COMMONWEALTH OF MASSACHUSETTS

Deval L. Patrick, Governor
Timothy P. Murray, Lt. Governor
Ian A. Bowles, Secretary
Phil Giudice, Commissioner
Mark Sylvia, Director

GREEN COMMUNITIES PROGRAM
DEPARTMENT OF ENERGY RESOURCES

Helping Massachusetts Municipalities Create a Greener Energy Future

Green Communities Webinar

November 3rd, 2010

The MA 'Stretch' Energy Code 201

Ian Finlayson

Manager of Buildings and Climate Programs

The webinar will be starting in a few minutes…

1

COMMONWEALTH OF MASSACHUSETTS

Deval L. Patrick, Governor
Timothy P. Murray, Lt. Governor
Ian A. Bowles, Secretary
Phil Giudice, Commissioner
Mark Sylvia, Director

GREEN COMMUNITIES PROGRAM
DEPARTMENT OF ENERGY RESOURCES

Helping Massachusetts Municipalities Create a Greener Energy Future

Green Communities Webinar

November 3rd, 2010

The MA 'Stretch' Energy Code 201

Ian Finlayson

Manager of Buildings and Climate Programs

2

Green Communities Division

Serves as the hub for all Massachusetts cities and towns on energy matters

3

Recording & Presentation

- The webinar was recorded and will be available for viewing at your convenience. It will be posted on our website at:
  www.mass.gov/energy/greencommunities
- The slide presentation will also be posted at:
  www.mass.gov/energy/greencommunities
- Websites are also listed at end of presentation

4

Stretch Code: Poll #1

What portions of the stretch code are you most interested in hearing about today?

- Residential
- Commercial
- Equal time for Both

5

Summary

- Energy/stretch code recap
- May 2010 updates to the stretch code
- Future Energy code
- Value of the stretch code approach
- Case studies
- Questions

6

MA Energy Codes 2010-2012

- IECC 2009 since July 1, 2010
  - Roughly 10% more energy efficient than 2006
  - ASHRAE 90.1-2007 commercial option
- Towns and Cities can opt into the "Stretch Code" appendix
  - Approx 20% more energy efficient than IECC 2009 or ASHRAE 90.1-2007

7

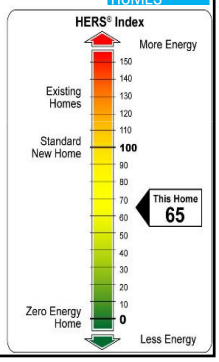
Residential Recap

New Homes = Performance

- HERS rating of 65 or 70
- Energy star checklist

Renovations or Additions:

- Performance (HERS) or
- Prescriptive code
- Energy star checklist



8

Commercial Recap

- New buildings & additions only
- Prescriptive code 5,000-100,000 sq ft
- Performance over 100,000 sq ft.
  - Uses ASHRAE / LEED energy model

9

Performance Energy Code

Performance path = an Energy Model

- HERS Rating is an energy model of the home/unit (estimates energy use / sq ft)
- ASHRAE appendix G is the LEED energy model for commercial bldgs. (also energy use /sq ft)
- Design decisions lead to better buildings
- Occupants are unknown so assume average behavior

10

Prescriptive Energy Code

Prescriptive = detailed minimum standards

- How much insulation, air sealing is needed
- What kind of windows, heating/cooling equipment, etc, are good enough
- What controls, design details are required
- Sets minimum spec. - design flexibility is to go higher, with some trade-offs

11

Stretch Code Updates

12

Stretch Code Updates (May 2010)

- Updated FAQ (Oct 2010) on BBRS website:

http://www.mass.gov/Eeops/docs/dps/inf/faqs_stretch_energy_code_qa_oct11_10.pdf

Q&A for MA Stretch Energy Code Appendix 780CMR 115.AA

Stretch Appendix to the Building Energy Code in Massachusetts

Question and Answer (Q&A) – October 2010

General Questions	Page
1. What is the 'stretch' code?	2
2. How is the stretch code different from the existing 'base' energy code?	2
3. Why did the Board of Building Regulations and Standards (BBRS) create this option?	2
4. What are the expected benefits to a municipality of a more stringent energy code?	2
5. What is the anticipated cost of implementing a more stringent energy code?	3
6. Where can I find and read more about the stretch code appendix?	3
Scope	
7. What building types does the stretch energy code apply to?	3
8. Does the stretch code apply to major renovation projects as well as new construction?	3

