Helping Massachusetts Municipalities Create a Greener Energy Future

COMMONWEALTH OF MASSACHUSETTS

Deval L. Patrick, Governor
Timothy P. Murray, Lt. Governor
Richard K. Sullivan, Secretary
Mark Sylvia, Commissioner

November 14, 2011
Northfield, Ma

The Stretch Code
Background and Overview

Jim Barry – Regional Coordinator
Green Communities Division
Department of Energy Resources
Executive Office Energy and Environmental Affairs
Green Communities Division

- DOER Programs/Support for Municipalities
  - Energy Audit Program
  - Performance Contracting Technical Assistance
  - Mass Energy Insight System
  - Green Communities Grant
  - Outreach / Regional Coordinators
Green Communities Grant Program

- Provides up to $10M annually in grants and loans to qualifying communities
  - Grants will fund significant energy efficiency initiatives, renewable energy, innovative projects

- Qualification Criteria
  - Adopt as-of-right siting, in designated locations, for RE/AE generation, or RE/AE R&D, or RE/AE manufacturing
  - Adopt expedited (12 month) application/permitting process
  - Establish an energy use baseline inventory with a program to reduce baseline by 20% in 5 years
  - Purchase only fuel-efficient vehicles
  - Require all new residential construction > 3000 ft$^2$, and new commercial and industrial real estate construction to minimize life-cycle energy costs
Criteria #1: As-Of Right Siting

Adopt as-of-right siting, in designated locations, for RE/AE Generation, or RE/AE Manufacturing, or RE/AE Research and Development.

- Site Plan Approval and ConCom review still applicable but NO Special Permits
- Designated locations means NOT everywhere in town
- RE = Renewable Energy (Solar PV, Wind, Wave)
- AE = Alternative Energy (Biomass Combined Heat & Power)
Criteria #2: Expedited Permitting Process

- 12 Months from date of complete application
- Not all permits, just those that relate to Criteria #1

MGL 43 D ~ Priority Development Site is acceptable (requires 6 month process)

Or a letter from legal counsel:
- Affirm no preclusions for expedited permitting
- Include language addressing approval procedures
- Associated timing from any applicable bylaws/ordinances or regulations.
Criteria #3: Energy Use Baseline

Establish Energy Use Baseline
And adopt a 5 Year Plan to reduce it by 20%

- All Municipal Buildings, Vehicles, Street and Traffic Lights

- Can use Energy Star Portfolio Manager
  Or ICLEI Software or new Mass Energy Insight

- Can be FY 2009 or CY 2009

- Comprehensive 5 year plan to reduce that baseline by 20 %
Criteria #4: Purchase Only Fuel Efficient Vehicles
Criteria #4: Purchase Only Fuel Efficient Vehicles
Criteria #4: Purchase Only Fuel Efficient Vehicles

Whenever such vehicles are commercially available and practicable

- Heavy duty vehicles such as Fire Trucks, Ambulances and some DPW trucks are exempt

- Police cruisers are exempt; until they become commercially available

- If you do not have a fleet, must have a policy to promote reduced fossil fuel use
Criteria 4 – Fuel Efficient Vehicles

Based on 2009 and 2008 EPA data, vehicles are to have a combined city and highway MPG ≥
Criteria #5: Require all new residential construction $> 3000 \text{ ft}^2$ and new commercial and industrial real estate construction to minimize life-cycle energy costs

Municipalities can meet this criteria by adopting the Stretch Code created by the BBRS (Board of Building Regulations and Standards).
Topics to be covered

- What is the Stretch Code, who is involved
- What it means for New Homes, Additions, Renovations & Repairs, Commercial buildings
- Costs vs. Benefits
- How to adopt it
- Questions, Questions
Criteria #5: Require new buildings to be more Energy Efficient

Municipalities can meet this criteria by adopting the Stretch Code created by the BBRS (Board of Building Regulations and Standards).

- Stretch Code is an optional appendix to the 8th Edition of the Mass Building Code 780 CMR
- Similar process to Energy Star for Homes
- Training for Building Officials has been done
- Provides for **Performance** testing, rather than **Prescriptive** measures.
Why Test Performance?

