Residential IECC2021 MA amendments – BBRS revisions 10-21-21

Red underline and ~~black strike-out~~ designates existing MA amendments in the 9th edition IECC2018 proposed to continue with the 10th edition IECC2021.

~~Red strike-out~~ designates MA amendments in the 9th edition IECC2018, removed for the 10th edition IECC2021.

Blue underline and ~~Blue strike-out~~ designates changes to MA amendments (new or revised amendments) to the 10th edition IECC2021.

Yellow highlight designates revisions requested by BBRS members in October

List of new amendments:

a) Allow Stretch energy code and zero appendix – as optional compliance paths
b) Modify EV ready wiring to 1 space per home, or 10% of multi-family spaces, with exceptions
c) HERS rating option update (from ERI 55 minus 5%) to HERS 52 and simplify language
d) Simplify HERS rating incentives for clean energy (Table R406.5)
e) PHIUS option updated from 2018 to 2021
f) Energy Star homes 3.1 option dropped – pending 4.0 in future code
g) Simplification of new section R408 optional requirements

RESIDENTIAL MA AMENDMENTS (780CMR Chapter 51)

CHAPTER 11: ENERGY EFFICIENCY

Add the following sections as follows:

[E] 1101.1.1 Criteria. Buildings shall be designed and constructed in accordance with the ~~2018~~ 2021 *International Energy Conservation Code* (IECC) with Massachusetts Amendments contained herein.

Exception. Temporary structures, as regulated by Section 3103, do not need to comply with the building envelope requirements of Chapter 51.

CHAPTER 1 [RE]
SCOPE AND ADMINISTRATION

SECTION R103
CONSTRUCTION DOCUMENTS

R103.2 Amend as follows:

R103.2 Information on construction documents. Construction documents shall be drawn to scale on suitable material. Electronic media documents are permitted to be submitted where

approved by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the *building*, systems and equipment as herein governed. Details shall include the following as applicable:

1. Insulation materials and their *R*-values.
2. Fenestration *U*-factors and *solar heat gain coefficients* (SHGC).
3. Area-weighted *U*-factor and *solar heat gain coefficients* (SHGC) calculations.
4. Mechanical system design criteria.
5. Mechanical and service water-heating systems and equipment types, sizes and efficiencies.
6. Equipment and system controls.
7. Duct sealing, duct and pipe insulation and location.
8. Air sealing details.
9. EV Ready Space locations per R404.2
10. Solar-Ready Zone in accordance with Appendix RAB

CHAPTER 2 [RE]
DEFINITIONS

R202 GENERAL DEFINITIONS

Add the following definitions:

CLEAN BIOMASS HEATING SYSTEM. Wood-pellet fired central boilers and furnaces where the equipment has a thermal efficiency rating of 80% (higher heating value) or greater; and a particulate matter emissions rating of no more than 0.15 lb/MMBtu PM heat output.

ELECTRIC VEHICLE. An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, electric motorcycles, and the like, primarily powered by an electric motor that draws current from a rechargeable storage battery, fuel cell, photovoltaic array, or other source of electric current.
Informational Note: defined as in 527 CMR 12.00: Massachusetts Electrical Code (Amendments) section 625.2.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). The conductors, including the ungrounded, grounded, and equipment grounding conductors, and the *Electric Vehicle* connectors, attachment plugs, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the *Electric Vehicle*.
Informational Note: defined as in 527 CMR 12.00: Massachusetts Electrical Code (Amendments) section 625.2.

ELECTRIC VEHICLE CHARGING SPACE ("EV Ready Space"). A designated parking space which is provided with one dedicated 50-ampere branch circuit for EVSE servicing *Electric Vehicles*.

CHAPTER 4 [RE]
RESIDENTIAL ENERGY EFFICIENCY

SECTION R401
GENERAL

R401 Revise as follows:

R401.1 Scope. This chapter applies to *residential buildings*. Municipalities which have adopted the Stretch Energy Code or the Municipal Opt-in Specialized Stretch energy code, shall use the energy efficiency requirements of 225 CMR, and chapter 51 or this chapter as applicable.

