WELLESLEY WILL
BUILD A SUSTAINABLE FUTURE

TOWN OF WELLESLEY

MUNICIPAL SUSTAINABLE BUILDING GUIDELINES

February 2020

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A. INTENT AND BACKGROUND

The design, construction and operation of its buildings are among a municipality's most important responsibilities. Buildings are essential for education, community life, security, and governance; and new schools, town halls, and police stations come with major financial as well as environmental costs. Buildings require the consumption of resources and generate greenhouse gases (GHGs). GHG emissions from Wellesley's municipal buildings contribute approximately 70% of Wellesley's municipal energy use and 70% of the municipal carbon footprint. As a Massachusetts Green Community, Wellesley agreed to decrease its annual municipal energy use 20% below 2015 levels by the end of 2020. In 2014, Annual Town Meeting approved a goal to reduce town-wide GHG emissions 25% below 2007 levels by the year 2020. Wellesley's Municipal Sustainable Building Guidelines (MSBG or Guidelines) will help Wellesley pursue its energy and emission goals with the recognition that successful building projects require a balance among programmatic, environmental and economic factors.

The Guidelines outline a process and criteria by which the Town may design, construct and operate municipal buildings in a cost-effective and sustainable way such that these projects support the health, comfort and productivity of building occupants, minimize environmental degradation, and conserve resources. The Guidelines also encourage buildings that are resilient and adaptable to a changing environment and flexible such that they accommodate multiple uses. MSBG present a minimum level of requirements for the design and development of the projects listed below.

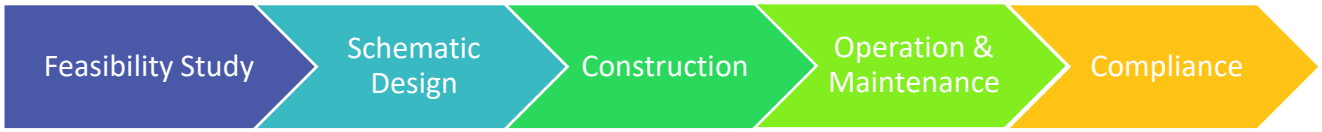
Municipal Sustainable Building Guidelines apply to:

- **New buildings**
- **Major renovations affecting 15,000 square feet or more with significant upgrades to the mechanical systems and building envelope**

- **Large additions of 10,000 square feet or more**
- **Private development on Town-owned land**
- **New roofs: exploration of solar-ready and photovoltaic installations**

More modest projects should strive to follow these Guidelines as closely as is reasonable.

The Guidelines Apply at All Stages of a Project



MSBG address sustainability throughout the various stages of building development and use as discussed below.

Adherence to the Guidelines is the responsibility of the **Building Project Proponents.**

Building Project Proponents are town entities that propose building projects, and include:

Board of Selectmen

School Committee

Wellesley Free Library Board of Trustees

Municipal Light Board

Board of Public Works

Natural Resources Commission

Recreation Commission

MSBG complement established Wellesley processes for municipal building development.

