

Introduction to Green Communities and the Stretch Energy Code

March 2, 2010

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Horsley Witten Group, Inc.**



Green Communities Grant and Loan Program

- Up to \$10M annually to qualifying communities.
 - 5 Minimum Criteria must be met to be eligible.
 - FY10 Designation application deadline: May 14, 2010
 - FY10 Grant application deadline: May 28, 2010
- Funds generated annually from fees paid to Northeast RGGI (Regional Greenhouse Gas Initiative)
- Subsequent grant rounds: TBD



Green Communities Grant and Loan Program

Eligible Projects

Studying, designing, constructing and implementing energy efficiency activities, including but not limited to:

- Energy conservation measures and projects;
- Procurement of energy management services;
- Installation of energy management systems;
- Adoption of demand side reduction initiatives;
- Adoption of energy efficiency policies;
- Financing the siting and construction of renewable and alternative energy projects on municipally-owned land.



5 Criteria for Qualifying as a Green Community

1. As-of-right Siting for Renewable/Alternative Energy Facilities in Designated Areas
2. Expedited Permitting for those Facilities
3. Municipal Energy Use Baseline Inventory and Reduction Plan
4. Fuel Efficient Vehicle Purchasing Policy
5. Energy Efficient Building Code – The Stretch Code

The Stretch Code

- Appendix 120 of the MA Building Code
- Requires 20% greater building energy efficiency than IECC* 2009 energy code (current Base Code)
- Provides a Uniform Alternative to the Base Code. Under consideration in over 100 MA communities.
- Green Communities Act of 2008 requires that MA adopt each new IECC within one year of release. IECC is updated every 3 years.
- We expect that the IECC 2012 will be similar to the current Stretch Code

*International Energy Conservation Code

Adoption Process

- City Form of Government (Salem)
 - City Council Vote of Approval
 - 2 Readings minimum, Simple Majority
- Town Form of Government (Swampscott)
 - Town Meeting Approval
 - Simple Majority
 - Swampscott: First Monday of May
- 6 month concurrency period, code effective either July 1 or January 1.

Questions, Comments

Green Communities Program

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Stretch Code

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Additional Information Online

www.mass.gov/doer/

Click on Green Communities

Stretch Code Workshop

February 3, 2010



Agenda

- What is the Stretch Code?
- What does the Stretch Code Mean to My Community?
- What is the Adoption Process for the Stretch Code?
- Discussion and Q&A

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



History of the 'stretch' code

- May 2008 - BBRS Requested public comment on Energy Star and LEED as 'stretch' codes
- July 2008 - Green communities act passes
 - Includes building lifecycle cost-effective energy efficiency as green community criteria
- May 2009 – BBRS votes to adopt 'stretch appendix'

IECC and ASHRAE Codes

- ICC & ASHRAE develop model building codes and standards for the US.
- ICC: publishes IECC energy code
 - 3 year cycle IECC 2006, IECC 2009
- ASHRAE: publishes 90.1 standard
 - 3 year cycle 90.1-2007, 90.1-2010



IECC = [International Energy Conservation Code](#) – of [International Codes Council](#) (ICC)
ASHRAE = [American Society of Heating, Refrigerating and Air-Conditioning Engineers](#)

