MA 2024 Residential Stretch code and Specialized Opt-in code (IECC2021 with MA amendments) DOER Final Draft 11-15-24 REDLINED

225 CMR 22.00: **MASSACHUSETTS STRETCH CODE AND SPECIALIZED CODE FOR LOW-RISE RESIDENTIAL – ~~2023~~2024 RESIDENTIAL LOW-RISE AMENDMENTS TO IECC2021 AND IRC 2021 CHAPTER 11: ENERGY EFFICIENCY**

(Note: please *see* 225 CMR 23.00 for Commercial, Multi-family and all other construction)

Chapter 1: [RE] SCOPE AND ADMINISTRATION

SECTION R103 CONSTRUCTION DOCUMENTS

R103.2 *Revise Section R103.2 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. Energy compliance path.
2. Insulation materials and their *R*-values.
3. Fenestration *U*-factors and *solar heat gain coefficients* (SHGC).
4. Area-weighted *U*-factor and *solar heat gain coefficients* (SHGC) calculations.
5. Mechanical system design criteria.
6. Mechanical and service water-heating systems and equipment types, sizes and efficiencies.
7. Equipment and system controls.
8. Duct sealing, duct and pipe insulation and location.
9. Air sealing details.
10. EV Ready Space locations per R404.4.
11. Solar-Ready Zone in accordance with Appendix RB, or Solar Zone Area when complying with Appendix RC for *mixed-fuel buildings*.

Chapter 2: [RE] DEFINITIONS

SECTION R202 GENERAL DEFINITIONS

R202 *Add the following definitions:*

ALL-ELECTRIC BUILDING. A building with no on-site *combustion equipment* for fossil fuel use or capacity including fossil fuel use in space heating, water heating, cooking, or drying appliances.

CLEAN BIOMASS HEATING SYSTEM. Wood-pellet fired central boilers and furnaces where the equipment has a thermal efficiency rating of 85% (higher heating value) or greater; and a particulate matter emissions rating of no more than 0.08 lb. $PM_{2.5}$/MMBtu heat output.

COMBUSTION EQUIPMENT. Any *equipment* or *appliance* used for space heating, *service water heating*, cooking, clothes drying and/or lighting that can use *fuel gas*, *fuel oil* or solid fuel and that is not a *clean biomass heating system*.

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 READY PARKING SPACE ("EV Ready Space"). A designated parking space which is provided with wiring and electrical service sufficient to provide ~~240~~ AC level II or equivalent EV charging, as defined by Standard SAE J1772 or SAE J3400 for *EVSE* servicing light duty *Electric Vehicles*.

ENTHALPY RECOVERY RATIO. ~~Change in the enthalpy of the outdoor air supply divided by the difference between the outdoor air and entering exhaust air enthalpy, expressed as a percentage.~~ The ratio of change in enthalpy of the entering supply airflow and the leaving supply airflow to the difference in enthalpy between the entering supply airflow and the entering exhaust airflow, with no adjustment to account for that portion of the psychrometric change in the leaving supply airflow that is the result of leakage of entering exhaust airflow rather than exchange of heat or moisture between the airstreams.

HIGH-EFFICACY LAMPS. Light-emitting diode (LED) lamps with an efficacy of not less than the following:
1. 60 lumens per watt for lamps over 40 watts.
2. 50 lumens per watt for lamps over 15 watts to 40 watts.
3. 45 lumens per watt for lamps 15 watts or less.

MIXED-FUEL BUILDING. A *building* that contains *combustion equipment* or includes piping for such *equipment*.

POTENTIAL SOLAR ZONE AREA. The combined area of any ~~flat roofs, or~~ low-sloped roofs and any steep-sloped roofs oriented between 90 degrees and 300 degrees of true north where the annual solar access is 70% or greater. Annual solar access is the ratio of "annual solar insolation with shade" to the "annual solar insolation without shade". Shading from obstructions located on

the roof or any other part of the building shall not be included in the determination of annual solar access.