R401.2 Application. Residential buildings shall comply with Section R401.2.5 and either Sections R401.2.1, R401.2.2, R401.2.3 or R401.2.4.

Exception: Additions, *alterations*, repairs and changes of occupancy to existing buildings complying with Chapter 5.

R401.2.1 Prescriptive Compliance Option.
The Prescriptive Compliance Option requires compliance with Sections R401 through R404.

R401.2.2 ~~Total~~ Passivehouse Building ~~Performance~~ Certification Option.
The ~~Total~~ Passivehouse Building ~~Performance~~ Certification Option requires compliance with Section R405.

R401.2.3 Energy Rating Index Option.
The Energy Rating Index (ERI) Option requires compliance with Section R406.
Qualifying approaches under R406 include the following:

a. Certified RESNET HERS rating with MA amendments.
b. ~~Certified Energy Star Homes, Version 3.1.~~
c. ~~Certified Passive house performance method.~~

R401.2.4 APPENDIX RC. Residential Buildings and dwelling units covered by this chapter may elect to comply with the requirements of IECC Appendix RC - ZERO ENERGY RESIDENTIAL BUILDING PROVISIONS

R401.2.5 MA Stretch energy code. Residential Buildings and dwelling units may elect to comply with the requirements of 225 CMR MASSACHUSETTS STRETCH ENERGY CODE, or, the MUNICIPAL OPT-IN SPECIALIZED STRETCH ENERGY CODE promulgated by the Massachusetts Department of Energy Resources.

R401.2.5 Additional energy efficiency. This section establishes additional requirements applicable to all compliance approaches to achieve additional energy efficiency.
1. For buildings complying with Section R401.2.1, one of the additional efficiency package options shall be installed according to Section R408.2.
~~2. For buildings complying with Section R401.2.2, the building shall meet one of the following:~~
~~2.1. One of the additional efficiency package options in Section R408.2 shall be installed without including such measures in the proposed design under Section R405; or~~
~~2.2. The proposed design of the building under Section R405.3 shall have an annual energy cost that is less than or equal to 95 percent of the annual energy cost of the standard reference design.~~

23. For buildings complying with the Energy Rating Index alternative Section R401.2.3, the Energy Rating Index value shall be ~~at least 5 percent less than the Energy Rating Index~~ less than or equal to the HERS index of 52 prior to credit for onsite renewable electric generation or as specified in Table R406.5.
The option selected for compliance shall be identified in the certificate required by Section R401.3.

R401.3 Certificate
~~The Certificate shall list the final HERS index score when applicable.~~

R402.1.5.1 Add the section as follows:

R402.1.5.1 Approved software for Total UA alternative: The following software is approved for demonstrating Total UA compliance:

RESCheck-Web ~~or RESCheck for Windows Version 4.6.5 or later,~~ available at http://www.energycodes.gov/rescheck

R402.4.1.1 Amend Table R402.4.1.1 as follows:

TABLE R402.4.1.1

AIR BARRIER AND INSULATION INSTALLATION

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	All insulation shall be installed at Grade I quality in accordance with ICC/RESNET 301. Air-permeable insulation shall not be used as a sealing material.

R403.3.5 Amend as follows:

R403.3.5 Duct testing. Ducts shall be pressure tested in accordance with ANSI/RESNET/ICC 380 or ASTM E1554 to determine air leakage by one of the following methods:
1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. Registers shall be taped or otherwise sealed during the test.
2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Postconstruction or rough-in testing and verification shall be done by a HERS Rater, HERS Rating Field Inspector, or an applicable BPI Certified Professional. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*.

Exception: A duct air-leakage test shall not be required for ducts serving heating, cooling or ventilation systems that are not integrated with ducts serving heating or cooling systems.