Massachusetts Building Codes

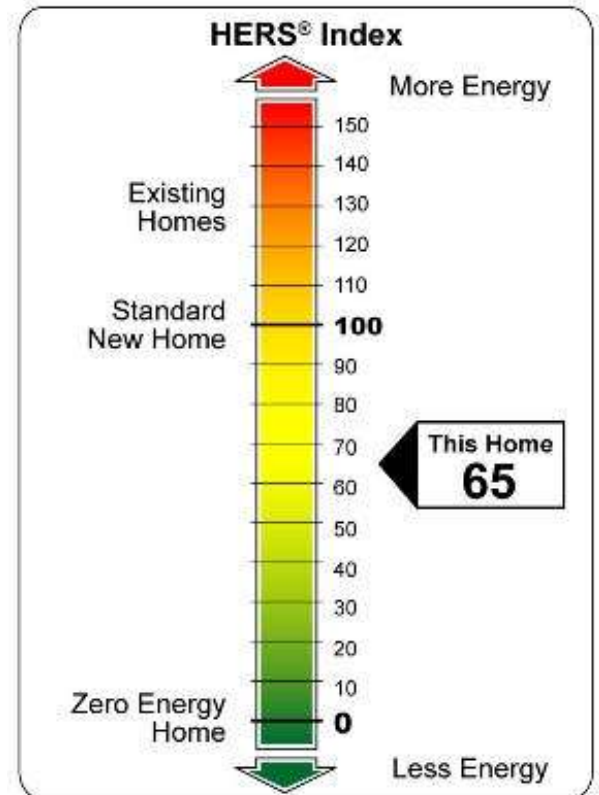
- Uniform State-Wide Code in place since 1975
 - Board of Building Regulations and Standards (BBRS) oversees the code; changes; appeals, etc.
- MA 6th Edition
 - Unique to MA
- MA 7th Edition
 - Energy code based on IECC 2006/2007 & ASHRAE 90.1-2007
- MA 8th Edition
 - Energy code based on IECC 2009 & ASHRAE 90.1-2007
 - Begins in 2010, becomes sole code in July 2010
 - **Includes optional “Stretch Code” – IECC with more stringent amendments, or ASHRAE 2007 but ‘exceed 20%’**

Why an Optional Stretch Code?

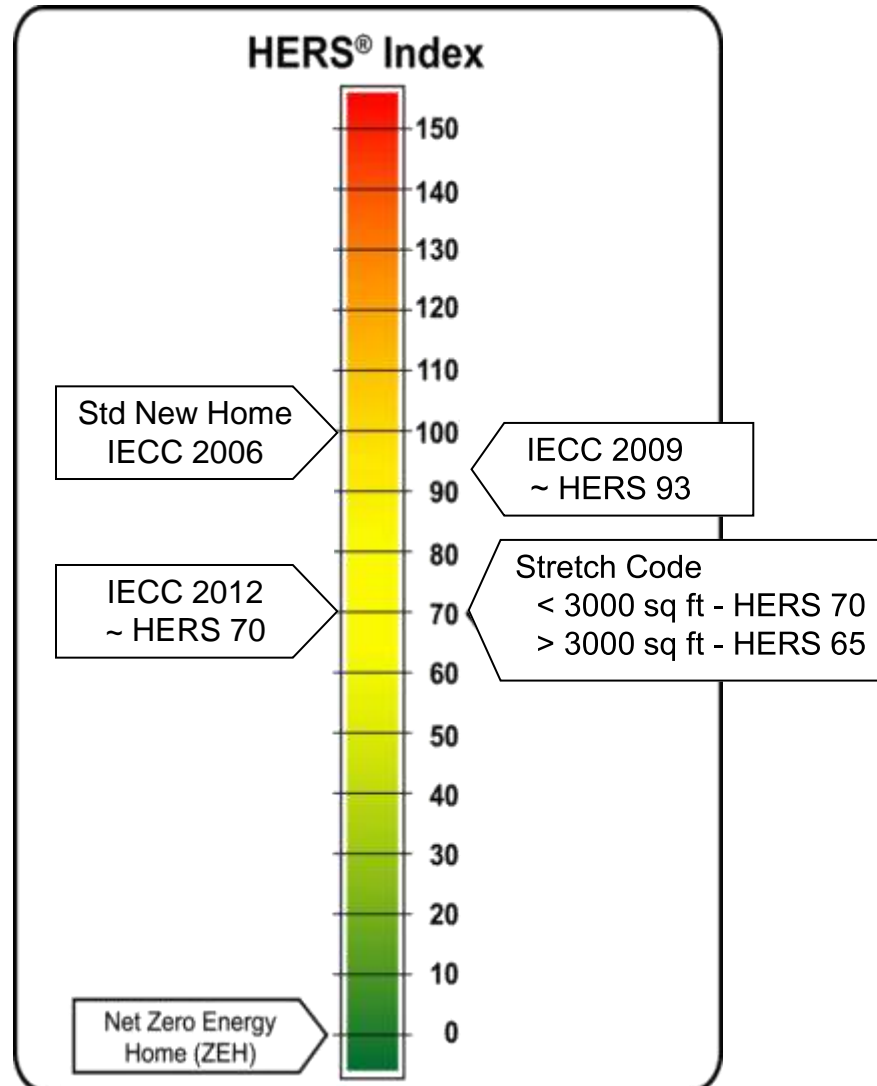
- Growing desire to reduce costs, reduce dependency on imported fuels, and address climate change
- Several towns and cities asked for the ability to adopt stronger building codes
- BBRS developed one alternative code that is consistent across the state

