

Existing Residential Buildings



# 2023 Massachusetts General Requirements and Stretch Code Introduction

WE ARE MASS SAVE™:








1



## What is Mass Save®?

- Mass Save® is an initiative sponsored by Massachusetts' gas and electric Program Administrators and energy efficiency service providers, including
  - The Berkshire Gas Company
  - Cape Light Compact
  - Eversource Energy
  - Liberty Utilities
  - National Grid
  - Unitil
- The Sponsors of Mass Save work closely with the Massachusetts Department of Energy Resources to provide a wide range of services, incentives, trainings, and information promoting energy efficiency that help residents and businesses manage energy use and related costs.



WE ARE MASS SAVE™:









2



# Presented by:


# PSD

3



## Moving Energy Efficiency Forward

We combine building science with technology to help utility companies, program implementers, and building performance professionals achieve energy savings.



4

## Continuing Education

This webinar is approved for:

- 1-hour CSL CEU
- 1 AIA LU | HSW
- 1 CO CEU
- 1 BPI CEU

*Everyone will receive a certificate of attendance via email*



5



**Introduction**

**2023 Massachusetts Energy Code**

**Stretch Code Overview**

**Chapter 5 Existing Building – Overview**

**Prescriptive Path**

**HERS Index**

**Appendix RB Solar Ready – Existing Buildings**

**Summary**

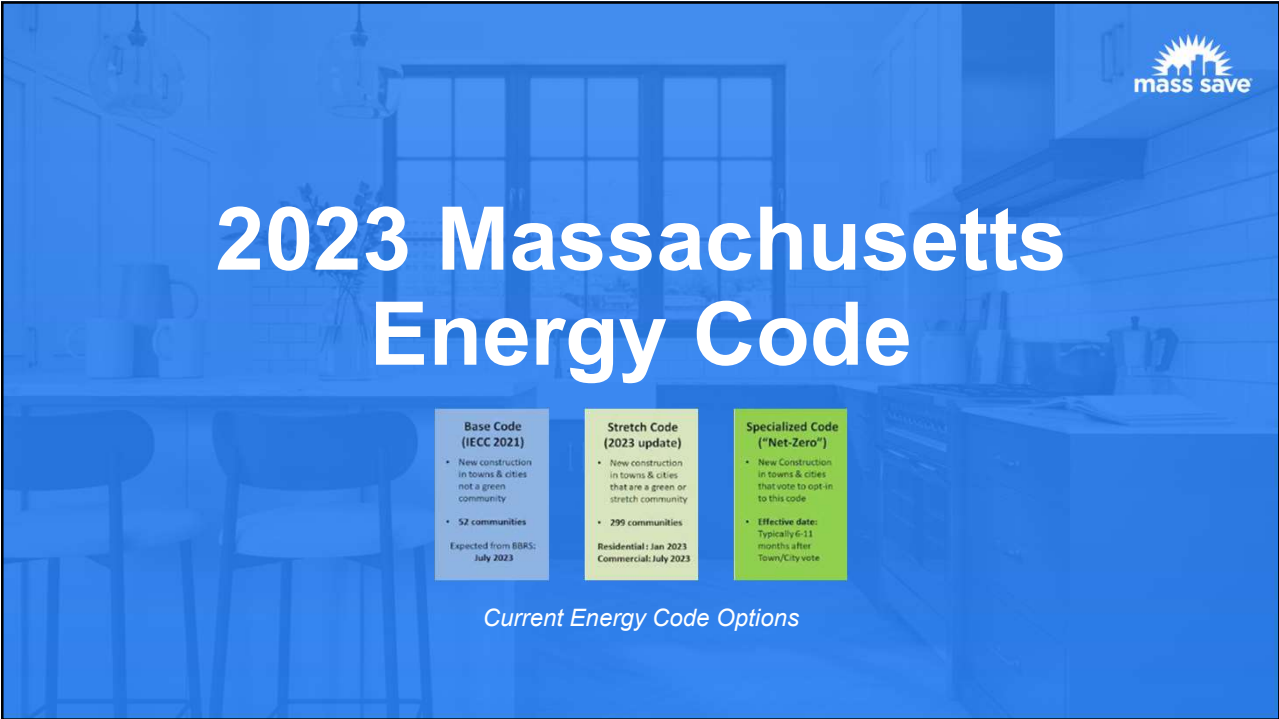
**Mass Save Opportunities**

6

## Learning Objectives

- Upon completion of this training sessions, participants will possess knowledge of how to apply the Energy and Stretch Code to residential buildings.
- Differentiate between Small and Large Additions and their compliance pathways under the Stretch Code.
- Identify the compliance pathways for Non-Stretch and Stretch Additions and Alterations, including Prescriptive, Passive House, and ERI.
- Summarize the key requirements of Chapter 5 Existing Buildings and how it impacts compliance with the Stretch Code.
- Describe the key elements of Appendix RB Solar Ready and its role in compliance with the Stretch Code.

7



# 2023 Massachusetts Energy Code

**Base Code (IECC 2021)**

- New construction in towns & cities not a green community
- 52 communities

Expected from BDRS: July 2023

**Stretch Code (2023 update)**

- New construction in towns & cities that are a green or stretch community
- 299 communities

Residential: Jan 2023  
Commercial: July 2023

**Specialized Code ("Net-Zero")**


- New Construction in towns & cities that vote to opt-in to this code
- **Effective date:** Typically 6-11 months after Town/City vote

*Current Energy Code Options*

8


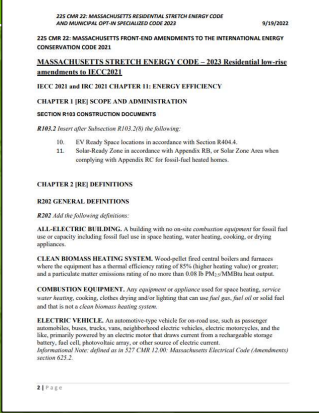


**The 2023 Massachusetts Energy Code**



The 2021 IECC

Massachusetts  
Amendments


+


9




## Green Communities Act

- Passed by the MA Legislature and signed into law in 2009
- Requires the Program Administrators to submit EE plans every 3 years – must be approved by the Dept. of Public Utilities
- *Requires adoption of the International Energy Conservation Code and subsequent updating to the latest version within one year of its publication*
- Created the Energy Efficiency Advisory Council of DOER
- Created the Green Communities Program
  - Provides \$10 million per year statewide in technical and financial help to municipalities to promote energy efficiency and the financing, siting and construction of renewable alternative energy facilities.
  - *Municipalities must adopt the Stretch Energy Code and meet a variety of other energy efficiency policies.*