R403.6 Revise the section as follows:

R403.6 Mechanical ventilation.

~~*Buildings* and *dwelling units* shall be provided with mechanical *ventilation* that complies with the requirements of the *International Residential Code* or *International Mechanical Code*, as applicable, or with other *approved* means of *ventilation.*~~ Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the *ventilation* system is not operating.

Each dwelling unit of a residential building shall be provided with continuously operating exhaust, supply or balanced mechanical ventilation that has been site verified to meet a minimum airflow per one of the following methods:

1. Table R403.6.1

TABLE R403.6.1 MINIMUM REQUIRED AIRFLOW IN CFM BASED ON SIZE OF HOUSE AND NUMBER OF BEDROOMS

SIZE OF HOUSE	0-1 BEDROOMS	2-3 BEDROOMS	4-5 BEDROOMS	6-7 BEDROOMS	>7 BEDROOMS
Up to 1500 sq ft	30	45	60	75	90
1501 – 3000 sq ft	45	60	75	90	105
3001 – 4500 sq ft	60	75	90	105	120
4501 – 6000 sq ft	75	90	105	120	135
6001 – 7500 sq ft	90	105	120	135	150
> 7500 sq ft	105	120	135	150	165

2. RESNET HERS Index ~~Energy Star Homes' Version 3.1~~ or
3. ASHRAE 62.2 - 2019 or
4. the following formula for one- and two-family dwellings and townhouses of three or less stories above grade plane:

$$Q = .03 \times CFA + 7.5 \times (N_{br} + 1) - 0.052 \times Q_{50} \times S \times WSF$$

Where: CFA is the conditioned floor area in sq ft
N_{br} is the number of bedrooms

Q_{50} is the verified blower door air leakage rate in cfm measured at 50 Pascals
S is the building height factor determined by this table:

stories above grade plane	1	2	3
S	1.00	1.32	1.55

WSF is the shielded weather factor as determined by this table:

County	WSF
Barnstable	0.60
Berkshire	0.52
Bristol	0.54
Dukes	0.59
Essex	0.58
Franklin	0.52
Hampden	0.49
Hampshire	0.59
Middlesex	0.55
Nantucket	0.61
Norfolk	0.52
Plymouth	0.53
Suffolk	0.66
Worcester	0.59

R403.6.3 through R403.6.7 Replace R403.6.3 and add the sections as follows:

R403.6.3 Testing and Verification. Installed performance of the mechanical ventilation system shall be tested and verified by a HERS Rater, HERS Rating Field Inspector, or an applicable BPI Certified Professional, and measured using a flow hood, flow grid, or other airflow measuring device in accordance with either RESNET Standard Chapter 8 or ACCA Standard 5.

R403.6.4 Air-moving equipment, selection and installation. As referenced in ASHRAE Standard 62.2-2013, Section 7.1, ventilation devices and equipment shall be tested and certified by AMCA (Air Movement and Control Association) or HVI (Home Ventilating Institute) and the certification label shall be found on the product. Installation of systems or equipment shall be carried out in accordance with manufacturers' design requirements and installation instructions. Where multiple duct sizes and/or exterior hoods are standard options, the minimum size shall not be used.

R403.6.5 Sound Rating. Sound ratings for fans used for whole building ventilation shall be rated at a maximum of 1.0 sone.

Exception: HVAC air handlers and remote-mounted fans need not meet sound requirements. There must be at least 4ft of ductwork between the remote-mounted fan and intake grille.

R403.6.6 Documentation. The owner and the occupant of the dwelling unit shall be provided with information on the ventilation design and systems installed, as well as instructions on the proper operation and maintenance of the ventilation systems. Ventilation controls shall be labeled with regard to their function, unless the function is obvious.

