



# **RAISING THE BAR: NEW BUILDING STANDARDS**

## **Affordable Comfort New England 2010**

# The Evolving RNC Marketplace



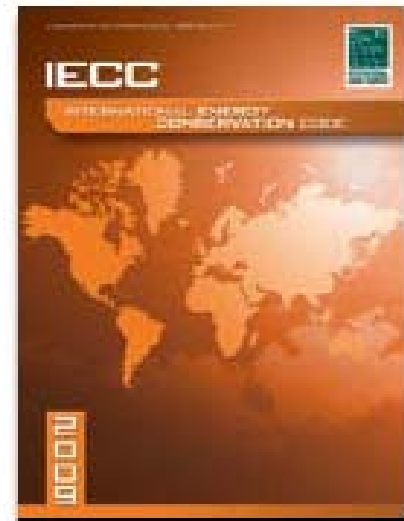
- Overview
  - ▣ Code Update
  - ▣ ENERGY STAR Homes
  - ▣ Advanced Programs
    - Green Building Programs
    - Zero Energy Homes Initiatives
    - Passive House
  - ▣ Q&A



# Codes

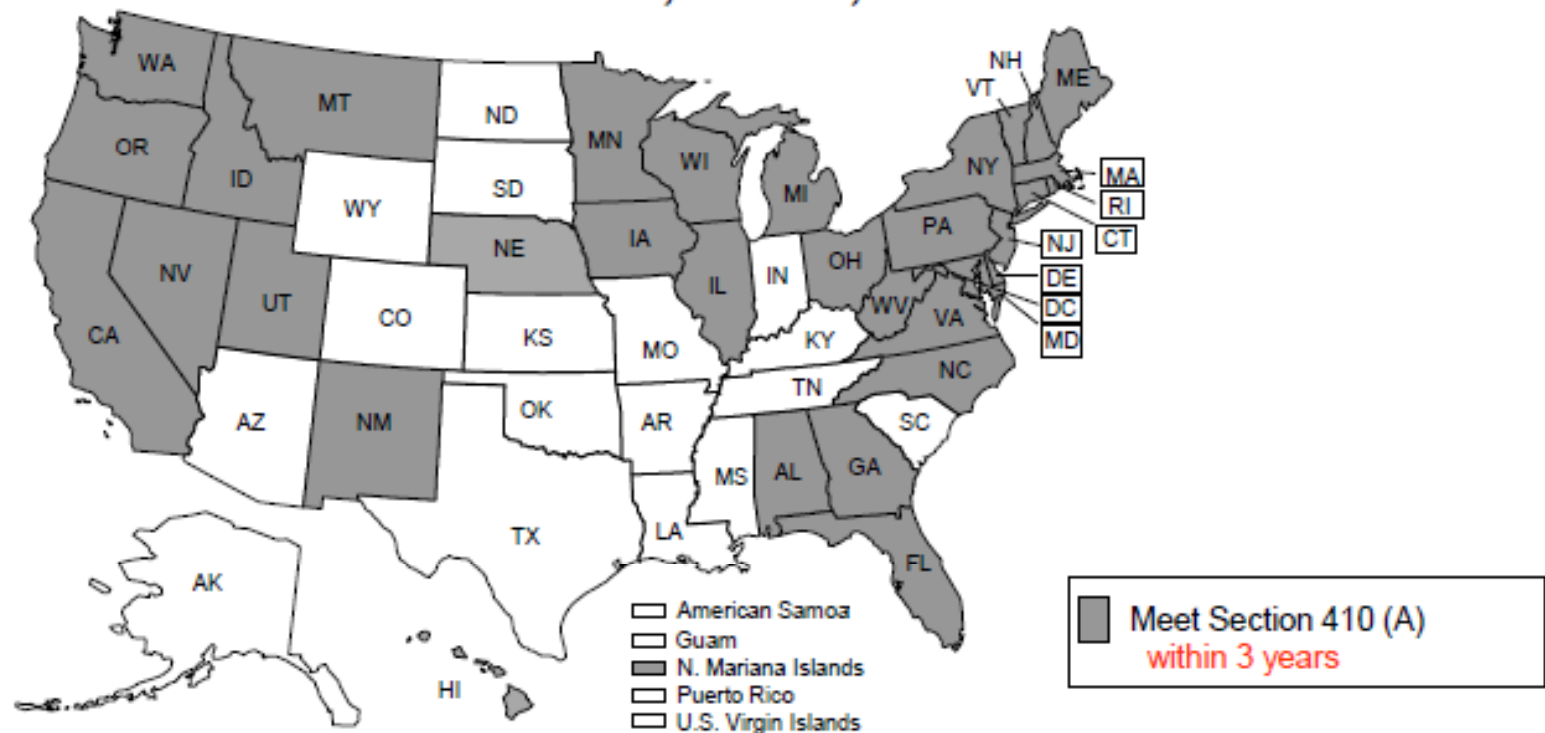
# Code Update

- Status of Energy Codes in the Northeast
- IECC 2009
- Stretch Codes
- IECC 2012



# IECC 2009 Adoption by 2012

## Residential Energy Code Adoption Activity 2009 IECC, meets, or exceeds

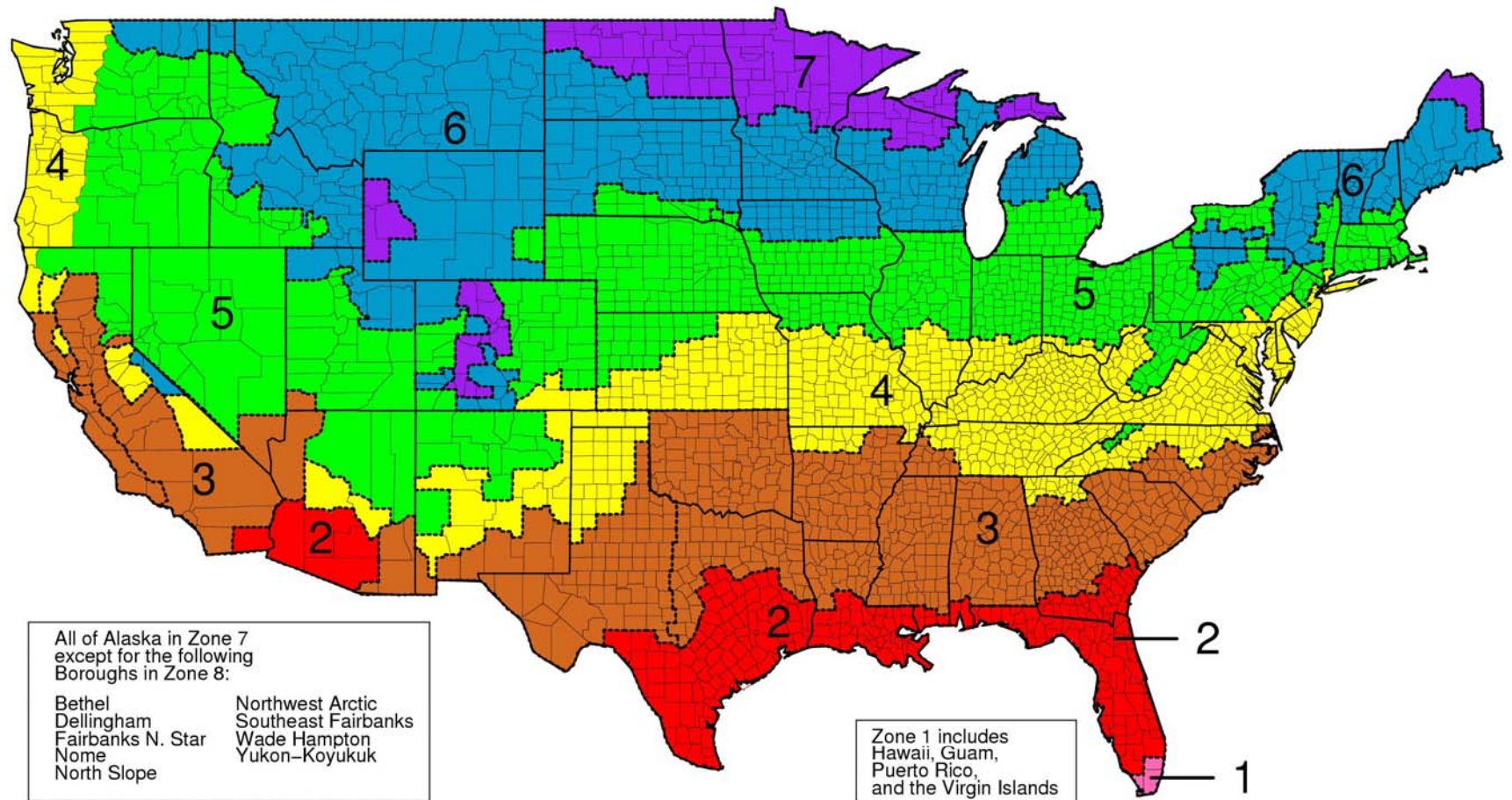


Source: BECP's Status of State Codes  
[http://www.energycodes.gov/implement/state\\_codes/index.stm](http://www.energycodes.gov/implement/state_codes/index.stm)

