STRETCH CODE OVERVIEW

Town of Acton – Monday February 1st 2010

Ian Finlayson – Department of Energy Resources

Energy Codes in MA are changing

- New base energy code in July (IECC 2009)
  - Roughly 10% more energy efficient

- Towns and Cities can opt into the "Stretch Code" appendix
  - Approx 20% more energy efficient than IECC 2009 or ASHRAE 90.1-2007
- Commercial bldgs. ASHRAE 90.1-2007 remains

ASHRAE 90.1 = *Energy Standard for Buildings Except Low-Rise Residential Buildings*

Residential based on ‘Energy Star’

- Proven cost-effective program
  - 15% of new construction in MA
- Builder incentives/rebates
  - $1,250/home for HERS 65 (energy star tier 2)
  - Up to $8,000 for HERS <40
  - Rebates on appliances,
    heating and cooling, lighting, etc.
- Builder training and materials
- Subsidized HERS raters

New Homes – Energy Rating (HERS)

- Energy 'Performance' rating (like car MPG)
  - Uses Home Energy Rating System (HERS) Index
  - 70 or less < 3,000 sq ft.
  - 65 or less > 3,000 sq ft.
- Requires a certified HERS rater
  - Review building plans
  - Check insulation installation
  - Blower-door and duct testing
  - Thermal bypass Checklist