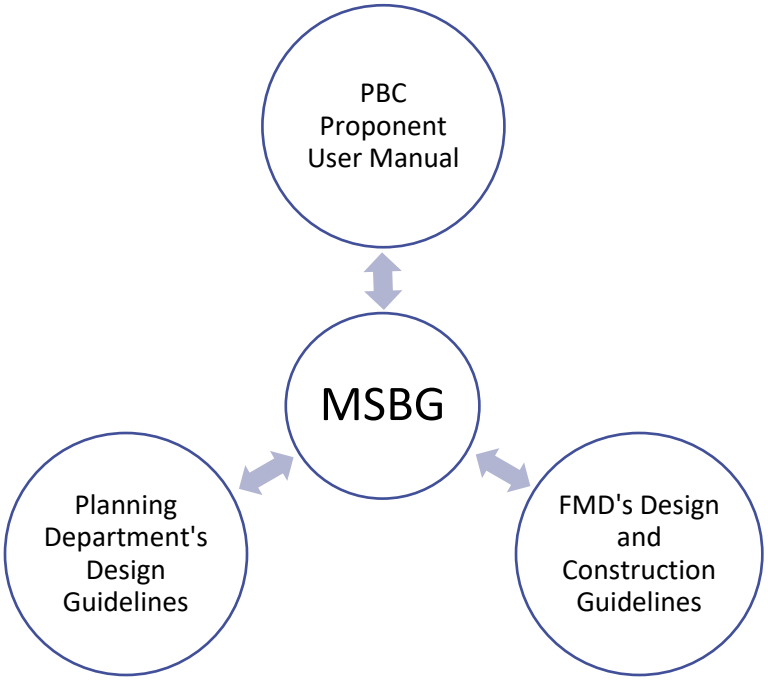


Diagram 1: MSBG's Relationship to other Municipal Building Guidance

As reflected in Diagram 1, the Guidelines work with:

- The public design and construction program, as detailed in the **Permanent Building Committee's *Proponent User Manual*** (Appendix A)

- General design, energy efficiency, and sustainability and maintenance measures described in ***FMD's Design and Construction Guidelines*** (Appendix B)

- The **Planning Department's *Design Guidelines*** to maintain and enhance the town's character (Appendix C)

B. GENERAL COMMITMENTS: Elements of Sustainable Buildings

An understanding of Proponent needs, intended building uses, energy consumption, site characteristics and the broader project context will allow the

Project Team to identify clear goals and metrics at the beginning of the process and make cost-effective trade-offs as the project progresses.

The Project Team, consisting of the Project Proponent and the boards, committees and/or departments charged with assisting the Project Proponent will commit, strive and fully explore the following:

Sustainable Design	Sustainable buildings that are cost effective and high performing require a commitment to sustainability at the earliest stages of project development, while considering schedule, budget, and competing or conflicting project objectives. The Request for Qualifications (RFQs) should reference a **sustainable, holistic approach** so that the project can address GHG emissions, energy use, environmental health, environmental impacts, etc. in an integrated way while realizing cost-saving trade-offs.
Energy Efficiency /EUI	Building energy use intensity (EUI) is the measure of the total energy consumed in a building, expressed as energy per gross square foot of building area, typically expressed in kBTU/sq.ft./yr. Buildings will be designed to achieve an EUI of 25 to 30. To achieve low energy targets, consideration should be given to strategies and standards set forth in Passive House and Living Building Challenge.
Zero Net Energy	A ZNE building, as defined here, is a building in which on- or off-site renewables offset 100% of building energy load. After establishing a target EUI, the Project Team will explore opportunities for **ZNE** such that on- and off-site renewable systems provide 100% of building energy use. If ZNE is not feasible, the Designer shall provide evidence to the Proponent, and Permanent Building Committee demonstrating why ZNE status is not attainable.
Solar-ready and PV roofs	Fully explore the possibility of **solar-ready roofs and photovoltaic roof installations** when replacing a roof on an existing building.

LEEDv4	In addressing sustainable siting, water conservation, indoor environmental quality and other sustainability criteria, the Project Team will ensure that the Project meets the criteria of **LEED v4 Silver** (or equivalent) and will strive to meet **LEED v4 Platinum** where possible. See diagram 1 below.
Peer Review/ Commissioning	Engage a **Professional Sustainability Peer Reviewer** or **Commissioning Agent**. The Peer Reviewer/Commissioner will consult on and review all sustainability-related aspects of the Project throughout the Schematic Design and Construction phases to ensure that the project meets its sustainability goals.
Education	Develop the building as an **educational resource** and exemplar for building occupants and the community at large. Highly sustainable buildings provide opportunities to **educate and inspire the community**. Sustainable buildings in Wellesley, especially schools, should include signs, displays, and demonstration spaces, through which students and other community members can learn about the building's architectural, landscaped, structural and mechanical features and how they minimize environmental harm and promote human and environmental well-being.
Service Life	Construct the building to have an expected **service life of at least 50 years**, but preferably much longer, with regular planned system/equipment/finishes replacement.
Electricity and Carbon-Free Energy	Consider **electricity or carbon-free preferred forms of energy** in heating and cooling.
Sustainable Operation	Develop and implement plans for the **sustainable operation of a building** guided by a program such as the WELL Building Standard.
Recycling, Food Waste Diversion, Food Rescue	Provide sufficient interior and exterior space for the collection, storage and pick-up of **recycling, food waste diversion and food rescue** items, where possible.

