Town of North Andover
Green Communities Action Plan

Tuesday, June 8, 2010

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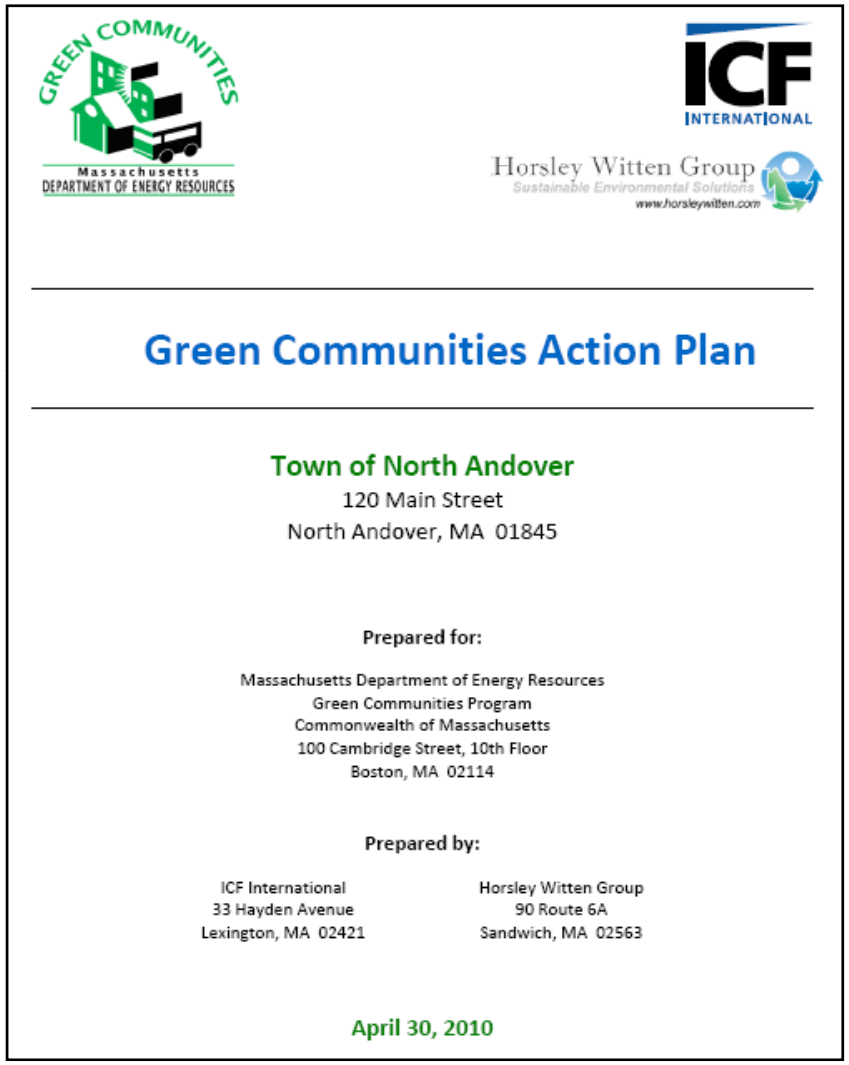
Green Communities Act

- To be a Green Community, the Town must meet 5 Criteria
  - ☑ Zoning
  - ☑ Permitting
  - ☑ Energy-Use
  - ☑ Vehicle Policy
  - ☐ Stretch Code
- Designated Green Communities eligible for $10M Grant Program
  - Funding Source:
    RGGI Auction Trust Fund
    (Electricity Generation Sector)
  - NOT a budget line item
  - Town does NOT pay higher taxes



Green Communities Action Plan

Town of North Andover
120 Main Street
North Andover, MA 01845

Prepared for:

Massachusetts Department of Energy Resources
Green Communities Program
Commonwealth of Massachusetts
100 Cambridge Street, 10th Floor
Boston, MA 02114

Prepared by:

ICF International
33 Hayden Avenue
Lexington, MA 02421

Horsley Witten Group
90 Route 6A
Sandwich, MA 02563

April 30, 2010

Contact: Curt Bellavance

Community Planning Assistance

- North Andover applied for Planning Assistance to become a designated Green Community under the Green Communities Act
- ICF/HW were contracted to provide Planning Assistance to North Andover on behalf of the Department of Energy Resources (DOER)
- Reviewed Town documents and identified methods for becoming a Green Community
- Developed an Action Plan

North Andover: Criteria 1 – 3

1. Adopt As-of-Right Siting
   - ☑ As-of-right siting of manufacturing and R&D facilities for R/A energy at Osgood Landing

"provide for the as-of-right siting of renewable or alternative energy generating facilities, renewable or alternative energy research and development (R&D) facilities, or renewable or alternative energy manufacturing facilities in designated locations."

2. Adopt Expedited Permitting
   - ☑ Chapter 43D Priority Development Site (PDS) at Osgood Landing

"adopt an expedited application and permitting process under which these energy facilities may be sited within the municipality and which shall not exceed 1 year from the date of initial application to the date of final approval"

3. Energy Use Baseline and Reduction Strategy
   - ☑ NASC using 2008 data for baseline
   - ☑ Developing 20% reduction plan for 2013, including municipal buildings, streetlights, and vehicles

"establish an energy use baseline inventory for municipal buildings, vehicles, street and traffic lighting, and put in place a comprehensive program designed to reduce this baseline by 20 percent within 5 years of initial participation in the program."