Stretch Code Updates (May 2010)

- May 2009 Stretch code voted in by BBRS
  - First published in August 2009
- May 2010 BBRS approved modifications
  - 7th edition appendix 120.aa **(June 2010)** or
  - 8th edition appendix 115.aa
- 2 Main Changes in May 2010:
  - 401.3 Residential prescriptive path simplified
  - 501.1.2 Commercial performance path mandatory requirements clarified

Appendix 120.aa or 115.aa How to Adopt the Latest Version?

If you are already a 'stretch code' community

- No action needed – MA 8th edition bldg. code changes don't affect energy chapter or stretch code
- Reference to 7th edition 120.aa changes to 8th edition 115.aa once MA code update is completed

If you are considering 'stretch code' adoption

- Recommend bylaw reference to 8th edition 115.aa (formerly 7th edition 120.aa)

Residential Updates

- Additions and Renovations – prescriptive path is simplified.
  - Removed reference to Energy Star BOP

401.3 Prescriptive - Meet IECC 2009 plus:

1. Energy Star Thermal Checklist.
2. Energy Star v5.0 for **new** Doors, Windows and Skylights
3. Ducts for **new** HVAC systems max 4 cfm per 100 ft^2 (4% leakage to outside)

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	☐	☐	☐	☐
3. Floors between Conditioned and	**Requirements:** • Air barrier is installed at any exposed fibrous insulation edges				

ENERGY STAR Qualified Homes
Thermal Enclosure System Rater Checklist

Home Address: _____ City: _____ State:_____

Inspection Guidelines	Must Correct	Builder Approved[1]	Rater Approved	N/A
1. High-Performance Windows				
1.1 *Prescriptive Path:* Windows shall meet or exceed ENERGY STAR window requirements[2]	☐	☐	☐	☐
1.2 *Performance Path*: Windows shall meet or exceed 2009 IECC requirements[3]	☐	☐	☐	☐
2. Quality-Installed Insulation				
2.1 Ceiling, floor, and wall insulation levels shall meet or exceed 2009 IECC levels[4]	☐	☐	☐	☐
2.2 For Climate Zones 4 and higher, slab insulation shall meet or exceed 2009 IECC levels[4]	☐	☐	☐	☐
2.3 Insulation shall achieve RESNET-defined Grade I installation or, alternatively, Grade II for walls with insulated sheathing, (see checklist item 4.3.1 for required insulation levels)	☐	☐	☐	☐
3. Fully-Aligned Air Barriers [5]				
At each location noted below, a complete air barrier shall be provided that is fully aligned with the insulation as follows: • At interior surface of ceilings in all Climate Zones • At exterior surface of walls in all Climate Zones; and also at interior surface of walls for Climate Zones 4-8[6] • At interior surface of floors in all Climate Zones, including supports to ensure permanent contact and blocking at exposed edges[7]				
3.1 Walls				
3.1.1 Walls behind showers and tubs	☐	☐	☐	☐
3.1.2 Walls behind fireplaces	☐	☐	☐	☐
3.1.3 Attic knee walls	☐	☐	☐	☐
3.1.4 Skylight shaft walls	☐	☐	☐	☐
3.1.5 Wall adjoining porch roof	☐	☐	☐	☐
3.1.6 Staircase walls	☐	☐	☐	☐
3.1.7 Double walls	☐	☐	☐	☐
3.1.8 Garage rim / band joist adjoining conditioned space	☐	☐	☐	☐
3.1.9 All other exterior walls	☐	☐	☐	☐
3.2 Floors				

18

Stretch Code: Poll #2

Who completes and signs the EPA thermal checklist for the residential prescriptive path (most home additions and renovations)?