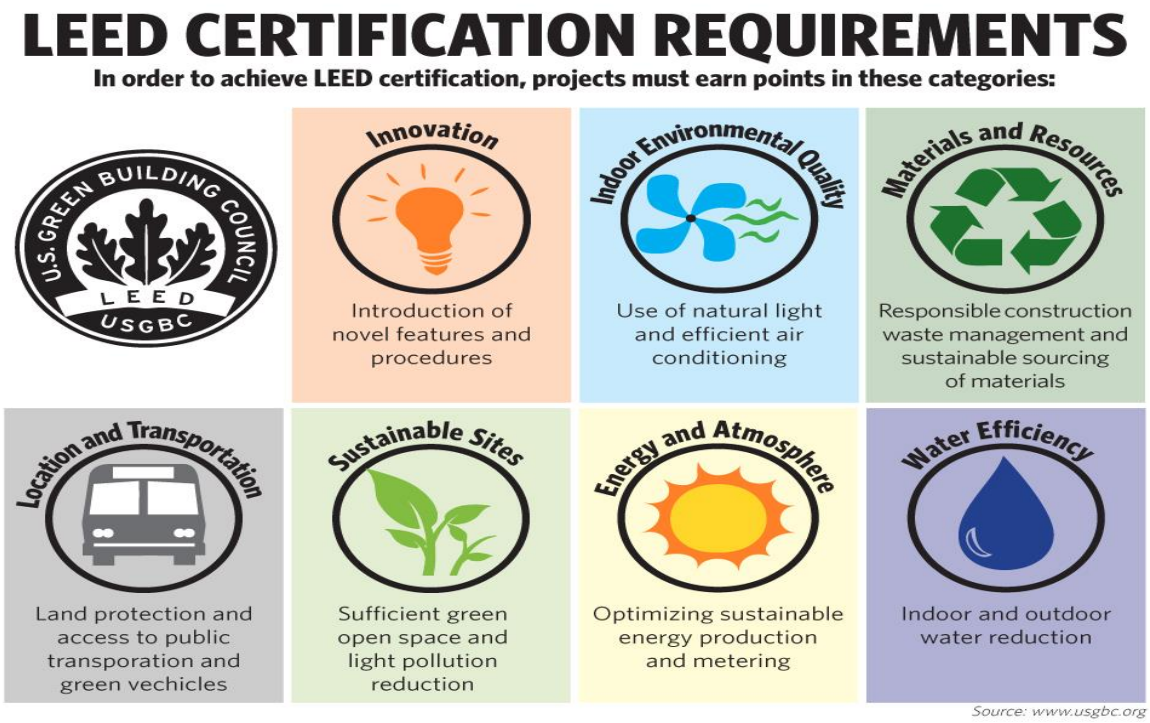


Diagram 2: LEED Framework

C. FEASIBILITY STUDY

During the Feasibility Study, the Designer confirms and explains the Proponent's requirements, identifies and evaluates alternative solutions and sites, recommends and defines solutions, summarizes the proposed scope of work, and provides a cost estimate. The Feasibility Study is a critical point in the process for identifying and integrating priorities related to sustainability. Feasibility Studies vary in scope, complexity and deliverables, based on the Owner's specific needs and available budget and schedule.

Decision to Renovate, Build an Addition or Build New

Before embarking on the development of an entirely new building, a prospective Proponent should consider if a renovation or addition can meet programming needs and other key project objectives and goals. In some cases, renovations and additions offer the most sustainable pathway.

