***A. Create a new Article to consolidate the green zoning elements. Delete Sec 11.40 and move the zoning text for Wind Turbine Systems, to the newly created Sec 22.70.***

# ARTICLE 22.000 SUSTAINABLE DESIGN AND DEVELOPMENT

**22.10 INTENT AND PURPOSE**
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## 22.10 INTENT AND PURPOSE

It is the intent of this Article 22.000 to promote environmentally sustainable and energy-efficient design and development practices in new construction and renovation of buildings in the city. Some of the regulations in this Article include design standards that shall be applied to new construction and renovation projects of a significant size. Other regulations in this Article modify regulations found elsewhere in this Zoning Ordinance in order to encourage the incorporation of specific design features that will improve the sustainability and energy-efficiency of buildings.

## 22.20 GREEN BUILDING REQUIREMENTS

**22.21 Statement of Purpose.** This Section 22.20 is adopted to ensure that major new projects and substantially rehabilitated buildings in the City of Cambridge are planned, designed and constructed in a sustainable way so as to minimize adverse environmental impacts as they are initially constructed and as they are occupied and operated over the course of their useful lives. It is the purpose of this Section 22.20 to encourage the reuse of existing buildings and materials; to encourage the conservation of natural resources and reduction of toxins in new construction and substantial rehabilitation of existing buildings through selection of recycled and otherwise environmentally appropriate building materials and methods; to ensure a reduction in the use of energy in both the initial construction of the project and in its daily operation; and to encourage an arrangement of buildings and mix of uses, on individual lots and within the city as a whole, that will foster pedestrian, bicycle, and public transit use in the city. While the provisions of this section apply to projects of 25,000 square feet or larger, developments of all sizes are encouraged to incorporate sustainable design principles. Notwithstanding the provisions of this Article 22.00, the requirements of all local, state and/or federal regulations applicable to a project must be met, particularly the State Building Code, including its energy components.

**22.22 Applicability.** Any new construction, or any substantial rehabilitation of an existing building for an existing or new use, that totals 25,000 square feet of Gross Floor Area or more and that (1) requires the issuance of a special permit under any provision of this Zoning Ordinance (including but not limited to special permits required in Article 13.000 – Planned Unit Development Districts,

Section 19.20 – Project Review Special Permit, and Section 5.28.2 – Conversion of Non-Residential Structures to Residential Use) or (2) is subject to the provisions of Section 19.50 – Building and Site Plan Requirements, shall be subject to the requirements of this Section 22.20.

**22.23 Requirement.** LEED, when used in this Section 22.20, refers to the Leadership in Energy and Environmental Design Green Building Rating System as developed and revised from time to time by the United States Green Building Council (USGBC).

1. *For construction of at least 25,000 square feet of gross floor area but less than 50,000 square feet.*

Such projects, for which a Special Permit application or Building and Site Plan Review application is submitted on or after October 1, 2009, shall be required to meet the requirements of the most current applicable LEED building rating system at the level 'Certified' or better.

2. *For construction of 50,000 square feet or more of gross floor area.*

Such projects, for which a Special Permit application or Development Consultation application is submitted on or after October 1, 2009, shall be required to meet the requirements of the most current applicable LEED building rating system at the level 'Silver' or better.

There shall be a period of twelve months from the time of adoption of a new version of LEED, during which projects shall have the option to file under either the old or newly-adopted version.

**22.24 Procedures.** Any project subject to this Section 22.20 shall comply with the following procedural requirements.

1. *Special Permit Application or Section 19.50 Compliance Documentation.*
As an element of the application or documentation, the applicant shall submit a completed LEED Project Checklist for the appropriate LEED building standard to demonstrate how the project is anticipated to meet the requirement of Section 22.23 above. The Checklist shall be accompanied by a brief narrative indicating the mechanisms proposed to achieve each of the credits and prerequisites and demonstrating the anticipated methods by which compliance with the requirements of this Section will be achieved at the time of construction of the authorized project. The checklist and narrative shall be accompanied by an affidavit by a LEED-Accredited Professional (LEED-AP) Project Manager or by appropriate consultants stating that to the best of their knowledge, the project has been designed to achieve the requirements of Section 22.23 above.