SENSIBLE RECOVERY EFFICIENCY. The net sensible energy recovered by the supply airstream as adjusted by any supply fan energy, energy consumption of other equipment transferring heat to/from the supply airstream, case heat loss or heat gain, air leakage, airflow mass imbalance between the two airstreams, and the energy used for defrost, as a percent of the sum of the potential sensible energy that could be recovered from ambient conditions, the exhaust fan energy, and the energy consumption of any other equipment transferring heat to/from the exhaust airstream.

Chapter 3: [RE] GENERAL REQUIREMENTS

SECTION R301 CLIMATE ZONES

R301 *Replace Section R301 as follows:*

R301.1 General. Massachusetts is in *climate zone* 5A

Chapter 4: [RE] RESIDENTIAL ENERGY EFFICIENCY

SECTION R401 GENERAL

R401 *Revise Section R401 as follows:*

R401.1 Scope. This chapter applies to *residential buildings*. Municipalities which have adopted the Stretch Energy Code shall use the energy efficiency requirements of this chapter, or Appendix AJ or Chapter 51 where applicable for existing buildings. Municipalities which have adopted the Municipal Opt-in Specialized Stretch energy code shall comply with R401.2.4 including both the requirements of Appendix RC and this chapter.

R401.2 Application. Residential buildings shall comply with Section R401.2.5 and either Sections R401.2.2, R401.2.3 or R401.2.4. R-use buildings without individually separate dwelling units (such as single-room occupancy buildings) may comply with Section R401.2.1. The option selected for compliance shall be identified in the certificate required by Section R401.3.

> **Exception:** ~~Additions under 1,000 sf, Level 1 and Level 2 alterations, and repairs to existing buildings complying with Chapter 5 [RE].~~ Additions under 1,000 sf shall comply with the requirements of Sections R402, R403, and R404. Level 1 and Level 2 alterations, and repairs to existing buildings, shall comply with Chapter 5 [RE].

R401.2.1 Prescriptive Compliance option.
The Prescriptive Compliance option requires compliance with Sections R401.2.5 through R404 and R408.

R401.2.2 Passive House Building Certification option.

The Passive House Building Certification option requires compliance with Sections R405 and R404.4.

R401.2.3 Energy Rating Index option.
The Energy Rating Index (ERI) option requires compliance with Sections R406, R403.6 and R404.4.

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 and R404 as amended.

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, two of the additional efficiency package options shall be installed according to Section R408.2.
2. For buildings electing to be *all-electric buildings*, both R408.2.2 and R408.2.3 shall apply for primary space heating and domestic hot water supply.

SECTION R402 BUILDING THERMAL ENVELOPE

Table R402.1.2 *Modify Table R402.1.2 as follows:*

TABLE R402.1.2 MAXIMUM ASSEMBLY U-FACTORS[a] AND FENESTRATION REQUIREMENTS

CLIMATE ZONE	FENESTRATION U-FACTOR[f]	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC[d, e]	CEILING U-FACTOR	WOOD FRAME WALL U-FACTOR	MASS WALL U-FACTORb	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWL SPACE WALL U-FACTOR
5 and Marine 4	0.30	0.55	~~0.40~~ NR	~~0.024~~ 0.026	0.045	0.082	0.033	0.050	0.055

Table R402.1.3 *Modify Table R402.1.3 as follows:*

TABLE R402.1.3 INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION U-FACTOR[f]	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC[d, e]	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE[b]	FLOOR R-VALUE	BASEMENT[c,g] WALL R-VALUE	SLAB[d] R-VALUE & DEPTH	CRAWL SPACE[c,g] WALL R-VALUE

5 and Marine 4	0.30 [i]	0.55	~~0.40~~ NR	~~60~~ 49	20&5ci or 13&10ci or 0&20	13/17	30	15ci or 19 or 13+5ci	10ci, 4 ft	15ci or 19 or 13+5ci

R402.1.5.1 *Add Subsection R402.1.5.1 as follows:*

R402.1.5.1 Approved software for Total UA alternative: The following software is approved for demonstrating Total UA compliance: REScheck-Web for 2023 Massachusetts Stretch Energy Code 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 ANSI/ICC/RESNET 301. Air-permeable insulation shall not be used as a sealing material.