# STATUS OF ENERGY CODES (Thanks to NEEP)

STATE	RESIDENTIAL	COMMERCIAL	LATEST UPDATE	CYCLE	RESPONSIBLE STATE AGENCY
Connecticut	2003 IRC	2003 IECC	Jan 2011 IRC & IECC 2009 IECC 2009 in 2012?	Not more than every 4 years	Department of Public Safety
Delaware	2009 IECC	2009 IECC Supplement (ASHRAE 90.1-07)	Effective July 1, 2010	No Schedule	Delaware Energy Office
District of Columbia	2006 IECC with '30%' amendments	ASHRAE 90.1-2007 with amendments	Effective Oct 8, 2008	Every 3 years	D.C. Energy Office
Maine	2009 IECC	2009 IECC	Adopted Jun 1, 2010 Effective Dec 1, 2010	Every 3 years	PUC
Maryland	2009 IECC	2009 IECC	Effective Oct 1, 2009	Every 3 years	Dept. of Housing and Community Development
Massachusetts	2009 IECC	ASHRAE 90.1-2007 or 2009 IECC	Effective July 1, 2010	Every 3 years	Board Of Building Regulations and Standards
New Hampshire	2009 IECC	2009 IECC	Effective 4/1/2010	Every 3 years	PUC
New Jersey	2006 IECC	2006 IECC or ASHRAE 90.1-2004	Adoption of 2009 on hold Fall 2010???	Every 3 years (overdue)	Department of Community Affairs
New York	2009 IECC w/NY Amendments (Pending)	ASHRAE 90.1-2007 (Pending)	Dec 2010	Every 5 years	Department of State
Pennsylvania	2009 IECC, 2009 IRC or PA Alt.	2006 IECC or ASHRAE 90.1-2007	Effective Dec 31, 2009	Every 3 years	Dept. of Labor and Industry
Rhode Island	2009 IECC	2009 IECC	Effective July 1, 2010	Every 3 years	Department of Administration
Vermont	2009 IECC w/VT amendments (Pending)	2009 IECC w/VT amendments or ASHRAE 90.1-2007 (Pending)	Jan 2011	Every 3 years	Department of Public Service

# IECC 2009 Climate Zones



# IECC 2009 – R & U Value Table

**TABLE 402.1.1**  
**INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT<sup>a</sup>**

CLIMATE ZONE	FENESTRATION U-FACTOR <sup>b</sup>	SKYLIGHT <sup>b</sup> U-FACTOR	GLAZED FENESTRATION SHGC <sup>b, e</sup>	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE <sup>i</sup>	FLOOR R-VALUE	BASEMENT <sup>c</sup> WALL R-VALUE	SLAB <sup>d</sup> R-VALUE & DEPTH	CRAWL SPACE <sup>c</sup> WALL R-VALUE
1	1.2	0.75	0.30	30	13	3/4	13	0	0	0
2	0.65 <sup>j</sup>	0.75	0.30	30	13	4/6	13	0	0	0
3	0.50 <sup>j</sup>	0.65	0.30	30	13	5/8	19	5/13 <sup>f</sup>	0	5/13
4 except Marine	0.35	0.60	NR	38	13	5/10	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.35	0.60	NR	38	20 or 13+5 <sup>h</sup>	13/17	30 <sup>g</sup>	10/13	10, 2 ft	10/13
6	0.35	0.60	NR	49	20 or 13+5 <sup>h</sup>	15/19	30 <sup>g</sup>	15/19	10, 4 ft	10/13
7 and 8	0.35	0.60	NR	49	21	19/21	38 <sup>g</sup>	15/19	10, 4 ft	10/13



# IECC 2009 – Air Sealing

- ❑ Blower door tested to less than 7 ACH-50, or
- ❑ Checklist approach
- ❑ (Mandatory)

TABLE 402.4.2  
AIR BARRIER AND INSULATION INSPECTION COMPONENT CRITERIA

COMPONENT	CRITERIA
Air barrier and thermal barrier	Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier. Breaks 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.
Ceiling/attic	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.
Walls	Corners and headers are insulated. Junction of foundation and sill plate is sealed.
Windows and doors	Space between window/door jambs and framing is sealed.
Rim joists	Rim joists are insulated and include an air barrier.
Floors (including above-garage and cantilevered floors)	Insulation is installed to maintain permanent contact with underside of subfloor decking. Air barrier is installed at any exposed edge of insulation.
Crawl space walls	Insulation is permanently attached to walls. Exposed earth in unvented crawl spaces is covered with Class I vapor retarder with overlapping joints taped.
Shafts, penetrations	Duct shafts, utility penetrations, knee walls and flue shafts opening to exterior or unconditioned space are sealed.
Narrow cavities	Batts in narrow cavities are cut to fit, or narrow cavities are filled by sprayed/blown insulation.
Garage separation	Air sealing is provided between the garage and conditioned spaces.
Recessed lighting	Recessed light fixtures are air tight, IC rated, and sealed to drywall. Exception—fixtures in conditioned space.
Plumbing and wiring	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.
Shower/tub on exterior wall	Showers and tubs on exterior walls have insulation and an air barrier separating them from the exterior wall.
Electrical/phone box on exterior walls	Air barrier extends behind boxes or air sealed-type boxes are installed.
Common wall	Air barrier is installed in common wall between dwelling units.
HVAC register boots	HVAC register boots that penetrate building envelope are sealed to subfloor or drywall.
Fireplace	Fireplace walls include an air barrier.

# IECC 2009 – Duct Sealing

- Duct leakage tested to  $\leq 8$  CFM/100 sq. ft. unless ducts located within conditioned space (Mandatory).

Joints and seams shall comply with Section M1601.4.1 of the *International Residential Code*.

Duct tightness shall be verified by either of the following:

1. Postconstruction test: Leakage to outdoors shall be less than or equal to 8 cfm (226.5 L/min) per 100 ft<sup>2</sup> (9.29 m<sup>2</sup>) of *conditioned floor area* or a total leakage less than or equal to 12 cfm (12 L/min) per 100 ft<sup>2</sup> (9.29 m<sup>2</sup>) of *conditioned floor area* when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test.

2. Rough-in test: Total leakage shall be less than or equal to 6 cfm (169.9 L/min) per 100 ft<sup>2</sup> (9.29 m<sup>2</sup>) of *conditioned floor area* when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the roughed in system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test. If the air handler is not installed at the time of the test, total leakage shall be less than or equal to 4 cfm (113.3 L/min) per 100 ft<sup>2</sup> (9.29 m<sup>2</sup>) of *conditioned floor area*.

**Exceptions:** Duct tightness test is not required if the air handler and all ducts are located within *conditioned space*.

# IECC 2009 - Lighting



## SECTION 404 ELECTRICAL POWER AND LIGHTING SYSTEMS

**404.1 Lighting equipment (Prescriptive).** A minimum of 50 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps.

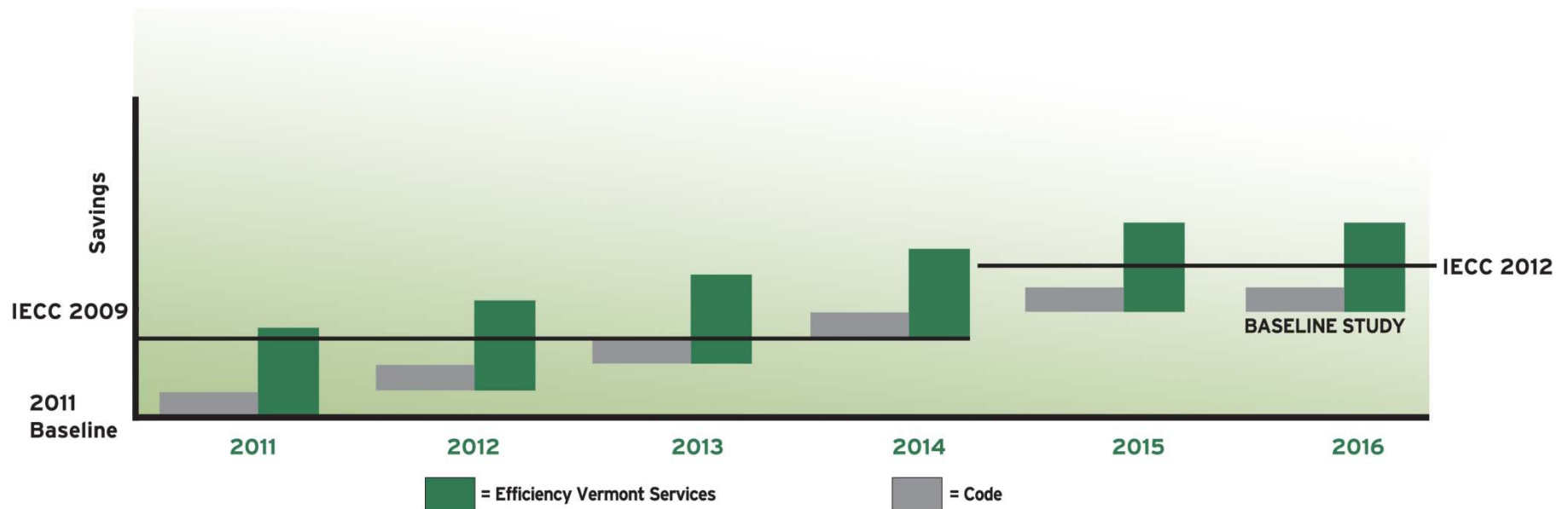
# IECC 90% by 2017

- In return for ARRA funding, states committed to:
  - ▣ “Decouple” utility profits from energy sales
  - ▣ Adopt IECC 2009
  - ▣ Achieve 90% compliance with “current code” by 2017
    - IECC 2009 or IECC 2015?
    - Plan for achieving 90% by 2012
    - Compliance studies are under way
      - DOE grants
        - Mass.
      - NYSERDA