2. *The following requirements shall apply to all development subject to this Section 22.20:*

a. Prior to the issuance of the first Building Permit for each authorized building.

(1) Submittal of an updated LEED checklist and narrative description outlining compliance with the certification level required by Section 22.23 above to the Inspectional Services Department (ISD) and the Community Development Department (CDD). The narrative shall highlight any design changes made subsequent to the Development Consultation or granting of the Special Permit.

(2) The checklist and narrative shall be accompanied by an affidavit by a LEED-AP Project Manager or appropriate consultants stating that to the best of their knowledge, the project has been designed to achieve the stated credit requirements.

b. Prior to issuance of the first Certificate of Occupancy for each authorized building.

(1) Submittal of a final LEED checklist and narrative description indicating in detail how the requirements of this Section 22.20 have been met to the Inspectional Services Department (ISD) and the Community Development Department (CDD).

(2) The checklist and narrative shall be accompanied by an affidavit by a LEED-AP Project Manager or appropriate consultants stating that to the best of their knowledge, the project has been designed and constructed to achieve the requirements of Section 22.23 above.

**22.30 GREEN ROOFS**

**22.31** *Purpose.* The purpose of this Section is to remove potential impediments to the development of green roof systems on new and existing buildings by clarifying that such systems should not count against a building's Gross Floor Area, and by providing for limited access and enjoyment of green roofs by occupants of a building.

**22.32** ***Functional Green Roof Area*** shall be defined as area atop a roof surface on a building, open to the sky and air, which is surfaced with soil and living plant materials for the purpose of retaining rainwater and absorbing heat from sunlight. The depth of soil and planted material shall be at least two (2) inches to be considered Functional Green Roof Area. For the purposes of maintaining the plant material, Functional Green Roof Area may be accessible by means of a roof entrance.

**22.33** *Floor Area Exemptions for Functional Green Roof Area.*

**22.33.1** Spaces meeting the definition of Functional Green Roof Area as defined in Subsection 22.32 above, which are to be accessed only for maintenance purposes and are not intended to be used by building occupants or others, shall be exempt from the calculation of Gross Floor Area of a building.

**22.33.2** Spaces meeting the definition of Functional Green Roof Area as defined in Subsection 22.32 above, which are intended to be accessed for use by occupants of the building or others, and which are located above the third floor of the building, may be exempted from the calculation of Gross Floor Area of a building only after the granting of a special permit by the Planning Board. The proponent seeking such a special permit must demonstrate that the Functional Green Roof Area is designed such that the vegetation will withstand the foot traffic associated with its anticipated use. The Planning Board shall also consider the potential visual, noise and privacy impacts of the anticipated use on neighbors. Unless such a special permit is granted, any Functional Green Roof Area located above the third floor of a building that is intended to be accessed for use by building occupants or others shall be counted as Gross Floor Area.

**22.34** *Floor Area Exemptions for Patios or Decks Adjacent to Functional Green Roof Area*

**22.34.1** In non-residential zoning districts and in Residence C-1A, C-2, C-2A, C-2B, C-3, C-3A, and C-3B zoning districts, where a rooftop surface above the third floor includes Functional Green Roof Area as defined in Section 22.32 above, adjacent open-air outdoor space intended for use by building occupants or other persons that does not meet the definition of Functional Green Roof Area, such as a patio or deck, shall be exempted from the calculation of Gross Floor Area of the building, provided that the total space exempted in such a manner shall not exceed fifteen percent (15%) of the amount of Functional Green Roof Area on the building and that all such usable outdoor space shall be set back at least ten (10) feet from all outer roof edges.