What is a HERS Rating?

- Home Energy Rating System (HERS) Index
- Each home is tested, certified and labeled by an independent HERS Rating Company
 - Must follow Residential System Network (RESNET) testing procedures
 - A HERS Rater/Rating Provider uses REMRate software to model the home's energy performance based on plan analysis and on-site testing to calculate a HERS Index. (Can be used instead ResCheck)



Stretch Code vs. IECC Comparison

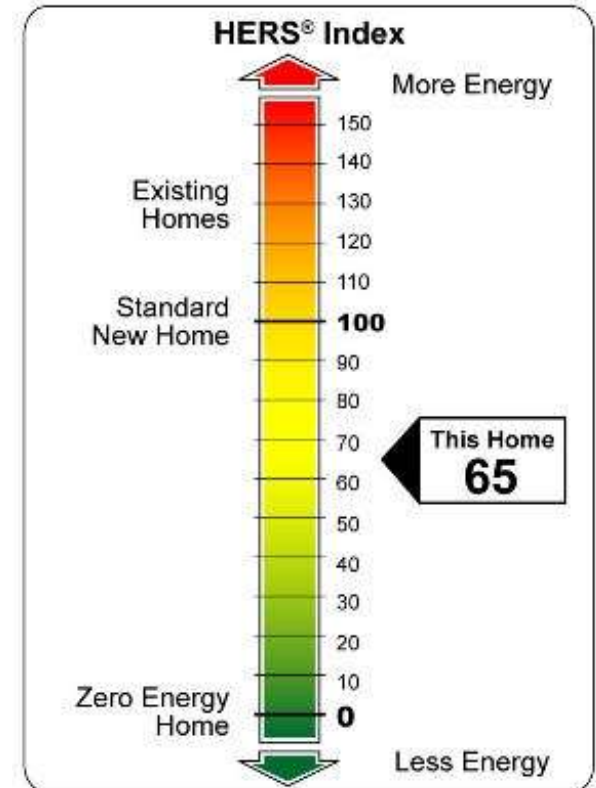


IECC 2012 – Code Committee Endorses Stretch Code

- The International Code Council (ICC) held preliminary hearings for the 2012 residential and commercial codes Baltimore in October 2010
 - Based on estimates from the measures that were approved by the IECC committee, upwards of 30% energy savings beyond the 2006 IECC could be possible
 - Final hearings are not until next year, but there's a lot of momentum for the 30% savings target
 - The 2012 code wouldn't likely be adopted by states until 2013
 - Requires 25% better than ASHRAE 90.1-2007

Residential New Construction

- Performance Path is the only option
 - Uses [Home Energy Rating System](#) (HERS)
 - 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



Stretch Code and ENERGY STAR

- The Stretch appendix puts the current ENERGY STAR Homes program into code
- ENERGY STAR is a proven cost-effective program
 - 31% in 2009 of new construction in MA
- Builder incentives/rebates
 - Incentives up to \$8000,
 - Rebates on appliances, heating and cooling, lighting, etc.
- Builder training and materials
- Subsidized HERS raters
 - Third party verification





