



CAPE COD COMMISSION

3225 MAIN STREET
P.O. BOX 226
BARNSTABLE, MA 02630
(508) 362-3828
FAX (508) 362-3136

E-mail: frontdesk@capecodcommission.org

Technical Bulletin 09-002 Development of Regional Impact Guidelines for Energy Compliance

Adopted May 14, 2009
(Revised June 9, 2011)

Introduction

Energy use is projected to continue increasing globally, nationally and locally, on both a per-capita and an absolute basis. Air and water pollution, climate change, and sprawl represent significant energy-related challenges to a sustainable Cape Cod. These negative impacts to the resources protected by the Cape Cod Commission Act cannot be fully addressed unless we change our current energy supply, delivery and use practices.

The 2009 Regional Policy Plan (RPP) introduces policies and standards addressing development. The Cape Cod Commission acknowledges the significance of climate change and intends to contribute positively toward mitigating and adapting to climate change. As such, the 2009 RPP Energy policies focus attention on energy intensive building and land use practices that contribute to climate change. The energy policies of the 2009 RPP are similar to many other local and regional policies being developed to address greenhouse gas emissions across the United States.

Purpose

The purpose of this technical bulletin is to provide Development of Regional Impact (DRI) applicants with guidance in the preparation and submission of data required to evaluate compliance with the 2009 RPP Minimum Performance Standards E1.1 through E1.6 for Energy. The standards can be found in Appendix A of this technical bulletin for reference.

Energy Goal

To promote a healthy and sustainable environment by, "...reducing greenhouse gas emissions and energy consumption through design and construction practices that increase energy conservation, promote energy efficiency, and promote self sufficiency through the use of locally distributed renewable energy."

Applicability of Standards

The Minimum Performance Standards of the Energy section in the 2009 RPP (see Appendix A of this technical bulletin) apply to the review of commercial and multi-family residential DRI projects. To render a project application complete, applicants should demonstrate compliance with the standards of the RPP by providing the information outlined in **Application Requirements (below)**. Recognizing that every project presents a unique set of circumstances, some of the submission requirements may be waived or modified depending on the nature of the project.

Application Requirements

Commission staff strongly encourages applicants attend a pre-application meeting to discuss the energy standards prior to submitting an application with a fully developed project design. Improving energy efficiency in buildings is largely attributed to an integrated design process that involves common understanding of project goals and corresponding regulations.

Additionally, applicants are encouraged to submit plans and specifications to the Cape Light Compact (CLC), Barnstable County's regional energy services organization, for consultation and review to ensure the project may take full advantage of the technical energy efficiency program services, technical assistance, and incentives offered by this program. This consultation and review is at no cost to the applicant through the CLC's administration of the ratepayer funded energy efficiency programs. For more on these programs, please visit the CLC's energy efficiency for businesses website, www.capelightcompact.org.

The following itemized information provides a description of the items required to deem a DRI application complete for the purposes of energy.

E1.1 Redevelopment Energy Audit

The purpose of this standard is to improve the energy efficiency of existing buildings during the redevelopment process. Redevelopment applicants shall submit the following:

- i. The name of a qualified building auditor who will perform the energy audit.
- ii. An energy audit of existing conditions, performed by a qualified auditor, including recommendations for increased energy efficiency. Qualified auditors include, but are not limited to Registered Professional Engineers, Certified Energy Managers, LEED Accredited Professionals, and Building Performance Institute Analysts.
- iii. A project narrative detailing how recommendations from the energy audit will be incorporated into the project design.

E1.2 Designed to Earn ENERGY STAR® Certification

The purpose of this standard is to design and build more energy efficient commercial buildings by utilizing the established ENERGY STAR® rating system (www.energystar.gov). By increasing the energy efficiency of new development, long-term energy savings, reduced impact on the environment, and less strain on the energy grid may be realized. ENERGY STAR® certification typically occurs within a year of occupancy, therefore applicants are required to provide the following as part of the DRI application, which will become a condition of the decision for an approved project. Non-residential development and redevelopment applicants shall submit the following:

- i. A Statement of Energy Design Intent (SEDI), prepared by a licensed architect or engineer (using the ENERGY STAR® Target Finder), as required by the ENERGY STAR® program (see Appendix C for a sample copy of the Statement of Energy Design Intent).

E1.3 ASHRAE/LEED Standards

ASHRAE 90.1-2007, Section 5.4 (or current standard), also used by LEED, establishes minimum design requirements for more energy efficient building envelopes. The standard is available on the ASHRAE website (www.ashrae.org). Applicants may choose instead to follow the *Advanced Buildings Core Performance Guide* published by the New Buildings Institute (<http://www.advancedbuildings.net>). More on this performance guide can be found in Appendix D. This guide may be utilized in place of the ASHRAE 90.1-2007 (or current).

Nonresidential development and redevelopment applicants shall demonstrate the following:

- i. Compliance in project plans with ASHRAE Standard 90.1-2007, Section 5.4 (or current), where possible, and provide a project design narrative where compliance in working plans is not explicit. This application requirement may be waived if the applicant chooses the following:
 - a. Compliance in project plans with the *Advanced Buildings Core Performance Guide*, where possible (in place of the ASHRAE 90.1-2007, Section 5.4), and provide a project design narrative where compliance in working plans is not explicit.