- Prescriptive codes do not 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.
Common air leaks

- Recessed light
- Attic hatch
- Duct register
- Top plate
- Sill plate
- Crawl space
- Plumbing vent stack
- Dropped soffit

Dryer vent
Outdoor faucet
Insulation

- Performance suffers rapidly when details aren’t followed
- Quality installation is key

Photos courtesy Conservation Services Group ©
Tools to Test Performance

IECC 2009 moves towards performance testing – Stretch code requires:

• Blower-door test for air leakage
• Duct test for heating & AC
• Optional infra-red camera tests thermal barrier installation.
Stretch Code for New Residential Construction

New low-rise (three stories or less) residential buildings shall require a HERS (Home Energy Rating System) index rating as verified by a RESNET (Residential Energy Services Network) certified HERS rater.

- For units greater than or equal to 3,000 sq ft in conditioned floor space, a HERS rating of 65 or less is required.
- For units less than 3,000 sq ft, a HERS rating of 70 or less is required.

- In addition, all new construction shall demonstrate compliance with the Energy Star Qualified Homes Thermal Bypass Inspection Checklist
Residential Energy Services Network

- RESNET: National, nonprofit HERS (Home Energy Rating System) advocacy organization (www.resnet.us)
  - Standards development and maintenance
  - Quality Assurance oversight
  - Forum for public comment on rating issues

- Recognized by
  Environmental Protection Agency - EPA
  Department of Energy – DOE
  Internal Revenue Service – IRS
HERS - Home Energy Rating System Industry and Stake Holders

HERS Provider Organization

Accredited Training Organization

HERS Rater

QA Designee

Client: builder, homebuyer, homeowner
What is a HERS Rating?

Annualized energy analysis
   Heating, Cooling, Water Heating, Lighting and Appliances….
   On site power generation-renewable energy

Reference Home

- Based on IECC 2006 Code
  (International Energy Conservation Code)
  Defined as 100 Points
- 1 % change in consumption = 1 point

HERS 65 means about
35% more efficient than reference home
What is HERS Process?

1. Review Building Plans via Computer Modeling
2. In-process inspections
   – First inspection
     • Thermal Bypass Checklist
     • Duct tightness test (if applicable)
   – Second Inspection
     (usually combined with 1st)
     • Insulation
   – Final Inspection
     • Blower door test
3. Finalize energy model based on verified performance and equipment
The EPA Thermal Bypass Checklist

- EPA requirement for ENERGY STAR Qualified New Homes
- Multi-point checklist for ‘common mistakes’
  - Focus: comfort, energy, warranty issues
- Builders may verify up to six items
  - Subject to the HERS Rater’s approval
  - All remaining items must be verified by the certified rater
- Builder and certified rater both sign the Checklist to ensure accountability
# ENERGY STAR Qualified Homes

## Thermal Bypass Inspection Checklist

<table>
<thead>
<tr>
<th>Thermal Bypass</th>
<th>Inspection Guidelines</th>
<th>Corrections Needed</th>
<th>Builder Verified</th>
<th>Rater Verified</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Overall Air Barrier and Thermal Barrier Alignment</strong></td>
<td><strong>Requirements:</strong> 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)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>All Climate Zones:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Overall Alignment Throughout Home</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2 Garage Band Joist Air Barrier (at bays adjoining conditioned space)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3 Attic Eave Baffles Where Vents/Leakage Exist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Only at Climate Zones 4 and Higher:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4 Slab-edge Insulation (A maximum of 25% of the slab-edge may be uninsulated in Climate Zones 4 and 5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Best Practices Encouraged, Not Req’d:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5 Air Barrier At All Band Joists (Climate Zones 4 and higher)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6 Minimize Thermal Bridging (e.g., CFE framing, SIPs, ICFs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2. Walls Adjoining Exterior Walls or Unconditioned Spaces</strong></td>
<td><strong>Requirements:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Fully insulated well aligned with air barrier at both interior and exterior, OR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Alternate for Climate Zones 1 thru 3, sealed exterior air barrier aligned with RESNET Grade 1 insulation fully supported</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Continuous top and bottom plates or sealed blocking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1 Well Behind Shower/Tub</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2 Wall Behind Fireplace</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3 Insulated Attic Slopes/Walls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.4 Attic Knee Walls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5 Skylight Shunt Walls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.6 Well Adjoining Porch Roof</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.7 Staircase Walls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.8 Double Walls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3. Floors between Conditioned and Exterior Spaces</strong></td>
<td><strong>Requirements:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Air barrier is installed at any exposed fibrous insulation edges</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Insulation is installed to maintain permanent contact with sub-floor above including necessary supports (e.g., staves for blankets, netting for blown-in)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Blanket insulation is verified to have no gaps, voids or compression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Blown-in insulation is verified to have proper density with firm packing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1 Insulated Floor Above Garage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2 Cantilevered Floor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 4. Shafts