North Andover: Criteria 4 – 5

4. Fuel-Efficient Vehicle Purchase Policy
   - ☑ Vehicle Inventory and Vehicle Replacement Plan in development by B. Thibodeau (DPW)
   - ☑ Purchasing Policy in development by B. Thibodeau (DPW)

"purchase only fuel-efficient vehicles for municipal use whenever such vehicles are commercially available and practicable"

5. Minimize Life-Cycle Costs in Energy Construction
   - ☑ Stretch energy code forums
   - ☐ Present additional information to builders and Board of Selectmen
   - ☐ Vote on Stretch Code at Town Meeting – likely in 2011
   - ☐ Would be effective in January 2012

"require all new residential construction over 3,000 square feet and all new commercial and industrial real estate construction to minimize, to the extent feasible, the life-cycle cost of the facility by utilizing energy efficiency, water conservation and other renewable or alternative energy technologies"

Final Steps: Designation and Grant Applications

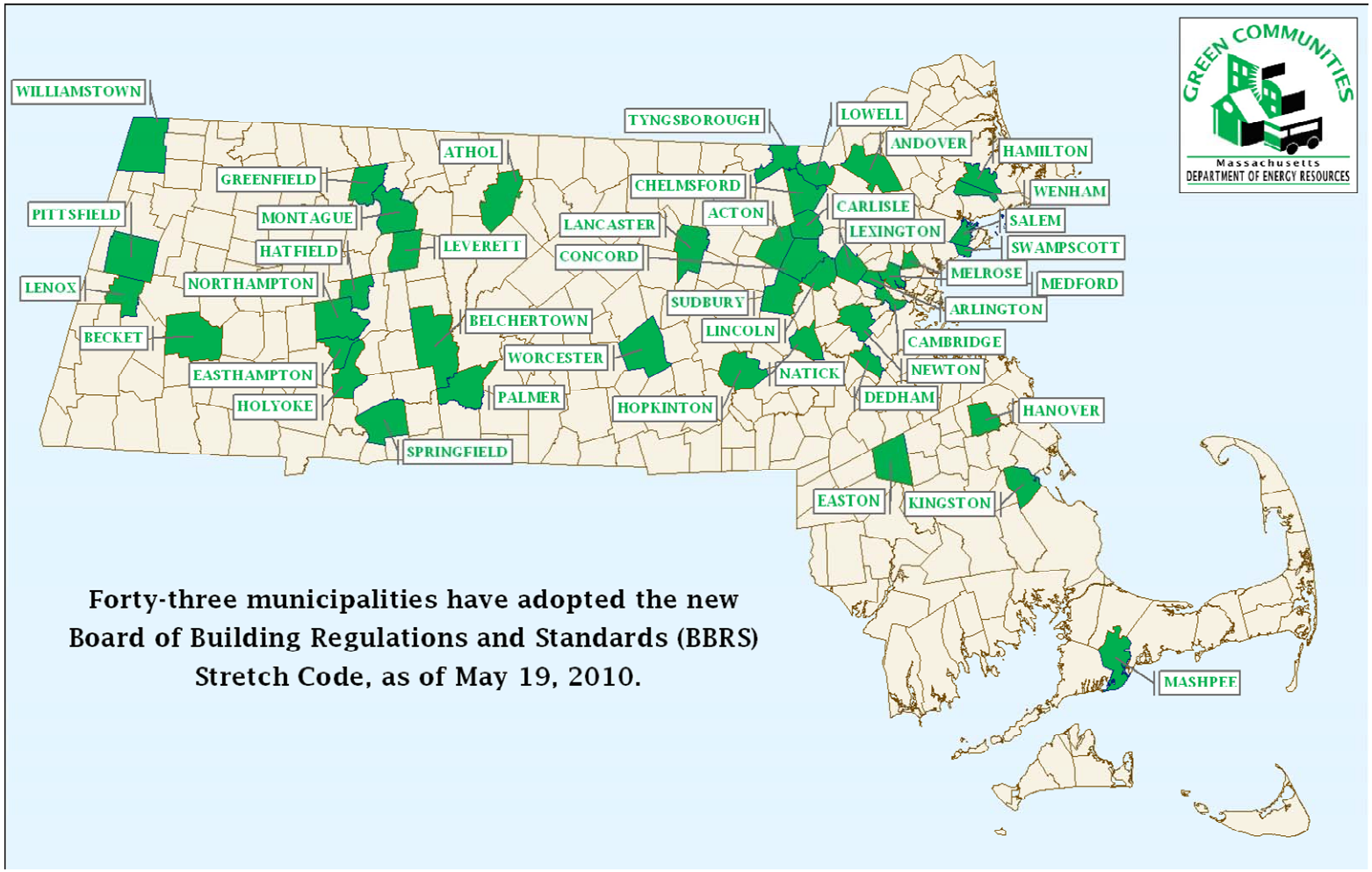
- Apply for Designation as a Green Community
  - Rolling process – No deadline
  - Next grant round in Fall 2010, then in May 2011.
- Apply for Green Community Grants
  - $8.1 M in current (June 2010) round, up to $1 million for each grant
  - Approximately $2 M expected in Fall 2010
  - Approximately $10 M available each year

Why Become a Green Community?