E1.4 Multi-family Projects

The purpose of this standard is to design and build more energy efficient multi-family residential buildings by utilizing the established ENERGY STAR® rating system. All multi-family residential project (townhouses, condominiums, apartments) applicants shall submit the following:

- i. A copy of the required ENERGY STAR® National Attached Builder Option Package specification (BOP), along with a statement of intent to satisfy ENERGY STAR® BOP (the ENERGY STAR® BOP for Barnstable County can be found in Appendix C).

E1.5 On-site Renewable Energy Generation

The purpose of this standard is to promote increased energy efficiency, self-sufficiency, reduced operating costs, and reduced GHG emissions through distributed generation of renewable energy for commercial projects. The preceding standards target methods for achieving higher efficiencies in building design. Projects that successfully meet these standards, and incorporate other efficient building design strategies, are better positioned to sufficiently reduce their energy load, and therefore meet the 10% on-site requirement. Flexibility for compliance with this standard is offered through *Alternative Methods for Compliance* (below). Federal and State incentives have made renewable energy installations increasingly cost effective (for an overview of federal and state incentives, see Appendix D). Renewable energy systems shall be sized based on the building's projected annual electrical demand. The annual electrical demand is a component of the overall building's projected design load for energy, which is a calculation required by the MA Building Code (CMR 780, Chapter 13, Section 1305). The methodology used to calculate design load is provided in the 1997 ASHRAE Handbook of Fundamentals, Chapters 25 and 26, as referenced by the MA Building Code, and should be conducted by a professional engineer. Applicants are encouraged to submit a schedule for pursuing federal and state incentives for the renewable energy installation. Commission staff will inform applicants of additional funding sources or incentive programs that are not included in the schedule. Applicants shall submit the following:

- i. Estimated annual electrical site demand for the proposed project. In lieu of this information, EPA median electricity energy-intensity levels by building type and square feet, as determined by the most recent Commercial Buildings Energy Consumption Survey (CBECS) shall be used as a baseline to calculate the 10-percent electrical demand. This number shall be expressed in kBtu/sf.
- ii. Based on the previous criteria, a projection of the annual kilowatt hours (kWh) to be offset with renewable energy, the type of renewable energy system to be installed (solar PV, wind, small hydro or biomass), including the system size in kilowatts (kW).

Requirements for Alternative Methods of Compliance for E1.5

Applicants who select one of the alternative methods for satisfying the E1.5 requirement shall submit the following, as applicable:

Option A. Provide 5% On-Site Renewable Energy Generation and Participate in the Cape Light Compact Green Program

Applicants who anticipate 10% on-site renewable energy generation will be unattainable for reasons pertaining to scale, siting, local permitting, or other reasons may select this option. The Cape Light Compact's Green Power Purchase program sells electricity at approximately \$0.016 per kWh over the standard rate. The project owner shall agree to purchase all of its electricity (100%) through this program through a power purchase agreement with the Cape Light Compact, as conditioned by the CCC decision for an approved project, for a term no less than seven (7) years. The purchase of green power through this program supports the development of renewable energy sources. Applicants shall provide the following:

- i. Estimated annual electrical site demand for the proposed project, as determined by MA Building Code (CMR 780, Chapter 13). In lieu of this information, EPA median electricity energy-intensity levels by building type and square feet, as determined by the Commercial Buildings Energy Consumption Survey (CBECS) shall be used as a baseline to calculate the 5-percent electrical demand. This number shall be expressed in kBtu/sf.

- ii. A projection of the annual kilowatt hours (kWh) to be offset with renewable energy, the type of renewable energy system to be installed (solar PV, wind, small hydro or biomass), including the system size in kilowatts (kW).
- iii. A statement of intent to enter into a power purchase agreement with the CLC for the 100% Green Power Purchase Program for a term of not less than seven (7) years. Prior to the Commission decision, provide a copy of the power purchase agreement with the CLC.

-OR-

Option B. Designed to be Leadership in Energy & Environmental Design (LEED) Certifiable

Applicants who anticipate 10% on-site renewable energy generation will be unattainable for reasons pertaining to scale, siting, local permitting, or other reasons may select this option. Applicants that choose this option will need to demonstrate the LEED criteria the project intends to pursue. LEED certification is achieved post-occupancy by earning a minimum 40 credits (see sample checklist, Appendix B). A member of the design team must be LEED accredited. A project narrative outlining how these credits will be achieved through project design is also required. If the Commission approves the project, a condition of the decision shall be LEED certification, or demonstration of “LEED Certifiability”, within 2 years of occupancy. Projects that pursue this option are eligible to meet one of the Economic Development waiver criteria (see 2009 RPP/Economic Development). Applicants shall submit the following:

- i. LEED checklist with criteria (or points) the project will pursue to achieve LEED certification (a minimum of 40 points).
- ii. Resume of a LEED accredited professional, including experience with at least 3 similar projects.
- iii. Project narrative describing how the project design intends to achieve selected LEED credits.

-OR-

Option C. Green Building Techniques (select 6)

Applicants who select the green building option for compliance with the standard shall provide a narrative of how they intend to comply with the standard for a complete application. Below are suggested ways applicants can show compliance with the standard.