**Requirements:**
Openings to unconditioned space are fully sealed with solid blocking or flashing and any remaining gaps are sealed with caulk or foam (provide fire-rated collars and caulking where required).

<table>
<thead>
<tr>
<th>4.1 Duct Shaft</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2 Piping Shaft/penetrations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.3 Flue Shaft</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 5. Attic/ Ceiling Interface

**Requirements:**
- All attic penetrations and dropped ceilings include a full interior air barrier aligned with insulation with any gaps fully sealed with caulk, foam or tape.
- Movable insulation fits snugly in opening and air barrier is fully gasketed.

<table>
<thead>
<tr>
<th>5.1 Attic Access Panel (fully gasketed and insulated)</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5.2 Attic Drop-down Stair (fully gasketed and insulated)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.3 Dropped Ceiling/Soffit (full air barrier aligned with insulation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.4 Recessed Lighting Fixtures (ICAT labeled and sealed to drywall)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.5 Whole-house Fan (insulated cover gasketed to the opening)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 6. Common Walls Between Dwelling Units

**Requirements:**
Gap between drywall shaft wall (i.e., common wall) and the structural framing between units is fully sealed at all exterior boundary conditions.

| 6.1 Common Wall Between Dwelling Units |   |   |   |   |

---

Home Energy Rating Provider: ___________________________  Rater Inspection Date: _____________  Builder Inspection Date: _____________

Home Energy Rater Company Name: ___________________________  Builder Company Name: ___________________________

Home Energy Rater Signature: ___________________________  Builder Employee Signature: ___________________________
402.4.2.2 Visual Inspection Option (this is the 2009 code language)

- Building envelope tightness and insulation installation shall be considered acceptable when the items listed in Table 402.4.2, applicable to the method of construction, are field verified.

- Where required by the code official, an approved party independent from the installer of the insulation shall inspect the air barrier and insulation.
<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air barrier and thermal barrier</td>
<td>Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier. Brakes or joints in the air barrier are filled or repaired. Air-permeable insulation is not used as a sealing material. Air-permeable insulation is inside of an air barrier.</td>
</tr>
<tr>
<td>Ceiling/attic</td>
<td>Air barrier in any dropped ceiling/soffit is substantially aligned with insulation and any gaps are sealed. Attic access (except unvented attic), knee wall door, or drop down stair is sealed.</td>
</tr>
<tr>
<td>Walls</td>
<td>Corners and headers are insulated. Junction of foundation and sill plate is sealed.</td>
</tr>
<tr>
<td>Windows and doors</td>
<td>Space between window/door jambs and framing is sealed.</td>
</tr>
<tr>
<td>Rim joists</td>
<td>Rim joists are insulated and include an air barrier.</td>
</tr>
<tr>
<td>Floors (including above-garage and cantilevered floors)</td>
<td>Insulation is installed to maintain permanent contact with underside of subfloor decking. Air barrier is installed at any exposed edge of insulation.</td>
</tr>
<tr>
<td>Crawl space walls</td>
<td>Insulation is permanently attached to walls. Exposed earth in unvented crawl spaces is covered with Class I vapor retarder with overlapping joints taped.</td>
</tr>
<tr>
<td>Shafts, penetrations</td>
<td>Duct shafts, utility penetrations, knee walls and flue shafts opening to exterior or unconditioned space are sealed.</td>
</tr>
<tr>
<td>Narrow cavities</td>
<td>Batt insulation in narrow cavities is cut to fit, or narrow cavities are filled by sprayed/blown insulation.</td>
</tr>
<tr>
<td>Garage separation</td>
<td>Air sealing is provided between the garage and conditioned spaces.</td>
</tr>
<tr>
<td>Recessed lighting</td>
<td>Recessed light fixtures are air tight, IC rated, and sealed to drywall. Exception — fixtures in conditioned space.</td>
</tr>
<tr>
<td>Plumbing and wiring</td>
<td>Insulation is placed between outside and pipes. Batt insulation is cut to fit around wiring and plumbing, or sprayed/blown insulation extends behind piping and wiring.</td>
</tr>
<tr>
<td>Shower/tub on exterior wall</td>
<td>Showers and tubs on exterior walls have insulation and an air barrier separating them from the exterior wall.</td>
</tr>
<tr>
<td>Electrical/phone box on exterior walls</td>
<td>Air barrier extends behind boxes or air sealed-type boxes are installed.</td>
</tr>
<tr>
<td>Common wall</td>
<td>Air barrier is installed in common wall between dwelling units.</td>
</tr>
<tr>
<td>HVAC register boots</td>
<td>HVAC register boots that penetrate building envelope are sealed to subfloor or drywall.</td>
</tr>
<tr>
<td>Fireplace</td>
<td>Fireplace walls include an air barrier.</td>
</tr>
</tbody>
</table>
Some Efficiency steps to reach HERS 70