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 (<i>Walls Adjoining Exterior Walls or Unconditioned Spaces</i>)				
	All Climate Zones:				
	1.1 Overall Alignment Throughout Home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2 Garage Band Joist Air Barrier (at bays adjoining conditioned space)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.3 Attic Eave Baffles Where Vents/Leakage Exist	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	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.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Best Practices Encouraged, Not Req'd.:				
	1.5 Air Barrier At All Band Joists (Climate Zones 4 and higher)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.6 Minimize Thermal Bridging (e.g., OVE framing, SIPs, ICFs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. Walls Adjoining Exterior Walls or Unconditioned Spaces	Requirements: <ul style="list-style-type: none"> 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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2 Wall Behind Fireplace	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.3 Insulated Attic Slopes/Walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.4 Attic Knee Walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.5 Skylight Shaft Walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.6 Wall Adjoining Porch Roof	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.7 Staircase Walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.8 Double Walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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





ENERGY STAR Qualified Homes National Builder Option Package

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.

	Hot Climates ¹ (2004 IRC Climate Zones 1,2,3)	Mixed and Cold Climates ¹ (2004 IRC Climate Zones 4,5,6,7,8)
Cooling Equipment (Where Provided)	Right-Sized ² : <ul style="list-style-type: none"> ENERGY STAR qualified A/C (14.5 SEER / 12 EER); <u>OR</u> ENERGY STAR qualified heat pump ³ (14.5 SEER / 12 EER / 8.2 HSPF) 	Right-Sized ² : <ul style="list-style-type: none"> 13 SEER A/C; <u>OR</u> ENERGY STAR qualified heat pump ³ (14.5 SEER / 12 EER / 8.5 HSPF)
Heating Equipment	<ul style="list-style-type: none"> 80 AFUE gas furnace; <u>OR</u> ENERGY STAR qualified heat pump ^{2,3} (14.5 SEER / 12 EER / 8.2 HSPF); <u>OR</u> 80 AFUE boiler; <u>OR</u> 80 AFUE oil furnace 	<ul style="list-style-type: none"> ENERGY STAR qualified gas furnace (90 AFUE); <u>OR</u> ENERGY STAR qualified heat pump ^{2,3} (See Note 3 for specifications); <u>OR</u> ENERGY STAR qualified boiler (85 AFUE); <u>OR</u> ENERGY STAR qualified oil furnace (85 AFUE)
Thermostat ³	ENERGY STAR qualified thermostat (except for zones with radiant heat)	
Ductwork	Leakage ⁴ : ≤ 4 cfm to outdoors / 100 sq. ft.; <u>AND</u> R-6 min. insulation on ducts in unconditioned spaces ⁵	
Envelope	<ul style="list-style-type: none"> Infiltration ^{6,7} (ACH50): 7 in CZ's 1-2 6 in CZ's 3-4 5 in CZ's 5-7 4 in CZ 8; <u>AND</u> Insulation levels that meet or exceed the 2004 IRC ⁸; <u>AND</u> Completed Thermal Bypass Inspection Checklist ⁹ 	
Windows	ENERGY STAR qualified windows or better (additional requirements for CZ2 and CZ4) ^{10, 11, 12}	
Water Heater ^{13,14}	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 Gas ¹⁵ : Integrated with space heating boiler	
Lighting and Appliances ^{16,17}	Five or more ENERGY STAR qualified appliances, light fixtures, ceiling fans equipped with lighting fixtures, water heaters, and/or ventilation fans	