- i. Provide a detailed narrative outlining how the projects intends to comply with six (6) of the green building techniques, as follows:
 - a) Manufacturer specifications for the ENERGY STAR® compliant reflective roof system of choice, or design specifications for a vegetated roof.
 - b) Project plans detailing the re-use of at least 50% of the existing building.
 - c) Project narrative describing the type (wind, solar PV, solar thermal, small hydro or biomass) and size (kW) of renewable energy system to be installed, including projected annual cost savings as a result of the system.
 - d) Engineer certified design plans or manufacturer specifications for a geothermal heating system to be used in the project.
 - e) Site plans and building plans demonstrating passive solar design features, along with a project narrative that details the passive solar features.
 - f) Landscape plan specifying native species, and a proposal for a water conserving irrigation plan.
 - g) Project plans and narrative that details compliance with ANSI standards (6.4 – HVAC; 7.4 – Load Calculations, Equipment Efficiency, Service Hot Water Piping Insulation, Service Controls, Pools, Heat Traps; 9.4 – Lighting Control, Tandem Wiring, Exit Signs, Exterior Grounds Lighting).

E1.6 Alternative Method of Meeting MPS E1.1 through E1.5 – 25% on-site requirement

Applicants who pursue compliance with this standard must generate 25 percent or more of their electrical demand through on-site renewable energy. The method for complying with this standard is the same as is outlined in E1.5 herein, and requires the applicant submit annual electrical site demand for the proposed project. Applicants that demonstrate compliance with this standard may waive compliance with standards E1.1, E1.2, E1.3, E1.4, and E1.5. Projects subject to this requirement shall submit the following:

- i. Estimated annual electrical site demand for the proposed project as determined by MA Building Code (CMR 780, Chapter 13). In lieu of this information, EPA median electricity energy-intensity levels by building type and square feet, as determined by the Commercial Buildings Energy Consumption Survey (CBECS) shall be used as a baseline to calculate the 25-percent electrical demand. This number shall be expressed in kBtu/sf.

Appendix A – RPP Minimum Performance Standards for Energy

Minimum Performance Standards

E1.1 Redevelopment Energy Audit

Redevelopment shall perform an energy audit of existing conditions and incorporate recommendations into the project design. Guidance on audit components can be found in a technical bulletin to be developed.

E1.2 Designed to Earn ENERGY STAR® Certification

Nonresidential development and redevelopment shall receive current ENERGY STAR® certification.

E1.3 ANSI/LEED Standards

Nonresidential development and redevelopment shall comply with current ANSI/ASHRAE/IESNA Standard 90.1-2007, Section 5.4 – Insulation, Fenestration, and Doors or current prerequisite LEED-certified standard, or successor standards designated by the Commission.

E1.4 Multi-family Projects

All multi-family residential projects (townhouses, condominiums, apartments) shall be designed, certified, and constructed according to current ENERGY STAR® National Attached Builder Option Package specifications.

E1.5 On-site Renewable Energy Generation

Except for mixed-use projects located in designated Economic Centers as identified on the Regional Land Use Vision Map, development and redevelopment involving net new development shall provide a minimum of 10 percent of a building's electrical demand through on-site renewable energy generation. In the case of redevelopment, the 10-percent calculation shall be based solely on the gross floor area of the additional new development in excess of 10,000 square feet. EPA average energy-intensity levels by building type and square feet are used as a baseline to calculate the 10-percent energy demand. In addition, applicants may provide an energy model to determine annual site-demand input for their project. Guidance on calculating energy demand can be found in a technical bulletin to be developed. The Commission may waive this requirement if:

- The project provides 5 percent of electrical demand through on-site renewable energy systems and participates in the Cape Light Compact Green Program for 100 percent of their remaining electricity needs,
 - or -
- The project is LEED certifiable,
 - or -
- The project demonstrates compliance with six of the following:
 - a) Installs ENERGY STAR®-compliant reflective roofing, or a vegetated roof.
 - b) Re-uses existing structures (including shell and non-shell).
 - c) Incorporates renewable energy.
 - d) Installs a geothermal heating system.
 - e) Incorporates passive solar design.
 - f) Installs energy-conserving landscapes (for example, native species).
 - g) Complies with ANSI standards (6.4 – HVAC; 7.4 – Load Calculations, Equipment Efficiency, Service Hot Water Piping Insulation, Service Controls, Pools, Heat Traps; 9.4 – Lighting Control, Tandem Wiring, Exit Signs, Exterior Grounds Lighting).

E1.6 Alternative Method of Meeting MPS E1.1 through E1.5

To meet the requirements of Goal E1 and applicable Minimum Performance Standards, DRIs may, at the applicant's option, provide 25 percent or more of their electrical demand through on-site renewable energy.