R403.6.7 Air Inlets and Exhausts. All ventilation air inlets shall be located a minimum of 10ft from vent openings for plumbing drainage systems, appliance vent outlets, exhaust hood outlets, vehicle exhaust, or other known contamination sources; and shall not be obstructed by snow, plantings, or any other material. Outdoor forced air inlets shall be covered with rodent screens having mesh openings not greater than ½ inch. A whole house mechanical ventilation system shall not extract air from an unconditioned basement unless approved by a registered design professional. Where wall inlet or exhaust vents are less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, a metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the vent terminal. The sign shall read, in print size no less than one-half (1/2) inch in size, "MECH. VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS".

Exceptions:

1. Ventilation air inlets in the wall ≥ 3 ft. from dryer exhausts and contamination sources exiting through the roof.
2. No minimum separation distance shall be required between local exhaust outlets in kitchens/bathrooms and windows.
3. Vent terminations that meet the requirements of the National Fuel Gas Code (NFPA 54/ ANSI Z223 .1) or equivalent.

R404.4 Add the section as follows:

~~**R404.2 Electric Vehicle Charging Spaces ("EV Ready Spaces") Reserved.** EV Ready spaces are not required for detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories above grade place. All other occupancies otherwise directed to follow the provisions of 780 CMR 51.00: *Massachusetts Residential Code* must adhere to any EV requirements found in 780 CMR 1300.1(C405.10).~~

R404.4 Wiring for Electric Vehicle Charging Spaces ("EV Ready Spaces"). *EV Ready Spaces* shall be provided in accordance with Table R404.4. The branch circuit shall be identified as "EV READY" in the service panel or subpanel directory, and the termination location shall be marked as "EV READY". The circuit shall terminate in a NEMA receptacle or a Society of Automotive Engineers (SAE) standard J1772 electrical connector.

TABLE R404.4 EV READY SPACE REQUIREMENTS

Type of Building	Number of parking spaces
1 & 2 family dwellings and town houses	At least 1 per unit
Multi-family	At least 10%

Exceptions:

1. In no case shall the number of required *EV Ready Spaces* be greater than the number of parking spaces otherwise required by local ordinance.
2. This requirement will be considered met if all spaces which are not *EV Ready* are separated from the premises by a public right-of-way.
3. Any 50-ampere branch circuit may be replaced by 3 or more "EV READY" labelled 20-ampere branch circuits and terminations where sufficient spaces are available.
4. Residential structures of 1-4 dwelling units may use a 40-ampere dedicated circuit, or if necessary a 110 volt 20-ampere dedicated circuit, if a 50-ampere dedicated circuit would require the dwelling unit to upgrade the size of the electrical service beyond what would be required per the MA Electrical Code (527 CMR) for the unit if a dedicated circuit was not reserved for EVSE.

   Construction documents shall identify the total service load required to serve the residential unit. If the reservation of a 50-ampere branch circuit will require an upgrade to a larger electrical service, the exception shall apply.

R405. Delete subsection and replace as follows:

R405 Passivehouse Building Certification Option.

R405.1 Scope. Projects certified as meeting the PHIUS CORE 2021 ~~2015~~ or PHIUS ZERO 2021 ~~2018~~ Passive Building Standard – North America, or newer, demonstrated using approved software by PHIUS, where PHIUS certification is demonstrated by a Certified Passive House Consultant; or,

Projects certified as meeting the Certified Passive House standard using software by the Passive House Institute (PHI), where PHI certification is demonstrated by a Certified Passive House Designer.

R405.2 ~~R406.6.4~~ Passive House Documentation.

1. If using PHIUS or PHI Passive House software, prior to the issuance of a building permit, the following items must be provided to the Building Official:
   a. A WUFI or PHPP compliance report which demonstrates project compliance with PHIUS~~2018 (or newer)~~ or PHI performance requirements;
   b. A statement that the WUFI or PHPP results are "based on plans";
   c. Evidence of precertification approval from PHIUS or PHI.
2. Prior to the issuance of a certificate of occupancy, the following item(s) must be provided to the building official:

a. An updated WUFI or PHPP compliance report which demonstrates project compliance with PHIUS~~2018 (or newer)~~ or PHI performance requirements;
b. A copy of the Passive House Rater's test results;
c. A statement that the WUFI or PHPP results are "based on 'as-built' conditions, incorporating the relevant test results and documented changes to equipment, materials, and assemblies that impact performance".