Selection of Designer and Owner's Project Manager (OPM)

Once the Proponent, working in conjunction with FMD or PBC, decides on the general scope of the Project, the Proponent prepares Requests for Qualifications (RFQs) for prospective Designers and Owner's Project Managers (OPMs). As outlined in the *PBC Proponent User Manual*, the Town is required to follow M.G.L. Chapter 7C, governing Designer selection, when both the estimated construction cost of the Project exceeds $300,000 and the Designer fee exceeds $30,000.

The Designer and OPM's RFQs should include the Proponent's sustainability requirements for the Project, including:

- A preference for consultants who can demonstrate expertise in sustainable design of high performance and ZNE buildings and who will consider sustainability throughout the process, including the very earliest stages.
- A preference for a team with openness to and experience with whole-systems thinking and collaboration across specialties.
- The Town's commitment to exploring the feasibility of a ZNE building and its interest in constructing a ZNE building.
- The Town's commitment to identifying a Certification Program(s) which, at a minimum, meets the requirements of the LEEDv4 Silver program.
- The Town's commitment to hiring a Designer and OPM with qualifications and experience that will support achievement of MSBG goals.

Eco-Charrette

Where appropriate, large projects such as new schools should include at least one Project-specific workshop (or "eco-charrette") at the start of the project planning and design effort. The eco-charrette will include the OPM, representatives of the Designer's team, the Proponent, Facilities Management Department, Sustainable

Energy Committee, and stakeholders from Town government and the community to identify sustainability-related goals and pathways for achieving these goals. Eco-charrette participants will provide an initial set of sustainability objectives that will allow the Designer to explore sustainability within the Feasibility Study budget.

Immediately following the first eco-charrette, the Designer should document preliminary sustainability goals in an Owner's Project Requirements document. This document will be shared with the broader Project team, and revised as the Designer carries out ZNE, LEED implementation, life-cycle cost analysis, renewable energy analysis, and a review of available financial incentives. These analyses are described in more detail below.

Preliminary LEEDv4 Checklist

The Project Team should develop a preliminary LEEDv4 checklist to identify the LEED credits that the Project is likely to seek.

Basic Energy Analyses

EUI targets represent total metered energy inputs (chilled water, steam, electricity, and natural gas) for building heating, cooling, ventilation systems, water heating, lighting, receptacle loads, and process energy use. EUI targets will be established on a project-by-project basis based on case study research and modeling, but Project teams should aim for a goal ***between 25 and 30 kBTU/sq.ft./yr***

The Designer should use eQuest, Energy Plus or similar tools to model proposed building designs, assist with life-cycle costing, estimate GHG emissions, and facilitate future measurement and verification. During the Schematic Design Phase, the Designer should use energy modeling to evaluate energy in relation to building massing, orientation, heating, ventilation and air conditioning systems in the preferred schematic option.

Additional Basic Modeling

The Schematic Design Phase should include solar analysis and daylight modeling to examine internal light levels, heat gain and photovoltaic feasibility associated with various building orientation scenarios. These studies inform the choice of, for example, optimal building orientation, solar systems, glazing and shading, and

implications for indoor environment conditions and electric lighting requirements.

Zero Net Energy

The Designer should also evaluate and present:

- An energy budget/target in terms of EUI.
- Opportunities for on-site renewable energy generation, including assessments of site photovoltaic capacity and geothermal potential. The Project Team (at a minimum, the Designer, OPM, WMLP and FMD representatives) will determine whether any of the identified options should be pursued as part of the Project or if enabling infrastructure for future renewable energy systems should be incorporated at the site.

During the Schematic Design Phase, the Designer should carry out energy modeling to optimize the energy budget and use of renewable energy systems. At each design submission, the consultant will update the energy model to test the energy performance of the design.