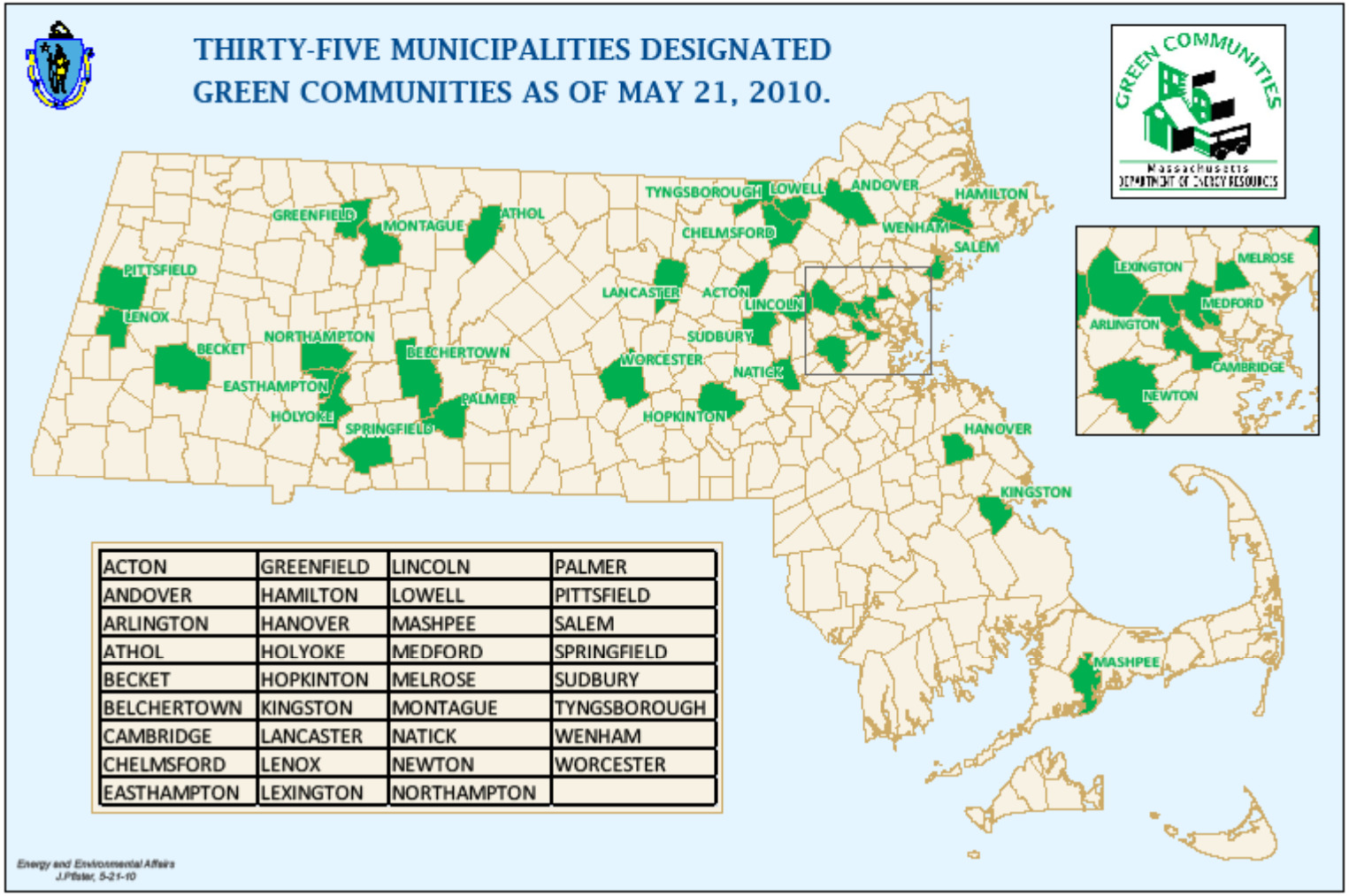
- Economic Benefits – save energy
- Environmental benefits – reduce greenhouse gas emissions
- Recognition – Sustainability leader in the Commonwealth
  - Recognized on DOER website, printed materials
  - Recognition sign placed in each community
- Grants – to become even greener

Criteria	Task	2010								2011				
		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
1	1A: Draft counsel note and gather documentation for submission to DOER													
	1B: Passage of the Zoning Bylaw amendment through Town Meeting													
	1C: Obtain certified letter from Town Counsel, and finalize paperwork for submission to DOER													
2	2A: Obtain certified copy of the Town meeting vote on the Osgood PDS from the Town Clerk													
3	3A: Incorporate all CY 2008 energy-use data into the MEI tool and generate energy-use baseline inventory													
	3B: In coordination with Town staff, develop a comprehensive plan to reduce energy use by 20 percent by CY2013 from CY2008 levels, as measured in Step 3A													
	3C: Adopt energy-use reduction plan (approval by Town Manager required, by Board of Selectmen recommended)													
4	4A: Draft vehicle purchasing policy through coordination among all relevant departments													
	4B: Develop vehicle inventory and vehicle replacement plan													
	4C: Town Manager approves policy; approval by Board of Selectmen is not necessary, but may be sought													
5	5A: Hold first educational forum on energy stretch code													
	5B: Hold additional forums, as needed													
	5C: Identify and solicit support from key stakeholder builders; engage with and solicit support from building inspector													
	5D: Present energy stretch code information to Board of Selectmen with support from builders and technical experts; continue efforts to educate the Board of Selectmen on stretch code before vote													
	5E: Submission of energy stretch code to Board													
	5F: Town Meeting – Stretch Code													
All	Complete and submit Green Communities designation application to DOER, with all required documentation													
	Complete and submit Green Communities grant application to DOER													