Appendix B - Sample LEED Checklist (use corresponding checklist for appropriate LEED product)



LEED 2009 for New Construction and Major Renovation

Project Checklist

Project Name

Date

0	0	0	Sustainable Sites	Possible Points: 26
---	---	---	--------------------------	----------------------------

Y	N	?		
Y			Prereq 1 Construction Activity Pollution Prevention	
			Credit 1 Site Selection	1
			Credit 2 Development Density and Community Connectivity	5
			Credit 3 Brownfield Redevelopment	1
			Credit 4.1 Alternative Transportation—Public Transportation Access	6
			Credit 4.2 Alternative Transportation—Bicycle Storage and Changing Rooms	1
			Credit 4.3 Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
			Credit 4.4 Alternative Transportation—Parking Capacity	2
			Credit 5.1 Site Development—Protect or Restore Habitat	1
			Credit 5.2 Site Development—Maximize Open Space	1
			Credit 6.1 Stormwater Design—Quantity Control	1
			Credit 6.2 Stormwater Design—Quality Control	1
			Credit 7.1 Heat Island Effect—Non-roof	1
			Credit 7.2 Heat Island Effect—Roof	1
			Credit 8 Light Pollution Reduction	1

0	0	0	Water Efficiency	Possible Points: 10
---	---	---	-------------------------	----------------------------

Y	N	?		
Y			Prereq 1 Water Use Reduction—20% Reduction	
			Credit 1 Water Efficient Landscaping	2 to 4
			<input type="checkbox"/> Reduce by 50%	2
			<input type="checkbox"/> No Potable Water Use or Irrigation	4
			Credit 2 Innovative Wastewater Technologies	2
			Credit 3 Water Use Reduction	2 to 4
			<input type="checkbox"/> Reduce by 30%	2
			<input type="checkbox"/> Reduce by 35%	3
			<input type="checkbox"/> Reduce by 40%	4

0	0	0	Energy and Atmosphere	Possible Points: 35
---	---	---	------------------------------	----------------------------

Y		Prereq 1 Fundamental Commissioning of Building Energy Systems	
Y		Prereq 2 Minimum Energy Performance	
Y		Prereq 3 Fundamental Refrigerant Management	
	[] [] []	Credit 1 Optimize Energy Performance	1 to 19
	[]	Improve by 12% for New Buildings or 8% for Existing Building Renovations	1
	[]	Improve by 14% for New Buildings or 10% for Existing Building Renovations	2
	[]	Improve by 16% for New Buildings or 12% for Existing Building Renovations	3
	[]	Improve by 18% for New Buildings or 14% for Existing Building Renovations	4
	[]	Improve by 20% for New Buildings or 16% for Existing Building Renovations	5
	[]	Improve by 22% for New Buildings or 18% for Existing Building Renovations	6
	[]	Improve by 24% for New Buildings or 20% for Existing Building Renovations	7
	[]	Improve by 26% for New Buildings or 22% for Existing Building Renovations	8
	[]	Improve by 28% for New Buildings or 24% for Existing Building Renovations	9
	[]	Improve by 30% for New Buildings or 26% for Existing Building Renovations	10
	[]	Improve by 32% for New Buildings or 28% for Existing Building Renovations	11
	[]	Improve by 34% for New Buildings or 30% for Existing Building Renovations	12
	[]	Improve by 36% for New Buildings or 32% for Existing Building Renovations	13
	[]	Improve by 38% for New Buildings or 34% for Existing Building Renovations	14
	[]	Improve by 40% for New Buildings or 36% for Existing Building Renovations	15
	[]	Improve by 42% for New Buildings or 38% for Existing Building Renovations	16
	[]	Improve by 44% for New Buildings or 40% for Existing Building Renovations	17
	[]	Improve by 46% for New Buildings or 42% for Existing Building Renovations	18
	[]	Improve by 48%+ for New Buildings or 44%+ for Existing Building Renovations	19
	[] [] []	Credit 2 On-Site Renewable Energy	1 to 7
	[]	1% Renewable Energy	1
	[]	3% Renewable Energy	2
	[]	5% Renewable Energy	3
	[]	7% Renewable Energy	4
	[]	9% Renewable Energy	5
	[]	11% Renewable Energy	6
	[]	13% Renewable Energy	7
	[] [] []	Credit 3 Enhanced Commissioning	2
	[] [] []	Credit 4 Enhanced Refrigerant Management	2
	[] [] []	Credit 5 Measurement and Verification	3
	[] [] []	Credit 6 Green Power	2

0	0	0	Materials and Resources	Possible Points: 14
---	---	---	--------------------------------	----------------------------

Y				Prereq 1 Storage and Collection of Recyclables	
				Credit 1.1 Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
				Reuse 55%	1
				Reuse 75%	2
				Reuse 95%	3
				Credit 1.2 Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
				Credit 2 Construction Waste Management	1 to 2
				50% Recycled or Salvaged	1
				75% Recycled or Salvaged	2
				Credit 3 Materials Reuse	1 to 2
				Reuse 5%	1
				Reuse 10%	2
				Credit 4 Recycled Content	1 to 2
				10% of Content	1
				20% of Content	2
				Credit 5 Regional Materials	1 to 2
				10% of Materials	1
				20% of Materials	2
				Credit 6 Rapidly Renewable Materials	1
				Credit 7 Certified Wood	1

0	0	0	Indoor Environmental Quality	Possible Points: 15
---	---	---	-------------------------------------	----------------------------