- HERS rater only
- Builder and HERS rater
- Builder only
- Any combination of the above

19

Commercial Updates

Performance path mandatory requirements clarified

The ASHRAE 90.1-2007 appendix G, energy model is not a stand-alone code compliance path, so some prescriptive code requirements are also needed

Two choices: Stretch code prescriptive path or ASHRAE 90.1-2007 mandatory requirements

Listed in section 501.1.2

- Appendix AA 502.4, 503.2, 504 and 505,

or

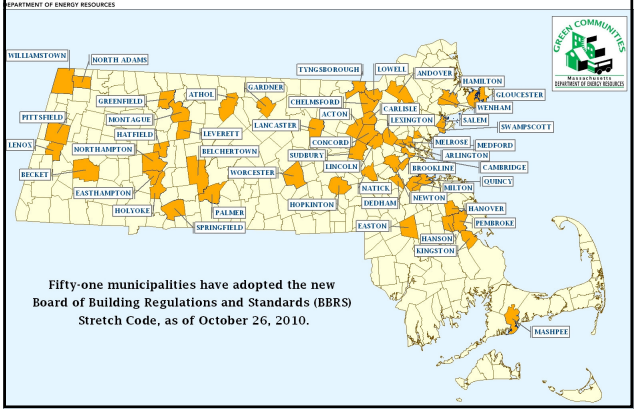
- ASHRAE 90.1-2007: 5.4, 6.4, 7.4, 8.4, 9.4, 10.4.

plus

- lighting requirements of Appendix AA TABLE 505.5.2

20

Municipal Adoption Update



Fifty-one municipalities have adopted the new Board of Building Regulations and Standards (BBRS) Stretch Code, as of October 26, 2010.

Code Training Update

- Wrapping up 40 trainings on IECC 2009 and stretch code.
  - Designed for building code officials
  - Builders, contractors, designers welcome
- New training coming soon – Winter 2011
  - Focused on building best practices
  - And how to meet the stretch code
  - Designed for builders/contractors/designers
  - Code officials, local govt, public welcome

http://cetonline.org/Events/events.php?id=124

22

Future Energy Code

23

IECC 2012 – Big Energy Savings

November 2, 2010

US Adopts 30% Energy-Efficiency Savings for Buildings

Share | Email This Post | Add your comments

More than 500 U.S. state and local code officials voted to adopt new building codes that will achieve 30 percent in energy savings, using the 2006 model code as the baseline, for commercial and residential buildings, reports the **American Council for an Energy-Efficient Economy** (ACEEE).

The new 2012 International Energy Conservation Code (IECC) will align with the 30 percent energy savings goal of the U.S. Department of Energy, the U.S. Conference of Mayors, the National Association of State Energy Officials, governors, lawmakers, and the broad-based Energy Efficient Codes Coalition (EECC), says ACEEE.

The model energy code governs residential and commercial building construction, additions, and renovations in 47 states and the District of Columbia where local building codes are based on these

RELATED STORIES

Energy Department, Realtors Form Energy Alliance

San Jose Adopts LEED Standards For All New Construction

Commercial Buildings Guzzle 37% of CA's Energy

24

MA Energy Code in 2012/13 IECC 2012 or Stretch 2012

- Residential – IECC stays mostly Prescriptive
  - Expected ~20% more efficient than 2009 in MA
- Commercial – IECC stays mostly Prescriptive
  - Adopts the MA stretch code prescriptive language
  - ASHRAE 90.1-**2010** allowed alternative
  - Expected ~20% more efficient than 2009 in MA
- New Stretch code in 2012/13
  - Requires BBRS approval
  - Requires renewed adoption by municipality

25

Stretch code value

26

Stretch Code – A Pathway to Zero Energy Buildings

Residential - more performance testing

- Provides home-buyer quality assurance
- Rewards MA builders for quality workmanship and good design
- Is the most cost-effective way to save energy in homes

Commercial – more energy design modeling

- Flexible and rewards whole-system energy design
- Prescriptive requirements are most cost-effective tested in our climate

27

Stretch Code: Poll #3

What performance testing is already **required** for new homes in the MA residential energy code (IECC 2009)?