10

## The 2023 Massachusetts Energy Code



**Base Code**

**Stretch Code**


**Municipal Opt-In Specialized Stretch Code**

11

## MA Stretch Energy Code

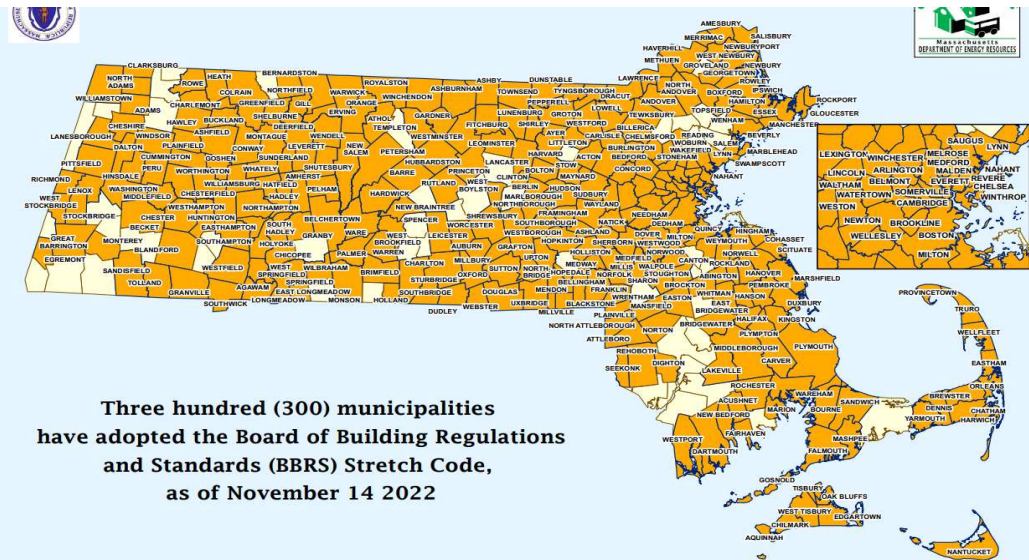
The residential Stretch Energy Code...

- Is developed by the MA Department of Energy Resources (DOER)
- Results in greater energy savings than the Base Energy Code
- Requires new homes and large additions and alterations to receive a HERS Rating
- Requires compliance with 2021 IECC “mandatory” provisions (Passive House excluded)
- Is found in 225 CMR 22.00 and 225 CMR 23.00
- Is adopted at the level of the local jurisdiction



12

### Stretch Code Communities



13

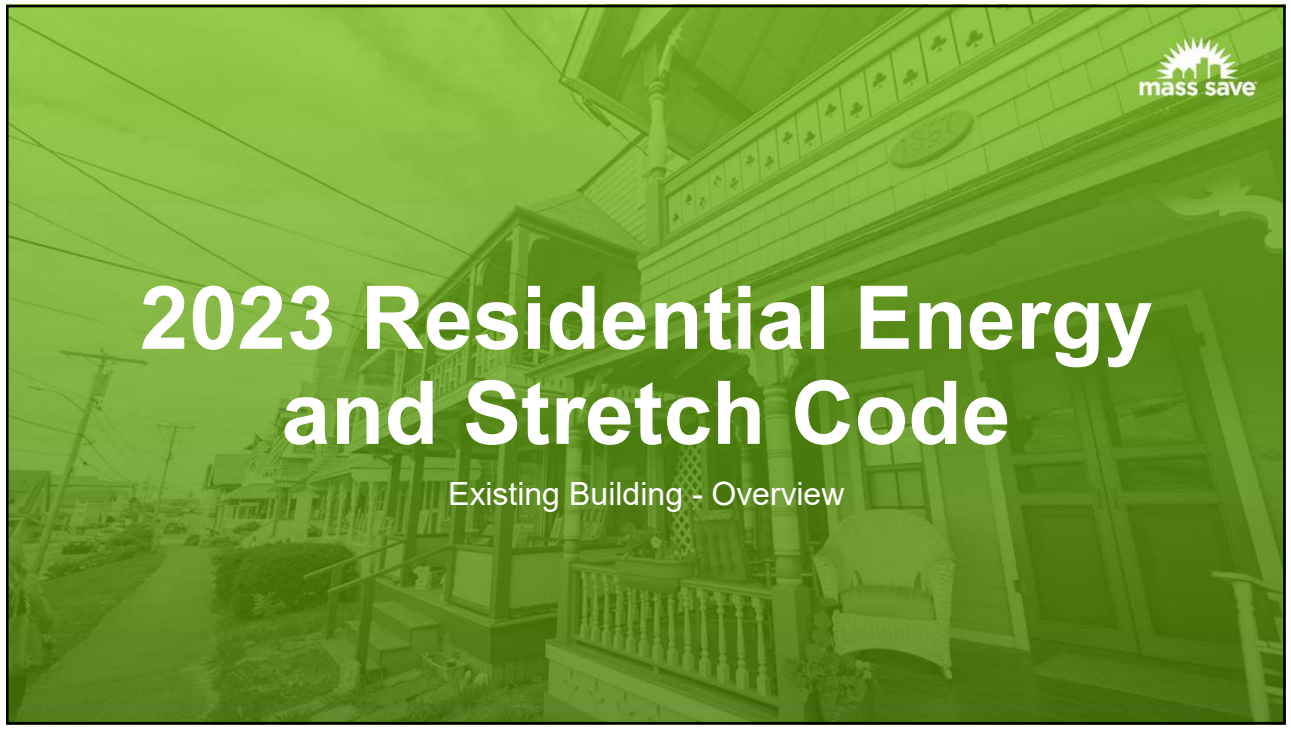
### Poll Question #1

What is your career?

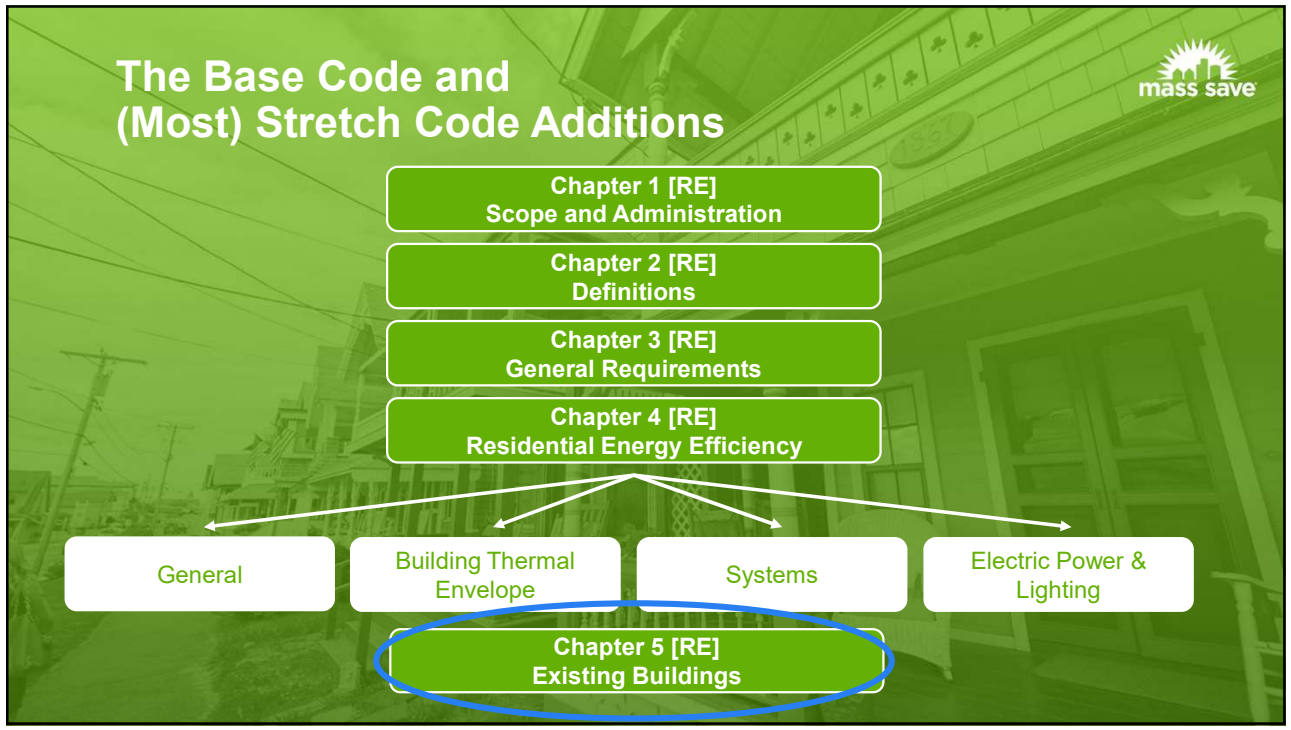
- A. Builder
- B. Architect
- C. Code Official
- D. HERS Rater
- E. Passive House Consultant