Stretch Code Communities

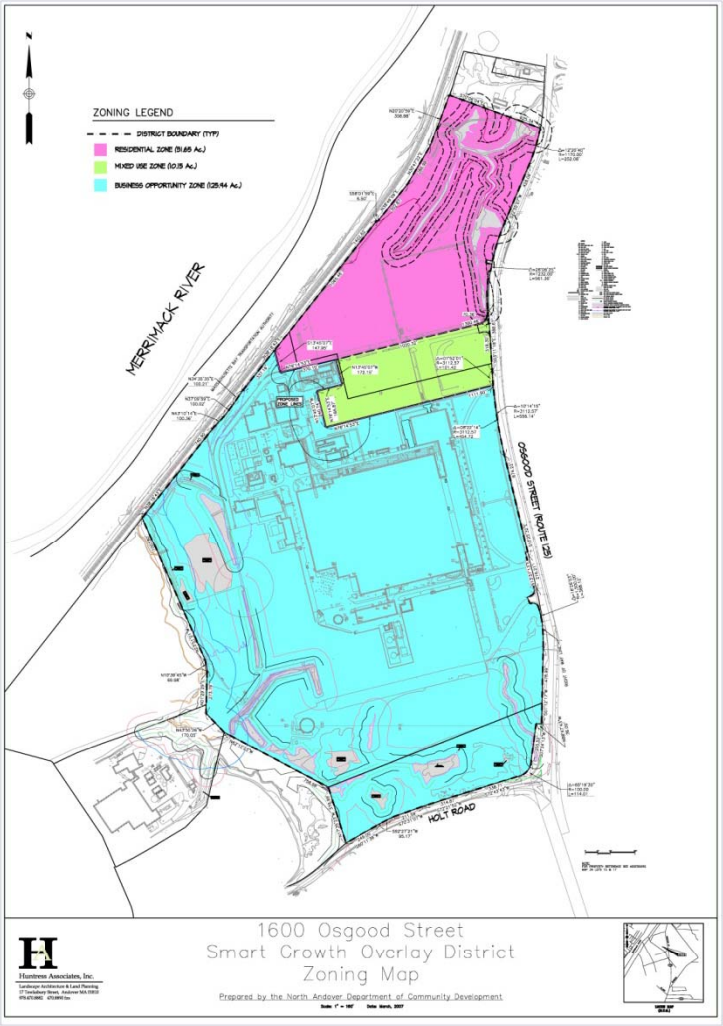


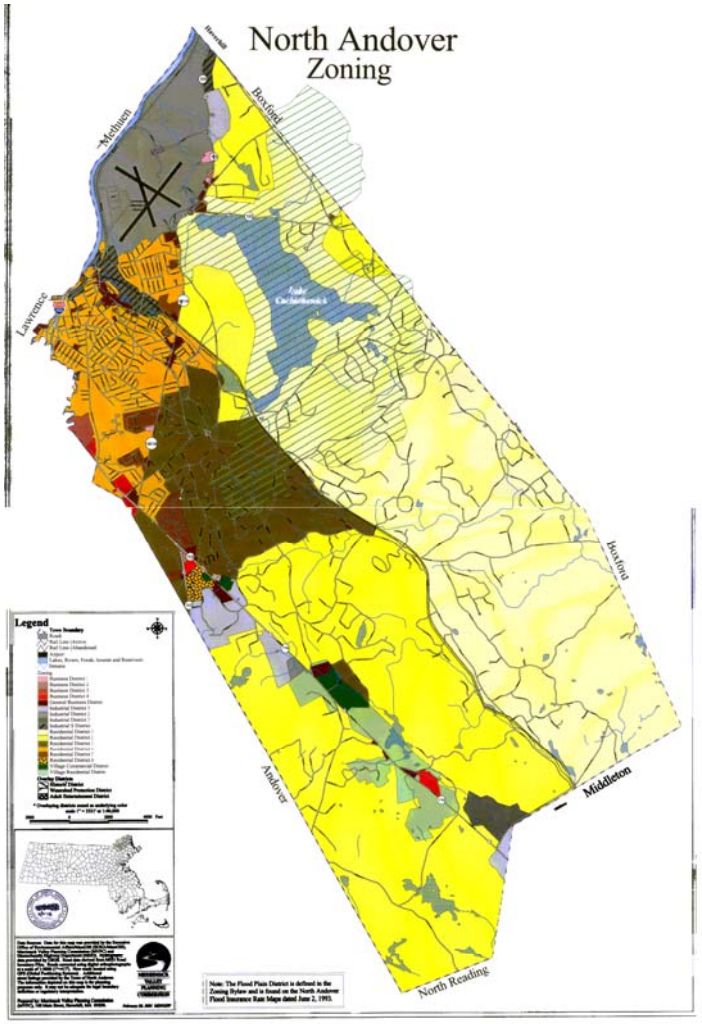
Stretch Code Communities



ACTON	GREENFIELD	LINCOLN	PALMER
ANDOVER	HAMILTON	LOWELL	PITTSFIELD
ARLINGTON	HANOVER	MASHPEE	SALEM
ATHOL	HOLYOKE	MEDFORD	SPRINGFIELD
BECKET	HOPKINTON	MELROSE	SUDBURY
BELCHERTOWN	KINGSTON	MONTAGUE	TYNGSBOROUGH
CAMBRIDGE	LANCASTER	NATICK	WENHAM
CHELMSFORD	LENOX	NEWTON	WORCESTER
EASTHAMPTON	LEXINGTON	NORTHAMPTON	

Map of Osgood Landing





Green Communities Grant Program
Stretch Energy Code

Town of North Andover

June 8, 2010

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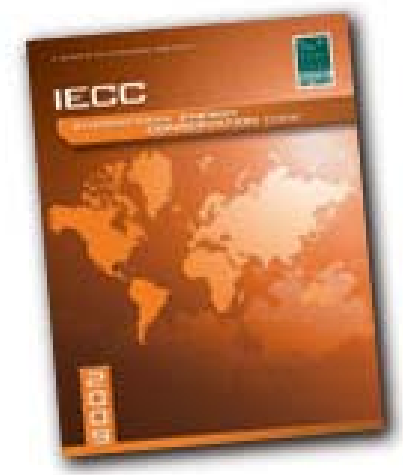
Overview of the Criteria