Life-Cycle Cost Analysis

Each project under MSBG should involve life-cycle cost analysis (LCCA) to quantify impacts on energy costs, maintenance costs, etc. The scope of the LCCA will vary with the Project, but will typically address building envelope, heating, ventilation, cooling and air conditioning and many other building components. All LCCA should include analysis of net present value.

- Because of energy price uncertainty and the lifetime of typical components, life-cycle costing for energy purposes should typically be done over a 20 to 30-year period.
- Simple payback can be used with flat energy costs to provide a "quick check" on the applicability of energy saving measures during the Feasibility Study. The generation of a full-fledged life-cycle cost analysis (including calculation of net present value) shall follow during the Schematic Design Phase once the measure is determined to be viable for consideration. In general, Wellesley encourages measures which present the lowest life-cycle cost.

- The Designer should optimize the design for the lowest life-cycle cost. In general, the Designer will be responsible for providing the best available cost and energy data.
- The Designer should minimize life-cycle costs due to energy use via: optimization of the building orientation, building envelope and fenestration systems to minimize losses/gains, use of natural light and window overhangs, passive solar design features to control and utilize solar gain, attention to materials selection, construction inspection, and commissioning.

Incentives and Rebates

The Designer will identify what utility, federal and state tax, and other incentives and rebates are available to the Project and will pursue incentives, as appropriate.

FMD Approval of Equipment

New energy efficiency technologies, without a proven "track record," that are difficult or complex to operate and/or maintain should not be specified without prior approval from FMD. FMD's concerns for proposed "green" or sustainable equipment and systems include the following:

- Can existing staff and vendors operate and maintain the equipment?
- Are repair/replacement parts and technical support readily available?
- Are proposed energy savings guaranteed?
- Are back-up systems required if the proposed system fails?
- Can a 5-year or longer warranty be provided?

After the above analyses and consideration of performance guidelines, the Designer will adjust the Owner's Project Requirements Document to include:

- Comprehensive sustainable design measures;
- Zero Net Energy decisions;
- Green building standard goal (LEED v4 Silver or equivalent is a minimum); and

- Inclusion of sustainable design criteria within design options cost estimate.

D. SCHEMATIC DESIGN

Selection of Designer and Owner's Project Manager

The PBC takes over the Project at this stage as defined by Town bylaws. If a Lead Designer and OPM are not carried over from the Feasibility Study Phase (as is typically the case), the Designer and Owner's Project Manager Request for Qualifications should state a preference for:

- Consultants who can demonstrate expertise in the sustainable design of high performance/ZNE buildings and who will consider sustainability throughout the process.
- A team with openness to and experience with whole-systems thinking and collaboration across specialties.

The PBC should consider engaging Envelope and HVAC Commissioning Agents and a Sustainability Peer Reviewer to help monitor the Project.

Advanced Energy Analyses

The Designer should initiate energy modeling to compare the energy use and performance of various systems and strategies.

FMD Design and Construction Guidelines

See Appendix B: FMD's Permanent Building Committee Proponent User Manual[1] for details on lighting, boilers, transformers, variable frequency drives, energy management systems, roofing, windows, sensors, kitchen equipment and hot

[1] Current FMD guidance on preferred energy sources is under review.

water heaters, hydration systems, rainwater harvesting, and porous pavement, exterior façade, electrical, and more.

Update Life-cycle Cost Analysis

The Designer will update LCCA for final building systems and features.

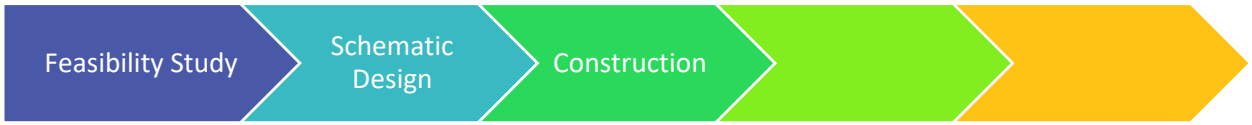
Update of LEEDv4 Checklist

The Project Team should reassess and revise the Preliminary LEEDv4 Checklist.