**22.34.2** In residential zoning districts not listed in Section 22.34.1 above, where a rooftop surface above the third floor includes Functional Green Roof Area as defined in Section 22.32 above, adjacent open-air outdoor space intended for use by building occupants or other persons that does not meet the definition of Functional Green Roof Area, such as a patio or deck, may be exempted from the calculation of Gross Floor Area of the building only after the granting of a special permit by the Planning Board. The total space exempted in such a manner shall not exceed fifteen percent (15%) of the amount of Functional Green Roof Area on the building and all such usable outdoor space shall be set back at least ten (10) feet from all outer roof edges. In granting the special permit, the Planning Board shall consider the location and orientation of the patio or deck in relation to adjacent properties and potential visual, noise and privacy impacts of the anticipated use on abutters.

**22.40 EXTERIOR WALLS AND INSULATION**

**22.41** *Purpose.* The purpose of this Section is to remove potential impediments to the construction of exterior walls with additional insulation or wall-based mechanical systems that can improve the energy-efficiency of a building, by exempting the additional gross floor area created by such features from the calculation of a building's total Gross Floor Area.

**22.42** *Double-Skin Facades*

**22.42.1** A ***Double-Skin Façade*** shall be defined as a multilayer exterior wall system comprising a solid outer wall, a solid inner wall, and a ventilated intermediate air space, intended to improve insulation and manage solar heat gain as an element of a building-wide mechanical system for heating and cooling a building.

**22.42.2** *Floor Area Exemption for Double-Skin Façades.* Within an exterior wall system that meets the definition of a Double-Skin Façade as defined in Section 22.42.1 above, the area occupied by the intermediate air space shall be excluded from the calculation of Gross Floor Area on a lot, up to a depth of one (1) foot, provided the space is not to be accessed except for maintenance purposes.

**22.43** *Exterior Insulation*

**22.43.1** *Floor Area Exemption for Added Exterior Insulation.* Where the thickness of a solid, non-removable exterior wall of a building is greater than six (6) inches, such wall being comprised entirely of structural material, insulating material and interior and exterior finishes, any Gross Floor Area that is further than six (6) inches from the innermost solid plane of the exterior wall may be excluded from the calculation of Gross Floor Area of a building.

**22.43.2** *Yard Exceptions for Added Exterior Insulation.* A building that received a building permit prior to November 1, 2009 may encroach or further encroach into the required yard setback through the addition of insulation external to the exterior structural wall of the building, provided that the additional insulation does not increase the thickness of the exterior wall by more than four (4) inches and that the resulting outermost plane of each exterior wall is no closer than seven feet, two inches (7'-2") to the nearest property line.

**22.50 OVERHANGS AND SUN-SHADING DEVICES**

**22.51** *Purpose.* The purpose of this section is to remove potential impediments to the addition of passive solar shading devices intended to reduce the impact of solar heat gain on a building or lot, by exempting areas underneath such devices from the calculation of Gross Floor Area under certain circumstances.

**22.52** *Floor Area Exemption for Sun-Shading Devices.* Areas directly underneath a building overhang, eave, awning or other sun-shading device shall be excluded from the calculation of Gross Floor Area for a lot, provided that the overhang, eave, awning or other sun-shading device extends no more than three (3) feet from the exterior wall plane of the section of the building beneath it, and provided that the ground surface directly beneath the overhang, eave, awning or other sun-shading device meets the definition of Permeable Open Space as defined in Article 2 of this Zoning Ordinance.

**22.53** *Floor Area Exemption for Pergolas, Arbors and Trellises.* Ground space directly underneath an outdoor pergola, arbor or trellis structure shall be excluded from the calculation of Gross Floor Area of a lot, provided that the structure is at least 80% open to the air across all horizontal or vertical surfaces, and that any parallel structural support members with a cross-section of greater than one (1) inch by two (2) inches are separated from each other by at least three (3) feet on center. These features may be freestanding or attached to a building.