Y				Prereq 1 Minimum Indoor Air Quality Performance	
Y				Prereq 2 Environmental Tobacco Smoke (ETS) Control	
				Credit 1 Outdoor Air Delivery Monitoring	1
				Credit 2 Increased Ventilation	1
				Credit 3.1 Construction IAQ Management Plan—During Construction	1
				Credit 3.2 Construction IAQ Management Plan—Before Occupancy	1
				Credit 4.1 Low-Emitting Materials—Adhesives and Sealants	1
				Credit 4.2 Low-Emitting Materials—Paints and Coatings	1
				Credit 4.3 Low-Emitting Materials—Flooring Systems	1
				Credit 4.4 Low-Emitting Materials—Composite Wood and Agrifiber Products	1
				Credit 5 Indoor Chemical and Pollutant Source Control	1
				Credit 6.1 Controllability of Systems—Lighting	1
				Credit 6.2 Controllability of Systems—Thermal Comfort	1
				Credit 7.1 Thermal Comfort—Design	1
				Credit 7.2 Thermal Comfort—Verification	1
				Credit 8.1 Daylight and Views—Daylight	1
				Credit 8.2 Daylight and Views—Views	1

0	0	0	Innovation and Design Process	Possible Points: 6
			Credit 1.1 Innovation in Design: Specific Title	1
			Credit 1.2 Innovation in Design: Specific Title	1
			Credit 1.3 Innovation in Design: Specific Title	1
			Credit 1.4 Innovation in Design: Specific Title	1
			Credit 1.5 Innovation in Design: Specific Title	1
			Credit 2 LEED Accredited Professional	1
0	0	0	Regional Priority Credits	Possible Points: 4
			Credit 1.1 Regional Priority: Specific Credit	1
			Credit 1.2 Regional Priority: Specific Credit	1
			Credit 1.3 Regional Priority: Specific Credit	1
			Credit 1.4 Regional Priority: Specific Credit	1
0	0	0	Total	Possible Points: 110
<p style="text-align: center;"> <small>Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110</small> </p>				

Appendix C – ENERGY STAR® Sample Statement of Energy Design Intent, and ENERGY STAR® BOPS for Barnstable County



STATEMENT OF ENERGY DESIGN

INTENT

September 5, 2008

FACILITY INFORMATION

Facility Name and Location

School
 Dallas, TX – United States 75202 Building _____
 Owner/Company _____

Facility Characteristics

K-12 School 90,000 Sq. Ft. Address _____
 Total Gross Floor Area 90,000 Sq. Ft. _____

Design Energy (kBtu)¹

Electricity 2,217,800 Contact Name _____
 Natural Gas 600,000 Phone _____
 Email _____

DESIGN ENERGY PERFORMANCE

Energy

EPA Energy Performance Rating (1-100)
 Percent Energy Reduction (%)
 Site Energy Use Intensity (kBtu/sf/yr)
 Total Annual Site Energy (kBtu)
 Total Annual Energy Cost (\$)

Pollution Emissions (1000 lbs/yr)

CO2

DESIGN
88
36
31.3
2,817,800
\$49,156
846

ENERGY STAR
75
20
39.4
3,543,974
\$61,824
1,060

PROFESSIONAL VERIFICATION

Licensed Architect/Engineer

Prepared by _____

Firm Name _____

Address _____

Phone _____

Email _____

Architect of Record (if different than above)

Name _____

Firm Name _____

¹ Target Finder uses data from "actual" performing buildings, therefore all energy use including plug, process, and all non-regulated loads, fuel sources and equipment specified in design must be included. An incomplete design energy use profile could result in a high but inaccurate rating.



STATEMENT OF ENERGY DESIGN INTENT*

September 5,
2008

Facility Name and Location

School

Dallas, TX – United States 75202

Facility Characteristics (detail)

K-12

School

Gross Floor Area	Number of Students	Number of PC's	Operating Hours/Week	Cooking Facility	% Air Conditioned	% Heated	Months	Ventilated
90,000 sq. ft.	600	100	70 hours	Yes	100	100	10	yes

Additional:

* This document was generated from Target Finder, an EPA tool located on the ENERGY STAR Web site, www.energystar.gov.



**ENERGY STAR Qualified Homes
Builder Option Package Notes**

2004/2006 IECC Climate Zone¹ – 5 ENERGY STAR Window Zone¹⁹ – Northern

The requirements for the ENERGY STAR Builder Option Package (BOP) are specified in the table below. To qualify as ENERGY STAR using this BOP, a home must meet the requirements specified, be verified and field-tested in accordance with the HERS Standards by a RESNET-accredited Provider, and meet all applicable codes.