14

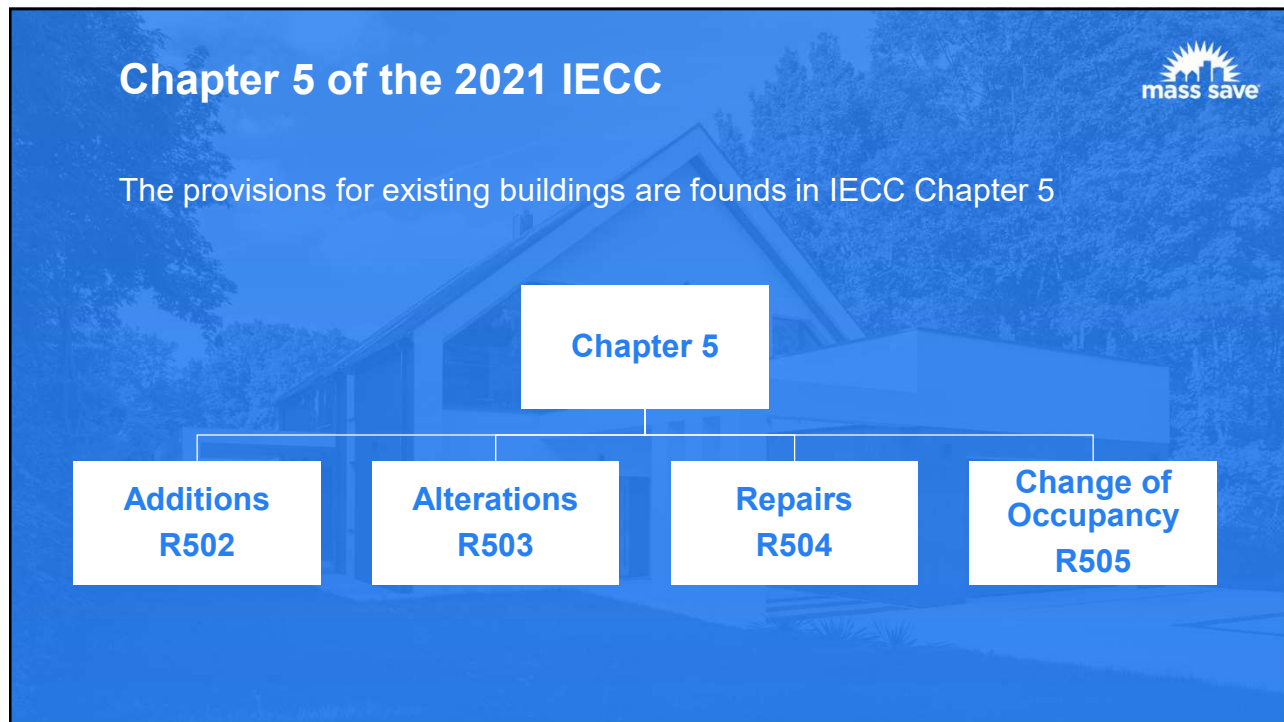


15



16





17

## Chapter 5 – Existing Building(s) Definitions

**Additions:** An extensions or increase in the conditioned space floor area, number of stories or height of a building or structure.

**Alterations:** Any construction, retrofit or renovation to an existing structure other than repairs or additions.

**Repairs:** The reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage.

**Changes of occupancy or use:** Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuels or electrical energy.



The right side of the slide features an aerial photograph of a residential neighborhood, showing numerous houses and streets. The entire image is overlaid with a semi-transparent green color.

18



## Compliance Paths – Existing Buildings

### Additions & Change of Use

- Prescriptive Compliance or
- Comply with Table 406.5 HERS Index (Mandatory greater than 1000sqft or 100% of Existing Floor Area)

### Alterations

- Prescriptive compliance or
- Comply with Table 406.5 HERS Index Level 3 alteration greater than 1000sqft

### Alterations Continued

- Exceptions: storm windows, roof recover, construction where roof, wall or floor cavities not exposed, etc.

### Repairs (exempt)

- Including glass-only replacements, roof repairs, lighting replacement within existing luminaires

19

## Existing Buildings

### R501.1.1 General

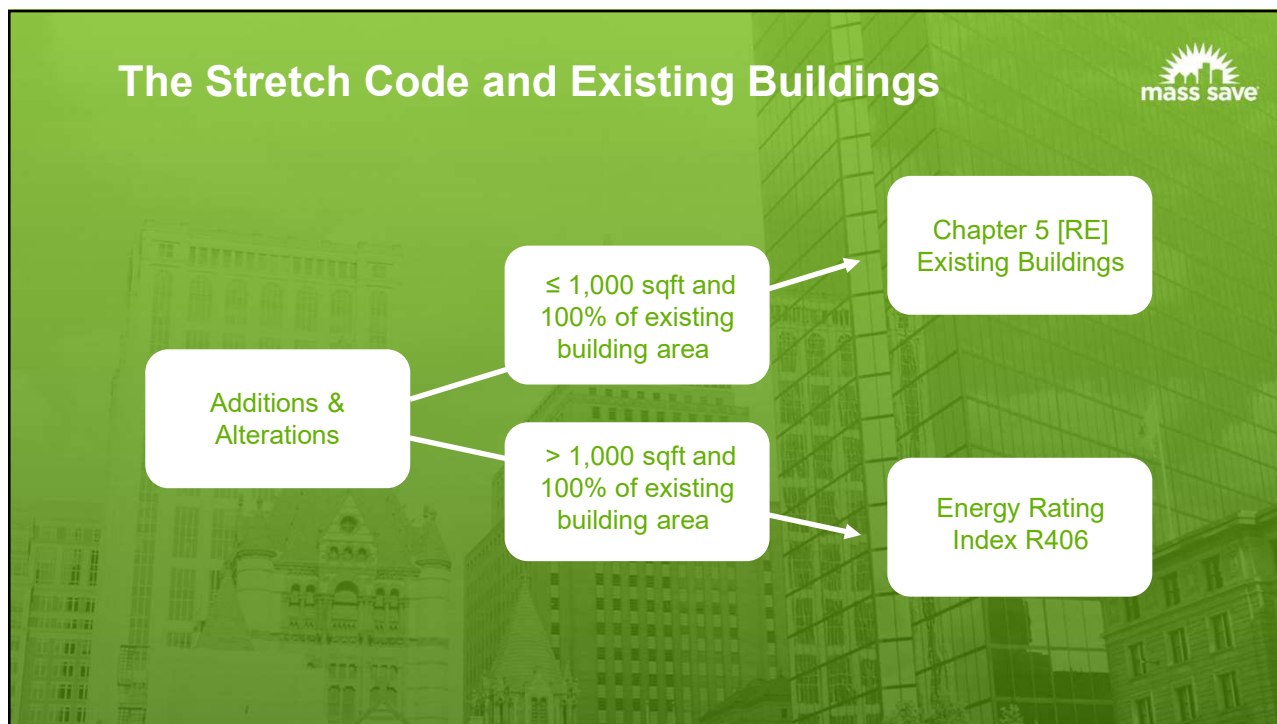
- Unaltered portions of the existing building or system shall not be required to comply
- This code shall not be used to require the removal, alteration or abandonment of, nor prevent the continued use of an existing building
  - *Provided it was legal when it was built*