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

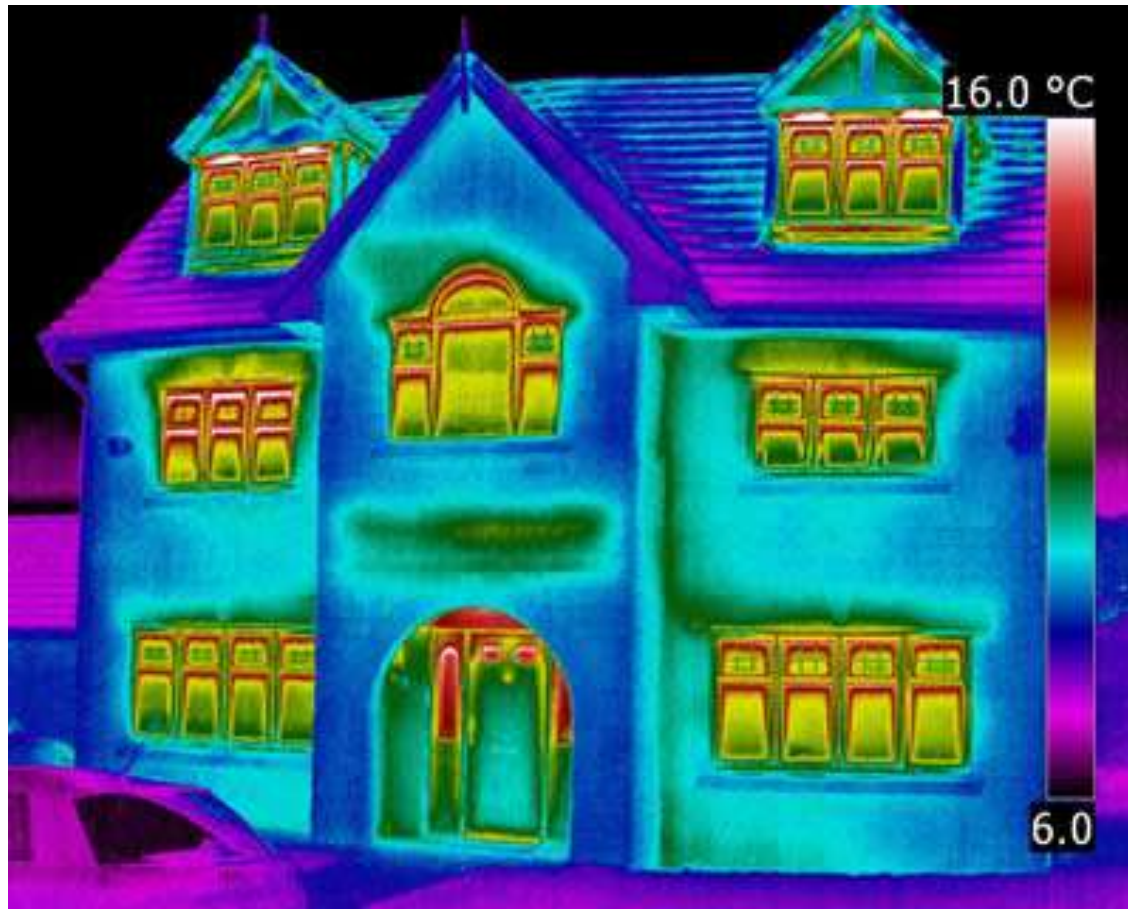


Why Test Performance?



Prescriptive codes don't guarantee good installation, air and water tightness, or that thermal insulation is effective. (small air gaps can reduce insulation R-values by 50% or more)

Why Test Performance?



Design, Installation
& Equipment all
important.

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

What Does the Stretch Code Mean to My Community?

Building Costs and
Code Compliance/Inspections

Cost of Stretch code

- Cost effective and already proven in the voluntary market
 - Energy star 15% of all MA new residential in 2008
 - Energy Star 31% of all MA new residential in 2009
- Example homes show clear \$\$ savings
 - New 3-bed 2,700 ft² ranch
- Updated examples for IECC 2009 coming soon
 - 4,500 sq ft, 2,700 sq ft, 1,800 sq ft & 3x1,400 sq ft

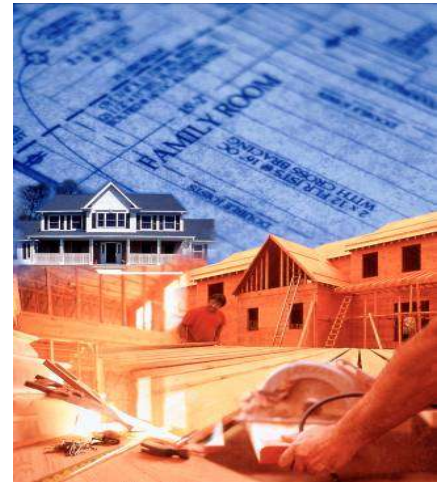
Example of Benefit-Cost Modeling: 2,672 square foot, New Home

HERS Index Modeled in REM/Rate	60 (energy use 40% below 2006 IECC code)
Improvement Measures (changes relative to base case)	<ul style="list-style-type: none"> - 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 and Federal Tax Credits (up to \$4000).