SECTION R403 SYSTEMS

R403.3.5 *Revise Section R403.3.5 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 Section R403.6 as follows:*

R403.6 Mechanical 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 a continuously operating mechanical balanced ventilation system that has been site verified to meet a minimum airflow per one of the following:

1. RESNET HERS Index in accordance with ANSI/RESNET/ICC Standard 301~~, or~~
2. ASHRAE Standard 62.2-2019 or 62.2-2022~~, or~~
3. 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

R403.6.1 *Revise Section R403.6.1 and Subsections R403.6.1.1 and R403.6.1.2 as follows:*

R403.6.1 Heat or Energy Recovery Ventilation. Heat or energy recovery balanced ventilation systems shall be provided for dwelling units as specified in either Section R403.6.1.1 or R403.6.1.2, as applicable.

> **R403.6.1.1 Large Systems.** Systems with a rated airflow exceeding 300 cfm shall have an *enthalpy recovery ratio* of not less than 50% at cooling design condition and not less than 60 percent at heating design condition, determined in accordance with AHRI 1060 at an airflow not less than the design airflow. Compliance to the *enthalpy recovery ratio* shall be demonstrated by ratings at design conditions and airflows by software or catalogs certified by AHRI.
>
> **R403.6.1.2 Other Systems.** Systems with a rated airflow of 300 cfm or less shall have a *sensible recovery efficiency* (SRE) of not less than 65% at 32°F (0°C) at an airflow not less than the design airflow. SRE shall be determined in accordance with CAN/CSA-C439 and compliance to the requirement shall be ~~listed~~ demonstrated by a listing in Home Ventilating Institute's Certified Product Directory. Linear interpolation of listed values for SRE shall be permitted.

R403.6.3 *Revise Subsection R403.6.3 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, Residential IAQ Fault Indicator Display certified to the California Energy Commission, or other airflow measuring device in accordance with either RESNET Standard 380 or ACCA Standard 5.

R403.6.4 *Add Subsection R403.6.4 as follows:*

R403.6.4 Air-moving equipment, selection and installation. As referenced in ASHRAE Standard 62.2, Section 7.1, ventilation devices and equipment shall be tested and certified in accordance with HVI 920 (Home Ventilating Institute), or equivalent, 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 *Add Subsection R403.6.5 as follows:*

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 *Add Subsection R403.6.6 as follows:*

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 or unless the function is communicated through a digital user interface provided with the control.

R403.6.7 *Add Subsection R403.6.7 as follows:*

R403.6.7 Air Inlets and Exhausts. All ventilation air inlets shall be located a minimum of 10 ft. 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 7 ft. 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 8 ft. 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.

SECTION R404 ELECTRICAL POWER AND LIGHTING SYSTEMS

R404.4 *Add Section R404.4 and Table R404.4 as follows:*

R404.4 Wiring for electric vehicle ready parking spaces ("EV ready spaces"). *EV ready spaces* shall be provided in accordance with Table R404.4. The dedicated 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 SAE J1772 or SAE J3400 electrical connector for *EVSE* servicing *Electric Vehicles*, located within 6 ft. (1828 mm) of each *EV ready space*. Conductors and outlets for *EVSE* shall be sized and installed in accordance with the MA electrical code.

TABLE R404.4 EV READY PARKING SPACE REQUIREMENTS

Type of Building	Number of parking spaces
1 & 2 family dwellings and town homes	At least one 50-amp branch circuit per dwelling unit to provide for AC Level II charging
All other R-use buildings	At least 20% of all installed spaces served with a 40-amp, 208/240-volt circuit with a minimum capacity of 9.6 kVA.

Exceptions:

1. In no case shall the number of required *EV Ready Spaces* be greater than the number of parking spaces installed.
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. R-1, and R-2 multi-family properties may elect to comply with Commercial EV ready requirements in C405.13.
4. One or more SAE Level II spaces may be substituted with multiple SAE Level I spaces provided with wiring for a minimum 20amp 120 volt EVSE, with a ratio of at least 3 Level I spaces for each Level II space required.