### R501.2 Compliance

- Additions, alterations, repairs, or changes in occupancy to, or relocation of, an existing building, building system, or portion thereof shall comply with Section 502, 503, 504, or 505, respectively. Changes where unconditioned space is changed to conditioned space shall Comply with section 502.



20



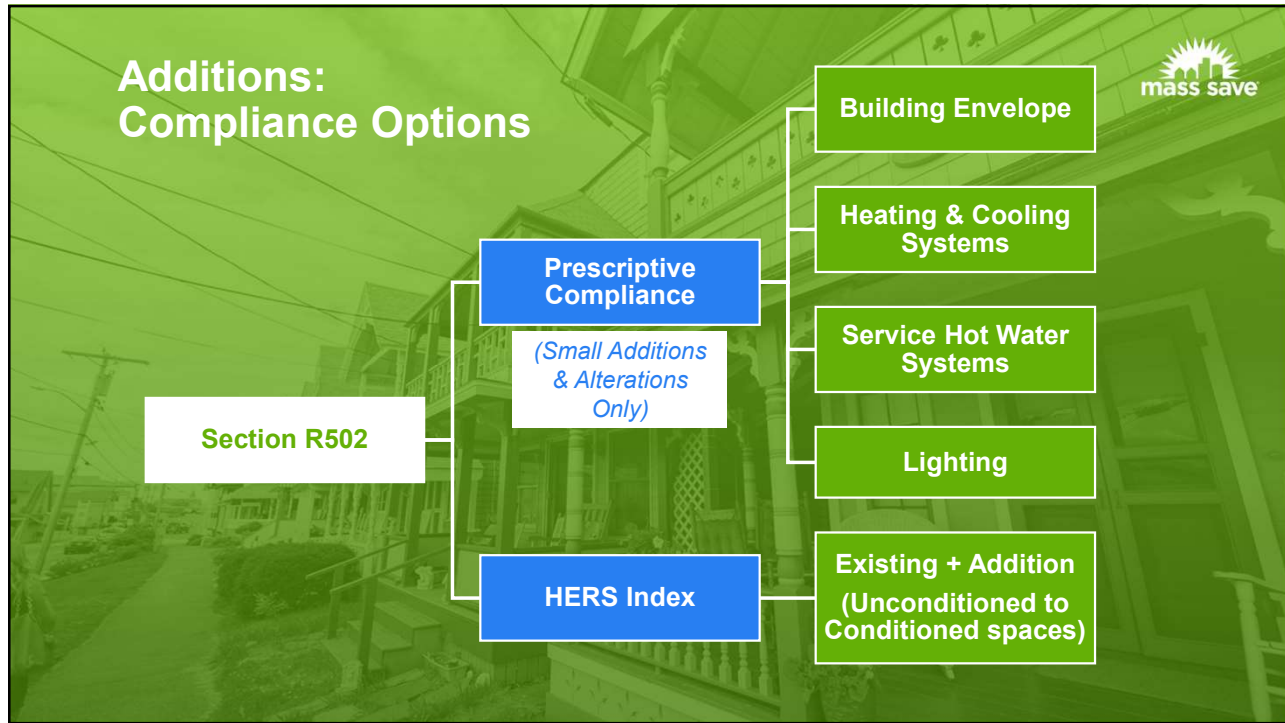
21

## Historic Buildings

R501.6 Energy code does not apply *provided:*

- A report is submitted to the code official demonstrating that compliance with a provision would threaten, degrade or destroy the historic form, fabric or function of the building
- The report must be signed by one of the following:
  - Owner
  - Registered design professional
  - Rep of the State Historic Preservation Office or historic preservation AHJ

22



23

**Table R406.5 Maximum Energy Rating Index**

| Clean Energy Application                  | New Construction Starts January 1, 2023, until June 30, 2024 | New Construction Permits After July 1, 2024 | Major Alterations, Additions, and Changes. Starts January 1, 2023 |
|---|--|---|---|
| Mixed-Fuel Building                       | 52   | 42  | 52  |
| Solar Electric Generation*                | 55   | 42  | 55  |
| All-Electric Building                     | 55   | 45  | 55  |
| Solar Electric* and All-Electric Building | 58   | 45  | 58  |

*\*Solar Electric Generation = Solar photovoltaic array rated at 4kW or higher HERS numbers for Additions Alterations Plus the Existing Home, unless can be tested separately.*

24



### R406.5.1 Trade-Off for Clean Energy Systems

New construction following Section R406, or existing buildings and additions following IECC chapter 5[RE] may use clean energy trade-offs to increase the maximum allowable HERS rating for each unit separately served by any combination of the following:


1. Solar Electric Generation: Solar photovoltaic array rated at 4kW or higher shall offset 3 HERS points for Level 3 alterations, Change of use to Residential R-use categories or for fully attached additions.
2. All-Electric Buildings shall offset 3 HERS points for each dwelling unit in new construction, Level 3 alterations, change of use to Residential R-use categories and fully attached additions.

25

### Poll Question #2

The new residential stretch code took effect on January 1, 2023. True or False.

- A. True
- B. False




26



27

## “Small” Stretch Code Additions and Alterations

- The Prescriptive Path is only available for Base Code projects and Stretch Code additions and alterations that are  $\leq 1,000$  sqft and  $\leq 100\%$  of existing building area
- The provisions for these projects come from the 2021 IECC with Massachusetts amendments
- There are no changes to the available envelope compliance sub-paths: U-factor table, R-value table, and Total UA Alternative (i.e., REScheck)
- Significant increases in R-values for above-grade walls and ceilings