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
- Final HERS Rating is required for Certificate of Occupancy



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



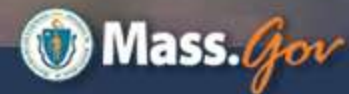
Training on new energy codes

- 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

The Official Website of the Executive Office of Public Safety and Security (EOPSS)

Public Safety

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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.quirgli@state.ma.us

[Appendix 120 AA July 9, 2009 Final](#) **PDF** (270kb)

[Stretch Code Overview June 5, 2009](#) **PDF** (66kb)

SEARCH

 ☒

What is the Adoption Process for the Stretch Code?

Adoption by Towns and Cities

- Adoption Process
 - Municipal Public Hearing
 - Vote of Board of Selectmen or City Manager, Mayor, and City Council
 - **Town Meeting is required**
 - Stretch Code cannot be adopted in pieces
- Newton example
 - Key stakeholders
 - Key messages

Adoption by Towns and Cities

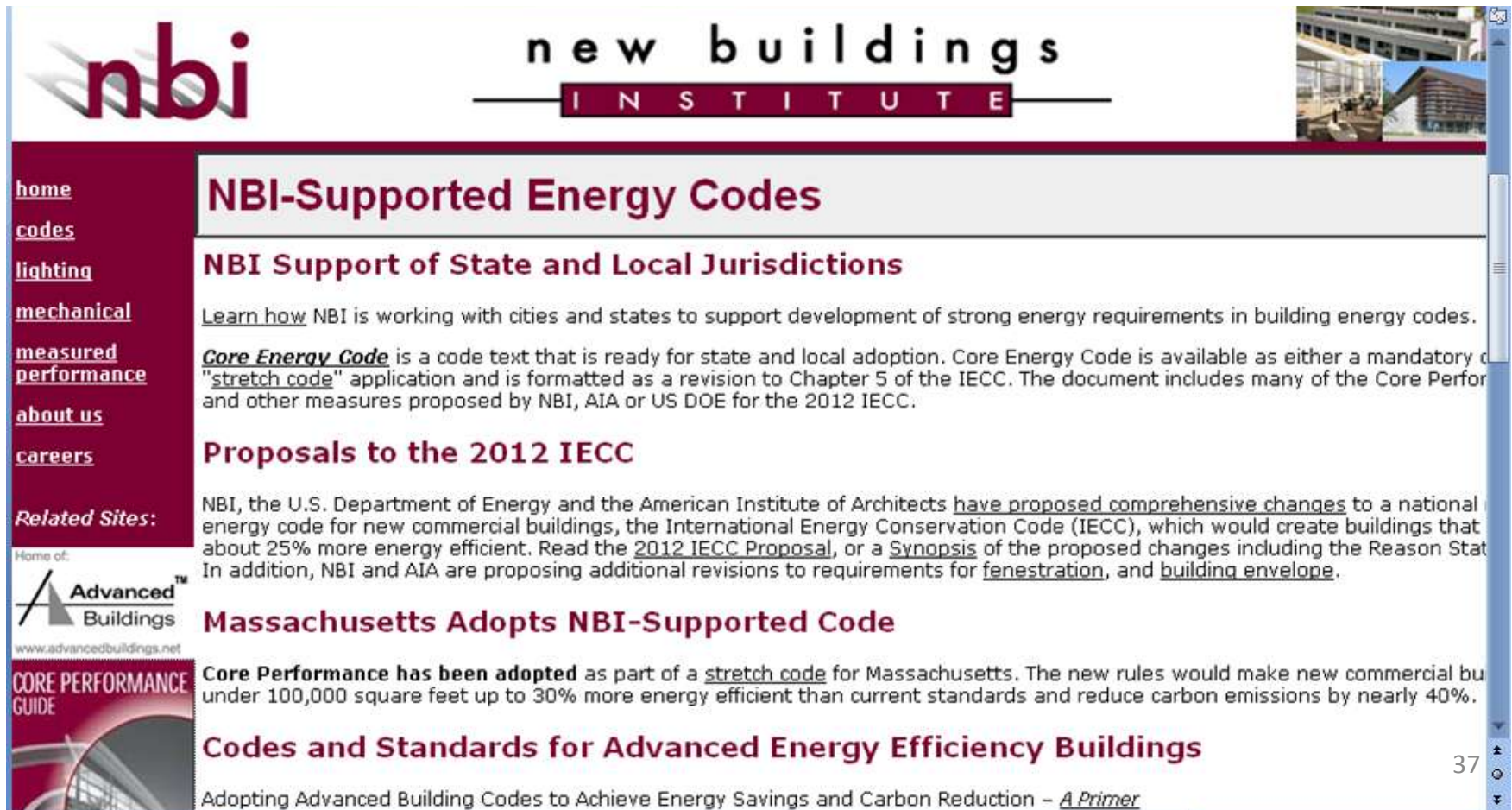
- Timing of Adoption
 - Codes go into effect on January 1 or July 1
 - Base Code and Stretch Codes run concurrently for the first 6 months
- Newton example
 - Passed by Board of Aldermen on 11/2/2009
 - Mayor signed Board Order on 11/20/09
 - Stretch Code in effect as of 1/1/10
 - Stretch Code becomes mandatory on 7/1/10