R406.1 Revise and add subsection as follows:

R406.1 Scope. This section establishes criteria for compliance using an Energy Rating Index (ERI) analysis, or approved alternative energy performance rating methods.

R406.1.1 Approved alternative energy performance methods. The following rating threshold criteria are sufficient to demonstrate energy code compliance under section R406 without calculation of a standard reference design. The mandatory provisions listed in R406.2 also apply:

1. ~~**ENERGY STAR Homes 3.1 certified.** New buildings or additions to an existing building, building system or portion thereof certified to conform to the ENERGY STAR Certified Homes, Version 3.1 standard.~~

2. ~~**Passive House Institute US (PHIUS) or Passive House Institute (PHI) certified**. Projects certified as meeting the PHIUS+ 2015 or 2018 Passive Building Standard – North America, or newer, demonstrated using approved software by PHIUS, where PHIUS certification is demonstrated by a Certified Passive House Consultant; or, Project certified as meeting Certified Passive House standard using software by PHI, where PHI certification is demonstrated by a Certified Passive House Designer.~~

3. Any other software approved by the Board of Building Regulations and Standards.

R406.3 Reserve this section:

R406.3 Building thermal envelope. Reserved. ~~Building and portions thereof shall comply with Section R406.3.1 or R406.3.2.~~
~~**R406.3.1 On-site renewables are not included.** Where on-site renewable energy is not included for compliance using the ERI analysis of Section R406.4, the proposed total building thermal envelope UA, which is sum of *U*-factor times assembly area, shall be less than or equal to the building thermal envelope UA using the prescriptive *U*-factors from Table R402.1.2 multiplied by 1.15 in accordance with Equation 4-1. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.~~
~~UAProposed design = 1.15 × UAPrescriptive reference design~~
~~**(Equation 4-1)**~~

~~**R406.3.2 On-site renewables are included.** Where onsite renewable energy is included for compliance using the ERI analysis of Section R406.4, the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4 of the 2015 *International Energy Conservation Code*.~~

R406.4 Revise the section as follows:

R406.4 Energy Rating Index. The Energy Rating Index (ERI) shall be the RESNET certified HERS index determined in accordance with RESNET/ICC 301 ~~except for buildings covered by the *International Residential Code*, the ERI reference design ventilation rate shall be in accordance with Equation 4-2.~~

~~Ventilation rate, CFM = (0.01 × total square foot area of house) + [7.5 × (number of bedrooms + 1)] **(Equation 4-2)**~~

Energy used to recharge or refuel a vehicle used for transportation on roads that are not on the building site shall not be included in the *ERI reference design* or the *rated design*.

~~For compliance purposes, any reduction in energy use of the rated design associated with on-site renewable energy shall not exceed 5 percent of the total energy use.~~

R406.5 ERI-based compliance. Compliance based on an ERI analysis requires that the *rated proposed design* and confirmed built dwelling be shown to have an ~~ERI~~ HERS index rating less than or equal to the appropriate value indicated in Table R406.5 when compared to the ~~*ERI*~~ *HERS index reference design* for each dwelling unit prior to credit for onsite renewable electric generation.

TABLE R406.5 MAXIMUM ENERGY RATING INDEX

On-site Renewable Energy Application	Maximum HERS Index score[a, b]	
	New construction	Whole house renovations; additions
None	52 ~~55~~	65
Solar Electric Generation	55 ~~60~~	70
Clean Space Heating	55 ~~60~~	70
~~DHW~~	~~57~~	~~67~~
Solar Electric & Clean Space Heating	58 ~~65~~	75
~~Solar Electric & DWH~~	~~62~~	~~72~~
~~Solar Electric & Clean Space Heating & DHW~~	~~67~~	~~77~~

[a] Maximum HERS rating prior to onsite renewable electric generation in accordance with Section R406.5

[b] Where on-site renewable energy is included for compliance using the ERI analysis of Section R406.4, the building shall meet the mandatory requirements of SectionR406.2, and the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4 of the 2015 International Energy Conservation Code.