- New Home – approx. 1500 sf, 2 Stories, Full Basement

  Home meeting Prescriptive Requirements of the CURRENT Building Code Requirements (IECC 2009)
  earned a HERS rating of 82

Option 1: Add R5 rigid insulation to the exterior of the home, change the basement wall exterior insulation to R15, change the windows U value to 0.30 and put the ductwork under the attic insulation = HERS 70

OR

Option 2: Change to a 92% efficient furnace, 14 SEER condensing unit and an 80% efficient on demand gas fired water heater = HERS 67
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>86</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>HERS Index Modeled in REM/Rate</td>
<td>86</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Improvement Measures (changes relative to Basecase)</td>
<td>- Unconditioned basement</td>
<td>- Ceiling, R38 G1</td>
<td>- Ceiling, R38 G1</td>
</tr>
<tr>
<td></td>
<td>- Floor, R30</td>
<td>- Heating, 94 AFUE</td>
<td>- Heating, 94 AFUE</td>
</tr>
<tr>
<td></td>
<td>- Walls, R21</td>
<td>- Water heating, .62 EF</td>
<td>- Water heating, .62 EF</td>
</tr>
<tr>
<td></td>
<td>- Ceiling, R38 G2</td>
<td>- Infiltration, 4 ACH50</td>
<td>- Infiltration, 4 ACH50</td>
</tr>
<tr>
<td></td>
<td>- Heating, 80 AFUE</td>
<td>- Efficient lighting, 75%</td>
<td>- Efficient lighting, 75%</td>
</tr>
<tr>
<td></td>
<td>- Cooling, 13 SEER</td>
<td>- Exhaust Only Ventilation</td>
<td>- Exhaust Only Ventilation</td>
</tr>
<tr>
<td></td>
<td>- Water Heating, .59 EF</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Duct leakage, 8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Infiltration, 7 ACH50</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Efficient lighting, 50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improvement Costs</td>
<td>$</td>
<td>$ 2,049</td>
<td>$ 2,155</td>
</tr>
<tr>
<td>HERS Rater Fee¹</td>
<td>$</td>
<td>$ 900</td>
<td>$ 900</td>
</tr>
<tr>
<td>HERS Rater reimbursement²</td>
<td>-</td>
<td>$ (650)</td>
<td>$ (650)</td>
</tr>
<tr>
<td>ENERGY STAR Incentive³</td>
<td>-</td>
<td>$ (650)</td>
<td>$ (650)</td>
</tr>
<tr>
<td>Total Improvement Costs</td>
<td>$</td>
<td>$ 2,949</td>
<td>$ 1,755</td>
</tr>
<tr>
<td>Mortgage Interest Rate</td>
<td>6%</td>
<td>6%</td>
<td>6%</td>
</tr>
<tr>
<td>Loan Term (Years)</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Annual Incremental Mortgage Payment</td>
<td>$</td>
<td>$ 214</td>
<td>$ 127</td>
</tr>
<tr>
<td>Annual Energy Costs⁶</td>
<td>$ 3,970</td>
<td>$ 3,463</td>
<td>$ 3,454</td>
</tr>
<tr>
<td>Annual Energy Savings from Baseline</td>
<td>$ 507</td>
<td>$</td>
<td>$ 516</td>
</tr>
<tr>
<td>Annual Cash Flow</td>
<td>$</td>
<td>$ -</td>
<td>$ 293</td>
</tr>
</tbody>
</table>
Residential Additions