- Blower-door test of air leakage
- Duct-blaster test of duct air leakage
- Both duct-blaster and blower-door test
- No performance testing is required

28

Residential Stretch Code = Performance Testing

29

Why Test Performance?

Prescriptive codes don't guarantee good installation, air and water tightness, or that thermal insulation is effective.

e.g. Small air gaps can reduce insulation R-values by 50% or more

30

Example: Insulation

- Performance suffers rapidly when details aren't followed
- Quality installation is key
- Old energy codes didn't test this

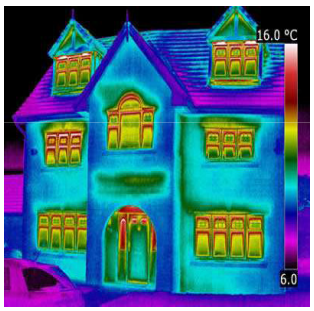
31

Photos courtesy Conservation Services Group ©

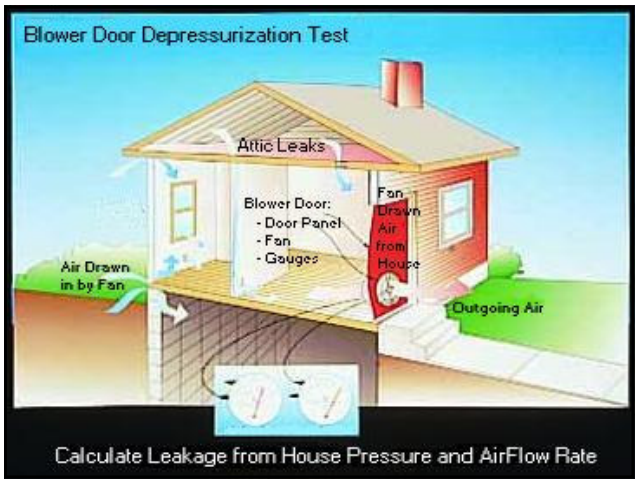
Tools to Test Performance

Stretch code requires:

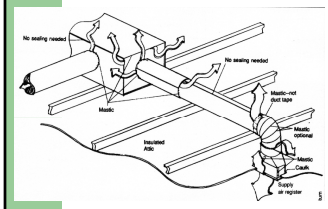
- Blower-door test for air leakage
- Duct test for heating & AC (unless all ducts are inside insulated space)
- Optional infra-red camera tests thermal barrier install.

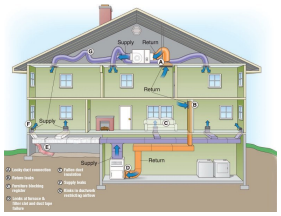


32



Ducts Are Now Tested Under Both Base & Stretch Codes





- If all ducts are inside the insulated space – no test required, only test when ducts can leak to the outside

34

Residential Stretch Code: Real World Examples in MA

35

Stretch Code: Poll #4

What is the expected incremental cost to build an average sized stretch code home rather than to IECC 2009?

- $20,000
- $8,000
- $2,000
- Depends on the builder

36

Small Townhouse Units
(1,200 square feet)

37

Small Townhouse Units
(1,200 square feet)

System	Code default	This Home
Walls	R-20	R-19
Ceiling	R-38	R-41
Slab (Perim./Under)	R-10/R-10	R-10/R-10
Heating	78% AFUE	Hydro-Air, 92%
Cooling	13 SEER	14 SEER
DHW		Integrated, 0.86 EF
Air Leakage	7 ACH@50	5 ACH@50
Duct Leakage	8% of floor area	6% of floor area
HERS Index	**~85**	**63**

38

Single Family
(2,600 square feet)

39

Single Family
(2,600 square feet)

Walls (cavity)	R-20	R-19
Ceiling (cavity)	R-38	R-37
Floor (cavity)	R-30	R-30
Slab (Perim./Under)	R10/R10	R5/R10
Heating	80% AFUE	Oil Boiler, 86%
Cooling	13 SEER	13 SEER
DHW		Integrated 0.79 EF
Air Leakage	7 ACH@50	5 ACH@50
Duct Leakage	8%	6% of floor area
HERS Index	**~85**	**66**

40

Another Single Family
(2,600 square feet)

