• Wind turbines may be up to 40 feet over the building height, measured to the highest point of the turbine.
Setback	• 200 feet from the nearest residential use (not including dormitories owned by the educational institution and hotels or other transient accommodations as defined in the zoning ordinance). • Setbacks from the parcel line adjacent to a public right of way or non-residential use not owned by the educational institution will be as follows: Turbine height — Setback < 10' — no setback required 10' - 20' — 25' setback > 20' — 50' setback
Time	• Turbines shall be permitted for two years, which may be extended by a request to the Building Department.
Requirements	• Wind energy equipment shall comply with building setbacks on the parcel. In districts with formula setbacks, the height of a building-mounted turbine shall not be considered when computing the setback. • Only instrumentation related to the turbine, energy generation, and wind energy monitoring are permitted. Wind turbines may not be used to mount cellular/mobile phone equipment. • Wind turbines may not be used for signage or for display of advertising except for

	standard, unobtrusive identification of the manufacturer. • Wind turbines may be lighted only if required for safety by local, state, or federal regulation. Any lighting shall be shielded from abutting residential properties. • Brightly colored turbines may not be permitted unless required by the Federal Aviation Administration or safety considerations. • Wind turbine installations on a site must be rated to meet the requirements of the Cambridge Noise Ordinance, cumulatively, for all turbines and mechanical equipment on the site. • Turbines must be sited so that laydown for maintenance occurs within the property, not on adjacent lots or on the public way.
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