1. Adopt as-of-right siting, in designated locations, for RE/AE generation, or RE/AE R&D or manufacturing
2. Adopt expedited (12 month) application/permitting process and enforcement mechanism
3. Establish an energy use baseline inventory with a plan to reduce baseline by 20% in 5 years
4. Adopt fuel-efficient vehicle purchase policy
5. **Passage of the Stretch Code**

Energy Codes in MA are changing

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



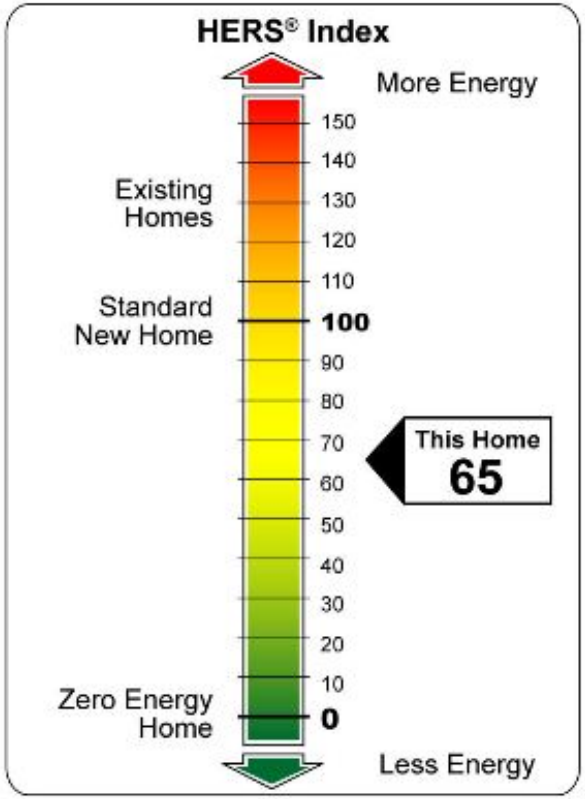
- Towns and Cities can opt into the "Stretch Code" appendix
  - Approx 20% more energy efficient than IECC 2009 or ASHRAE 90.1-2007

- Commercial bldgs. ASHRAE 90.1-2007 remains

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

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)



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

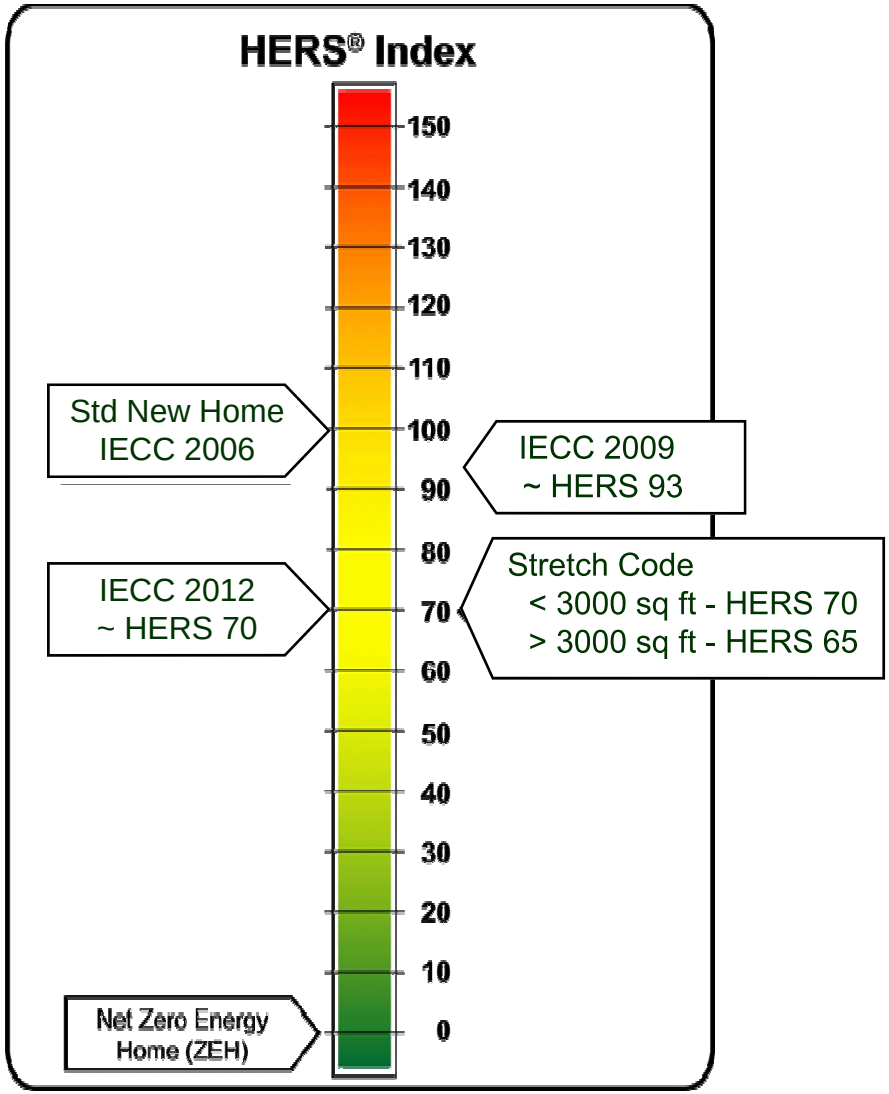
What does the Stretch Code Apply to?