# IECC 2009 – Claiming Savings by PAs

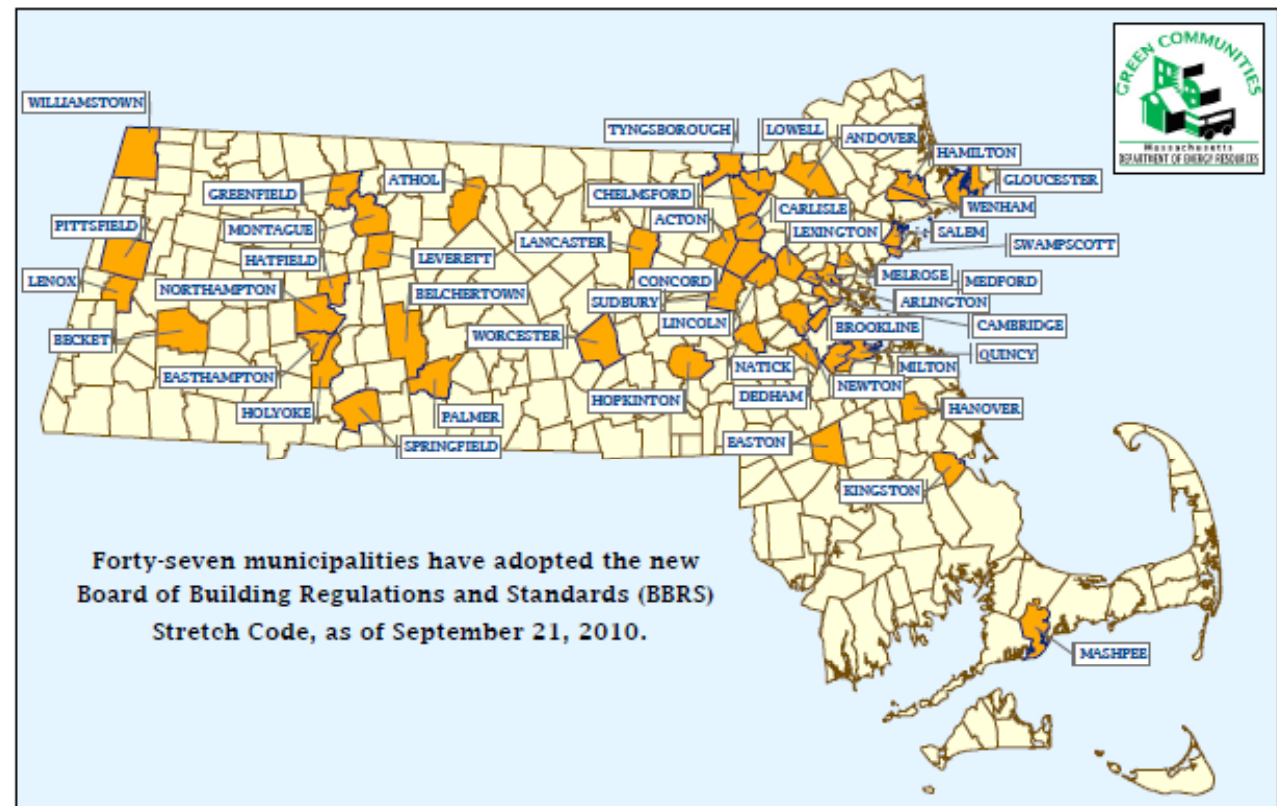
- Claiming savings for code support by program administrators

## Conceptual Savings from Code & Program Attribution

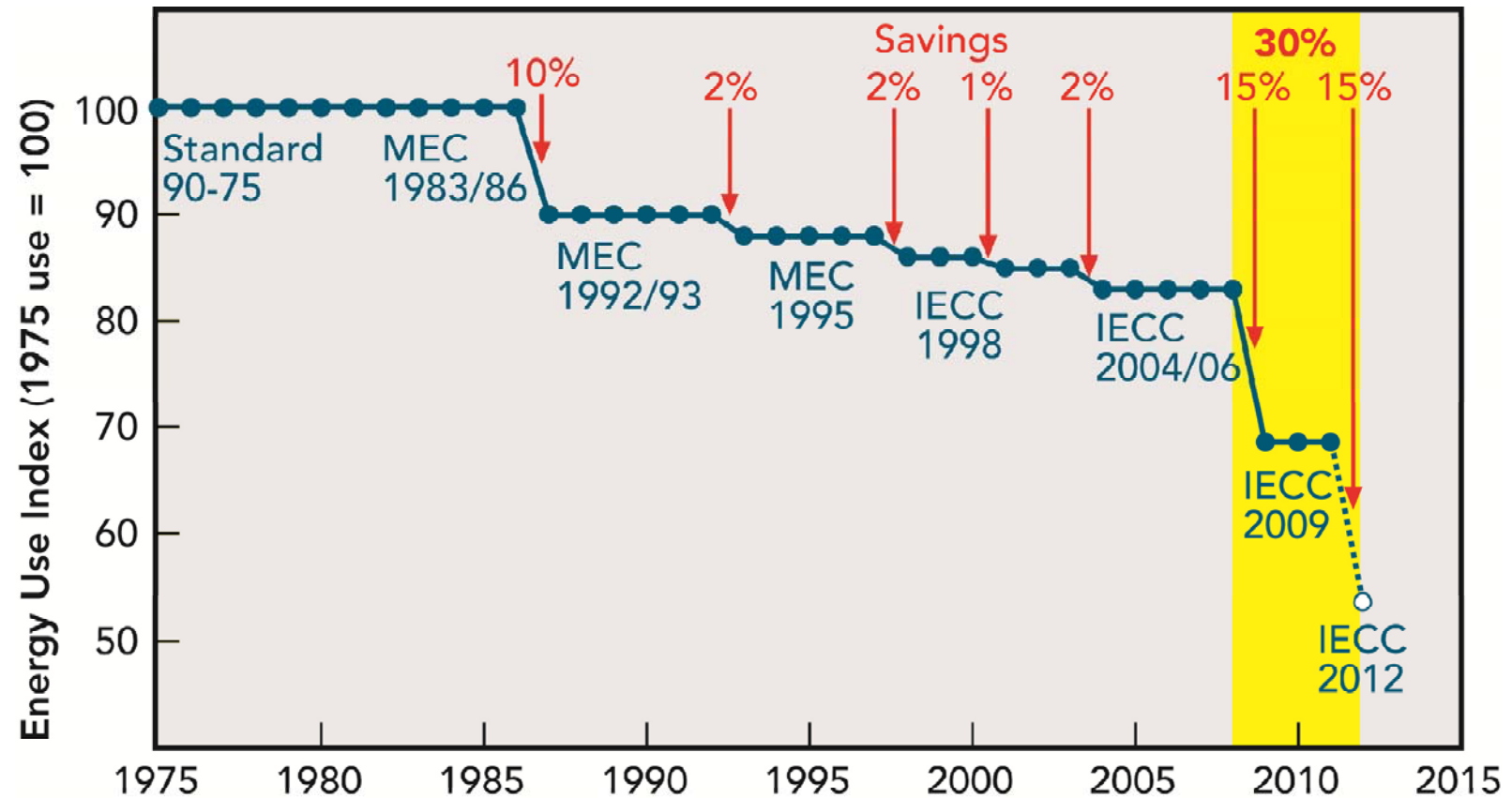


# Stretch Codes

- New York Communities
- Mass. Green Communities



# IECC 2012 – What's Next?





ENERGY STAR Homes



# ENERGY STAR Homes

- Version 3 overview (thanks to Sam Rashkin)
- The various Northeastern states approaches to v.3
- Some current issues
  - ▣ Cost-effectiveness issues
  - ▣ Open market HERS providers vs. centralized program implementation



**ENERGY STAR Qualified Homes Version 3:**

**Assured Performance  
with Every Labeled Home**

# WHAT IS ENERGY STAR FOR HOMES?

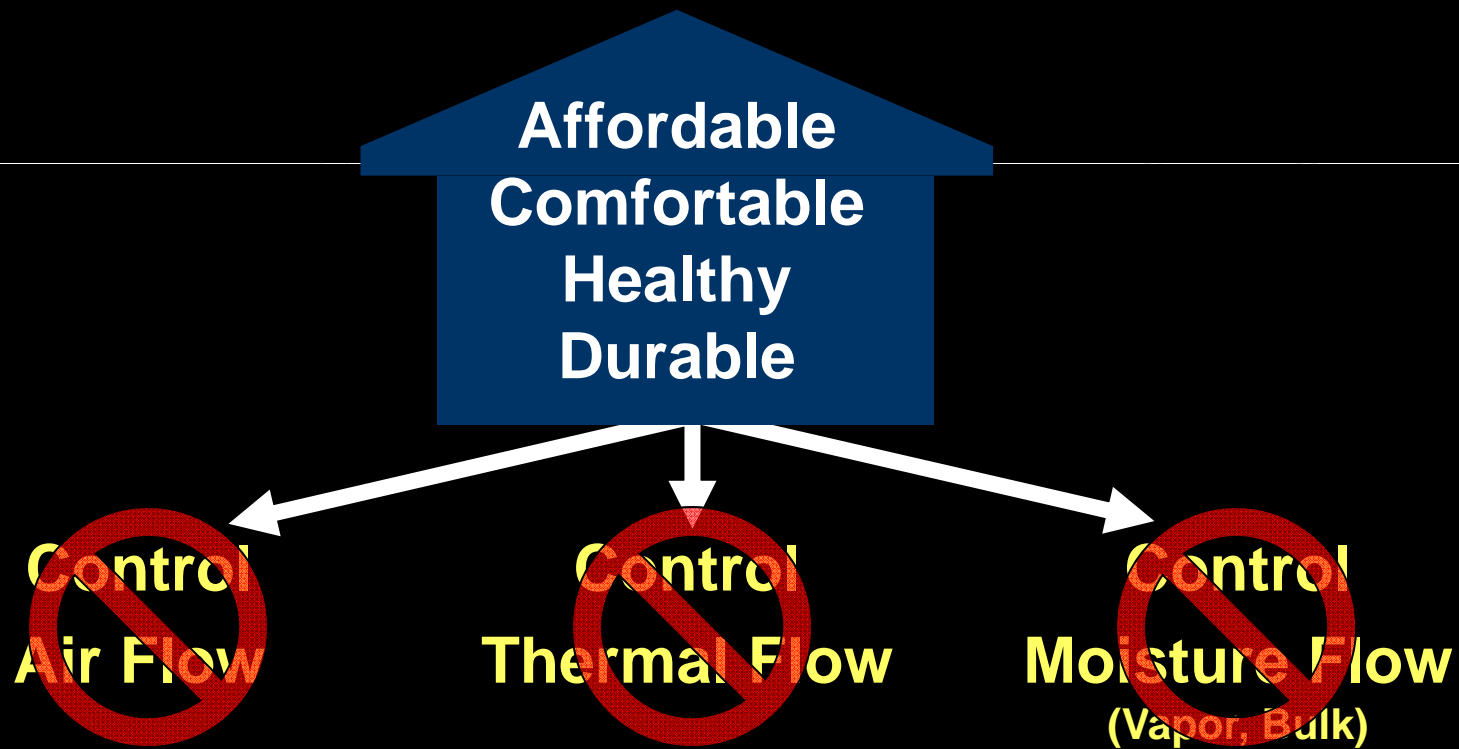


A voluntary labeling program that:

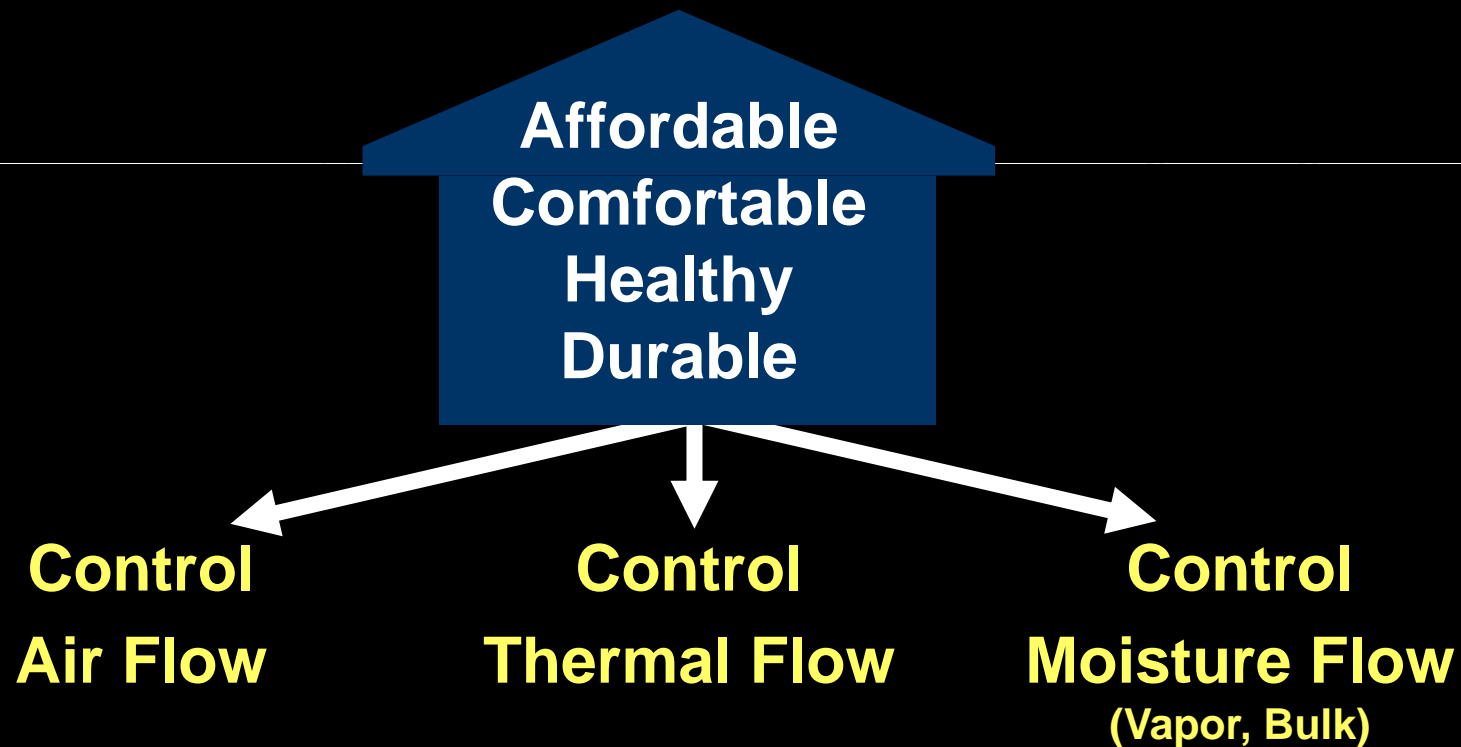
**Defines Energy Efficient**

**Recognizes Builders**

# PROBLEM: HOMES THAT FAIL



# SOLUTION: HOMES THAT WORK



# Defining Energy Efficient



Affordable  
Comfortable  
Healthy  
Durable

Control  
Air Flow

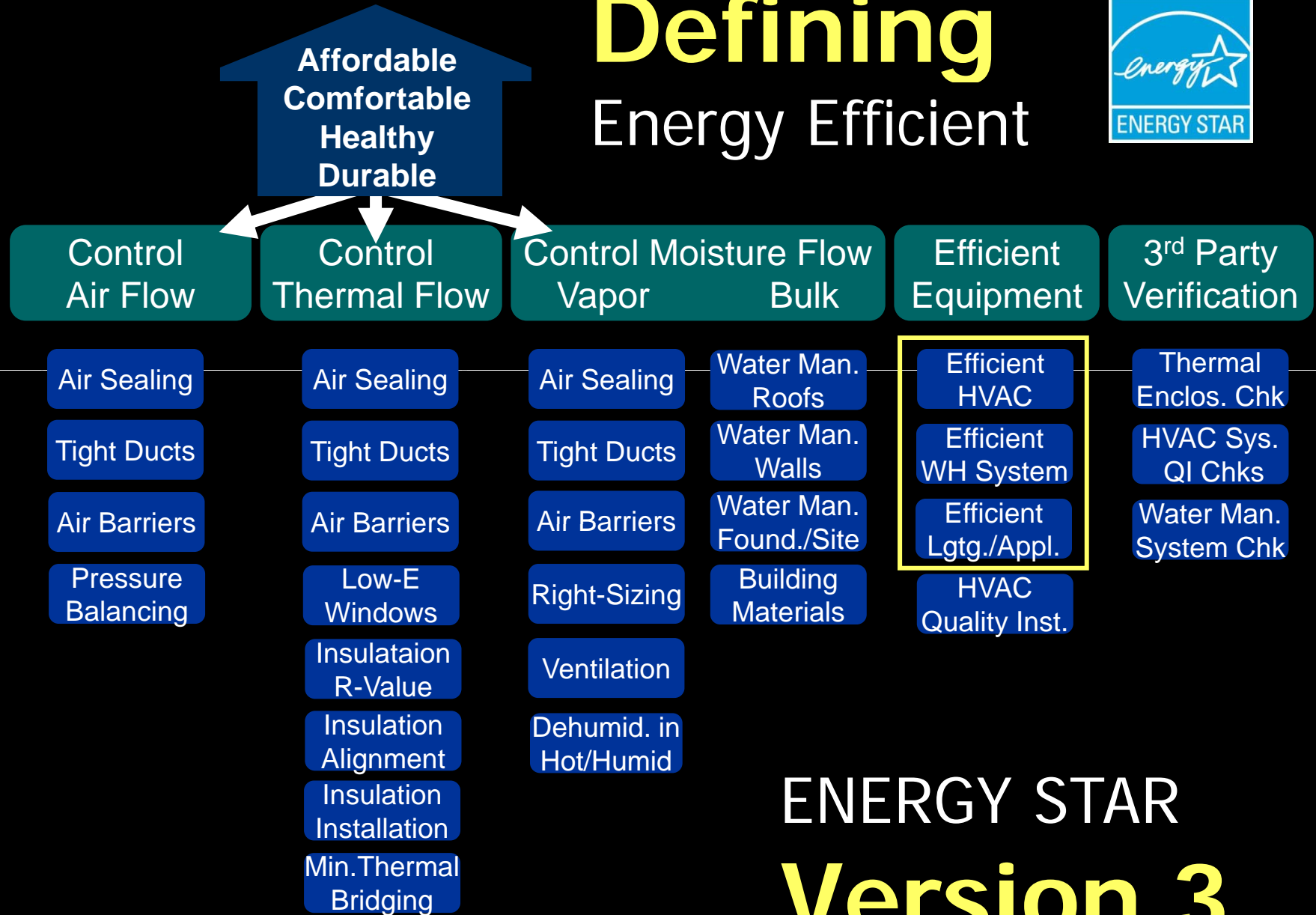
Control  
Thermal Flow

Control Moisture Flow  
Vapor Bulk

Efficient  
Equipment

3<sup>rd</sup> Party  
Verification

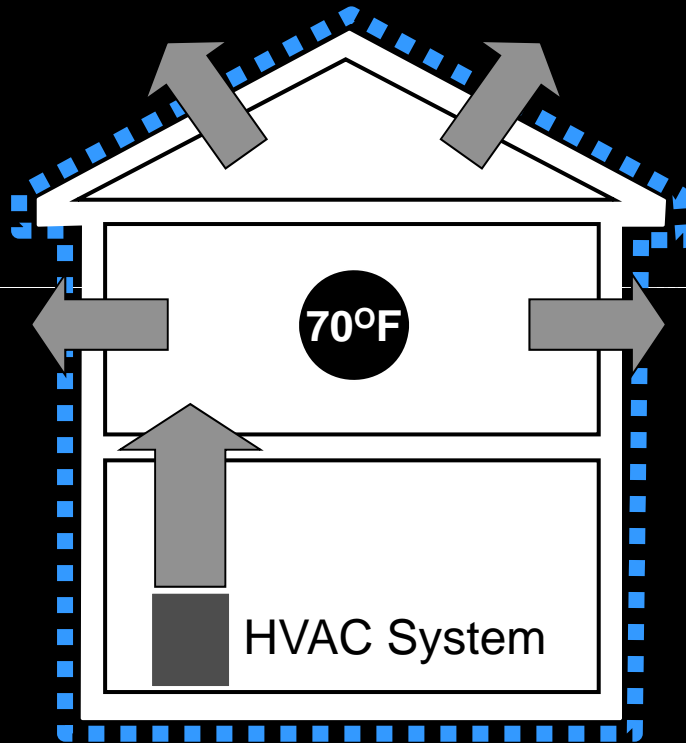
# Defining Energy Efficient



ENERGY STAR  
**Version 3**

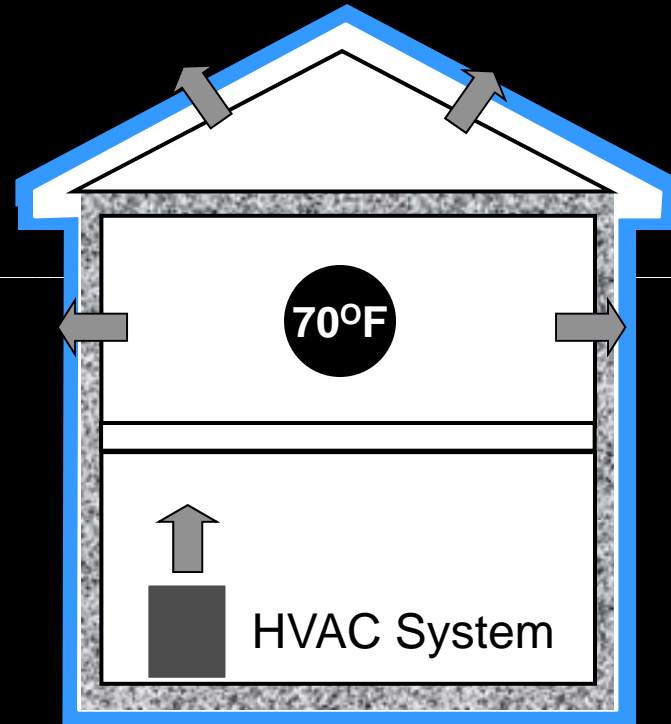
# ENERGY STAR QUALIFIED HOMES VERSION 3

## MAKING EXISTING HOMES OBSOLETE



### Existing Home:

- Thermal Enclosure Defects
- HVAC Min. Quality Installation
- Water Management Parts



### Energy Star v3 Home:

- Thermal Enclosure System
- HVAC Quality Installation
- Water Management System



# ENERGY STAR QUALIFIED HOMES VERSION 3 PROGRAM REQUIREMENTS



## Ref. Design:

[Performance or Prescriptive\*]

- Efficient Htg./Cooling
- Efficient Envelope
- Efficient Components



## Mandatory Checklists:

- Thermal Enclosure
- HVAC Quality Installation (2)
- Water Managed Construction

\* Prescriptive Path only allowed for homes  $\leq$  Benchmark Home size

ENERGY STAR QUALIFIED HOMES VERSION 3

# PERFORMANCE PATH PROCESS



## Initial HERS Index Target Score

### House Take-Offs:

- Square Footage by Floor
- Wall Areas by Orientation
- Roof Area
- Opaque Door Areas by Orientation