41

Another Single Family
(2,600 square feet)

Walls (cavity)	R-20	R-25
Ceiling (cavity)	R-38	R-59
Floor (cavity)	R-30	R-39
Foundation	R10/13	R0
Heating	78% AFUE	Furnace 80%
Cooling	13 SEER	13 SEER
DHW		standalone 0.55 EF
Air Leakage	7 ACH@50	2.5 ACH@50
Duct Leakage	8%	0% (inside)
HERS Index	**~85**	**68**

42

Large Single Family
(4,200 square feet)

43

Large Single Family (gut-rehab)
(4,200 square feet)

Walls (cavity)	R-20	R-15
Ceiling (cavity)	R-38	R-34
Floor (cavity)	R-30	R-22
Slab (Perim./Under)	R10/R10	R10/R10
Heating	78% AFUE	Hydro-Air, 92%
Cooling	13 SEER	14 SEER
DHW		Integrated 0.85 EF
Air Leakage	7 ACH@50	5 ACH@50
Duct Leakage	8%	6% of floor area
HERS Index	**~85**	**63**

44

Stretch Code – Top 5 Reasons

1. Consumer Protection – testing ensures new homes get built properly in practice – not just in theory
2. Its happening anyway – Almost all the stretch code language will be in the 2012 base energy code
3. Its good business – Designers and Builders who save energy are in demand – Energy star and LEED buildings sell faster, and others don't sell much at all.
4. The support is there – utility incentives and programs, state sponsored training, public support
5. It's the right thing to do – reducing energy imports and emissions, promoting local green jobs and improving buildings that will still be here in 2050

45

Stretch Code Questions?

Contacts:

Dept. of Public Safety
Mike Guigli (617) 826-5215
mike.guigli@state.ma.us

Dept. of Energy Resources
Ian Finlayson (617) 626-4910
ian.finlayson@state.ma.us

Energy & Environment (EOEEA)
Marc Breslow (617) 626-1105
marc.breslow@state.ma.us

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

46

Questions

- The webinar was recorded and will be available for viewing at your convenience. It will be posted on our website at:
  www.mass.gov/energy/greencommunities
- The slide presentation will also be posted at:
  www.mass.gov/energy/greencommunities

47

Commercial Stretch Code

48

Commercial by Size and Type

- 5,000-100,000 ft^2 – Performance or Prescriptive
  20% below ASHRAE or
  Stretch code amendments to IECC Chapter 5
- Over 100,000 ft^2 - 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 ft^2 - 20% below ASHRAE 90.1-2007
  Under 40,000 ft^2 are exempt

49

Commercial Stretch Code Requirements

Building category	Definition	Requirements base on energy performance (can do prescriptive where shown)	Alternative "prescriptive" requirement – specific efficiency measures
Large commercial and large residential multi-family	Commercial above 100,000 ft^2; residential 4 stories or more and 100,000 ft^2	Energy use 20% below ASHRAE 90.1 2007, determined by modeling	None
Medium commercial and residential multi-family	Commercial 5,000 to 100,000 ft^2, residential 4 stories or more and below 100,000 ft^2	Energy use 20% below ASHRAE 90.1 2007, determined by modeling	IECC 2009 with NBI Core performance: improved insulation, lighting, equipment etc.

50

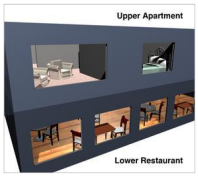
Commercial: Utility Efficiency Incentives, Rebates, Tax Credits

- Stretch code is designed to allow builders to get the maximum benefits of the existing utility programs
- Buildings considering the performance path should work with their utility:
  - Technical assistance available on larger projects
  - Cost sharing on incremental design and modeling costs
  - Up to 65% of incremental measures covered by rebates
- Additional rebates available for installing high efficiency heating and cooling equipment, appliances and lighting.
- Typically 1-2 year paybacks on new commercial buildings after utility incentives.

51

Mixed Use Buildings

- Mixed occupancies -3 stories or less
  - Treat the residential occupancy under the applicable residential code
  - Treat the commercial occupancy under the commercial code



52