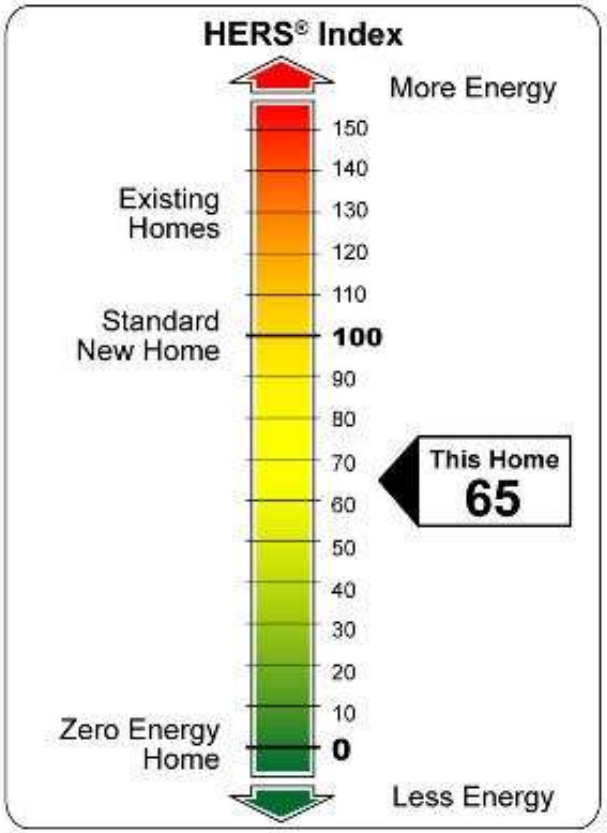


Image source: www.lexingtoninfrared.com/hers-ratings.php

ENERGY STAR Qualified Homes
Thermal Bypass Inspection Checklist

Home Address:_____ City:_____ State:_____

Thermal Bypass	Inspection Guidelines	Corrections Needed	Builder Verified	Rater Verified	N/A
1. Overall Air Barrier and Thermal Barrier Alignment	**Requirements:** Insulation shall be installed in full contact with sealed interior and exterior air barrier except for alternate to interior air barrier under item no. 2 *(Walls Adjoining Exterior Walls or Unconditioned Spaces)*				
	All Climate Zones:				
	1.1 Overall Alignment Throughout Home	☐	☐	☐	☐
	1.2 Garage Band Joist Air Barrier (at bays adjoining conditioned space)	☐	☐	☐	☐
	1.3 Attic Eave Baffles Where Vents/Leakage Exist	☐	☐	☐	☐
	Only at Climate Zones 4 and Higher:				
	1.4 Slab-edge Insulation (A maximum of 25% of the slab edge may be uninsulated in Climate Zones 4 and 5.)	☐	☐	☐	☐
	Best Practices Encouraged, Not Req'd.:				
	1.5 Air Barrier At All Band Joists (Climate Zones 4 and higher)	☐	☐	☐	☐
	1.6 Minimize Thermal Bridging (e.g., OVE framing, SIPs, ICFs)	☐	☐	☐	☐
2. Walls Adjoining Exterior Walls or Unconditioned Spaces	**Requirements:** • Fully insulated wall aligned with air barrier at both interior and exterior, **OR** • Alternate for **Climate Zones 1 thru 3**, sealed exterior air barrier aligned with RESNET Grade 1 insulation fully supported • Continuous top and bottom plates or sealed blocking				
	2.1 Wall Behind Shower/Tub	☐	☐	☐	☐
	2.2 Wall Behind Fireplace	☐	☐	☐	☐
	2.3 Insulated Attic Slopes/Walls	☐	☐	☐	☐
	2.4 Attic Knee Walls	☐	☐	☐	☐
	2.5 Skylight Shaft Walls	☐	☐	☐	☐
	2.6 Wall Adjoining Porch Roof	☐	☐	☐	☐
	2.7 Staircase Walls	☐	☐	☐	☐
	2.8 Double Walls	☐	☐	☐	☐

Home Additions – 2 options

- HERS index on just addition or whole house
  - 70 or less < 3,000 sq ft.
  - 65 or less > 3,000 sq ft.

- Prescriptive Path
  - Energy Star Windows
  - Base Code insulation and envelope (IECC 2009)
  - Thermal Bypass Checklist