### Assumptions:

- Max. 15% Glazing
- Glazing Evenly Distributed

## Reference Design Specifications

X

## Size Adjustment Factor

=

## Final HERS Index Target Score

ENERGY STAR QUALIFIED HOMES VERSION 3

# SIZE ADJUSTED TARGET SCORE



## Benchmark Home Size

BRs	1	2	3	4	5	6	7	8
CFA	1,000	1,600	2,200	2,800	3,400	4,000	4,600	5,200

$$\left[ \frac{\text{CFA Benchmark Home}}{\text{CFA Rated Home}} \right]^{0.25} \times \text{HERS Index Target Score}$$

Size Adjustment Factor not to exceed 1.0

ENERGY STAR QUALIFIED HOMES VERSION 3

## SIZE ADJUSTMENT EXAMPLE



5,000 sf, 4 BR Home with HERS Index Target Score of 78

0.25

$$\left[ \frac{2,800 \text{ sf 4-BR benchmark home}}{5,000 \text{ sf 4-BR rated home}} \right] \times 78$$

**= 67** ENERGY STAR HERS Index Target Score

3	FULLY-ALIGNED AIR-BARRIERS
1	WALLS
5	GARAGE RIM/BAND JOIST ADJOINING CONDITIONED SPACE

Checklist  
Reference



### SECTION 3: FULLY ALIGNED BARRIERS

At each location noted below, a complete air barrier shall be provided that is fully aligned with the insulation as follows:

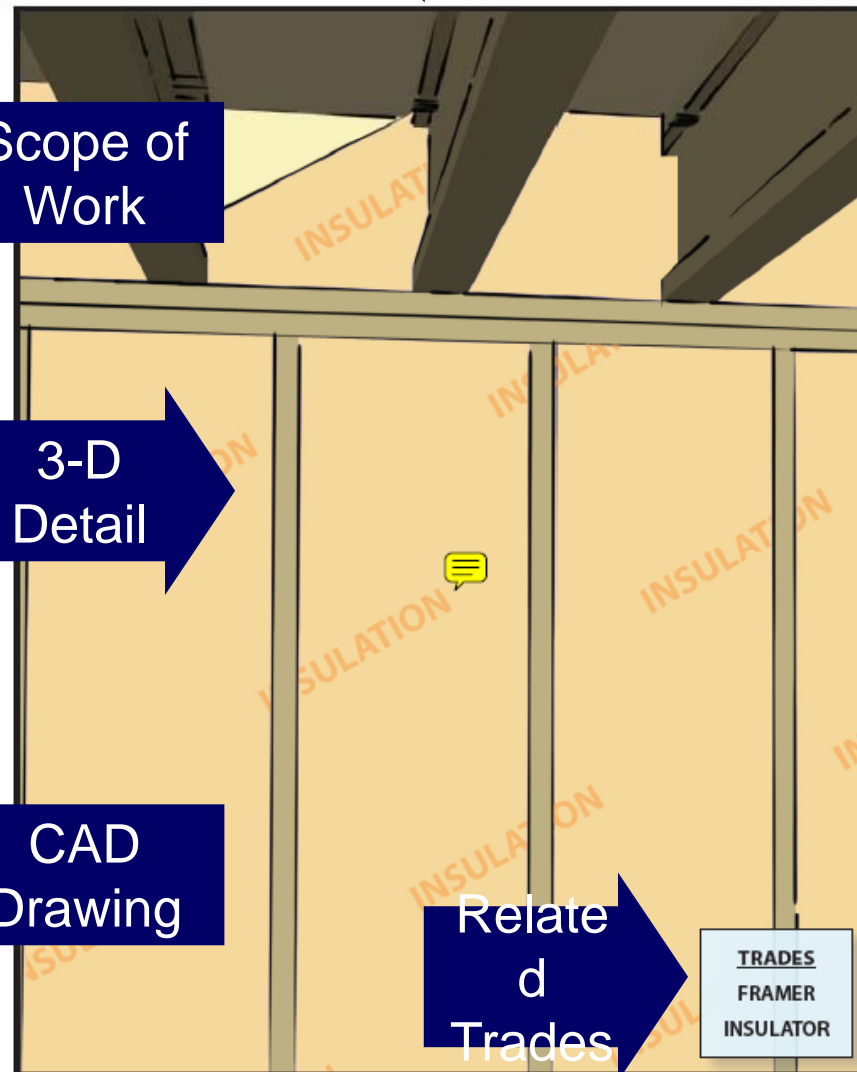
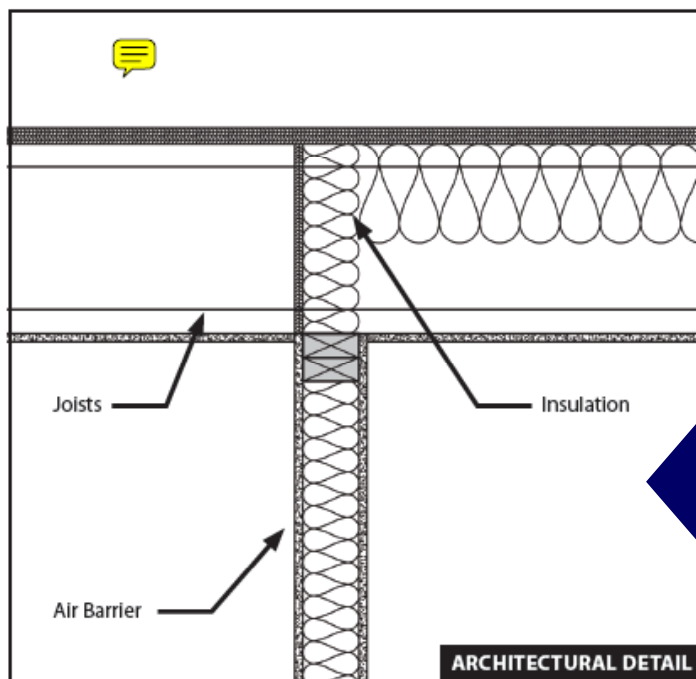
- At interior surface of ceilings in all climate zones
- At exterior surface of walls in all climate zones; and, for Climate Zones 4-8 only, also at interior surface of walls
- At interior surface of floors in all climate zones, including supports to ensure permanent contact and blocking at exposed edges