**22.60 SOLAR ENERGY SYSTEMS**

**22.61** *Purpose.* The purpose of this Section is to define solar energy systems within the zoning ordinance, to provide a mechanism for publicly registering such systems so that nearby developers can be aware of their existence, and to provide limited zoning protections for such systems in some instances where developers of neighboring properties are seeking a special permit or variance.

**22.62.1** Solar energy systems are viewed as potentially valuable contributors to meeting the City's objective of encouraging sustainable development and energy conservation. However, the complex nature of urban development in the city limits the extent to which the city's zoning regulations can be employed to guarantee long-term access to sunlight on a wide geographic basis. Therefore, the following provisions are intended to provide limited support for such systems and to raise awareness of their contribution to the objectives of this Article 22.000 on the part of the general public and property owners.

**22.62** A ***Solar Energy System*** shall be defined as a device or combination of equipment that converts radiant energy from the sun into heat or electricity that can be used for the purpose of heating indoor spaces, producing hot water, or powering electrical devices.

**22.63** A ***Registered Solar Energy System*** shall be defined as a Solar Energy System for which a building permit has been issued, provided that at least one year has passed since the issuance of such permit, and whose sun-exposed elements are at a height no lower than five (5) feet below the maximum height allowed within the base zoning district in which it is located. Such systems shall be recorded on a public registry of Solar Energy Systems that shall be maintained by the City's Inspectional Services Department and made available to property owners by request.

**22.64** *Protection of Registered Solar Energy Systems.* The impacts of a proposed development seeking a special permit or variance on a Registered Solar Energy System shall be considered by the Board of Zoning Appeal or the Planning Board, whichever is applicable, in making its determination, as described in Article 10, Subsection 10.32 and Article 19, Subsection 19.33 of this Zoning Ordinance. No protection shall be provided by this Zoning Ordinance to a Solar Energy System that does not meet the definition of a Registered Solar Energy System.

**22.70 WIND TURBINE SYSTEMS**

[Delete Section 11.40, Wind Turbine Systems, of the Zoning Ordinance and move the zoning text for Wind Turbine Systems from that section to this Section 22.70.]

***B. Amend the definition of Gross Floor Area in Article 2, Definitions, as follows (text changes shaded).***

**Floor Area Gross.** The sum, in square feet, of the gross horizontal areas of all floors of a building, as measured from the exterior walls [except in (8) and (9) below where only interior space shall be measured and in (h) where the area of the parking facility shall be measured] of a building or the centerline of party walls between buildings.

**Gross Floor Area shall include:**

(a) roofed porches and balconies whether enclosed or unclosed

(b) unroofed porches and balconies above third floor, with the exception of porch and balcony spaces associated with Functional Green Roof Area, in accordance with the regulations in Section 22.30 of this Zoning Ordinance;

(c) elevator shafts and stairwells on each floor, not excluded in (6) below;

(d) attic space, whether finished or unfinished, within the area of a horizontal plane that is five (5) feet above the attic floor and which touches the side walls and/or the underside of the roof rafters and which is not excluded in (5) below;

(e) interior balconies, mezzanines, and penthouses;

(f) basement and cellar areas not excluded in (1), (3), and (9) below;

(g) area of parking facilities in structures except as excluded in (2) below; and

(h) any accessory parking spaces not in above ground structures if in excess of the maximum number permitted on the premises as set forth in Section 5.25 and 6.30.