Commissioning Plan

Develop a Commissioning Plan that addresses sustainability goals and includes a program for metering and verification. The Peer Reviewer/Commissioning Agent should confirm the Commissioning Plan and verify that building systems contribute to goals as anticipated.

E. CONSTRUCTION



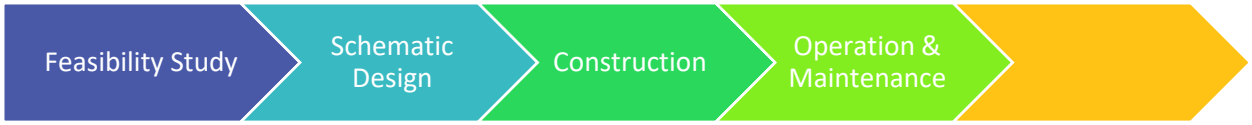
During construction the Designer should complete energy and other modeling for verifying compliance with Project goals and Building Certification requirements.

Construction should involve sustainable materials management practices.

Building envelope and HVAC Peer Reviewers/Commissioning Agents should monitor the project.

The Designer and Contractor will provide a User's Guide that explains how building managers and users can realize sustainability goals.

F. OPERATION AND MANAGEMENT



Building Management

FMD should develop a facility operations and management plan that includes contractor-provided training for building occupants and facilities staff, including custodians, maintenance and managers. FMD should also operate the Project in accordance with an energy budget, based on energy modeling of the final design.

The SEC and FMD should monitor the energy use and performance of the Project from the date of occupancy. The SEC and FMD should evaluate the building's actual energy use in comparison to the modeled projections and to comparable buildings. Peer Reviewer/Commissioning agents should carry out an initial commissioning at a suitable point prior to occupancy and conduct re-commissioning at a point 12 months after occupancy.

Plug Load Management

Effective plug load management is critical in highly efficient and ZNE buildings. Plug load includes energy use from computers, tablets, smart boards, projectors, battery chargers, appliances and most energy use not associated with HVAC and lighting. The following actions help to keep plug load at a minimum:

- Understand technology needs;
- Thoroughly vet equipment needs and uses;
- Use newest technology that is reliable and proven;
- Maximize wireless systems; and
- Shut-down unoccupied buildings where possible.

The Proponent and the SEC will develop a program to educate building users about the importance of reducing plug load. Sensors, lighting controls and signage can be particularly helpful. However, committing to live and work within building temperatures that result in reduced energy use is often the best way for occupants to do their part.

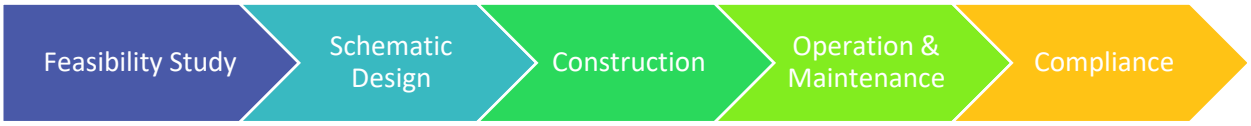
Metering

Metering is an important aspect of energy tracking and management. Buildings under MSBG will separately meter all utilities entering the building. When appropriate to project scope, buildings will separately sub-meter significant use types within the building such as parking garages, large kitchens, laboratories and computer/data centers.

LEEDv4 outlines the following requirements for metering – either: LEED-NCv4 Advanced Energy Metering or LEEDNCv4 Enhanced Commissioning, Option 1, Path 2, Enhanced and Monitoring-Based Commissioning.

Water metering will allow the tracking of water use.

G. COMPLIANCE WITH MSBG



Designer confirmation that the final construction documents, if followed, will produce a completed Project that is LEEDv4 Silver certifiable (at a minimum) and ZNE capable.

Peer Review confirmation that the final construction documents, if followed, will produce a completed project that is LEED v4 Silver certifiable and/or ZNE capable.