Scope of  
Work

3-D  
Detail

CAD  
Drawing

Related  
Trades



3	FULLY-ALIGNED AIR-BARRIERS	 ENERGY STAR
1	WALLS	
5	GARAGE RIM/BAND JOIST ADJOINING CONDITIONED SPACE	



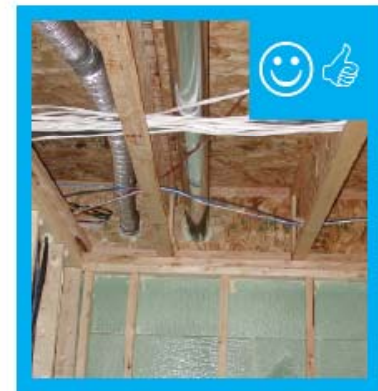
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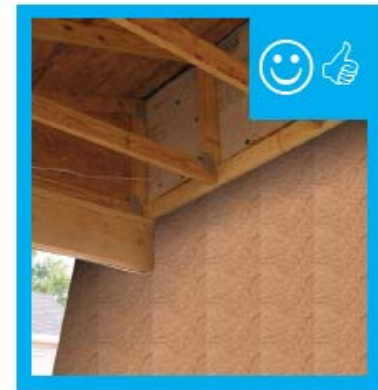
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# ENERGY STAR Qualified Home Certificate Report



## HOME INFORMATION

Builder Name:  
Permit Date/Number:  
Home Address:

## RATING INFORMATION

Rating Company:  
Rater Identification Number:  
Rating Date:

**ENERGY STAR FOR HOMES VERSION NUMBER:**

## YOUR ENERGY STAR QUALIFIED HOME FEATURES

Your home has been constructed to meet U.S. EPA's latest guidelines for energy efficiency including the following features:

### A COMPLETE THERMAL ENCLOSURE SYSTEM:

- Comprehensive air sealing  
(Blower Door Result)
- Code or Better Insulation Levels \*  
(R-values for attics, walls, floors,
- Properly installed insulation  
(RESNET Grade 1)
- High-performance windows\*  
(u-Value; SHGC)
- Complete Air Barrier
- Reduced Thermal Bridging  
(adv. framing, rigid insulation sheathing, adv. wall system)

### A COMPLETE WATER MANAGEMENT SYSTEM:

- Complete roof flashing details
- Heavy-duty membranes at roof valleys and eaves
- Pan flashing at all windows and doors
- Complete wall drainage plane
- Fabric filter at foundation drain
- Capillary break under foundation
- Site Drainage

### A COMPLETE HEATING AND COOLING QUALITY INSTALLATION SYSTEM:

- Efficient heating and cooling equipment  
(A/C SEER; Furnace AFUE, Boiler AFUE)
- Properly sized equipment and ducts
- Sealed and tested duct work  
(Duct Test Result)
- Verified proper refrigerant charge (when applicable)
- Whole-house and spot ventilation
- Programmable thermostat

### ENERGY EFFICIENT LIGHTING AND APPLIANCES:

- Efficient water heater  
(EF Rating)
- ENERGY STAR qualified lighting  
(list number of bulbs and/or fixtures)
- ENERGY STAR qualified appliances and fans  
(list specific products)

\* Where a feature varies across the home, the predominant performance level is shown.





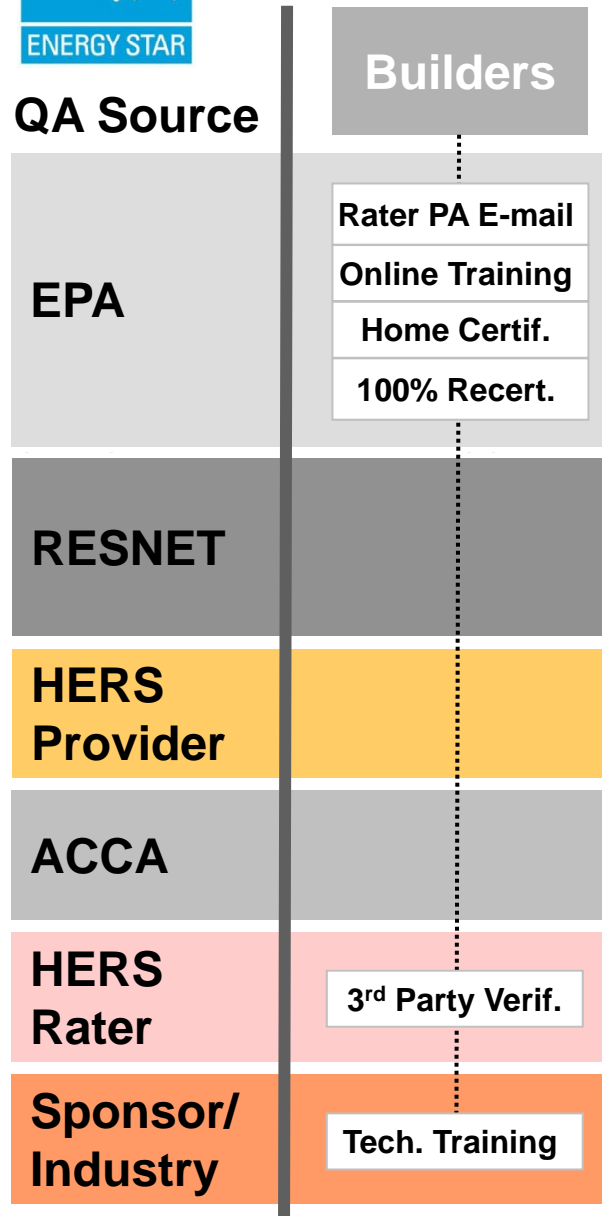
## ENERGY STAR Qualified Homes Water Management System Builder Checklist<sup>1,2,3</sup>

Home Address: _____ City: _____ State: _____			
Inspection Guidelines	Must Correct	Builder Approved	N/A
<b>1. Water-Managed Site and Foundation</b>			
1.1 Patio slabs, walks, and driveways sloped $\geq 0.25$ in. per ft. away from home to edge of surface or 10 ft., whichever is less. <sup>4</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2 Final grade is, or is scheduled by builder to be, sloped $\geq 0.5$ in. per ft. away from home for $\geq 10$ ft. and back-fill tamped to prevent settling <sup>4</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3 Capillary break beneath all concrete slabs using either: <sup>5</sup>			
1.3.1 4 in. bed of $\geq 0.5$ in. clean aggregate covered with $\geq 6$ mil polyethylene sheeting lapped 6-12 in. or $\geq 1$ " extruded polystyrene insulation with taped joints, in direct contact with concrete slab above, OR;	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3.2 4 in. uniform layer of sand overlaid with geotextile drainage matting and covered with sheeting or $\geq 1$ " extruded polystyrene insulation with taped joints.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.4 Capillary break for all crawlspace floors using either: <sup>6</sup>			
1.4.1 Concrete slab over $\geq 6$ mil polyethylene sheeting, lapped 6-12 in., OR;	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.4.2 $\geq 6$ mil polyethylene sheeting, lapped 6-12 in. and attached to bottom of walls and piers with furring strips or equivalent.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.5 Exterior surface of below-grade walls finished as follows: • For poured concrete, concrete masonry, and insulated concrete forms, finish with damp-proofing coating • For wood framed walls, finish with polyethylene and adhesive or other equivalent waterproofing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.6 Permeability of materials used on interior surface of below-grade exterior walls $> 0.1$ <sup>7</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.7 Sump pump covers mechanically attached with full gasket seal or equivalent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.8 Drain tile surrounded with clean gravel and fabric filter <sup>8</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>2. Water-Managed Wall Assembly</b>			
2.1 Flashing at bottom of exterior walls with weep holes included for masonry veneer and weep screed for stucco cladding systems, or equivalent drainage system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2 Fully sealed continuous drainage plane behind exterior cladding that laps over flashing in Section 2.1 <sup>9</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3 Window and door openings fully flashed <sup>10</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>3. Water-Managed Roof Assembly</b>			
3.1 Step and kick-out flashing at all roof-wall intersections, extending $\geq 4$ " on wall surface above roof deck and integrated with drainage plane above <sup>11</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2 Gutters & downspouts empty to lateral piping that deposits water on sloping finish grade $\geq 5$ ft. from foundation or to underground catchment system $> 10$ ft. from foundation <sup>12</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3 Self-sealing bituminous membrane or equivalent at all valleys and roof deck penetrations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.4 In 2009 IECC Climate Zones 5 and higher, self-sealing bituminous membrane or equivalent over sheathing at eaves, extending $> 2$ ft. up roof deck from wall plane	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>4. Water-Managed Building Materials</b>			
4.1 Wall-to-wall carpet <u>not</u> installed within 2.5 feet of toilets, tubs, and showers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2 Cement board or equivalent moisture-resistant backing material installed on walls behind tub and shower enclosures composed of tile or panel assemblies with caulked joints. Paper-faced backerboard shall not be used. <sup>13</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.3 In Warm-Humid climates, permeability rating of materials used on interior side of exterior walls is $> 0.1$ except at shower and tub walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.4 Building materials with visible signs of water damage or mold <u>not</u> installed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.5 Interior walls <u>not</u> enclosed (e.g., with drywall) if either the framing members or insulation products have high moisture content <sup>14</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Builder Employee: _____			
Builder Signature: _____		Date: _____	
Builder has completed Builder checklist in its entirety <sup>15</sup>			
Rater Signature: _____		Date: _____	