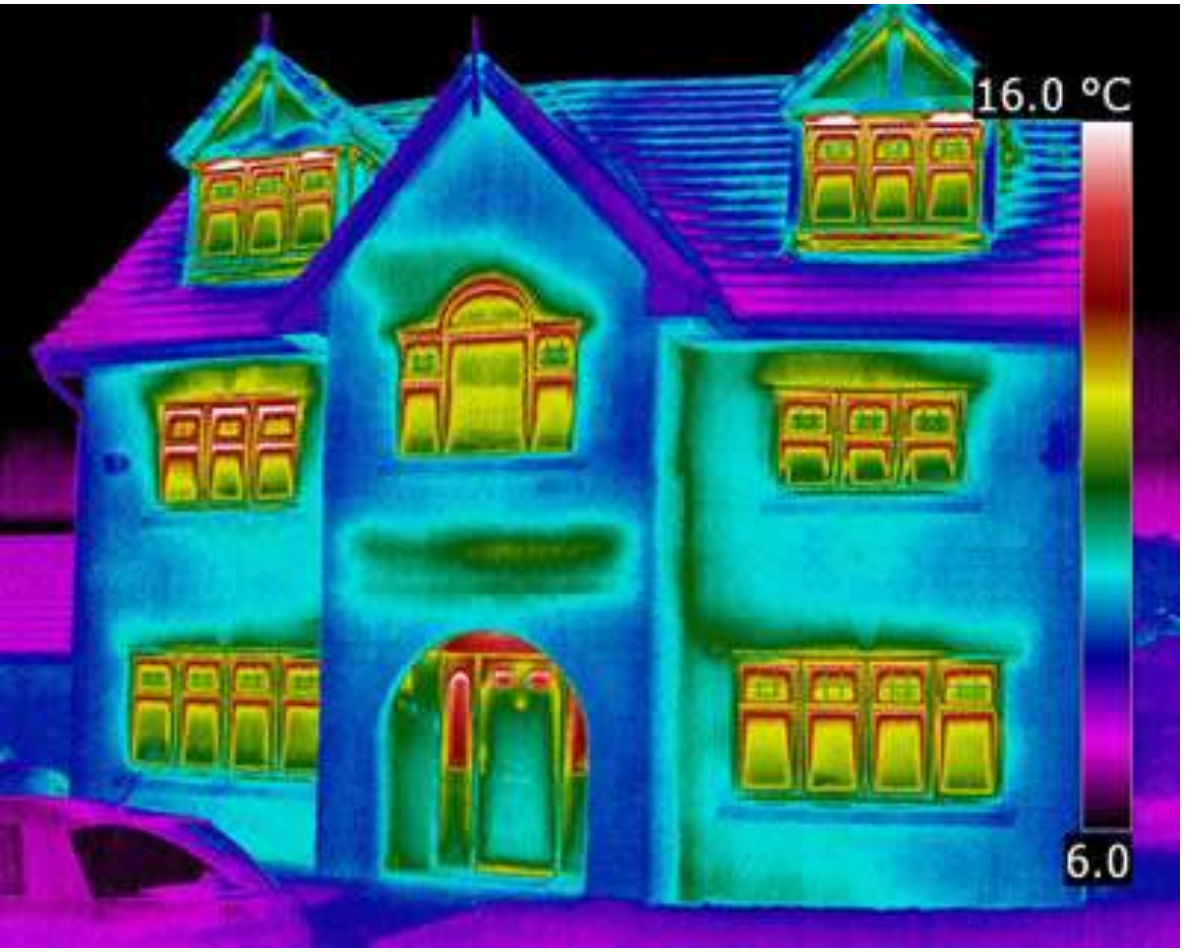
Home Renovations – 2 options

- Performance Path is easier
  - Easier HERS index requirement (mostly relevant for gut-renovations)
  - 85 or less < 2,000 sq ft.
  - 80 or less > 2,000 sq ft.

- Prescriptive Path
  - Same as for additions
  - Energy Star Windows
  - IECC 2009 envelope & Thermal bypass checklist

Image source: http://www.wilkinsonbuild.co.uk/Portals/5/Renovation/renovation2.jpg

Why test Performance?



Design, Installation & Equipment all important.

- Blower-door test for air leakage
- Duct test for heating & AC
- Optional Infra-red test thermal barrier install.

Image source: http://www.pixelthermographics.co.uk/images/FrontJoinedIR.jpg

Cost of Stretch code

- Cost effective and already proven in the voluntary market
  - Energy star 15% of all MA new residential in 2008

- Example homes show clear $$ savings
  - New 3-bed 2,700 ft^2 ranch
  - Rehab. urban triple-decker – 3x 1,400 ft^2 units