For ZNE, compliance is based on the modeled performance of the Project at the completion of the construction documents, with ZNE capability verified by the Project's Designer. The design will also be peer reviewed/commissioned for ZNE capability.

An independent third party must commission the building's mechanical, electrical, plumbing and control systems at a suitable point prior to occupancy, and at a point 12 months after occupancy. However, failure to achieve the ZNE

requirements at the point of 12-month re-commissioning shall not affect compliance with these guidelines.

H. REVIEW AND REVISION OF MSBG

The SEC will periodically review the Guidelines and make revisions as needed. Revisions will be subject to the approval of the Building Proponents identified above.

DEFINITIONS

Designer: The Architect or Engineer of Record whose professional seal is affixed to the construction documents.

Building: A structure with walls and a roof providing services and affording shelter, housing or enclosure to persons, animals or property.

Building Addition: New construction attached to an existing building.

Building Certification Program: A set of guidelines and criteria for judging the quality and performance of a building. Green building certification programs assess the building in terms of its impacts on the environment and human health.

Building Site: Building(s) and Building Addition(s) and Renovations and the area on which a building is located where energy is used.

Commissioning: The process that verifies and documents that the building systems, including all systems related to these Guidelines, have been designed, installed, and function according to the Construction Documents.

Re-commissioning: The process of testing and recommending adjustments to the building systems at least 12 months after the date of occupancy and on an ongoing, regular basis.

Construction: Phase of building development during which builders use the Construction Documents to create a building.

Construction Documents: Drawings and specifications sufficient for competitive public bidding in the Commonwealth of Massachusetts and for construction of the building.

Energy Budget: Established at the outset of design and updated periodically during design, an Energy Budget is based on estimated amounts of energy to be used once the building is occupied. As the term relates to FMD, which pays for all utilities in buildings it manages, the term shall refer to operational line item budgets established annually for electricity, natural gas, water and sewer.

Energy Use Intensity (EUI): EUI is the measure of the total energy consumed in a building, expressed as energy per gross square foot of building area, typically expressed in kBTU/sq.ft./yr. EUI targets represent total metered energy inputs (chilled water, steam, electricity, and natural gas) for building heating, cooling, ventilation systems, water heating, lighting, receptacle loads, and process energy use.

Feasibility Study: A process that culminates in a planning document that confirms and explains the owner's requirements, identifies and evaluates alternative solutions and sites, recommends and defines solutions, summarizes the proposed scope of work, and provides a cost estimate.

Fossil Fuels: Fuels from petroleum, natural gas or coal.

Leadership in Energy Efficient Design (LEED): The United States Green Building Council developed LEED which is the most widely used green building rating system in the world. Available for virtually all buildings, community and home project types, LEED provides a framework to create healthy, highly efficient and cost-saving green buildings. LEED certification is a globally recognized symbol of sustainability achievement.

LEED projects earn points across nine basic areas that address key aspects of green buildings. There are 110 Total Points available.

Integrative process	1
Location and transportation	15
Sustainable sites	12
Water efficiency	12
Energy and atmosphere	31
Materials and resources	13
Indoor environmental quality	16
Innovation	6
Regional priority	4

There are four levels of LEED certification:
Certified (40–49 points)
Silver (50–59 points)
Gold (60–79 points)
Platinum (80+ points)

Living Building Challenge **(LBC):** Rigorous green building certification program and design framework. LBC buildings remain within the resource limits of their site, collect and treat all water on-site and produce more energy than they use.

Net Present Value (NPV): NPV is determined by calculating the costs (negative cash flows) and benefits (positive cash flows) for an investment over time. For decisions on building design it is used to compare options. The cost of an option subtracted from the savings from that option (due to energy or operations cost reduction) over the life span.

Operation and Maintenance: The use and care of a building over its lifetime.

Passive House: Passive house is a voluntary, rigorous building standard that applies to all types of buildings. Passive buildings meet a rigorous level of energy efficiency and require little energy for space heating and cooling.