SECTION R405 TOTAL BUILDING PERFORMANCE

R405. *Replace Section R405 in its entirety as follows:*

Section R405 Passive House Building Certification Option.

R405.1 Compliance. Projects may document compliance with either Phius certification in accordance with R405.2.1 or PHI certification in accordance with R405.2.2 or follow R405.3. ~~Projects pre-certified as meeting the Phius CORE 2021 or Phius ZERO 2021 Passive Building Standard North America, or newer, demonstrated using approved software by Phius, where Phius design certification is demonstrated by Phius and a Certified Passive House Consultant (CPHC); or, Projects pre-certified as meeting the Certified Passive House standard using the current software and program criteria by the Passive House Institute (PHI), where PHI certification is demonstrated by a Certified Passive House Designer and a Certified Passive House Certifier.~~ Buildings shall be pre-certified as meeting the Phius CORE 2021 or Phius ZERO 2021 Passive Building Standard – North America, or newer, demonstrated using approved Passive House certification software and program criteria by PHIUS, where design-certification is demonstrated by Phius and a Certified Passive House Consultant (CPHC); or, Projects meeting the Certified Passive House standard using the approved Passive House certification software and program criteria by the Passive House Institute (PHI), where PHI certification is demonstrated by a PHI-accredited Certifier.

R405.2 ~~Phius~~ Documentation. Compliance with Phius or PHI shall be in accordance with R405.2.1 or R405.2.2.

R405.2.1 Phius Documentation. ~~When using WUFI Passive or other Phius-approved software:~~

1. Prior to the issuance of a building permit, the following items must be provided to the Building Official:
    a. A ~~Phius 2021 (or newer)~~ Passive House Verification report with results from the approved Passive House certification software which demonstrates project compliance with Phius CORE 2021 (or newer), or Phius ZERO 2021 (or newer) performance requirements.
    b. A statement from the CPHC that the verification report results accurately reflect the plans submitted.
    c. Evidence of project registration from Phius.

    OR

    a. A Design Certification Letter from Phius.

2. Prior to the issuance of a final certificate of occupancy, the following items must be provided to the building official:
    a. Design Certification Letter from Phius.
    b. An updated Passive House Verification Report ~~by the CPHC~~ with results from the approved Passive House certification software which reflects "as-built" conditions and test results (blower door and ventilation results) that demonstrate project compliance with Phius performance requirements ~~(blower door and ventilation results)~~.
    c. A statement from the CPHC that the envelope meets the Phius hygrothermal requirements found in Appendix B of the Phius 2021 Certification guidebook.
    d. A statement from the Phius project ~~Certified~~ Verifier ~~or Rater~~ that the project test results ~~and other Phius verification requirements are met~~ meet the model performance requirements, all the mandatory limits and any other mandatory requirements.
    e. A copy of the Phius workbook listing all testing results and as-built conditions.

    OR

    a. A ~~Project Certificate demonstrating final certification awarded~~ Final Certification Letter, provided by Phius.

    AND

    f. ~~A statement from the Phius Verifier or Rater~~ Verification of compliance with R404.4 EV ready, and Appendix RB: Solar Ready Provisions.

R 405.~~3~~2.2 Passive House ~~International~~ Institute (PHI) Documentation.

1. ~~If using PHI Passive House software,~~ P~~p~~rior to the issuance of a building permit, the following items must be provided to the Building Official:
    a. A PHPP (Passive House Planning Package) compliance report with results from the approved Passive House certification software which demonstrates project compliance with current PHI performance requirements;
    b. A statement from the PHI-accredited ~~Certified Passive House Consultant/Designer (CPHC/D)~~ Certifier that the approved Passive House certification software ~~PHPP~~ results and compliance report accurately reflect the plans submitted;
    c. Evidence of project registration from a PHI-accredited ~~Certified Passive House~~ Certifier.

OR

a. A ~~Design Certification Letter~~ Design State Conditional Assurance Letter from a PHI-accredited ~~Certified Passive House~~ Certifier.