Example of Benefit-Cost Modeling: 2,672 square foot, 3-bedroom home

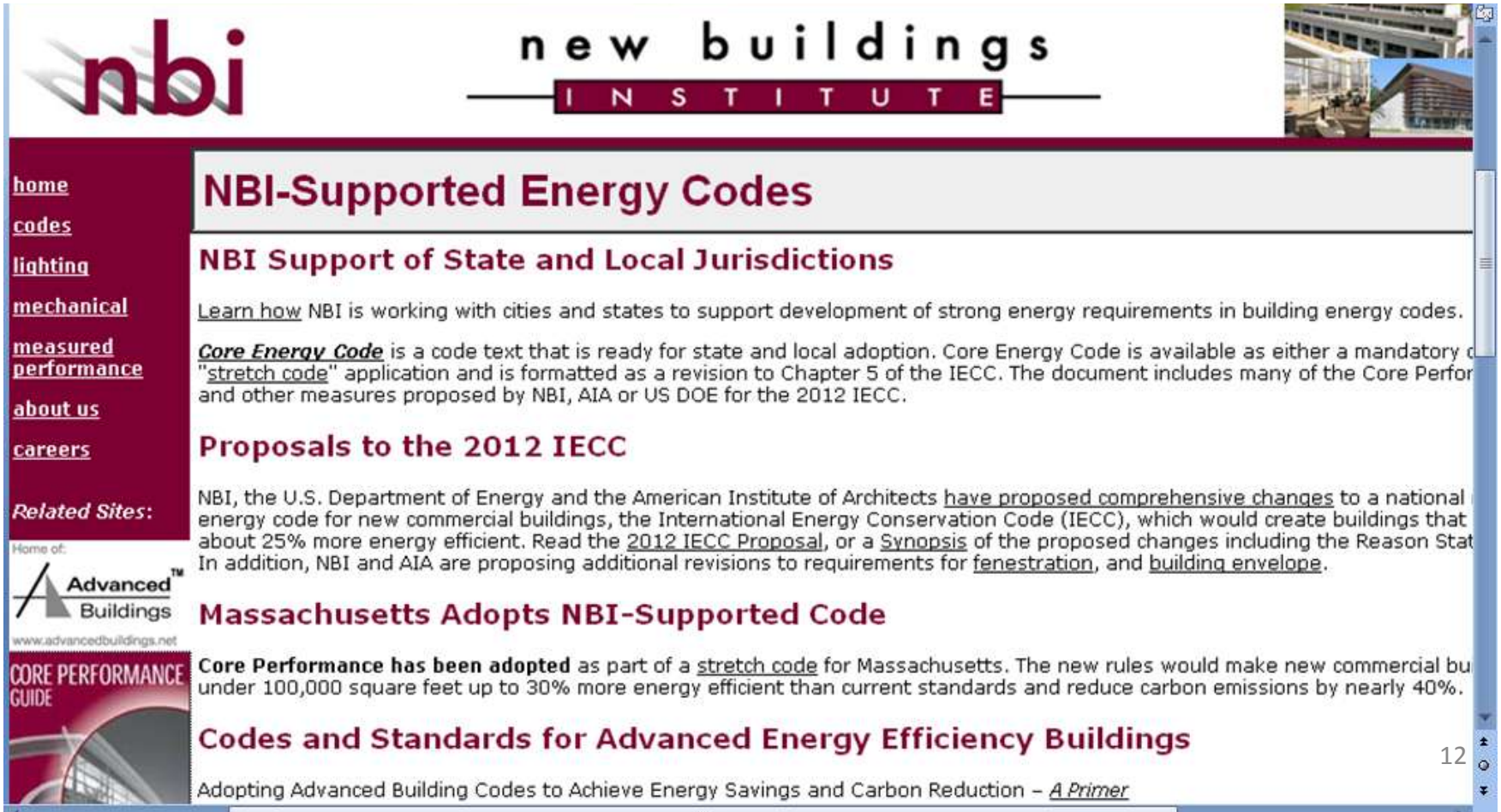
Task A – New Home	
HERS Index Modeled in REM/Rate	**60** (energy use 40% below 2006 IECC code)
Improvement Measures (changes relative to base case)	- Conditioned basement - Foundation Walls R10 insulation - Above grade walls R22 insulation - Window U-factor .33 - Attic ceiling R38 cellulose insulation - Slope ceiling R32 cellulose insulation - Infiltration 4 ACH50 - Natural Gas Furnace 94 AFUE, 65kBtuh - Central Air Conditioner 3 ton 15 SEER - Domestic Hot Water .62 natural gas tank - Programmable thermostat - 75% Fluorescent lighting
Improvement Costs	$ 8,103
Mortgage Interest Rate	5%
Loan Term (Years)	30
Annual Incremental Mortgage Payment	$527
Annual Energy Costs	$ 3,103
Annual Energy Savings from Baseline	$1,364
Annual Cash Flow Gain	**$ 837**

Note: This does not include the cost of a HERS rater (est. $500-1200) or the savings from utility rebates ($1,250) and Federal Tax Credits (up to $4000).

COMMERCIAL STRETCH CODE

Commercial ‘Stretch’ Appendix

- Based on New Buildings Institute – ‘Core Performance’ Energy Code



Commercial 'Stretch' Appendix

- Only New Commercial Buildings
- Only buildings or additions over 5,000 ft^2
- 2 Options (depending on size)
  - Performance option - 20% below Code
  - Prescriptive option for most building types

    5,000 - 100,000 ft2

Commercial 'Stretch' Appendix

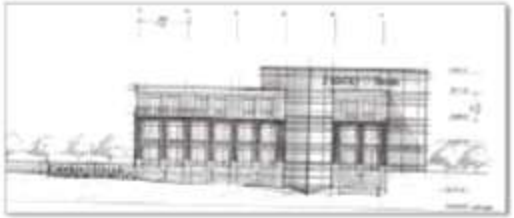
- Performance option
  - 20% below Code (ASHRAE 90.1-2007 appendix G)
  - all buildings over 100,000 ft^2
  - Labs, Supermarkets, over 40,000 ft^2
- Prescriptive option for most building types
  - 5,000 - 100,000 ft2
- Exemptions (comply with base code)
  - Special cases smaller than 40,000 ft^2