**Gross Floor Area shall not include:**

(1) areas used for off street loading purposes;

(2) area of parking facilities in structures located underground and the area of on grade open parking spaces outside the building footprint at or below the maximum number permitted on the premises as set forth in Sections 5.25 and 6.30;

(3) basement and cellar areas devoted to the operations and maintenance of the building such as heating and cooling equipment, electrical and telephone facilities, and fuel storage;

(4) open and lattice-work fire escapes;

(5) unroofed porches and balconies no higher than the third floor;

(6) attic space and other areas devoted to elevator machinery or mechanical equipment

necessary for the operation of the building, including 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, and energy recovery ventilators;

(7) elevator shafts and stairwells on floors where there is no other area which qualifies to be included in gross floor area;

(8) attic space not otherwise included in (d) above;

(9) basement and cellar spaces with less than seven (7) feet of ceiling height measured from the floor to the line of the bottom of the floor joists, or to any subfloor or finished surface above any floor joists that are spaced not less than four (4) feet on center, and further provided that the basement or cellar is not a Story Above Grade as defined in the State Building Code;

(10) bicycle parking meeting the requirements of Article 6.000, whether located in a principal use structure, any parking facility for motor vehicles, or in an accessory structure. In a building with more than two floors, the area of each floor level of any interior courtyard whether or not covered by a roof, which has a minimum dimension of less than forty (40) feet in any direction shall be included unless twenty (20) percent or more of the perimeter of such court yard at each floor level measured consecutively is not enclosed;

(11) Functional Green Roof Area, in accordance with the regulations in Section 22.30 of this Zoning Ordinance;

(12) interior air spaces within Double-Skin Façades and additional exterior wall thickness to accommodate insulation, in accordance with the regulations in Section 22.40 of this Zoning Ordinance; and

(13) space directly beneath overhangs, eaves, awnings, pergolas, arbors, trellises or other sun-shading devices, in accordance with the regulations in Section 22.50 of this Zoning Ordinance.

## C. *Amend Section 5.23 as follows (text changes shaded):*

**5.23** *Height Exceptions.* The provisions of this Ordinance governing the height of buildings and structures in all districts shall generally not apply to (a) chimneys, water towers, air conditioning equipment, elevator bulkheads, skylights, ventilators and other necessary features appurtenant to buildings which are usually carried above roofs and are not used for human occupancy, (b) to domes, towers, or spires above buildings if such features are not used for human occupancy and occupy less than ten (10) percent of the lot area, and (c) to wireless or broadcasting towers and other like unenclosed structures which occupy less than ten (10) percent of the lot area, and (d) to elements of a Solar Energy System, as defined in Section 22.60 of this Zoning Ordinance, that would ordinarily be located on a rooftop where they would have direct exposure to sunlight.

However, building elements enumerated in (a) above shall be limited in height where they are placed on a building located in a non-residential district, which district abuts a Residence A-1, A-

2, B, C, C-1, C-1A, C-2, C-2A, C-2B district. In these instances the following height limitations shall apply to those building elements:

1. The elements must be below one or more forty-five (45) degree bulk control planes. Each bulk control plane shall begin, in the vertical dimension, at the maximum height limit permitted in the non-residential zoning district. In the horizontal dimension, the plane shall begin at the residential/non-residential zoning district line: however, where that line lies within a street, the plane shall begin at the front lot line, located nearest the zoning district line, of the lots on which the building is sited. Thereafter the bulk control plane shall rise from its beginning over the non-residential zoning district. (*See illustrative figure 5.23*)

2. The limitations in Paragraph 1 above may be waived by special permit from the Planning Board upon a finding by the Board that the additional height is necessary. In making that determination the Planning Board shall consider the special and unique requirements of the use that the elements are serving, any special constraints imposed by the site upon which the building is located, the nature and character of development in the adjacent residential district, and the extent to which successful efforts are made to minimize the visual and acoustical impact of he elements on neighbors.

## *D. Amend Section 10.30 (Variances) as follows (text changes shaded):*

**10.31** A variance from the specific requirements of this Ordinance, including variances for use, may be authorized by the Board of Zoning Appeal with respect to particular land or structure. Such variance shall be granted only in cases where the Board finds all of the following:

(a) a literal enforcement of the provisions of this Ordinance would involve a substantial hardship, financial or otherwise to the petitioner or appellant.