COMMERCIAL STRETCH CODE



Commercial 'Stretch' Appendix

- Based on New Buildings Institute – 'Core Performance' Energy Code



The screenshot shows the New Buildings Institute (NBI) website. The header features the NBI logo on the left and the text 'new buildings INSTITUTE' in the center, with a small image of a modern building on the right. A left sidebar contains navigation links: home, codes, lighting, mechanical, measured performance, about us, and careers. Below these are 'Related Sites' including 'Advanced Buildings' and a 'CORE PERFORMANCE GUIDE' graphic. The main content area is titled 'NBI-Supported Energy Codes' and includes sections on NBI support for state and local jurisdictions, proposals to the 2012 IECC, Massachusetts adopting NBI-supported code, and codes and standards for advanced energy efficiency buildings. The page number '37' is visible in the bottom right corner.

nbi new buildings INSTITUTE

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Related Sites:
Home of:
Advanced Buildings
www.advancedbuildings.net
CORE PERFORMANCE GUIDE

NBI-Supported Energy Codes

NBI Support of State and Local Jurisdictions

Learn how NBI is working with cities and states to support development of strong energy requirements in building energy codes.

Core Energy Code is a code text that is ready for state and local adoption. Core Energy Code is available as either a mandatory or "stretch code" application and is formatted as a revision to Chapter 5 of the IECC. The document includes many of the Core Performance and other measures proposed by NBI, AIA or US DOE for the 2012 IECC.

Proposals to the 2012 IECC

NBI, the U.S. Department of Energy and the American Institute of Architects have proposed comprehensive changes to a national energy code for new commercial buildings, the International Energy Conservation Code (IECC), which would create buildings that about 25% more energy efficient. Read the 2012 IECC Proposal, or a Synopsis of the proposed changes including the Reason Statement. In addition, NBI and AIA are proposing additional revisions to requirements for fenestration, and building envelope.

Massachusetts Adopts NBI-Supported Code

Core Performance has been adopted as part of a stretch code for Massachusetts. The new rules would make new commercial buildings under 100,000 square feet up to 30% more energy efficient than current standards and reduce carbon emissions by nearly 40%.