28



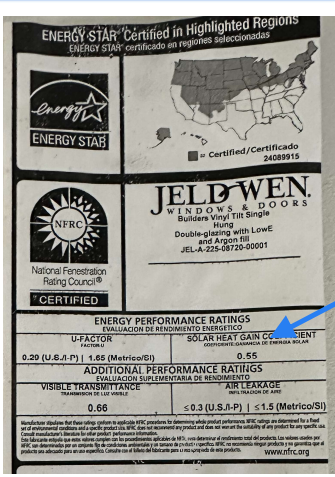
## Changes to Prescriptive Values for Climate Zone 5

|                          | 2018 IECC  | 2021 IECC                                |
|--------------------------|------------|--|
| FENESTRATION U-FACTOR    | 0.30       | 0.30                                     |
| SKYLIGHT U-FACTOR        | 0.55       | 0.55                                     |
| GLAZED FENESTRATION SHGC | NR         | <b>0.40</b>                              |
| CEILING R-VALUE          | 49         | <b>60</b>                                |
| WOOD FRAME WALL R-VALUE  | 20 or 13+5 | <b>30 or 20+5ci or 13+10ci or 0+20ci</b> |
| MASS WALL R-VALUE        | 13/17      | 13/17                                    |
| FLOOR R-VALUE            | 30         | 30                                       |
| BASEMENT WALL R-VALUE    | 15/19      | <b>15ci or 19 or 13+5ci</b>              |
| SLAB R-VALUE & DEPTH     | 10, 2ft.   | <b>10ci and 4'</b>                       |
| CRAWL SPACE WALL R-VALUE | 15/19      | <b>15ci or 19 or 13+5ci</b>              |

29

## Prescriptive Values for Climate Zone 5

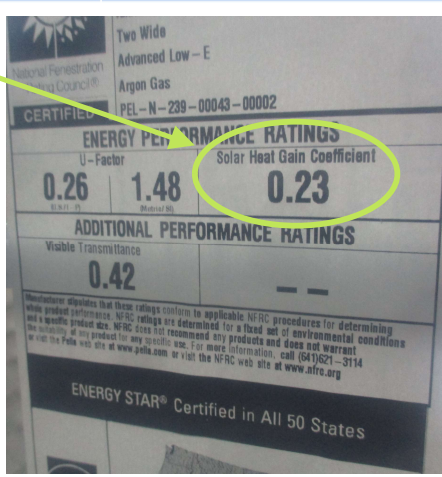
|                          | 2018 IECC | 2021 IECC   |
|--------------------------|-----------|-------------|
| GLAZED FENESTRATION SHGC | NR        | <b>0.40</b> |



Less than 0.40  
**OK**

PERFORMANCE RATINGS  
SOLAR HEAT GAIN COEFFICIENT  
0.55  
FORMANCE RATINGS  
NOTABIA DE MENDIMIENTO  
AIR LEAKAGE

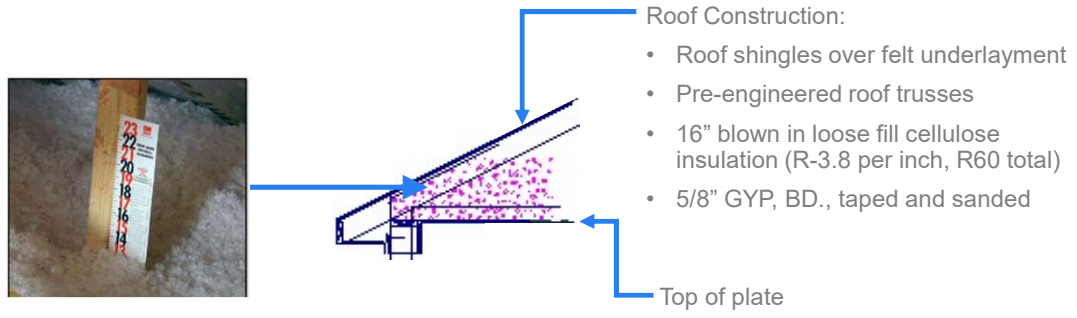
Greater than 0.40  
**NG**



30

### Prescriptive Values for Climate Zone 5

|                 | 2018 IECC | 2021 IECC |
|-----------------|-----------|-----------|
| CEILING R-VALUE | 49        | 60        |



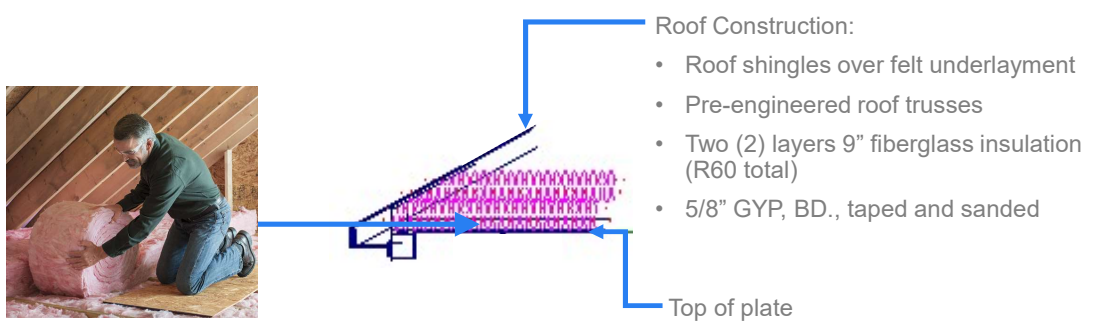
- Roof Construction:
- Roof shingles over felt underlayment
  - Pre-engineered roof trusses
  - 16" blown in loose fill cellulose insulation (R-3.8 per inch, R60 total)
  - 5/8" GYP, BD., taped and sanded

R-60 – Blown In Cellulose Insulation

31

### Prescriptive Values for Climate Zone 5

|                 | 2018 IECC | 2021 IECC |
|-----------------|-----------|-----------|
| CEILING R-VALUE | 49        | 60        |



- Roof Construction:
- Roof shingles over felt underlayment
  - Pre-engineered roof trusses
  - Two (2) layers 9" fiberglass insulation (R60 total)
  - 5/8" GYP, BD., taped and sanded

R-60 – Fiberglass Insulation

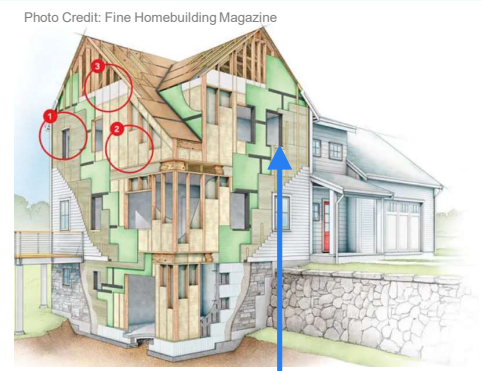
32

## Prescriptive Values for Climate Zone 5

|                         | 2018 IECC  | 2021 IECC                                |
|-------------------------|------------|--|
| WOOD FRAME WALL R-VALUE | 20 or 13+5 | <b>30 or 20+5ci or 13+10ci or 0+20ci</b> |



Double 2x4 Wall



Insulated Cavity + Continuous Insulation

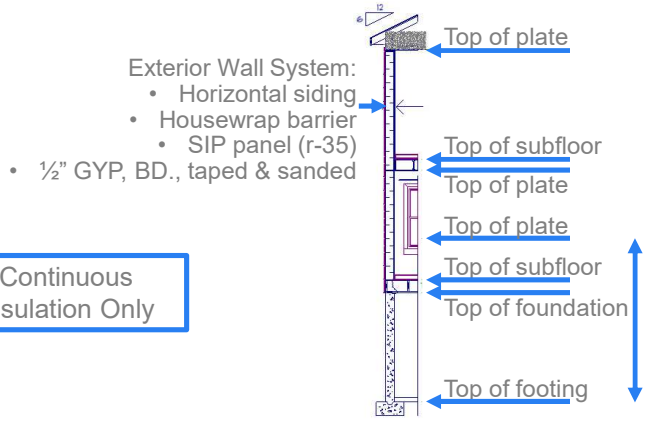
33

## Prescriptive Values for Climate Zone 5

|                         | 2018 IECC  | 2021 IECC                                |
|-------------------------|------------|--|
| WOOD FRAME WALL R-VALUE | 20 or 13+5 | <b>30 or 20+5ci or 13+10ci or 0+20ci</b> |