Peer Review: Review by a third-party reviewer skilled in energy analysis and energy modeling certified as a designer or engineer.

Photovoltaic Systems: Electrical Systems using photovoltaic panels to collect solar energy and convert it to electricity.

Project: Construction undertaking by and for the Town or by a private developer on Town-owned land, comprised of new Building(s), new Building Addition(s), and Building Renovations associated site work, and Renewable Energy Systems.

Project Proponent: Town entity that advocates for a building project.

Project Team: The Project Team includes decision makers involved with the building development at a particular point in the process. These decision makers can include the building Proponent, Building Committee and its subcommittees (including the Sustainability Technical Group), Facilities Management Department, Permanent Building Committee, Designer, and Owner's Project Manager.

Re-commissioning: See Commissioning above.

Renewable Energy: Energy from a source that is not depleted when used, such as wind or solar power.

Renewable Energy Certificate (REC): Represents and conveys the environmental, social and other non-power qualities of one megawatt-hour of renewable electricity generation and can be sold separately from the underlying physical electricity associated with a renewable-based generation source.

Renewable Energy Systems: Electrical and mechanical systems using Renewable Energy comprising one or more of the following: Photovoltaic Systems, Wind Energy Systems, and other systems that generate electricity without the use of fossil fuels.

Request for Qualifications: A request for qualifications (RFQ) is a step, sometimes used by a government entity, in the formal process of procuring a product or service. An RFQ outlines the scope of a project and the expertise required to carry it out. A response to the RFQ describes a company or individual's qualifications to supply a product or perform as service, but usually does not include specific details or price estimates.

Schematic Design: The phase of a building project that uses information and the preferred design from the Feasibility Study to produce a detailed plan for the chosen design option.

Site Energy: Energy consumed at the Building(s) and/or Building Addition(s)/Renovations and by energy-consuming features of their associated site(s).

Total Project Cost: The sum of the direct construction and non-construction (aka "soft") costs of a Project, exclusive of site acquisition costs.

WELL Building Standard: is a performance-based system for assessing and certifying built environment features that impact human health and wellbeing.

Zero Net Energy (ZNE): A zero net energy building is one that is optimally efficient, and over the course of a year, generates energy onsite, using clean renewable resources, in a quantity equal to or greater than the total amount of energy consumed onsite (MA DOER, 2019).

Zero Energy Capable: Designed based on the energy budget, in compliance with the Zero Net Energy requirements, incorporating highly efficient guidelines to minimize the Project's need for energy, and incorporating renewable energy systems with enough capacity to supply the energy needed.

Zero Energy Ready: Designed to be Zero Energy Capable, but without the inclusion of Renewable Energy Systems.

Zero Energy Ready Project Cost: Total Project Cost minus the purchase and installation cost of the Renewable Energy Systems.

REFERENCES

Maclay, William. 2014. The New Net Zero: Leading-Edge Design and Construction of Homes and Buildings for a Renewable Energy Future. White River Junction Vermont: Chelsea Publishing.

MA Department of Energy Resources (MA DOER) 2019. "What is a Zero Net Energy Building?" https://www.mass.gov/service-details/what-is-a-zero-net-energy-building. Visited 2.18.2019.

Wellesley Facilities Management Department. FMD Design Guidelines. Undated. FMD's Recommended Design and Construction Guidelines.

Wellesley Permanent Building Committee. 2018. Permanent Building Committee (PBC) Proponent User Manual. Ver. 24.

Whole Building Design Guide (WBDG) Sustainable Committee. 2018. Whole Building Design Guide: Sustainable. https://www.wbdg.org/design-objectives/sustainable Visited on September 15, 2018

APPENDICES

Appendix A:

Permanent Building Committee Proponent User Manual

Appendix B:

Facilities Management Department's Recommended Design and Construction Guidelines

Appendix C:

Planning Department's Design Guidelines

(These Guidelines are currently under revision and will be added as an appendix when available, see this link for more details.)

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