Codes and Standards for Advanced Energy Efficiency Buildings

Adopting Advanced Building Codes to Achieve Energy Savings and Carbon Reduction – *A Primer*

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Commercial 'Stretch' Appendix

- Only New Commercial Buildings
- Only buildings or additions over 5,000 ft²
- 2 Options (depending on size)
 - Performance option - 20% below Code
 - Prescriptive option for most building types
5,000 - 100,000 ft²

Commercial 'Stretch' Appendix

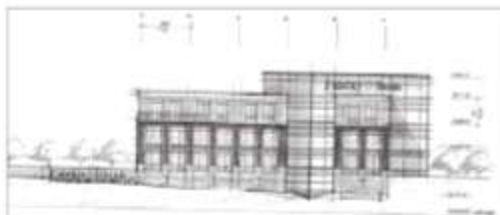
- Performance option
 - 20% below Code (ASHRAE 90.1-2007 appendix G)
 - all buildings over 100,000 ft²
 - Labs, Supermarkets, over 40,000 ft²
- Prescriptive option for most building types
 - 5,000 - 100,000 ft²
- Exemptions (comply with base code)
 - Special cases smaller than 40,000 ft²

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

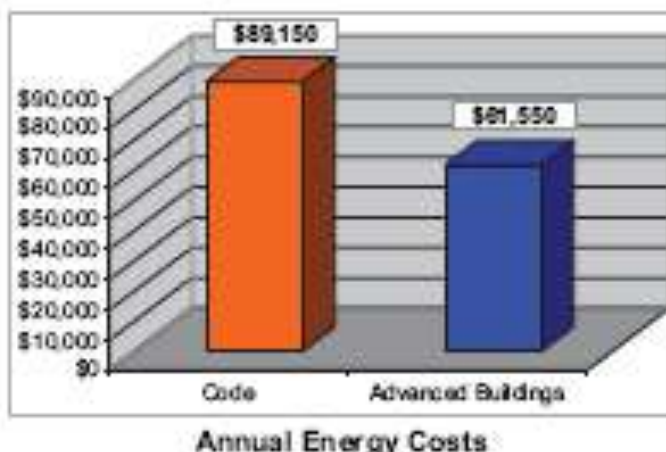
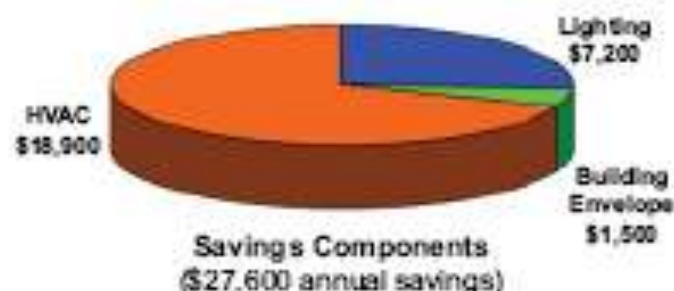
Payback with Incentives:

1.2 years ROI: 83%

Payback without Incentives:

3.7 years ROI: 27%

31% Improvement Over Code



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!

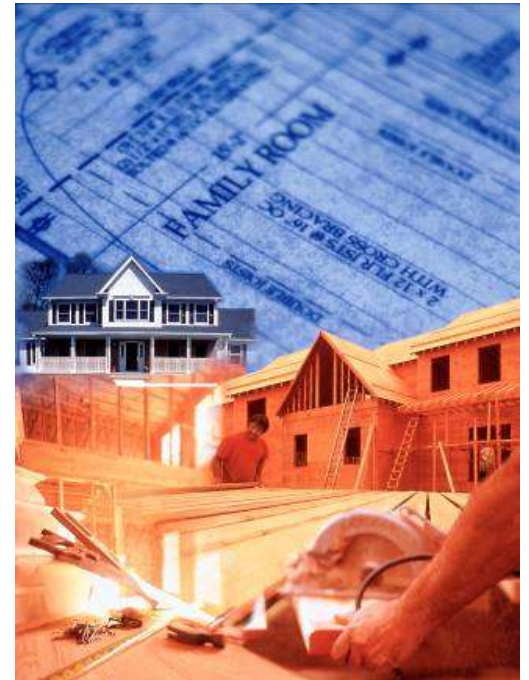
Commercial 'Stretch' & LEED(v.3)

- 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
 - ASHRAE 90.1-2007 – 20% = 5 LEED energy 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



Questions ?

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Image source: Manulife building, Fort Point Associates, Inc.

http://www.fpa-inc.com/HTML%20Files/Projects_Com.htm