Fidelity Bank
Corporate Office and Branch Case Study
Leominster, MA

Advanced Building Features
- High Efficiency T-5 Pendant Lighting
- Lighting Control Efficiency
- Reduced Lighting Power Density
- Efficient Site Lighting
- Additional Wall Insulation
- High Performance Glazing
- Efficient VAV RTU's, with ECM Motors
- Demand Control Ventilation
- Part Load HVAC Efficiency Enhancements

Funded Utility Services Support
- Early Life Cycle Cost Analysis
- Integrated Design Team Approach
- Commissioning

Project Description
The 47,000 SF Fidelity Bank Corporate Office and Branch was constructed as a design-build project in Leominster, MA. The four story building will provide office space plus a ground floor branch bank office. This project is acclaimed for its highly successful implementation of the national Advanced Buildings program. The project demonstrates the validity of the Advanced Buildings program assertions. The guideline cost effectively delivered even more than the expected 20% to 30% reduction in annual energy costs compared to a code based design.



Envelope Improvements
- Walls: Added 3-1/2" batt insulation to planned 2" rigid.
- Glazing:
  - Upgrade U value from 0.42 to 0.31
  - Upgrade SHGC from 0.50 to 0.30
- Projected envelope savings: $1,500

Project Team
Owner:
Fidelity Bank
Project Management:
Habitat Advisory Group

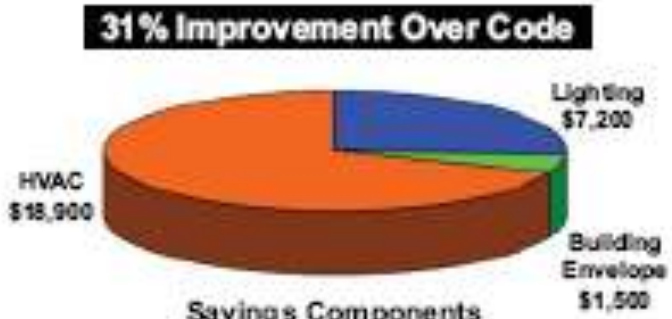
High Performance Building Design Uses 31% Less Energy

Savings Projection

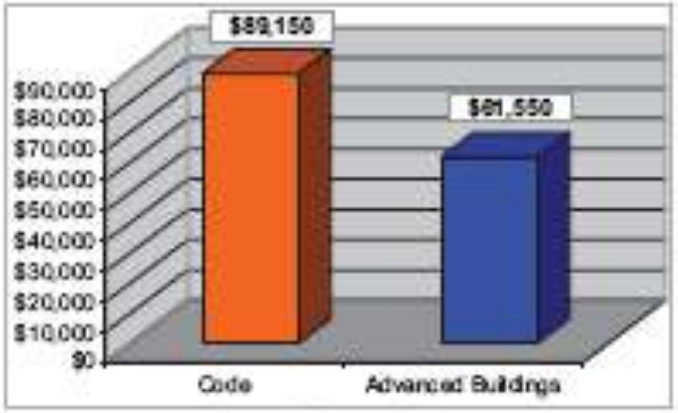
Annual Energy Savings:	$ 27,600
Additional Cost for Upgrades:	$100,622
Utility Incentives:	- $ 66,587
Net Owner Costs:	$ 34,035

Payback with Incentives: 1.2 years ROI: 83%

Payback without Incentives: 3.7 years ROI: 27%



Savings Components
($27,600 annual savings)



Annual Energy Costs

Lighting Savings Summary

The lighting layout consisted mainly of T-5 pendants in open office areas, and the latest generation of recessed T-5 fixtures in the remaining areas.

Projected Lighting Savings: $7,200

	Mass Energy Code	Advanced Buildings Criteria	Final Design	% Reduction
Lighting Power Density	1.34 w/SF	0.96 w/SF	0.86 w/SF	36%

Improved lighting quality while using less energy!