(b) the hardship is owing to circumstances relating to the soil conditions, shape or topography of such land or structures and especially affecting such land or structure but not affecting generally the zoning district in which it is located.

(c) Desirable relief may be granted without either:

(1) substantial detriment to the public good; or

(2) nullifying or substantially derogating from the intent or purpose of this Ordinance.

**10.32** In addition to considering the character and use of nearby buildings and land the Board, in determining its finding, shall take into account the number of persons residing or working in such buildings or upon such land, and the present and probable future traffic conditions. The Board shall also take into account the potential impact of the development to be authorized by the variance on Registered Solar Energy Systems as defined in Section 22.60 of this Zoning Ordinance.

***E. Insert a new Section 10.49 to read as follows:***

**10.49** Any special permit authorizing new construction or substantial rehabilitation of a building totaling 25,000 square feet or more shall be subject to the provisions of Section 22.20 of the Zoning Ordinance.

***F. Amend Section 19.30 (Citywide Urban Design Objectives), Subsection 19.33 as follows (text changes shaded):***

**19.33** The building and site design should mitigate adverse environmental impacts of a development upon its neighbors. Indicators include:

(1) Mechanical equipment that is carefully designed, well organized or visually screened from its surroundings and is acoustically buffered from neighbors. Consideration is given to the size, complexity and appearance of the equipment, its proximity to residential areas, and its impact on the existing streetscape and skyline. The extent to which screening can bring order, lessen negative visual impacts, and enhance the overall appearance of the equipment should be taken into account. More specifically:

(a) Reasonable attempts have been made to avoid exposing rooftop mechanical equipment to public view from city streets. Among the techniques that might be considered are the inclusion of screens or a parapet around the roof of the building to shield low ducts and other equipment on the roof from view.

(b) Treatment of the mechanical equipment (including design and massing of screening devices as well as exposed mechanical elements) that relates well to the overall design, massing, scale and character of the building.

(c) Placement of mechanical equipment at locations on the site other than on the rooftop (such as in the basement), which reduces the bulk of elements located on the roof; however, at-grade locations external to the building should not be viewed as desirable alternatives.

(d) Tall elements, such as chimneys and air exhaust stacks, which are typically carried above screening devices for functioning reasons, are carefully designed as features of the building, thus creating interest on the skyline.

(e) All aspects of the mechanical equipment have been designed with attention to their visual impact on adjacent areas, particularly with regard to residential neighborhoods and views and vistas.

(2) Trash that is handled to avoid impacts (noise, odor, and visual quality) on neighbors, e.g. the use of trash compactors or containment of all trash storage and handling within a building is encouraged.

(3) Loading docks that are located and designed to minimize impacts (visual and operational) on neighbors.

(4) Stormwater Best Management Practices and other measures to minimize runoff and improve water quality are implemented.

(5) Landscaped areas and required Green Area Open Space, in addition to serving as visual amenities, are employed to reduce the rate and volume of stormwater runoff compared to pre-development conditions.

(6) The structure is designed and sited to minimize shadow impacts on neighboring lots, especially shadows that would have a significant impact on the use and enjoyment of adjacent open space and shadows that might impact the operation of a Registered Solar Energy System as defined in Section 22.60 of this Zoning Ordinance.

(7) Changes in grade across the lot are designed in ways that minimize the need for structural retaining walls close to property lines.

(8) Building scale and wall treatment, including the provision of windows, are sensitive to existing residential uses on adjacent lots.

(9) Outdoor lighting is designed to provide minimum lighting and necessary to ensure adequate safety, night vision, and comfort, while minimizing light pollution.

(9) The creation of a Tree Protection Plan that identifies important trees on the site, encourages their protection, or provides for adequate replacement of trees lost to development on the site.

***G. In Article 19.000, insert a new Section 19.510 to read as follows:***

**19.510** *Green Building Requirements.* The requirements of Section 22.20 of this Zoning Ordinance shall be met.