2. Prior to the issuance of a final certificate of occupancy, the following items ~~item(s)~~ must be provided to the building official:
   a. A ~~Design Certification Letter~~ Design State Conditional Assurance Letter from a PHI-accredited ~~Certified Passive House~~ Certifier.
   b. An updated ~~PHPP~~ compliance report with results from the approved Passive House certification software which reflects "as-built" conditions and test results (blower door and ventilation results) that demonstrates project compliance with PHI performance requirements;
   c. A copy of both the air leakage test results and report on the commission settings and performance of the building's ventilation system;
   d. A statement from the ~~CPHD~~ Certified Passive House Consultant or Certified Passive House Designer that the project test results meet the model performance requirements, all the mandatory limits and any other mandatory requirements.

OR

   a. A Final Certification Letter from a PHI-accredited ~~Certified Passive House~~ Certifier.

AND

   e. ~~A statement from the Passive House Verifier or Rater~~ Verification of compliance with R404.4 EV ready, and Appendix RB: Solar Read Provisions.

R405.3 Documentation of projects that pursued Phius or PHI certification that did not achieve final certification.

R405.3.1 Compliance. Buildings shall be pre-certified per Section R405.1. If, at construction completion, final certification cannot be received from either Phius or PHI, this compliance pathway may be followed to receive a certificate of occupancy based on compliance with R405.3.2 Documentation. Compliance via R405.3.2 is not equivalent to either Phius or PHI Certification and will not designate the project as a certified passive house.

R405.3.2 Near Passive House Documentation. The following materials are required:

a. Statement from the Phius certified consultant or PHI-accredited verifier confirming project has completed all interim, final, and corrective testing and modeling requirements, including a summary of deviations from certification requirements.

b. Copy of executed contracts with Phius consultant or PHI rater/verifier covering all required inspections and testing requirements for certification.

c. Design phase pre-certification/approval, in the form of a statement issued from Phius or PHI-accredited verifier confirming design certification or pre-certification was achieved.

d. Report from rater/verifier demonstrating as-built conditions, including those that comply with Phius or PHI requirements, and those that do not.

i. If the initial whole building blower door tests do not meet the Phius or PHI airtightness requirement, a statement must be provided to reflect evidence of a re-test. Statement shall include an explanation for sources of leakage and attempted remediation efforts. Final test results shall not exceed Phius or PHI airtightness thresholds by more than 30%.

ii. If the mechanical ventilation flow rates and balance do not meet the requirements of Phius or PHI, report must show that installed ventilation system demonstrates compliance with the mechanical code in accordance with Section C403.

e. For projects with Phius design certification, provide final Energy Star and Zero Energy Ready Homes certificates.

f. A letter from a licensed professional engineer that states that the potential hygrothermal or moisture risk of the as-built assemblies, with the measured blower door test result, is acceptably low.

SECTION 406 ENERGY RATING INDEX COMPLIANCE ALTERNATIVE

R406.2 *Revise TABLE R406.2 as follows:*

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION[a]	**TITLE**
R403.6.1	Heat or Energy Recovery Ventilation
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R404.4	Wiring for Electric Vehicle Charging Spaces

[a] Reference to a code section includes all of the relevant subsections except as indicated in the table.

R406.3 *Reserve this section:*

R406.3 Building thermal envelope. *Reserved.*

R406.4 *Replace Section R406.4 with the following:*

R406.4 Energy Rating Index. The Energy Rating Index (ERI) shall be the RESNET certified HERS index determined in accordance with ANSI/RESNET/ICC 301. 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 *HERS index reference design* ~~ERI reference design~~ or the *rated design*.

R406.5 *Revise Section R406.5 and Table R406.5 as follows:*

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 a HERS index rating less than or equal to the appropriate value indicated in Table R406.5 when compared to the *HERS index reference design* for each *dwelling unit* prior to credit for onsite renewable electric generation.