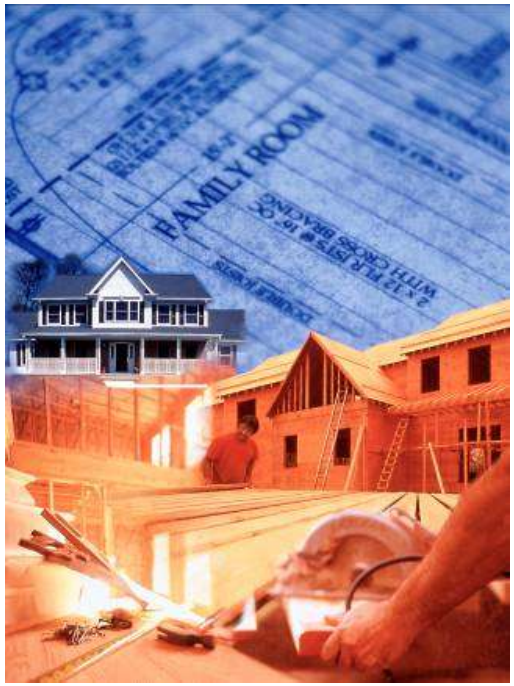
Commercial ‘Stretch’ & LEED(v.3)

- LEED and Commercial ‘Stretch’ code are fully compatible
  - Both use ASHRAE 90.1-2007 app. G as the energy modeling baseline.
- LEED energy model = Stretch code model

  20% better than ASHRAE 90.1-2007= 5 LEED energy modeling points
- LEED also has non-energy requirements