Cooling Equipment (Where Provided)	Right-sized² ≥13 SEER A/C; <u>OR</u> Right-sized² ≥14 SEER/11.5 EER/8.5 HSPF ENERGY STAR qualified heat pump³
Heating Equipment	≥90 AFUE ENERGY STAR qualified gas furnace; <u>OR</u> ≥14 SEER/11.5 EER/8.5 HSPF ENERGY STAR qualified heat pump^{2,3}; <u>OR</u> ≥90 AFUE ENERGY STAR qualified boiler; <u>OR</u> ≥85 AFUE ENERGY STAR qualified oil furnace
Thermostat³	ENERGY STAR qualified thermostat (except for zones with mass radiant heat)
Ductwork	Leakage⁴ : ≤ 4 cfm to outdoors/100 sq. ft.; <u>AND</u> Insulation⁵ : ≥ R-6 insulation on ducts in unconditioned spaces
Envelope	≤ 5 ACH50 Infiltration^{6,7}
	≤ Reference UVA UA Alternative Approach⁸; <u>OR</u> ≥ 38 R-Value Ceiling Insulation⁸; <u>AND (if applicable)</u> ≥ 30 R-Value Cathedral Ceiling Insulation⁸; <u>AND (if applicable)</u> ≥ 19 R-Value Wood Frame Wall Insulation⁸; <u>OR</u> ≥ 13 + 5 R-Value Wood Frame Wall Insulation and Sheathing <u>AND (if applicable)</u> ≥ 30 R-Value Floor Over Unconditioned Space Insulation⁸; <u>AND (if applicable)</u> ≥ 10 R-Value Crawlspace Wall Insulation Continuous⁸; <u>AND (if applicable)</u> ≥ 13 R-Value Crawlspace Wall Insulation Framed⁸; <u>AND (if applicable)</u> ≥ 10 R-Value Basement Wall Insulation Continuous⁸; <u>AND (if applicable)</u> ≥ 13 R-Value Basement Wall insulation Framed⁸; <u>AND (if applicable)</u> ≥ 10 R-Value Slab Insulation at 2 feet Depth⁸; <u>AND</u>
	Completed Thermal Bypass Inspection Checklist⁸
Windows^{10,11,12}	≤ 0.35 U-Value ≤ Any SHGC
Water Heater¹³	Gas (EF): 40 Gal = 0.61 60 Gal = 0.57 80 Gal = 0.53 Electric (EF): 40 Gal = 0.93 50 Gal = 0.92 80 Gal = 0.89 Oil or Gas¹⁴: Integrated with space heating boiler
Lighting and Appliances^{15,16}	Five or more ENERGY STAR qualified appliances, light fixtures, ceiling fans equipped with lighting fixtures, and/or ventilation fans

Energy Savings Values and associated average monthly savings are provided at the end of this document for the purpose of applying for an energy efficient mortgagee.¹⁷



ENERGY STAR Qualified Homes Builder Option Package Notes

2004/2006 IECC Climate Zone¹ – 5

ENERGY STAR Window Zone¹⁹ – Northern

1. The appropriate climate zone shall be determined by the 2004 International Residential Code (IRC), Figure N1101.2.
2. Cooling equipment shall be sized according to the latest editions of ACCA Manuals J and S, ASHRAE 2001 Handbook of Fundamentals, or an equivalent procedure. Maximum oversizing limit for air conditioners and heat pumps is 15% (with the exception in Climate Zones 5 – 8, where the maximum oversizing limit is 25%). The following operating conditions shall be used in the sizing calculations and verified where reviewed by the rater:
Outdoor temperatures shall be the 99.0% design temperatures as published in the ASHRAE Handbook of Fundamentals for the home's location or most representative city for which design temperatures data are available. Note that a higher outdoor air design temperature may be used if it represents prevailing local practice by the HVAC industry and reflects extreme climate conditions that can be documented with recorded weather data; Indoor temperatures shall be 75 F for cooling; Infiltration rate shall be selected as "tight", or the equivalent term.
In Specifying equipment, the next available size may be used. In addition, indoor and outdoor coils shall be matched in accordance with ARI standards.
3. Homes with heat pumps in Climate Zones 4 and 5 must have an HSPF ≥ 8.5 , which exceeds the ENERGY STAR minimum of 8.2 HSPF. Homes with heat pumps in Climate Zones 6, 7, and 8 cannot be qualified using this BOP, but can earn the label using the ENERGY STAR Performance Path requirements. In homes with heat pumps with programmable thermostats, the thermostat must have "Adaptive Recovery" technology to prevent the excessive use of electric back-up heating.
4. Ducts must be sealed and tested to be ≤ 4 cfm to outdoors/100 sq. ft. of conditioned floor area, as determined and documented by a RESNET-certified rater using a RESNET-approved testing protocol. If *total* duct leakage is ≤ 4 cfm to outdoors/100 sq. ft. of conditioned floor area, then leakage to outdoors does not need to be tested. Duct leakage testing can be waived if all ducts and air handling equipment are located in conditioned space (i.e within the home's air and thermal barriers) AND the envelope leakage has been tested to be ≤ 3 ACH50 OR ≤ 0.25 CFM 20 per sq. ft. of the building envelope. Note that mechanical ventilation will be required in this situation.
5. EPA recommends, but does not require, locating ducts within conditioned spaces (i.e inside the air and thermal barriers), and using a minimum of R-4 insulation for ducts inside conditioned space to prevent condensation.
6. Envelope leakage must be determined by a RESNET-certified rater using a RESNET-approved testing protocol.
7. To ensure consistent exchange of indoor air, whole-house mechanical ventilation is recommended, but not required.
8. Insulation levels of a home must meet or exceed Sections N1102.1 and N1102.2 of the 2004 IRC. These sections allow for compliance to be determined by meeting prescriptive insulation requirements, by using U-factor alternatives, or by using a total UA alternative. These section also provide guidance and exceptions that may be used. However, note that the U-factor for steel-frame envelope assemblies addressed in Section N1102.2.4 shall be calculated using the ASHRAE zone method, or a method providing equivalent results, and not a series-parallel path calculation method as is stated in the code. Additionally, Section N1102.2.2, which allows for the reduction of ceiling insulation in space constrained roof/ceiling assemblies, shall be limited to 500 sq. ft. or 20% of ceiling area, whichever is less. In all cases, insulation shall be inspected to Grade I insulation as defined in the RESNET Standards by a RESNET-certified rater, with the following exceptions:
 - a) Rim/Band Joists – the interior sheathing/enclosure material is optional in all climate zones, provided insulation is adequately supported and meets all other requirements.