Continuous Insulation Only



34

### Prescriptive Values for Climate Zone 5

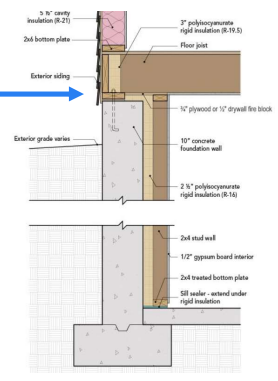
|                          | 2018 IECC | 2021 IECC            |
|--------------------------|-----------|----------------------|
| BASEMENT WALL R-VALUE    | 15/19     | 15ci or 19 or 13+5ci |
| CRAWL SPACE WALL R-VALUE | 15/19     | 15ci or 19 or 13+5ci |



Photo Credit: Fine Homebuilding Magazine

Continuous Insulation + Cavity

Continuous Insulation Only



Source: Fine Homebuilding

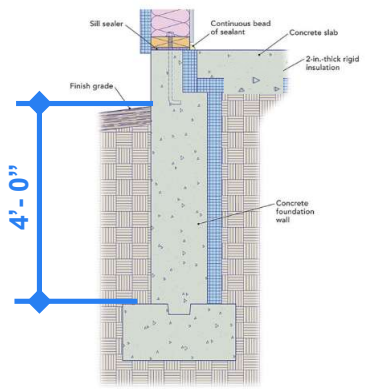
35

### Prescriptive Values for Climate Zone 5

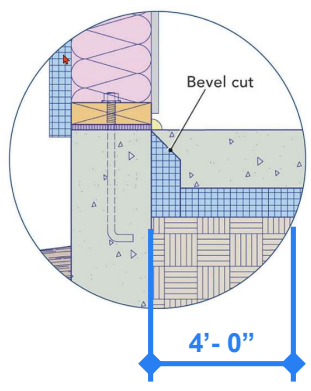
|                      | 2018 IECC | 2021 IECC   |
|----------------------|-----------|-------------|
| SLAB R-VALUE & DEPTH | 10, 2ft.  | 10ci and 4' |

Source: Fine Homebuilding

Source: Fine Homebuilding



Slab Insulation



36

**Poll Question #3**

Additions of what size require a HERS Index?

- A. 1000 square feet
- B. 500 square feet
- C. Over 1000 square feet
- D. None



37




**HERS Index**



38



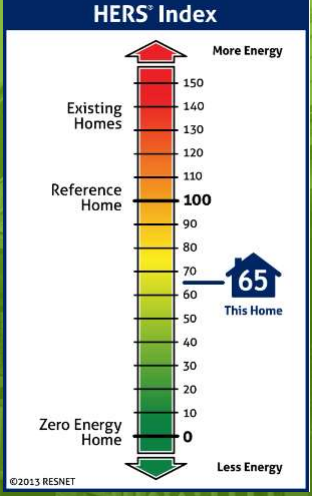
## HERS Index



A certified Home Energy Rater assesses the energy efficiency of a home, assigning it a relative performance score. The lower the number, the more energy efficient the home. A typical home built to 2006 energy efficiency standards scores 100 on the HERS® Index.


- A home with a HERS® Index Score of 70 is 30% more energy efficient than a standard new home
- A home with a HERS® Index Score of 130 is 30% less energy efficient than a standard home

### HERS® Index




### Some Variables Included In A HERS Rating

- All exterior walls (both above and below grade)
- Floors over unconditioned spaces (like garages or cellars)
- Ceilings and roofs
- Attics, foundations and crawlspaces
- Windows and doors, vents and ductwork
- HVAC systems, water heating system, and your thermostat




39

## R406.6.2 Documentation for Permit Application Energy Rating Index



**Prior to the issuance of a building permit:**




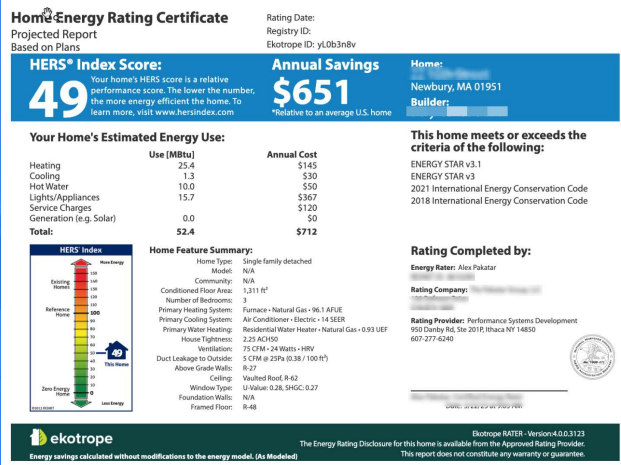
- A **HERS compliance report** which includes a HERS index score of 52 or lower, or otherwise complies via renewable trade-offs
- A **description of energy features**
- A statement that the rating index score is “**based on plans**”

40

# R406.6.2 Documentation for Permit Application

## Energy Rating Index





### IECC 2021 Proposed Home Summary

|          |              |                       |
|----------|--------------|-----------------------|
| Property | Organization | Inspection Status     |
| Builder  |              | Results are projected |

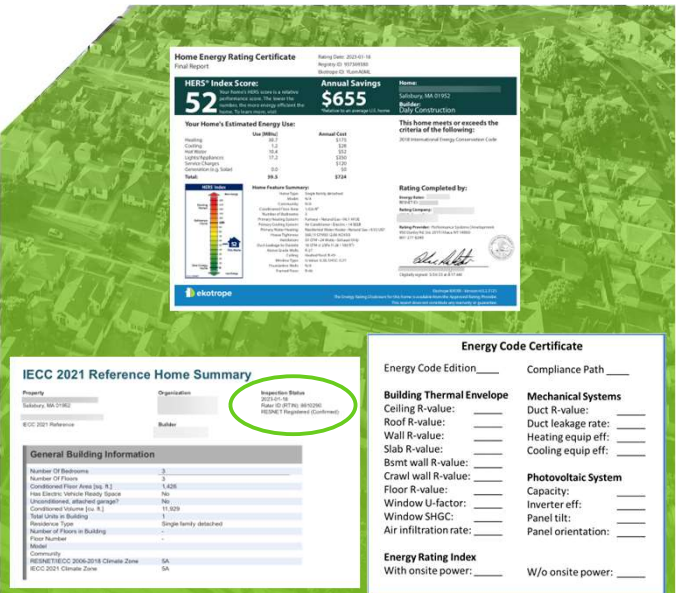
41

## MA Residential Amendments

### Recommended Documentation

The following are recommended documents for issuance of a **certificate of occupancy**:

1. A copy of the final certificate indicating that the HERS rating index score for each unit is verified to be 52 or less or otherwise complies via renewable trade-offs,
2. IECC 2021 Reference Home Summary – provided by the HERS Rater
3. An *Energy Code Certificate*, for each unit listing the final HERS index score of the dwelling unit to be posted on site adjacent to the electric panel.