1. Prescriptive:
   2009 IECC envelope insulation levels,
   Energy Star v5.0 for doors, windows, skylights
   Ducts for new HVAC systems must be 4cfm per 100 ft²
   **OR**

2. Performance-based: HERS 65 or 70
Stretch Code for Alterations, Renovations and Repairs

Two compliance options

1. Prescriptive (same as prescriptive for additions)

OR

2. Performance (HERS)
   Less stringent thresholds (80 or 85)

- Again, BOTH compliance options are complemented by EPA Thermal Bypass Checklist
‘Stretch Code’ and ‘Energy Star’

The Stretch appendix puts the current Energy Star Homes program (at Tier 2 level) into code.

All new residential construction can use the Energy Star homes program to receive:

– Builder incentives/rebates
  • $1250/home for HERS 65
  • other utility incentives – on appliances, flourescent lights, etc.
– Builder training and materials
– Subsidized HERS raters
Process in a Nutshell

- **PRE-CONSTRUCTION:**
  - Projected energy rating/ENERGY STAR compliance documentation submitted in conjunction with energy code compliance documentation (typically REScheck)

- **DURING CONSTRUCTION:**
  - HERS rater verifies ENERGY STAR compliance
  - Building official verifies energy code compliance

- **POST-CONSTRUCTION:**
  - Confirmed energy rating/ENERGY STAR compliance documentation submitted in addition to building official energy code compliance verification
Commercial by Size and Type

- 5,000-100,000 ft² – Performance or Prescriptive 20% below ASHRAE or Stretch code amendments to IECC Chapter 5
- Over 100,000 ft² - Only Performance option
  Energy model showing 20% below ASHRAE 90.1-2007
- Special cases
  buildings with unusual energy demands
  (Supermarkets, Labs, Warehouses…)
  Over 40,000 ft² - 20% below ASHRAE 90.1-2007
  Under 40,000 ft² are exempt
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 acclimated 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

Leominster, MA
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

**31% Improvement Over Code**

- Lighting $7,200
- HVAC $18,000
- Building Envelope $1,500

**Savings Components** ($27,600 annual savings)

**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

<table>
<thead>
<tr>
<th></th>
<th>Mass Energy Code</th>
<th>Advanced Buildings Criteria</th>
<th>Final Design</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting Power Density</td>
<td>1.34 w/SF</td>
<td>0.96 w/SF</td>
<td>0.86 w/SF</td>
<td>36%</td>
</tr>
</tbody>
</table>

*Improved lighting quality while using less energy!*
Energy Efficient Mortgages

- Energy Efficient Mortgages make it easier for borrowers to qualify for loans to purchase homes that are already energy efficient or to cover the expenses for making cost-effective energy improvements when purchasing or refinancing older existing homes.
  - Conventional Energy Efficient Mortgages
  - FHA Energy Efficient Mortgages
  - VA Energy Efficient Mortgages
Adoption by Cities & Towns

- Adoption Process
  - Building Official Training
  - Municipal Public Hearing / Forum (tonight)
  - Vote of Town Meeting (simple majority)

- Timing of Adoption
  - Municipality can vote any time
  - Code change starts on Jan 1 or Jul 1
  - Base & Stretch code both in place for the first 6 months (concurrency period)

Builder can choose EITHER code
Implementation Timeline example

- Example of adoption by Town of Canterburg,
  - October, 2011 … Municipal public meeting/forum
  - November, 2011 … Vote of Town Meeting to adopt Stretch Code; Canterburg is eligible to become a Green Community