- New Construction
- Additions
- Home Renovations
- Commercial

New Construction: Performance Path

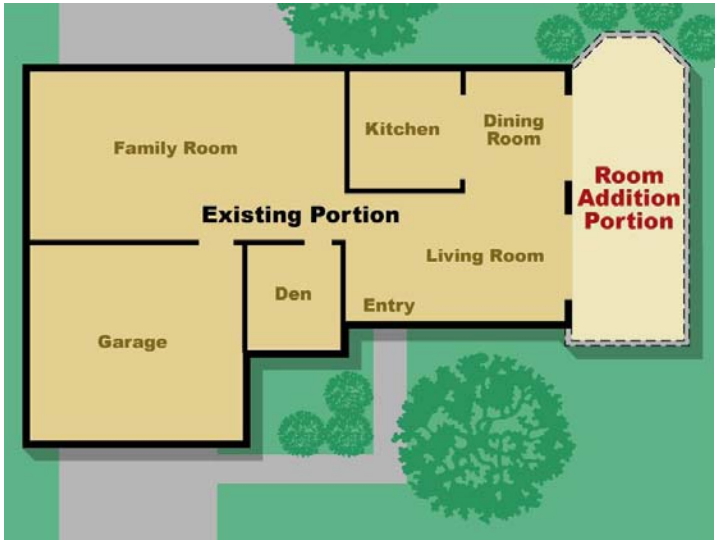
- Performance Path is the only option
  - Uses HERS
  - 70 or less < 3,000 sq ft.
  - 65 or less > 3,000 sq ft.
- Requires a certified HERS rater
  - Review building plans
  - Check insulation installation
  - Blower-door and duct testing
  - Thermal bypass Checklist

HERS = Home Energy Rating System



Additions: Performance or Prescriptive Path

- Performance Path
  - 70 or less < 3,000 sq ft.
  - 65 or less > 3,000 sq ft.



- Prescriptive Path
  - Base Code insulation and envelope (IECC 2009)
  - Builder Verified Thermal Bypass Checklist

What is the Thermal Bypass Checklist?

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	☐	☐	☐	☐

Renovations: Performance or Prescriptive Path

- 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
  - IECC 2009 envelope & Thermal bypass checklist

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

Cost of Stretch Code: Energy Cost Savings

- Cost effective and already proven in the voluntary market
  - ENERGY STAR 2008
    - ~ 9,600 Permits Pulled
    - 15% of all MA new residential in 2008
  - ENERGY STAR 2009
    - ~6,600 Permits Pulled
    - 31% of all MA new residential in 2009
- ENERGY STAR provides:
  - Builder incentives/rebates
    - Incentives up to $8000,
    - Rebates on appliances,
      heating and cooling, lighting, etc.
  - Builder training and materials
  - Subsidized HERS raters

STRETCH CODE ENERGY SAVINGS AND UPGRADE COSTS

Massachusetts Stretch Code Improvement - Cash Flow			
Baseline Home (2,672 sf)			
	IECC 2009 Code	Stretch Code	Stretch Code - with ENERGY STAR[4,5] -
HERS Index Modeled in REM/Rate	86	70	70
Improvement Measures (changes relative to Basecase)	- Unconditioned basement - Floor, R30 - Walls, R21 - Ceiling, R38 G2 - Heating, 80 AFUE - Cooling, 13 SEER - Water Heating, .59 EF - Duct leakage, 8% - Infiltration, 7 ACH50 - Efficient lighting, 50%	- Ceiling, R38 G1 - Heating, 94 AFUE - Water heating, .62 EF - Infiltration, 4 ACH50 - Efficient lighting, 75% - Exhaust Only Ventilation	- Ceiling, R38 G1 - Heating, 94 AFUE - Water heating, .62 EF - Duct leakage, 6% - Infiltration, 5 ACH50 - Efficient lighting, 80% - Exhaust Only Ventilation
Improvement Costs		$ 2,049	$ 2,155
HERS Rater Fee[1]		$ 900	$ 900
HERS Rater reimbursement[2]		-	$ (650)
ENERGY STAR Incentive[3]		-	$ (650)
Total Improvement Costs		$ 2,949	$ 1,755
Mortgage Interest Rate		6%	6%
Loan Term (Years)		30	30
Annual Incremental Mortgage Payment		$ 214	$ 127
Annual Energy Costs[6]	$ 3,970	$ 3,463	$ 3,454
Annual Energy Savings from Baseline		$ 507	$ 516
Annual Cash Flow	**$ -**	**$ 293**	**$ 389**

[1] Estimated Massachusetts ENERGY STAR Homes Program HERS Rater Fee (Range is from $750-$1500, but typically close to $750). Includes cost for conducting Thermal Bypass Inspection

[2] HERS Rater Fees are reimbursed by the Massachusetts ENERGY STAR Homes program by between $650-900 per unit, depending upon the HERS rating achieved.

[3] Massachusetts ENERGY STAR Homes Program may receive a minimum incentive of $650.

[4] ENERGY STAR requirements have been added to the Stretch Code package.

[5] Stretch code homes may qualify for of $1250 where the HERS rating is ~65 or lower

[6] Annual energy costs are based on most recently available fuel costs, from November 2009. Costs for heating are based on natural gas prices, the least expensive heating fuel. With oil, savings would increase.