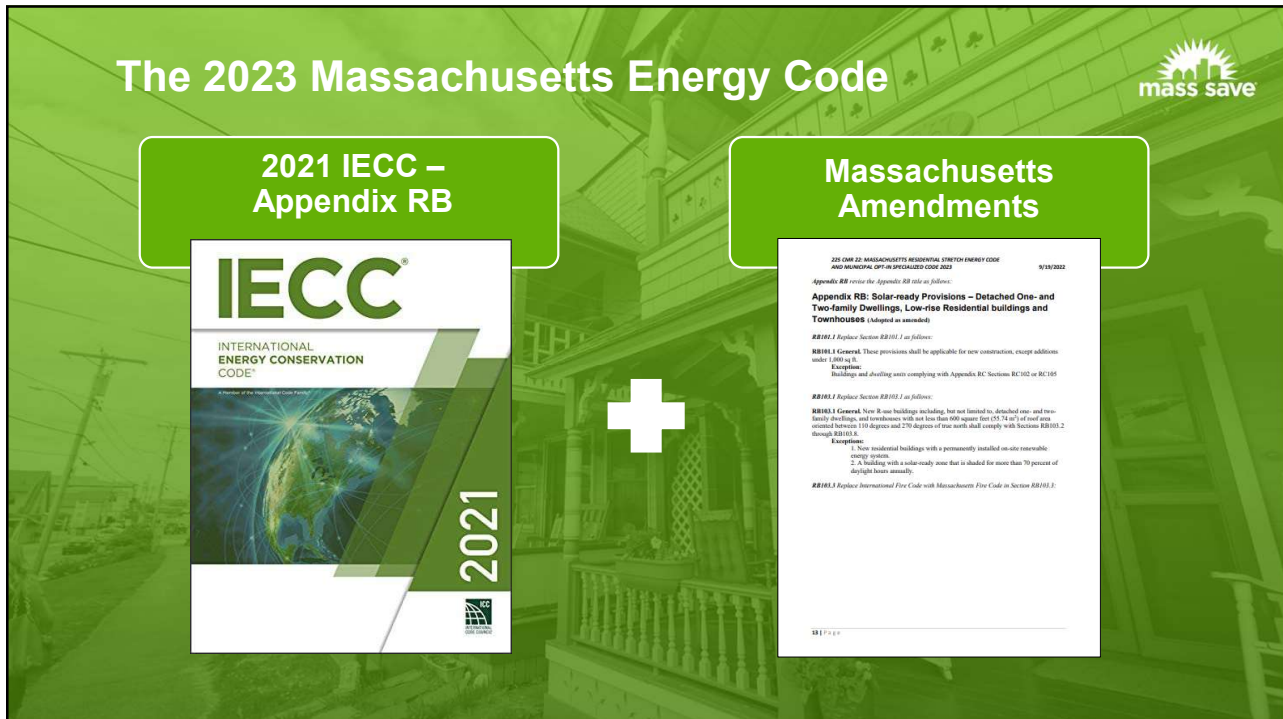
#### Energy Code Certificate

|                                  |                            |
|----------------------------------|----------------------------|
| Energy Code Edition              | Compliance Path            |
| <b>Building Thermal Envelope</b> | <b>Mechanical Systems</b>  |
| Ceiling R-value: _____           | Duct R-value: _____        |
| Roof R-value: _____              | Duct leakage rate: _____   |
| Wall R-value: _____              | Heating equip eff: _____   |
| Slab R-value: _____              | Cooling equip eff: _____   |
| Born wall R-value: _____         |                            |
| Crawl wall R-value: _____        | <b>Photovoltaic System</b> |
| Floor R-value: _____             | Capacity: _____            |
| Window U-factor: _____           | Inverter eff: _____        |
| Window SHGC: _____               | Panel tilt: _____          |
| Air infiltration rate: _____     | Panel orientation: _____   |
| <b>Energy Rating Index</b>       |                            |
| With onsite power: _____         | W/o onsite power: _____    |

42



43



44

## RB 101 Scope


RB101.1 General. These provisions shall be applicable for new construction, **except additions 1,000 sq ft and under.**

Exceptions

- Buildings and dwelling units complying with Appendix RC
  - Section RC102 (Zero energy pathway)
  - Section RC105 (Solar-roof zone)



45

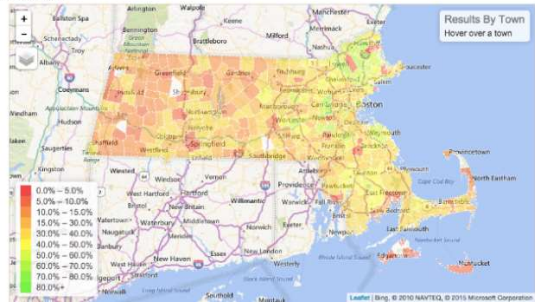


## Appendix RB: Solar-Ready Provisions

**New in 2023:**

- Applies to Group R (in addition to one- and two-family dwellings and townhouses)
- Zone setbacks from obstructions
- Capped roof penetration sleeve for flat roofs

**Mass State**



Results By Town  
Hover over a town

46



## Existing Buildings Summary

- For additions or increases in size of over 1000 square feet or 100% of the existing square footage, a HERS Rating is required as per Table 406.5.
- For “small” additions or alterations, the guidelines in chapter 5 for existing buildings should be followed.
- Solar Ready applies only to additions over 1000 square feet.
- Historical buildings can still apply for exemptions if the work would affect the historical nature of the building.