R406.5.1 Add the subsection, as follows:

R406.5.1 Trade-off for onsite renewable energy systems. New construction following R406.3 or existing buildings and additions following IECC chapter 5[RE] may use

renewable 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 ~~2.5~~ 4kW or higher shall offset ~~5~~3 HERS points for new construction, or 5 HERS points for renovations and fully attached additions.
2. Clean Space Heating: Clean Biomass Heating System, solar thermal array, cold climate air source heat pump having rated coefficient of performance (COP) of at least 1.75 at 5 degrees Fahrenheit, or geothermal heat pump, or a combination of these systems, operating as the primary heating system shall offset ~~5~~3 HERS points for new construction, or 5 HERS points for renovations and fully attached additions.
3. ~~Renewable Domestic Hot Water Heating (DHW): Solar thermal array heating shall offset 2 HERS points.~~

R406.6 Revise section as follows:

R406.6 Verification by approved agency. Verification of compliance with Section R406 as outlined in Sections R406.4 and R406.6~~5~~ shall be completed by an *approved* third party. Verification of compliance with Section R406.2 shall be completed by the authority having jurisdiction or an *approved* third-party inspection agency in accordance with Section R105.4.

~~For compliance using a HERS Index rating or Energy Star Homes 3.1 certification, verification of compliance shall be completed by the certified HERS rater. For compliance using PHIUS+ 2015, PHIUS+ 2018 or PHI software, verification of compliance shall be completed by a certified Passive House consultant.~~

~~***R406.7 Revise this section as follows:***~~

~~**R406.6 Documentation**. Documentation of the software used to determine the ERI and the parameters for the residential building shall be in accordance with Sections R406.6.1 through R406.6.3~~4~~.~~

~~**R406.6.1 Compliance software tools.** If using the ERI or Energy Star Homes compliance path, software tools used for determining ERI shall be Approved Software Rating Tools in accordance with RESNET/ICC 301. Where calculations require input values not specified by Sections R402, R403, R404 and R405, those input values shall be taken from RESNET/ ICC 301. If using the Passive House compliance path, software tools for determining Passive House certification shall be approved software tools by PHIUS or PHI.~~

~~**R406.6.2 ERI Documentation.** Prior to the issuance if a building permit, the following items must be provided to the Building Official:~~

1. ~~A HERS compliance report which includes a proposed HERS index score of 55 or lower, or otherwise complies via renewable trade-offs;~~
2. ~~A description of the unit's energy features; and~~
3. ~~A statement that the rating index score is "based on plans"~~

Prior to the issuance of a certificate of occupancy, the following items must be provided to the Building official:

4. A copy of the final certificate indicating that the HERS rating index score for each unit is verified to be 55 or less or otherwise complies via renewable trade-offs, together with a completed HERS rater verified ENERGY STAR Thermal Enclosure Checklist.
5. A copy of the certificate, as required by Section R401.3 for each unit listing the final HERS index score of the dwelling unit.

R406.6.3 ENERGY STAR Homes, Version 3.1 Documentation. Prior to the issuance of a building permit, the following items(s) must be provided to the Building Official:

1. A copy of the preliminary HERS rating, based on plans
2. A description of the unit's energy features; and
3. A statement that the rating index score is "based on plans"

Prior to the issuance of a certificate of occupancy, the following items must be provided to the Building Official:

4. A copy of the final ENERGY STAR Homes certificate;
5. A copy of the certified final HERS rating; and
6. A copy of the signed ENERGY STAR Thermal Enclosure System Checklist.
7. A copy of the certificate, as required by Section R401.3 for each unit listing the final HERS index score of the dwelling unit.