STRETCH CODE ENERGY SAVINGS AND UPGRADE COSTS

Massachusetts Stretch Code Improvement - Cash Flow			
Large Home (4,462 sf)			
	IECC 2009 Code	Stretch Code	Stretch Code - with ENERGY STAR[4,5] -
HERS Index Modeled n REM/Rate	92	65	65
Improvement Measures (changes relative to Basecase)	- Unconditioned basement - Floor, R30 - Walls, R21 Ceiling, R38 G2 - Heating, 80 AFUE - Cooling, 13 SEER - Water Heating, .59 EF - Duct leakage, 8% - Infiltration, 7 ACH50 - Efficient lighting, 50%	- Ceiling, R60 G1 - Heating, 94 AFUE - Water Heating .62 EF Duct Leakage, 6% - Infiltration, 3 ACH50 - Efficient Lighting, 90% - Exhaust Only Ventilation	- Ceiling, R60 G1 - Heating, 94 AFUE - Water Heating, .62 EF Duct Leakage, 6% - Infiltration, 3 ACH50 - Efficient Lighting, 90% - Exhaust Only Ventilation
Improvement Costs		$ 5,576	$ 5,576
HERS Rater Fee[1]		$ 900	$ 900
HERS Rater reimbursement[2]		-	$ (650)
ENERGY STAR Incentive[3]		-	$ (650)
Total Improvement Costs		$ 6,476	$ 5,176
Mortgage Interest Rate		6%	6%
Loan Term (Years)		30	30
Annual Incremental Mortgage Payment		$ 471	$ 376
Annual Energy Costs[6]	$ 6,510	$ 5,055	$ 5,055
Annual Energy Savings from Baseline		$ 1,455	$ 1,455
Annual Cash Flow	**$ -**	**$ 984**	**$ 1,079**

[1] Estimated Massachusetts ENERGY STAR Homes Program HERS Rater Fee (Range is from $750-$1500, but typically close to $750). Includes cost for conducting Thermal Bypass Inspection

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Questions?

North Andover
Stretch Code Information Session

Case Studies on
New Home Construction

North Andover Middle School Auditorium
June 8, 2010

Carter Scott, President

Transformations, Inc. Townsend, MA

(978) 597-0542

www.Transformations-Inc.us

Marla Circle homes, Tyngsborough MA

HERS Index of 50 Built in 2005

Construction Details…

- *2x4 walls with 1” rigid on the outside*
- *16” on center conventional framing*
- *1.2 to 2.4 kW photovoltaic systems*
- *Hot water heater as boiler (96% efficient)*
- *Foam sealing window and doors*
- *Energy Star windows (U-value < 0.35)*
- *Garages on the North or West sides*
- *Panasonic ventilation fans*

Costs

- About $95 to $100 per square foot for the hard costs of the house construction (2005 dollars)
- Town sewer; no road or soft cost included.

The Coppersmith Way Development in Townsend, MA

- 41 unit 40B project (includes affordable housing)
- Construction is 2006 to present.

Saving 60% (Hers Index of 40)

- 2 x 6 walls with an inch of rigid
- Advanced construction techniques
  - 24” on center
  - Headers designed for their loads only
  - 2 stud corners
- Paradigm windows with a U-value of .28
- The same 96% efficient water heater/boiler
- 3.45 kW PV system

HERS Index of 37.5

HERS Index of 43

HERS Index of 39

How we got to 70+% savings…

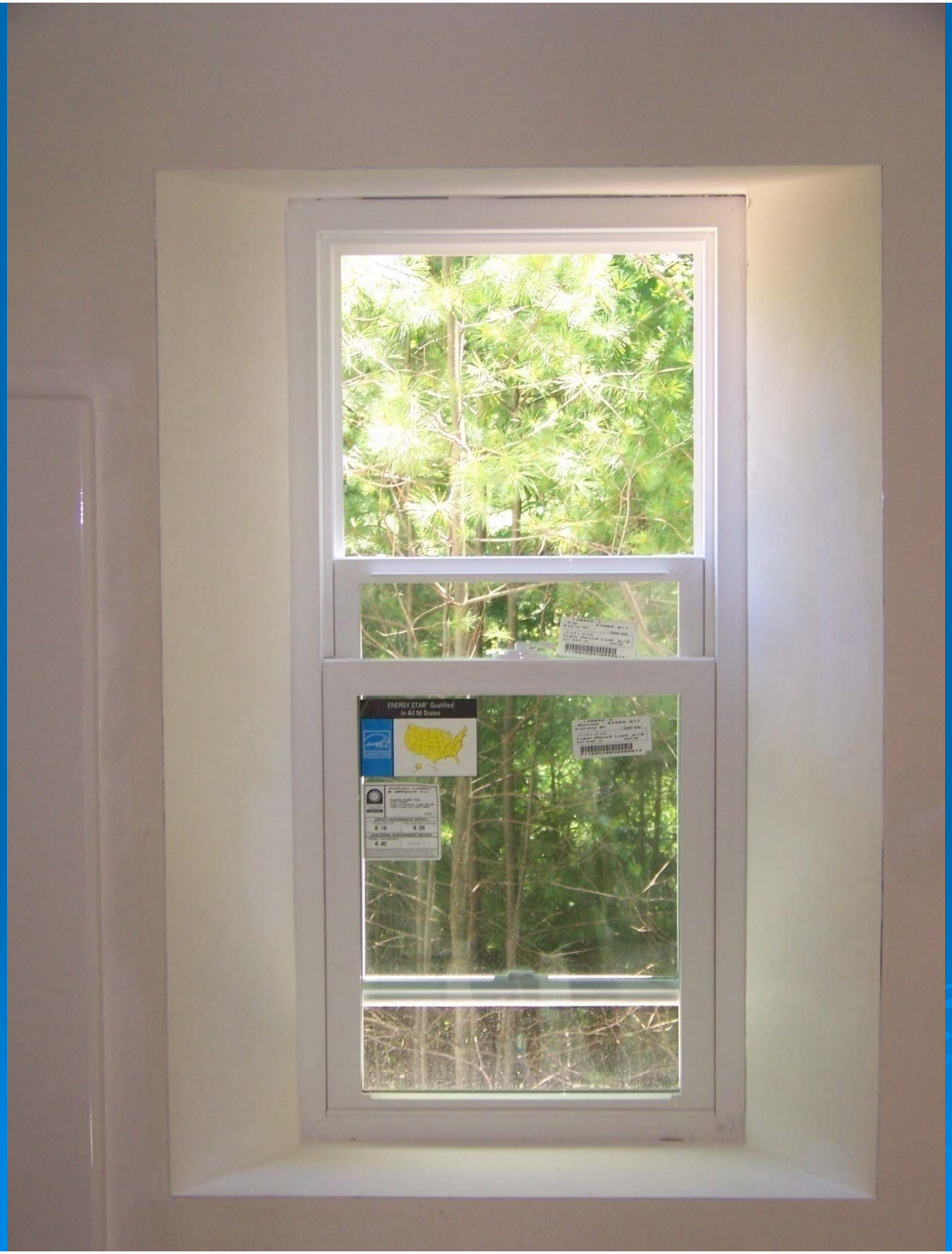
- Same specifications as the 60% homes, but…
- Smaller living spaces
- Multi-family units (shared wall or floor/ceiling)
- Forced hot water baseboard heating systems
- Larger PV system per square foot of living space