- b) Wall Insulation – the interior sheathing/enclosure material is optional in all climate zones 1 – 3, provided insulation is adequately supported and meets all other requirements.
- c) Sealed, Unvented Attic/Roof Assemblies – the interior sheathing/enclosure material is optional in climate zones 1 – 3, provided insulation is adequately supported and meets all other requirements, including full contact with the exterior (roof) sheathing.
- d) Floor insulation over unconditioned basements or enclosed crawlspaces, either vented or unvented, need not be enclosed (though floor insulation over ambient conditions does).

Note that the fenestration requirements of the 2004 IRC do not apply to the fenestration requirements of the National Builder Option Package. Therefore, if UA calculations are performed, they must use the IRC requirements (with the exception of fenestration) plus the fenestration requirements contained in the national BOP. For more information, refer to the “Codes and Standards Information” document.

9. The Thermal Bypass Inspection Checklist must be completed for homes to earn the ENERGY STAR label. The Checklist requires visual inspection of framing areas where air barriers are commonly missed and inspection of insulation to ensure proper alignment with air barriers, thus serving as an extra check that the air and thermal barriers are continuous and complete.
10. All window and skylights must be ENERGY STAR qualified or meet all specifications for ENERGY STAR qualified windows. Windows in Climate Zones 2 and 4 must exceed ENERGY STAR specifications (CZ 2: U-value ≤ 0.55 and SHGC ≤ 0.35 ; CZ 4: U-value ≤ 0.40 and SHGC ≤ 0.45). Visit www.energystar.gov/windows for more information on ENERGY STAR qualified windows.
11. All decorative glass and skylight window area counts toward the total window area to above-grade conditioned floor area (WFA) ratio. For homes with a WFA ratio $> 18\%$, the following additional requirements apply:
 - a) In IRC Climate Zones 1, 2 and 3, and improved window SHGC is required, and is determined by:
Required SHGC = $[0.18/WFA] \times [ENERGY STAR SHGC]$
where the ENERGY STAR SHGC is the minimum required SHGC of the climate-appropriate window specified in this BOP.
 - b) In IRC Climate Zones 4, 5, 6, 7 and 8, and improved window U-value is required, and is determined by:
Required U-Value = $[0.18/WFA] \times [ENERGY STAR U-Value]$
where the ENERGY STAR U-value is the minimum required U-value of the climate-appropriate window specified in this BOP.
12. Up to 0.75% WFA may be used for decorative glass that does not meet ENERGY STAR requirements. For example, a home with total above-grade conditioned floor area of 2,000 sq. ft. may have up to 15 sq. ft. (0.75% of 2,000) of decorative glass.
13. To determine domestic hot water (DHW) EF requirements for additional tank sizes, use the following equations:
 Gas DHW EF $\geq 0.69 - (0.002 \times \text{Tank Gallon Capacity})$; Electric DHW EF $\geq 0.97 - (0.001 \times \text{Tank Gallon Capacity})$.
14. In homes with gas or oil hydronic space heating, water heating systems must have an efficiency of ≥ 0.78 EF. This may be met through the use of an instantaneous water heating system or an indirect storage system with a boiler that has a system efficiency ≥ 85 AFUE. Homes with tankless coil hot water heating systems cannot be qualified using this BOP, but can earn the label using the ENERGY STAR Performance Path requirements.
15. Any combination of ENERGY STAR qualified products listed may be installed to meet this requirement. ENERGY STAR qualified ventilation fans include range hood, bathroom, and inline fans. ENERGY STAR qualified lighting fixtures installed in the following locations shall not be counted; storage rooms (e.g., closets, pantries, sheds), or garages. Eligible appliances include ENERGY STAR qualified refrigerators, dish washers, and washing machines. Further efficiency and savings can be achieved by installing ENERGY STAR qualified products, in addition to those required (e.g., additional lighting, appliances, etc.).
16. Efficient lighting fixtures represent a significant opportunity for persistent energy savings and a meaningful way to differentiate ENERGY STAR qualified homes from those meeting minimum code requirements. In 2008, EPA intends to propose and solicit industry comments on adding the ENERGY STAR Advanced

Lighting Package (ALP) as an additional requirement for ENERGY STAR qualified homes in 2009. To learn more about the ALP, refer to www.energystar.gov/homes.

Appendix D - Resources

State Renewable Energy Generation Incentives

- Commonwealth Solar Hot Water
- Commonwealth Solar II
- Commonwealth Solar Stimulus Rebate
- Commonwealth Wind - Micro-Wind
- Commonwealth Wind – Community Scale
- Commonwealth Wind – Commercial Scale

For more information on these and other renewable energy generation programs and incentives currently available in the Commonwealth, please visit the Massachusetts Clean Energy Center website (www.masscec.com).

- RPS Solar Carve Out
- SRECs
- Net-Metering
- [Energy Efficiency Programs Offered by Mass. Utilities](#)
- [Mass. Incentives/Policies for Renewables and Efficiency \(DSIRE\)](#)
- [Net Metering](#)
- [Renewable Energy Portfolio Standard](#)

More information on these and other renewable energy generation incentives is available through the Department of Energy Resources (DOER) and the Executive Office of Energy and Environmental Affairs (EOEEA).