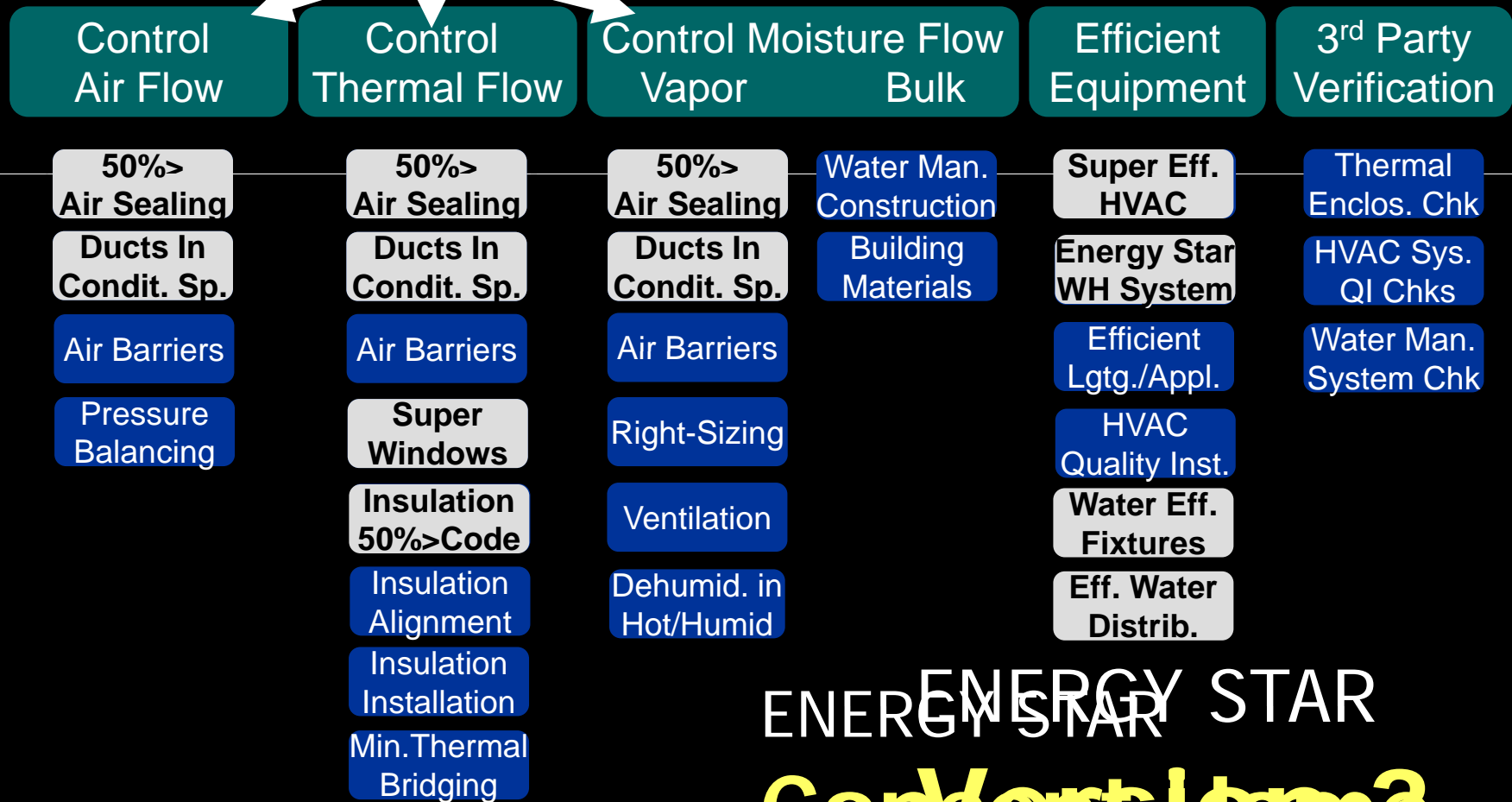
## ENERGY STAR Qualified Homes QA Flow Chart



# Defining Net-Zero Ready



Affordable  
Comfortable  
Healthy  
Durable



ENERGY STAR  
Concept Home

# ENERGY STAR NEW SPEC TRANSITION



Version	Description
2.0	2006 Guidelines
2.5	Version 3 Reference Design with Air Barriers and Air Sealing Checklist Items
3.0	Version 3 Reference Design with All Checklists
4.0	ENERGY STAR Concept Home (Version 3 + EPA IAP + Adv. Techs.)

# ENERGY STAR New Homes Implementation Schedule

Permit Date	Building Completion Date				
	7/1/2010	1/1/2011	7/1/2011	1/1/2012	7/1/2012
Before 1/1/2011	V2.0 Single Family Homes		V2.5	V3.0	
	V2.0 Condos/Apts. in Multi-Family Buildings			V3.0	
On or After 1/1/2011			V2.5 All Homes	V3.0	
On or After 1/1/2012				V3.0 All Homes	
Any Time		Concept Home All Homes			