- Timing of code implementation in Canterburg,
  - Jan 1, 2012 Stretch code implemented alongside base code in Canterburg
  - Jan→June 2012 Building permits can comply with either current base code (IECC 2009) or Stretch code until Dec 31, 2011
  - July 1, 2012 Stretch code becomes sole energy code in Canterburg – for new building permits
One hundred one municipalities have adopted the new Board of Building Regulations and Standards (BBRS) Stretch Code, as of November 7, 2011.
GREEN COMMUNITIES GRANT PROGRAM

$8,100,000 was awarded to 35 Municipalities in Spring 2010.

$4,100,000 was awarded to 18 Municipalities Winter 2010/2011

$4,000,000 to awarded this summer to another 21 more municipalities

<table>
<thead>
<tr>
<th>Population</th>
<th>Grant</th>
</tr>
</thead>
<tbody>
<tr>
<td>521</td>
<td>$138,025</td>
</tr>
<tr>
<td>930</td>
<td>$138,000</td>
</tr>
<tr>
<td>2,000</td>
<td>$134,150</td>
</tr>
<tr>
<td>1,800</td>
<td>$140,000</td>
</tr>
<tr>
<td>3,200</td>
<td>$131,000</td>
</tr>
<tr>
<td>3,000</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ACTON</th>
<th>GREENFIELD</th>
<th>LINCOLN</th>
<th>PALMER</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANDOVER</td>
<td>HAMILTON</td>
<td>LOWELL</td>
<td>PITTSFIELD</td>
</tr>
<tr>
<td>ARLINGTON</td>
<td>HANOVER</td>
<td>MASHPEE</td>
<td>SALEM</td>
</tr>
<tr>
<td>ATHOL</td>
<td>HOLYOKE</td>
<td>MEDFORD</td>
<td>SPRINGFIELD</td>
</tr>
<tr>
<td>BECKET</td>
<td>HOPKINTON</td>
<td>MELROSE</td>
<td>SUDSBURY</td>
</tr>
<tr>
<td>BELCHERTOWN</td>
<td>KINGSTON</td>
<td>MONTAGUE</td>
<td>TYNGSBOROUGH</td>
</tr>
<tr>
<td>CAMBRIDGE</td>
<td>LANCASTER</td>
<td>NATICK</td>
<td>WENHAM</td>
</tr>
<tr>
<td>CHELMSFORD</td>
<td>LENOX</td>
<td>NEWTON</td>
<td>WORCESTER</td>
</tr>
<tr>
<td>EASTHAMPTON</td>
<td>LEXINGTON</td>
<td>NORTHAMPTON</td>
<td></td>
</tr>
</tbody>
</table>

Energy and Environmental Affairs  
J.Fleiter, 5-21-10
New Green Community Designations

- Boston
- Hatfield
- Scituate
- Dedham
- Marlborough
- Swampscott
- Easton
- Medway
- Watertown
- Gardner
- Milton
- Wayland
- Gloucester
- New Salem
- Williamstown
- Harvard
- Newburyport
- Winchester

**New Green Community Designation** - December 16, 2010

**Round One Designation** - May 25, 2010
TWENTY-ONE NEW GREEN COMMUNITY DESIGNATIONS
~ SEVENTY-FOUR IN TOTAL

New Green Community Designations

<table>
<thead>
<tr>
<th>AYER</th>
<th>GRANBY</th>
<th>MONSON</th>
<th>SUTTON</th>
<th>BEDFORD</th>
<th>HOLLAND</th>
<th>REVERE</th>
<th>TEWKSBURY</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUCKLAND</td>
<td>MIDDLEFIELD</td>
<td>SHUTESBURY</td>
<td>MILLBURY</td>
<td>WOBURN</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- New Green Community Designation - July 19, 2011
- Previously Designated Community

Department of Energy Resources
J. Pfiester, 7-9-11
Why Become a Green Community?

- **Economic Benefits** – reduce energy consumption, reduce energy costs
- **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 $$

www.mass.gov/energy/greencommunities

Jim.Barry@State.Ma.US