Federal Renewable Energy Incentives

- [Business Energy Investment Tax Credit \(ITC\) \(DSIRE\)](#)
- [Energy-Efficient Commercial Buildings Tax Deduction \(DSIRE\)](#)
- [Renewable Electricity Production Tax Credit \(PTC\) \(DSIRE\)](#)
- [Renewable Energy Production Incentive \(REPI\) \(DSIRE\)](#)
- [U.S. Department of Treasury - Renewable Energy Grants \(DSIRE\)](#)
- [Tax Credits for Home Energy Improvements](#)

More information on Federal Renewable Energy Incentives is available through the Database of State Incentives for Renewable Energy (DSIRE) website, www.dsireusa.org/incentives.

Advanced Buildings Core Performance Program

Core Performance Program

INTRODUCTION TO *ADVANCED BUILDINGS CORE PERFORMANCE*

Advanced Buildings Core Performance is a prescriptive program to achieve significant, predictable energy savings in new commercial construction. The program describes a set of simple, discrete integrated design strategies and building features. When applied as a package, they result in energy savings of at least 20 to 30% (depending on climate) beyond the performance of a building that meets the prescriptive requirements of ASHRAE 90.1-2004, and at least 25 to 35% beyond a building that meets ASHRAE 90.1-2001. This program is the revised and updated version of the *Advanced Buildings Benchmark* program released previously.

Elements of the program can be applied to new commercial construction projects of all sizes, but the Criteria and analysis supporting the program were designed particularly for smaller scale commercial projects ranging from 10,000 to 70,000 square feet. At the larger end of this range, HVAC system complexity may suggest additional energy savings opportunities not fully addresses by a prescriptive program. However, even much larger projects with simple mechanical systems can benefit from the *Core Performance* savings strategies. Building envelope and lighting system energy savings strategies in *Core Performance* are scalable to projects of any size.

The program is based on the results of an extensive energy modeling protocol used to identify consistent strategies that lead to anticipated energy savings across climates. These strategies are combined in a prescriptive guideline for new construction to guide energy performance improvements. The analysis included evaluations of three major building prototypes, four HVAC system permutations for each prototype, evaluated for climate variations for 16 U.S. cities. The program also includes guidelines on implementing improved design processes to foster design integration, thereby improving overall building performance opportunities. These strategies set the stage for additional whole building performance improvements beyond the basic requirements of this program.

A key aspect of the *Core Performance* program is that the strategies that make up the program represent ‘state of the shelf’ technologies and practices that are broadly available in the building industry, and have been demonstrated to be cost-effective.



Cape Light Compact
Superior Courthouse
PO Box 427
Barnstable, MA 02630

Energy Efficiency 1-800-797-6699
Office 508-375-6648
Fax 508-362-4136
www.capelightcompact.org

	<i>Core Performance</i> Program Outline	
SECTION 1	DESIGN PROCESS REQUIREMENTS	
1.1	IDENTIFY DESIGN INTENT	
1.2	COMMUNICATING DESIGN INTENT	
1.3	BUILDING CONFIGURATION	
1.4	MECHANICAL SYSTEM DESIGN	
1.5	CONSTRUCTION CENTRIFICATION (acceptance testing)	
1.6	OPERATOR TRAINING AND DOCUMENTATION	
1.7	PERFORMANCE DATA REVIEW	
SECTION 2	<i>CORE PERFORMANCE</i> REQUIREMENTS	
2.1	ENERGY CODE COMPLIANCE	
2.2	AIR BARRIER PERFORMANCE	
2.3	MINIMUM IAQ PERFORMANCE	
2.4	BELOW-GRADE EXTERIOR INSULATION	
2.5	OPAQUE ENVELOPE PERFORMANCE	
2.6	FENESTRATION PERFORMANCE	
2.7	LIGHTING CONTROLS	
2.8	LIGHTING POWER DENSITY	
2.9	MECHANICAL EQUIPMENT EFFICIENCY	
2.10	DEDICATED MECHANICAL SYSTEMS	
2.11	DEMAND CONTROL VENTILATION	
2.12	DOMESTIC HOT WATER EFFICIENCY	
2.13	ECONOMIZER PERFORMANCE	
SECTION 3	ADDITIONAL STRATEGIES	
3.1	COOL ROOFS	
3.2	DAYLIGHTING AND CONTROLS	
3.3	ADDITIONAL LIGHTING POWER REDUCTIONS	
3.4	PLUG LOADS/APPLIANCE EFFICIENCY	
3.5	SUPPLY AIR TEMPERATURE RESET (VAV)	
3.6	INDIRECT EVAPORATIVE COOLING	
3.7	HEAT RECOVERY	
3.8	NIGHT VENTING	
3.9	PREMIUM ECONOMIZER	
3.10	VARIABLE SPEED CONTROL	
3.11	DEMAND-RESPONSIVE BUILDINGS (peak power reduction)	
3.12	ON-SITE SUPPLY OF RENEWABLE ENERGY	
3.13	ADDITIONAL COMMISSIONING STRATEGIES	
3.14	FAULT DETECTION DIAGNOSTICS	
SECTION 4	ENERGY MODELING	
4.1	PREDICT PERFORMANCE WITH ENERGY MODELING	