R406.7.3 Delete this section:

R406.7.3 Renewable energy certificate (REC) documentation.
Where on-site renewable energy is included in the calculation of an ERI, one of the following forms of documentation shall be provided to the code official:
1. Substantiation that the RECs associated with the on-site renewable energy are owned by, or retired on behalf of, the homeowner.
2. A contract that conveys to the homeowner the RECs associated with the on-site renewable energy, or conveys to the homeowner an equivalent quantity of RECs associated with other renewable energy.

Add new section R407 as follows:

R407 Additional Efficiency Packages

R407.1 Requirements (Prescriptive)
Projects shall comply with at least one of the following:

1. More efficient HVAC performance in accordance with Section R407.2
2. Heat recovery ventilation (HRV) system in accordance with Section R403.6.1. The Exception in R403.6.1 shall not be applied if used for compliance with this Section.

3. High efficiency water heater or solar thermal hot water heater in accordance with Section R407.3

R407.2 More efficient HVAC performance. Primary heating equipment shall meet one of the following efficiency requirements:

1. Gas, propane or oil-fired furnaces with a minimum AFUE of 95%
2. Gas, propane or oil-fired boilers with a minimum AFUE of 95%
3. Closed-loop ground source heat pump with a minimum COP of 3.5
4. Air-source heat pump with a minimum HSPF of 10

R407.3 High efficiency water heating or solar thermal hot water heater. Hot water heating systems shall meet one of the following:

1. Natural gas or propane water heating with a minimum Uniform Energy Factor (UEF) of 0.87 or electric heat pump hot water heater with a minimum UEF of 2.2. On-demand natural gas or propane water heaters shall not include any buffer tank or hot water storage capacity outside the water heater itself.
2. A solar thermal hot water heating system with a minimum of 40 square feet of gross collection area. The solar hot water heating panels shall have a total solar resource fraction that is not less than 75%.

SECTION R408
ADDITIONAL EFFICIENCY PACKAGE OPTIONS

R408.1 Scope. This section establishes additional efficiency package options to achieve additional energy efficiency in accordance with Section R401.2.5.

R408.2 Additional efficiency package options. Additional efficiency package options for compliance with Section R401.2.1 are set forth in Sections R408.2.1 through R408.2.5.

R408.2.1 Enhanced envelope performance option.
The total *building thermal envelope* UA, the sum of *U*-factor times assembly area, shall be less than or equal to 95 percent of the total UA resulting from multiplying the *U*-factors in Table R402.1.2 by the same assembly area as in the proposed building. The UA calculation shall be performed in accordance with Section R402.1.5. The area-weighted average SHGC of all glazed fenestration shall be less than or equal to 95 percent of the maximum glazed fenestration SHGC in Table R402.1.2.

R408.2.2 More efficient HVAC equipment performance option. Heating and cooling *equipment* shall meet one of the following efficiencies:

1. Greater than or equal to 95 AFUE natural gas furnace and 16 SEER air conditioner.
2. Greater than or equal to 10 HSPF/16 SEER air source heat pump.
3. Greater than or equal to 3.5 COP ground source heat pump.

For multiple cooling systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the cooling design load.

For multiple heating systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the heating design load.

R408.2.3 Reduced energy use in service water-heating option. The hot water system shall meet one of the following efficiencies:

~~1. Greater than or equal to 82 EF fossil fuel service\water-heating system.~~

2. Greater than or equal to 2.0 EF electric service water-heating system.
3. Greater than or equal to 0.4 solar fraction solar water-heating system.

R408.2.4 More efficient duct thermal distribution system option. The thermal distribution system shall meet one of the following efficiencies:

1. 100 percent of ducts and air handlers located entirely within the *building thermal envelope*.
2. 100 percent of ductless thermal distribution system or hydronic thermal distribution system located completely inside the *building thermal envelope*.