Version 2.0

Version 2.5

Version 3.0

Concept Home

THE METRICS:  
ENERGY STAR QUALIFIED HOMES



**Policy:**

**Carbon Reduction/Yr.**

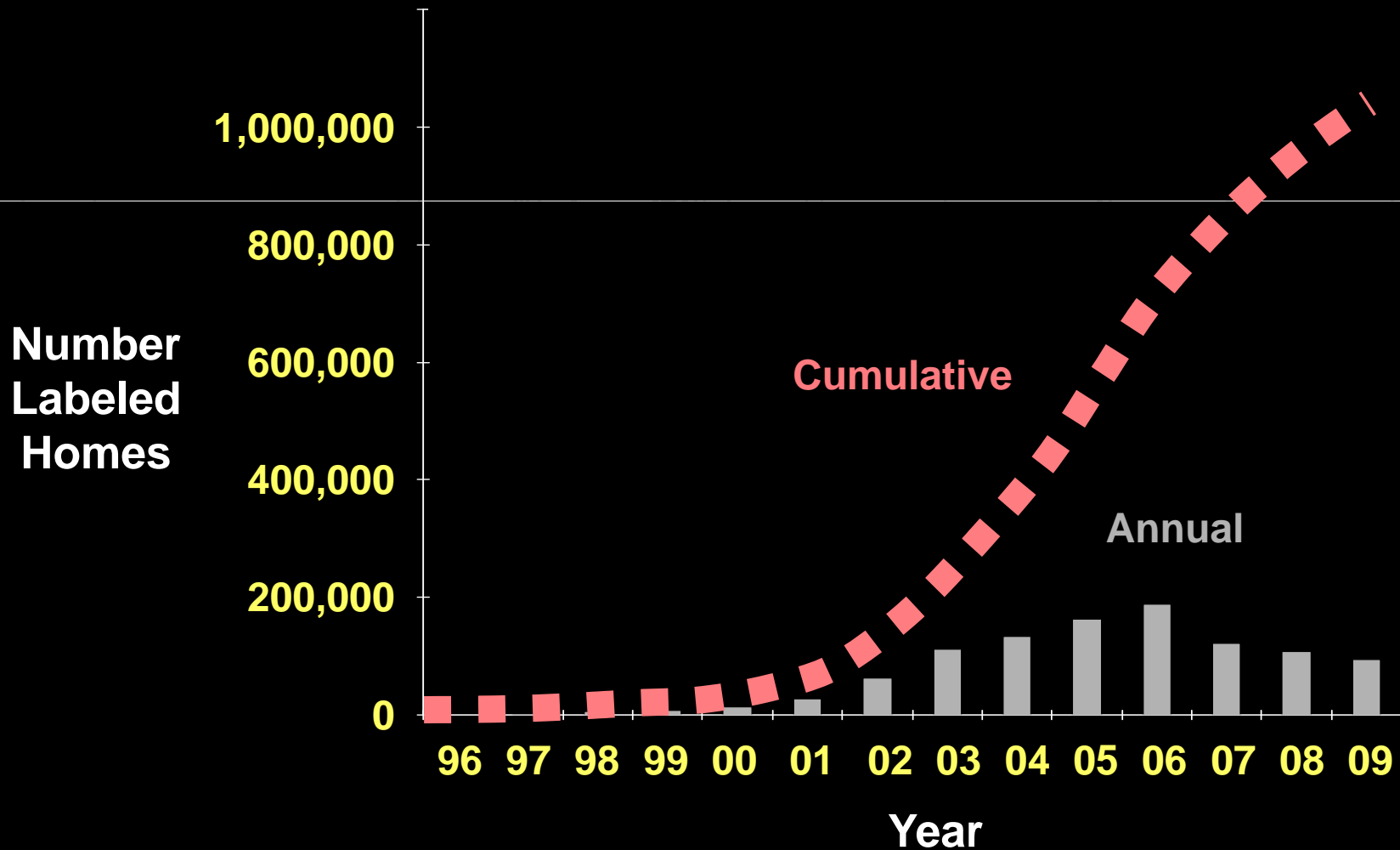
**Consumer:**

**Savings/Yr. (Energy, \$/Yr.)**

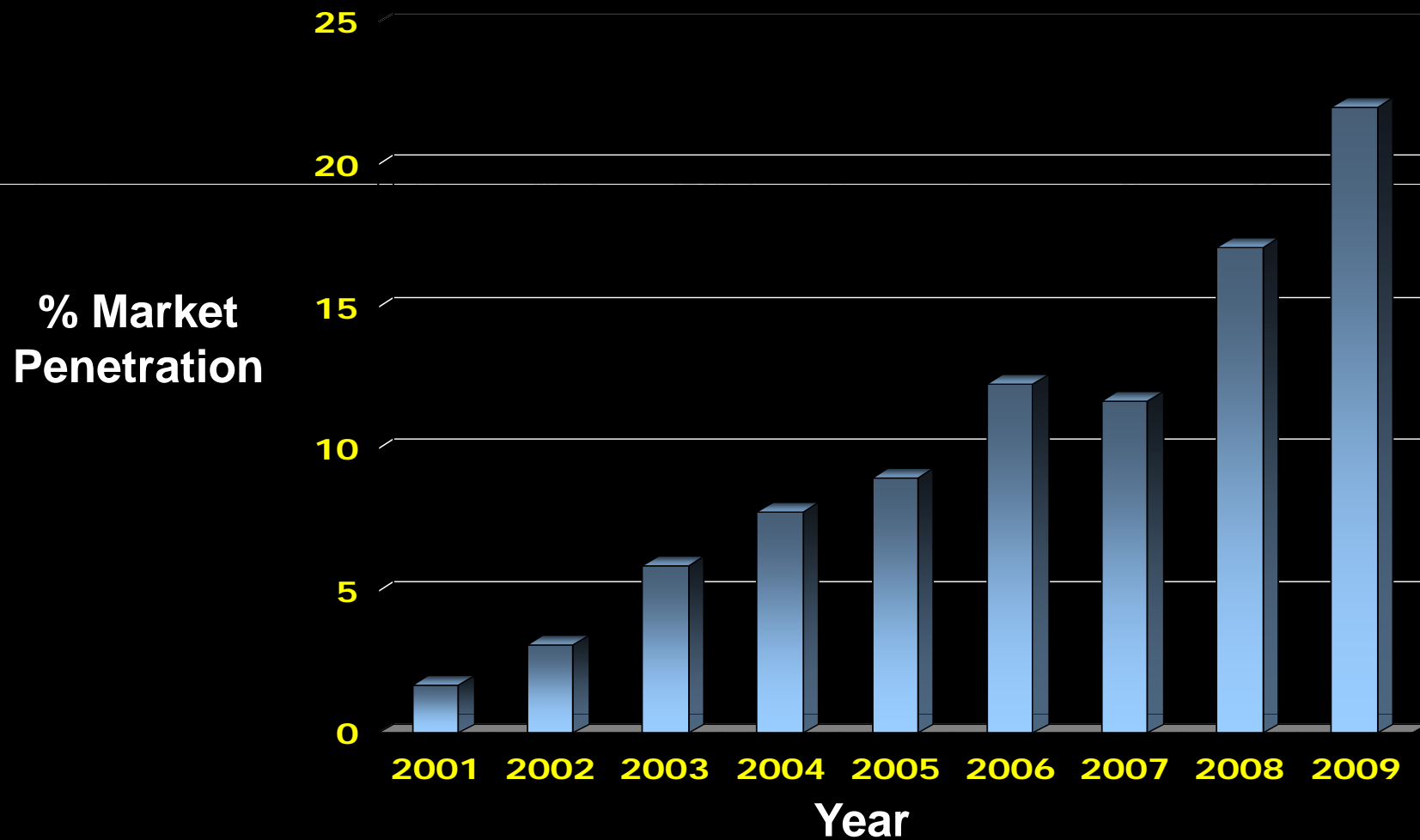
**Business:**

**Value/Builder Partner**

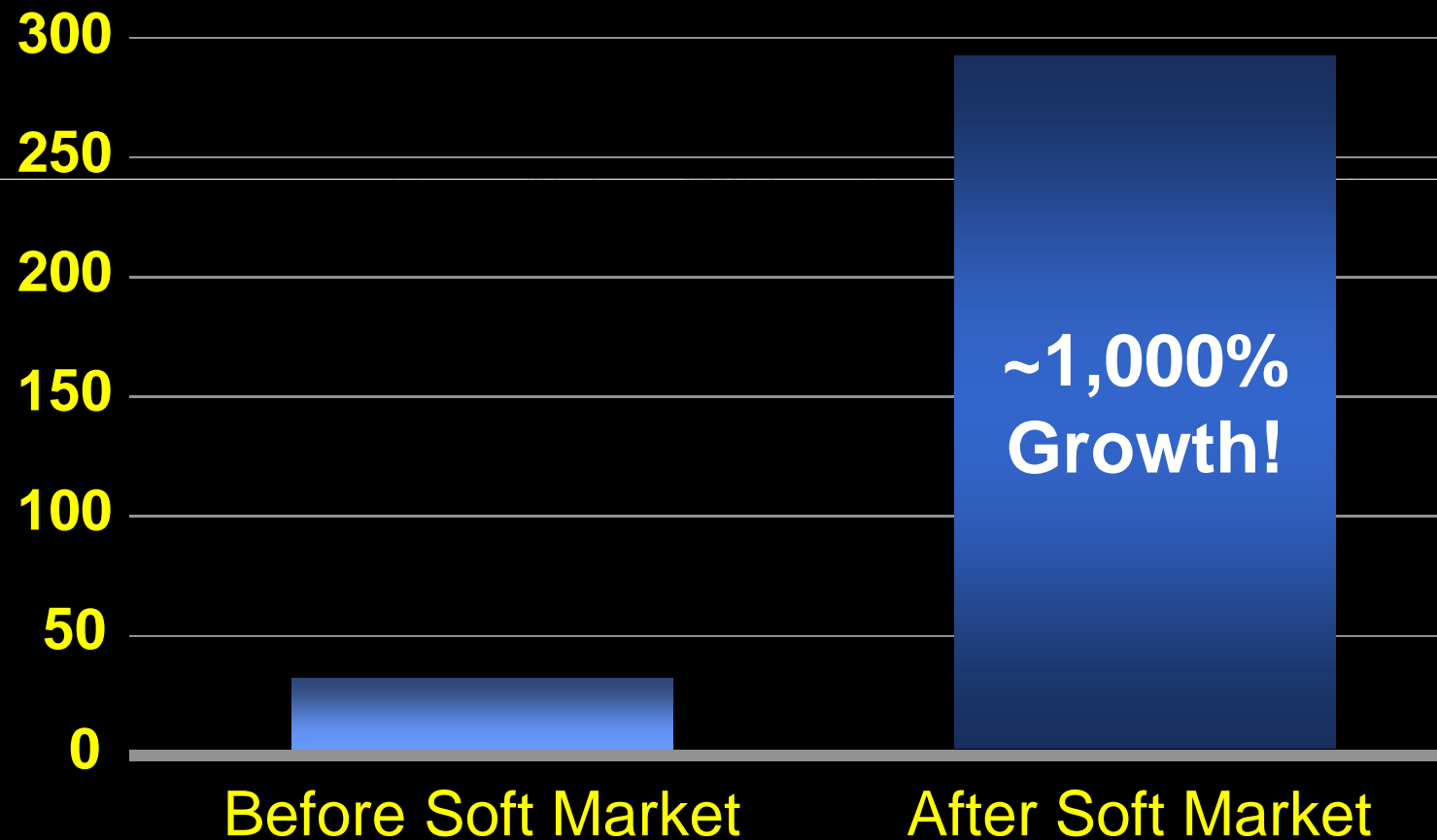
# ENERGY STAR QUALIFIED HOMES METRICS: CARBON AND SAVINGS



# ENERGY STAR QUALIFIED HOMES METRICS: CARBON AND SAVINGS



ENERGY STAR QUALIFIED HOMES METRICS:  
BUILDER VALUE: PARTNERS/MONTH





ENERGY STAR QUALIFIED HOMES METRICS:  
RETURN ON TAX PAYER INVESTMENT



15-Year Investment:

**\$.025 Billion**

[total program costs]

Return:

**~\$1.5 Billion**

[consumer energy savings]

**~\$1 Billion**

[local govt. tax revenue]

**~\$1 Billion**

[non-participant savings]

**~350,000 Cars**

[GHGC emission savings]

# HOW TO GET MORE INFORMATION



**On the Web at:**

<http://www.energystar.gov/homes>

# ENERGY STAR Homes Current Issues

- Various Northeastern program approaches to v.3:
  - ▣ Focus on savings (HERS or savings from baseline)
  - ▣ Let the market pay for ENERGY STAR qualification
  - ▣ “Code Plus” level
  - ▣ Multiple Tiers
- Cost-effectiveness issues with v.3
- Open market HERS providers vs. centralized program implementation



# Advanced RNC Programs

# Green Building Programs in the Northeast

- LEED for Homes
  - Providers in most states
  - About 8,000 homes certified

## LEED for Homes Pricing

	SINGLE-FAMILY HOUSING		MULTIFAMILY HOUSING		Volume PRICING
	REGISTRATION	CERTIFICATION	REGISTRATION	CERTIFICATION	PROJECT SPECIFIC
USGBC MEMBER	\$150	\$225	\$450	\$0.035 PER SQ FT	CONTACT PROVIDER
NON-MEMBER	\$225	\$300	\$600	\$0.045 PER SQ FT	FOR DETAILS

**Note:** The LEED for Homes Rating System requires completion of on-site inspections prior to certification. Additional Provider and Green Rater verification costs apply and are based on market prices. Please consult the Provider of your choice for applicable rates and fees. All fees are subject to change. Registration and Certification fees are nonrefundable.

# Green Building Programs con't

- National Green Building Program
  - ▣ ANSI Standard
  - ▣ NAHB sponsored
- Other local initiatives
  - ▣ Earth Advantage
  - ▣ Vermont Builds Greener
  - ▣ Others?
- International Green Code Council (IgCC)

# Zero Energy Homes Initiatives

- Mass. Zero Energy Challenge (2009)
  - ▣ Three prizes totaling \$50k
  - ▣ Five builders
- Connecticut Zero Energy Challenge
  - ▣ 2009-10: 18 projects
  - ▣ 2010-2011: under way
- NJ Climate Choice Home
  - ▣ HERS<50, >50% renewable electric, \$10k

# Mass. Zero Energy Challenge



Image source: Wisdom Way Solar Village – Greenfield, MA:  
[http://www.ruraldevelopmentinc.org/WWSV/wwwsv\\_update\\_current.htm](http://www.ruraldevelopmentinc.org/WWSV/wwwsv_update_current.htm)



# South Farm, Hinesburg, Vermont





# South Farm, Hinesburg, Vermont



# Passive House

## □ Performance Characteristics

- ▣ Airtight building shell  $\leq 0.6$  ACH @ 50 pascals
- ▣ Annual heat requirement  $\leq 4.75$  kBtu/sf/yr
- ▣ Primary Energy  $\leq 38.1$  kBtu/sf/yr

## □ PHPP Tool

## □ Certified Homes

- ▣ 25,000 in Europe
- ▣ About 13 in the US
- ▣ More in the works

# Habitat for Humanity Passive House Charlotte, Vermont



# Habitat for Humanity Passive House Charlotte, Vermont





# Habitat for Humanity Passive House Charlotte, Vermont



# Opportunities for Energy Pros

- Code support:
  - ▣ Duct and air leakage testing
  - ▣ Third-party verification
  - ▣ 90% code compliance baseline testing
- ENERGY STAR Homes verification
- Green Rater
- Passive House Verifier
- Trainers

# Q&A

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