47

## Low Rise/Repair & Additions

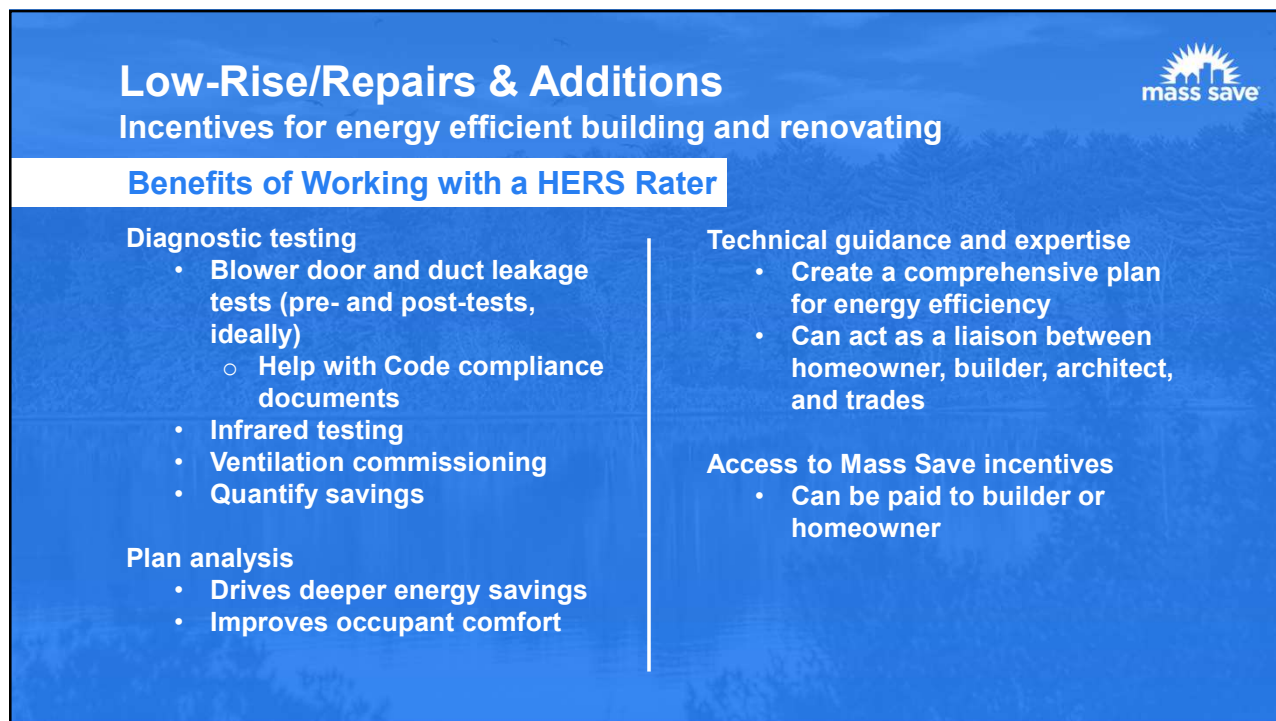
### Incentives for energy efficient building and renovating

- Single Family Homes
- Multi-Family 3 stories and residential-metered heat
- New Construction
- Major Renovations and Large Additions
- Residential Energy Code
- Residential HVAC and DHW Systems only
- On-site testing and verification completed by program-approved HERS Raters
- Incentives for commercially metered buildings/units are not available



48





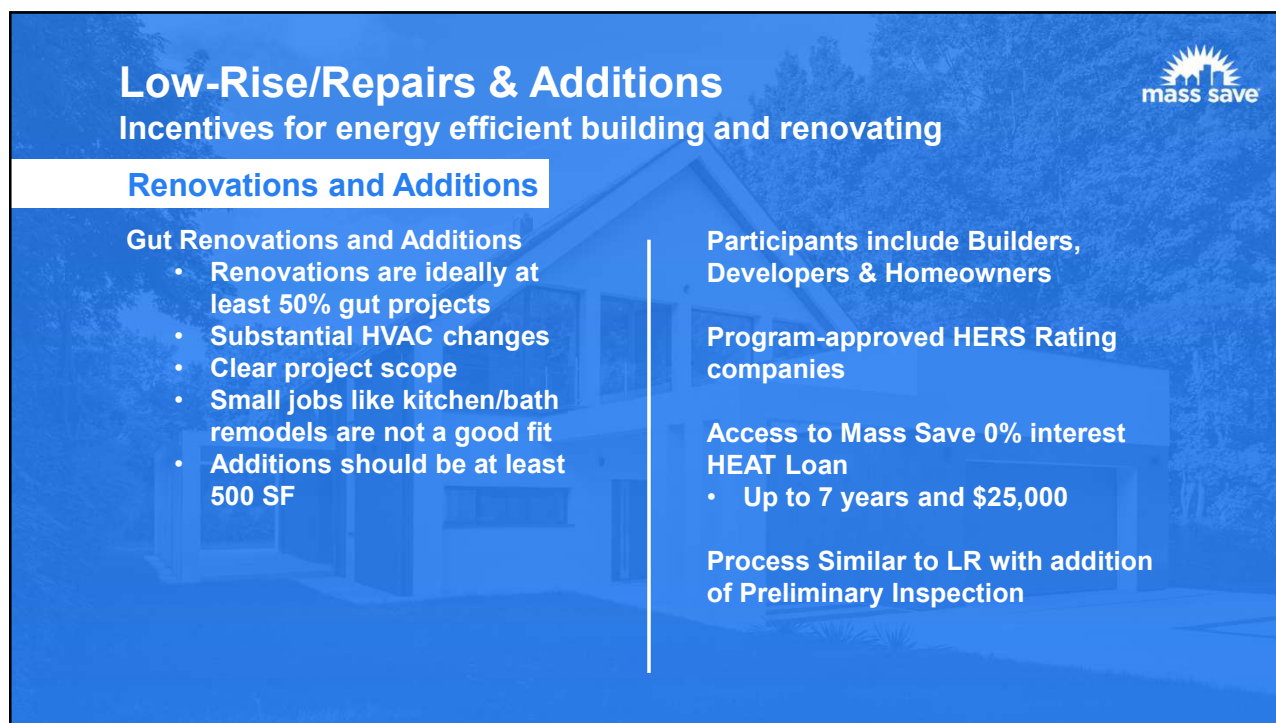
**Low-Rise/Repairs & Additions**  
Incentives for energy efficient building and renovating

**mass save**

**Benefits of Working with a HERS Rater**

|  |   |
|--|---|
| <p><b>Diagnostic testing</b></p> <ul style="list-style-type: none"> <li>• Blower door and duct leakage tests (pre- and post-tests, ideally)           <ul style="list-style-type: none"> <li>○ Help with Code compliance documents</li> </ul> </li> <li>• Infrared testing</li> <li>• Ventilation commissioning</li> <li>• Quantify savings</li> </ul> <p><b>Plan analysis</b></p> <ul style="list-style-type: none"> <li>• Drives deeper energy savings</li> <li>• Improves occupant comfort</li> </ul> | <p><b>Technical guidance and expertise</b></p> <ul style="list-style-type: none"> <li>• Create a comprehensive plan for energy efficiency</li> <li>• Can act as a liaison between homeowner, builder, architect, and trades</li> </ul> <p><b>Access to Mass Save incentives</b></p> <ul style="list-style-type: none"> <li>• Can be paid to builder or homeowner</li> </ul> |
|--|---|

49



**Low-Rise/Repairs & Additions**  
Incentives for energy efficient building and renovating

**mass save**


**Renovations and Additions**

|   |  |
|---|--|
| <p><b>Gut Renovations and Additions</b></p> <ul style="list-style-type: none"> <li>• Renovations are ideally at least 50% gut projects</li> <li>• Substantial HVAC changes</li> <li>• Clear project scope</li> <li>• Small jobs like kitchen/bath remodels are not a good fit</li> <li>• Additions should be at least 500 SF</li> </ul> | <p><b>Participants include Builders, Developers &amp; Homeowners</b></p> <p><b>Program-approved HERS Rating companies</b></p> <p><b>Access to Mass Save 0% interest HEAT Loan</b></p> <ul style="list-style-type: none"> <li>• Up to 7 years and \$25,000</li> </ul> <p><b>Process Similar to LR with addition of Preliminary Inspection</b></p> |
|---|--|


50

**Energy Code Support**

**Questions about the energy code?**



**Energy Code Support Hotline:**  
855-757-9717



**Energy Code Support Email:**  
energycodesma@psdconsulting.com

51



**Thanks!**

Massachusetts Energy Code Technical Support Program



Berkshire Gas  
An AVANGRID Company



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52