Zero Energy Home

- A Zero Energy Home is designed to produce as much energy as the home consumes over the course of a year.
- Another definition of a Zero Energy Home is one that has a HERS Index of 0.

SPACE PANELS
1/8 INCH AT ENDS
1/8 INCH AT EDGES
THIS SIDE DOWN
MADE IN U.S.A.
APA PRODUCT SUPPORT
APA

CHARLOTTE PIPE
CHARLOTTE PIPE


ENERGY STAR Qualified
In All 50 States

Hers Index of -4

Construction Costs

- ~$124 per square foot hard costs
- Excludes land, septic, fill, lot, builder margin and soft costs.
- Includes $26,200 Mass Technology Collaborative funding but no Federal and State tax incentives.

Hers Index of -3

“The Farmhouse”

- 1,818 square feet (169 square meters) of living space
- 3 Bedrooms
- $359,900 sale price
- HERS Index of -3

The Farmhouse cost to build:

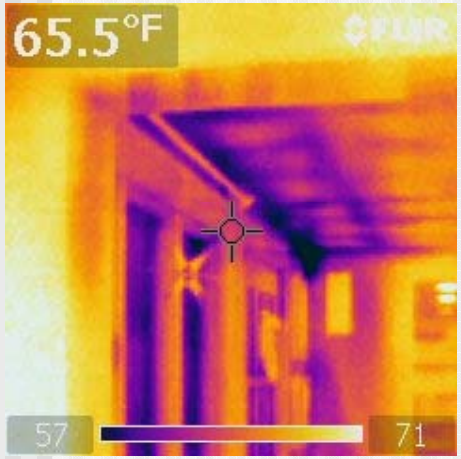
- $186,249 or $102.45 per square foot ($9.53 per square meter)
- Excludes land, road, engineering, permits, septic, soft costs and fill
- Includes $20,000 in incentives from the Massachusetts Technology Collaborative, and $21,432 in Federal/State tax credits

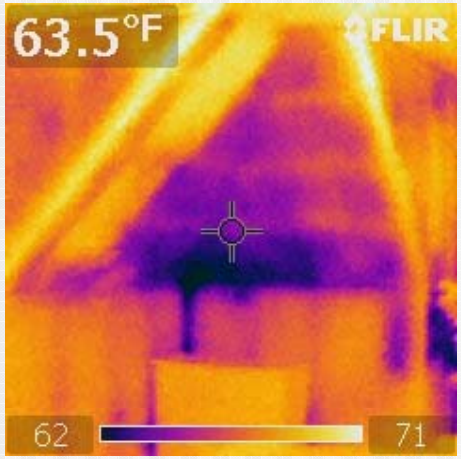
Stretch code as quality assurance—for consumers *and* builders

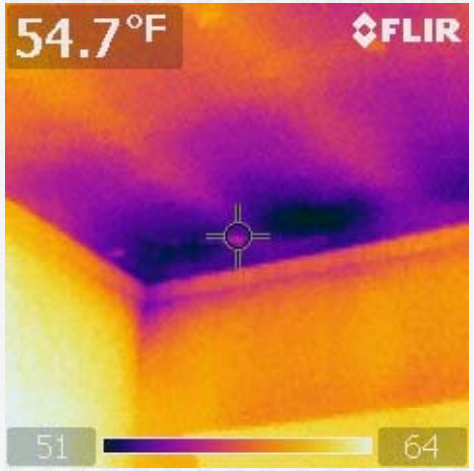
Paul Eldrenkamp

paul@byggmeister.com

Infrared images showing flaws in insulation—new construction







Darker areas are colder; lighter areas are warmer

Blower door testing

Case study: Cambridge

- Pre-project HERS index: 171
- Post project: 87
- Improvement measures:
  - Provided high efficiency boiler (95% AFUE)
  - Added basement wall insulation—for moisture management & household air quality improvements
  - Upgraded attic insulation
  - Good air sealing (9500cfm to 3500cfm)
  - Existing windows were retained

Case study: Brookline

Baseline HERS		128
Well-installed cellulose in above-grade walls	-16	112
Air leakage reduction from 8150 CFM50 to 2100 CFM50	-22	90

Subsequent measures (furnace replacement, basement insulation, etc) will bring final HERS to less than 80.

Case study: Newton

- Pre-project HERS index: 140
- Post-project index: 75
- Replacement windows
- Improved insulation in walls and roof
- Blower-door testing during renovation

Lessons learned…

- Quality-control testing can yield HERS improvements at little additional cost.
- HERS analysis helps consumers leverage efficiency investments in their homes more intelligently.
- Extra scrutiny during construction = inexpensive risk management for contractors.
- Many contractors have been meeting or exceeding Stretch Code standards for some time now—and are still very much in business.