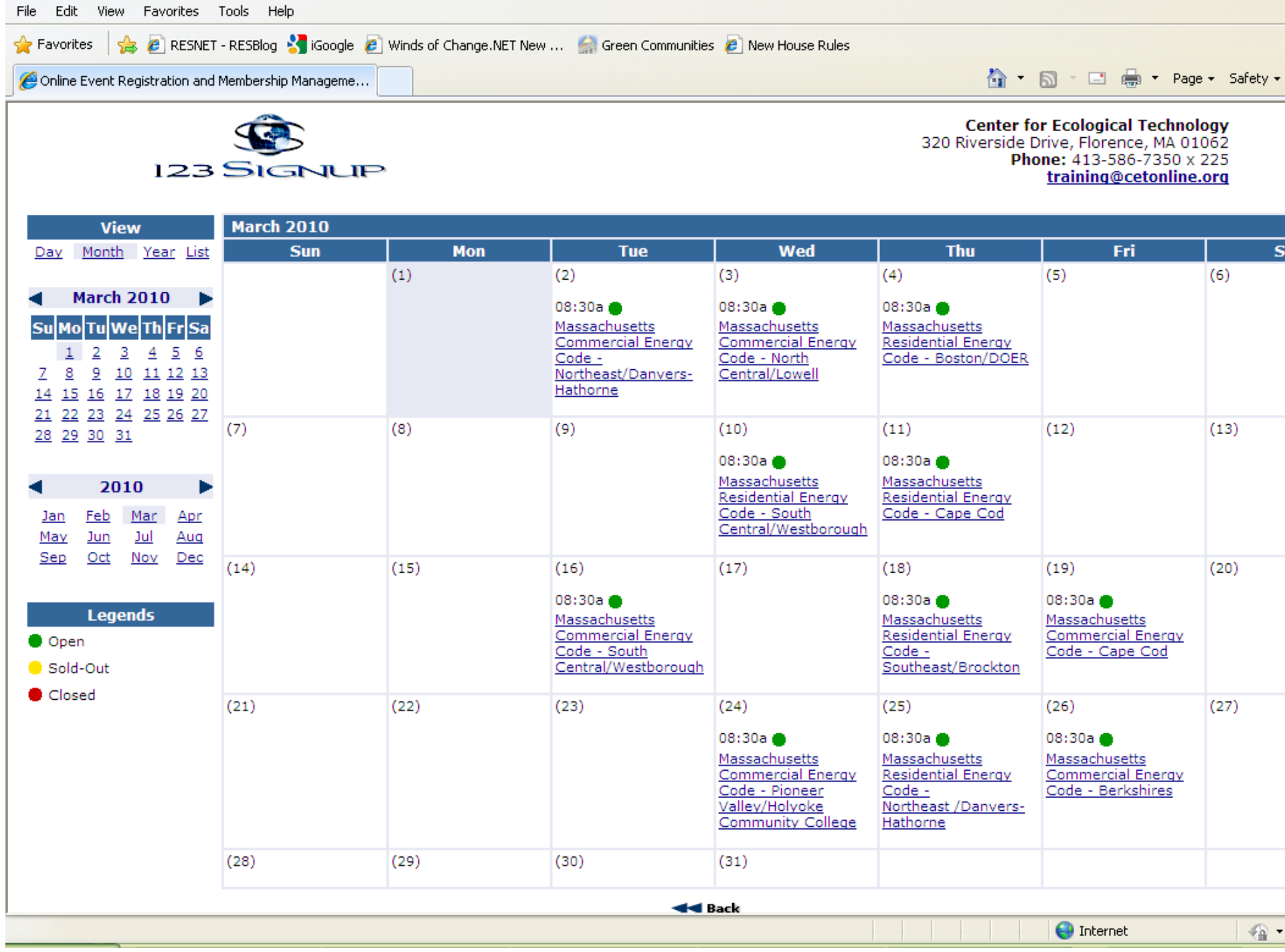
Code Compliance & Inspections

- Essentially the same as base code
- Code Official has the same authority
  - Same building inspections
  - Approves building documents, Energy Star and HERS rating or ASHRAE modeling as documentation of energy
- Certificate is required



Training on new energy codes

- Covering both the IECC 2009 & Stretch code
- Provided free to all Code Officials
  - Includes IECC code book and Stretch appendix
- Provided at cost to building professionals
- Register online: www.cetonline.org/Events/events.php
  - Separate Commercial and Residential sessions
- Energy star homes training available for free: www.energystarhomes.com/
- Utilities offer commercial 'Core Performance' energy training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Incentives available

- Towns/Cities – Green Communities Program
  - Technical assistance available now
  - Larger grant round out soon
- Builders – Energy Star & Utility Programs
  - Energy Star – Residential
  - Utility - Commercial
  - Federal $2k/unit residential tax credit

Image source: http://www.transformations-inc.us/zero-energy-homes.html

www.mass.gov/Eeops/docs/dps/inf/appendix_120_aa_jul09_09_final.pdf

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Energy Conservation 'Appendix 120 AA' Approved

A code change proposal relating to energy conservation was approved by the BBRS at the May 12, 2009 meeting and will become an appendix to the MA State Building Code (780 CMR) on or about August 1, 2009. It is based on the *International Energy Conservation Code (IECC) 2009* and can be viewed by following the 1st link below. The 2nd link will take you to a two-page overview of this new appendix.

This appendix may be adopted by any municipality in the commonwealth, by decision of its governing body. In a city having a Plan D or Plan E charter the governing body shall be the city manager and the city council, and in any other city the mayor and city council. In towns the governing body shall be the board of selectmen. In order to be adopted, the appendix must be considered at an appropriate municipal public hearing, subject to the municipality's existing public notice provisions. If adopted by a municipality this appendix rather than 780 CMR 13, 34, 61, or 93, as applicable, shall govern.

Also at the May 12 meeting a concurrency period and a training policy were approved. Concurrency period is a period when *either* the new code *or* the existing code can be used but *not comingled*. The BBRS approved a concurrency period of 6 months to a maximum of 12 months, with such period to begin on either January 1 or July 1 of any year. In addition a town or city which adopts the appendix must provide training to the building official. If you have comment or questions on this subject please forward them to mike.quigli@state.ma.us

Appendix 120 AA July 9, 2009 Final PDF (270kb)

Stretch Code Overview June 5, 2009 PDF (66kb)

SEARCH

Public Safety

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Questions ?

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Image source: Manulife building, Fort Point Associates, Inc.
http://www.fpa-inc.com/HTML%20Files/Projects_Com.htm