CHAPTER 5 [RE]
EXISTING BUILDINGS

R502 ADDITIONS.

R502.1.2 Revise the subsection as follows:

R502.1.2 Existing plus addition compliance (Simulated Performance Alternative). ~~Where no *unconditioned space* is changed to *conditioned space*, the *addition* shall comply where the annual energy cost or energy use of the *addition* and the existing *building*, and any *alterations* that are part of the project, is less than or equal to the annual energy cost of the existing *building* when modeled in accordance with Section R405.~~ The *addition* and any *alterations* that are part of the project shall comply with Section ~~R405 in its entirety.~~R406 and shall achieve a maximum HERS index using Table R406.4.~~1.~~

R503.2 Delete the exception:

R503.2 Change in space conditioning.
Any nonconditioned or low-energy space that is altered to become *conditioned space* shall be required to be brought into full compliance with this code.

~~**Exception:** Where the simulated performance option in Section R405 is used to comply with this section, the annual energy cost of the proposed design is permitted to be 110 percent of the annual energy cost otherwise allowed by Section R405.3.~~

Appendix RB: Solar-ready Provisions – Detached One- and Two-family Dwellings, Low-rise Residential buildings and Townhouses

(Adopted as amended)

SECTION RB101 SCOPE

RB101.1 General. These provisions shall be applicable for new construction, except additions.

SECTION RB102
GENERAL DEFINITION
SOLAR-READY ZONE. A section or sections of the roof or building overhang designated and reserved for the future installation of a solar photovoltaic or solar thermal system.

SECTION RB103
SOLAR-READY ZONE
RB103.1 General. New detached one- and two-family dwellings, and townhouses with not less than 600 square feet (55.74 m^2) of roof area oriented between 110 degrees and 270 degrees of true north shall comply with Sections RB103.2 through RB103.8.

Exceptions:

1. New residential buildings with a permanently installed on-site renewable energy system.
2. A building with a solar-ready zone that is shaded for more than 70 percent of daylight hours annually.
3. Buildings and structures as designed and shown in construction documents that do not meet the conditions for a solar-ready zone area.

RB103.2 Construction document requirements for solar ready zone. Construction documents shall indicate the solar ready zone where applicable.

RB103.3 Solar-ready zone area. The total solar-ready zone area shall consist of an area not less than 300 square feet (27.87 m2) exclusive of mandatory access or set back areas as required by the MA Fire Code. New townhouses three stories or less in height above grade plane and with a total floor area less than or equal to 2,000 square feet (185.8 m^2) per dwelling shall have a solar-ready zone area of not less than 150 square feet (13.94 m^2). The solar-ready zone shall be composed of areas not less than 5 feet (1524 mm) in width and not less than 80 square feet (7.44 m^2) exclusive of access or set back areas as required by the MA Fire Code.

RB103.4 Obstructions. Solar-ready zones shall consist of an area free from obstructions, including but not limited to vents, chimneys, and roof-mounted equipment.
NOTE: Nothing in RA103.4 shall require any construction documents to be redesigned or reconfigured so as to create a solar-ready zone area.

RB103.5 Roof load documentation. The structural design loads for roof dead load and roof live load shall be clearly indicated on the construction documents.

RB103.6 Interconnection pathway. Construction documents shall indicate pathways for routing of conduit or plumbing from the solar-ready zone to the electrical service panel or service hot water system.

~~**RB103.7 Electrical service reserved space.** The main electrical service panel shall have a reserved space to allow installation of a dual pole circuit breaker for future solar electric installation and shall be labeled "For Future Solar Electric." The reserved space shall be positioned at the opposite (load) end from the input feeder location or main circuit location.~~

RB103.87 Construction documentation certificate. A permanent certificate, indicating the solar-ready zone and other requirements of this section, shall be posted near the electrical distribution panel, water heater or other conspicuous location by the builder or registered design professional.