TABLE R406.5 MAXIMUM ENERGY RATING INDEX

Clean Energy Application	**Maximum HERS Index score [a,b]**				
	~~New construction until June 30, 2024~~	New construction permits after July 1, 2024	New Construction with R406.5.2 embodied carbon credit	Accessory Dwelling Units	Major alterations, additions, or change of use[c]
Mixed-Fuel Building	~~52~~	42	45	52	~~52~~ 65
Solar Electric Generation	~~55~~	42	45	55	~~55~~ 70
All-Electric Building	~~55~~	45	48	55	~~55~~ 70
Solar Electric & *All-Electric Building*	~~58~~	45	48	58	~~58~~ 75

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

[b] The building shall meet the mandatory requirements of Section R406.2.~~, 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.~~

[c] Alterations, Additions or Change of use covered by Section R502.1.1 or R503.1.5 are subject to this maximum HERS rating~~.~~, except for *Historic Buildings* which may opt to follow R503.1.1 for *alterations*.

R406.5.1 *Add Subsection R406.5.1~~,~~ as follows:*

R406.5.1 Trade-off for clean energy systems. ~~New construction~~ Accessory dwelling units (ADUs) 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 4 kW or higher shall offset 3 HERS points for new ADUs, and 5 HERS points for ~~Level 3~~ alterations, change of use to Residential R-use occupancies ~~categories~~ or for fully attached additions.
2. *All-Electric Buildings* shall offset 3 HERS points for each dwelling unit in new construction, including new ADUs, and 5 HERS points for ~~Level 3~~ alterations, change of use to Residential R-use occupancies ~~categories~~ and fully attached additions.

R406.5.2 *Add Subsection R406.5.2 as follows:*

R406.5.2 Embodied carbon credit. New construction following Section R406 may use either of the following embodied carbon credits to increase the maximum allowable HERS rating for each unit by 3 HERS points as shown in Table R406.5:

1. **Insulation embodied carbon credit**: new single *dwelling units* or R-use buildings containing multiple *dwelling units* that demonstrate an average calculated insulation Global Warming Potential (GWP) intensity (kg $CO2_e/m^2$) less than 0 across the whole building envelope shall offset 3 HERS points for each applicable *dwelling unit* of new construction. GWP intensity shall be based on the default values in Table R406.5.3, or product specific EPDs or calculations in the approved tools: EC3 and BEAM, may be used in place of default table values.

2. **Low GWP concrete mix credit:** new single *dwelling units* or R-use buildings containing multiple *dwelling units* that demonstrate an average calculated concrete mix Global Warming Potential (GWP) for at least 90% of all concrete mix used in the building of not more than 100% of the 2022 NRMCA NorthEast Benchmark average values shown in Table R406.5.4 shall offset 3 HERS points for each applicable *dwelling unit* of new construction.

R406.5.3 *Add Subsection R406.5.3 as follows:*

R406.5.3 Documentation for insulation embodied carbon credit. In order to apply the insulation embodied carbon credit for a new *dwelling unit* or averaged across a multi-*dwelling unit* building, the HERS rater of the unit or building must submit a complete calculation to summarize estimated embodied carbon emissions from all insulation materials used in the project. The output metric for this measure shall be Global Warming Potential (GWP) intensity, capturing insulation GWP per conditioned square meter of project area. To complete the basic calculation, project teams shall provide the following information for foundation, floor, wall, and roof insulation materials:

1. Insulation material type
2. Product R-value
3. Total surface area (m^2)

4. Default, industry-average GWP value, from Table R406.5.3 or GWP values from Type III Product-specific Environmental Product Declaration (EPD)
5. Total project area (conditioned square feet)

Projects may substitute product-specific data for the default GWP value if the specified product has a lower reported GWP than the default value. Substitution of default GWP values is only allowed when type III product-specific EPDs are sourced and noted. Projects shall use GWP values that include A1-A3 lifecycle stages, as documented in product-specific EPDs, with the exception of SPF and XPS products. For these products, the A5 and B1 values shall be included in the documented GWP value to account for the on-site and off-gassing impact of blowing agents. Projects shall provide the EPDs declaration number in product-specific data substitution.

TABLE R406.5.3 *Add Table R406.5.3 as follows:*

TABLE R406.5.3 DEFAULT INSULATION GLOBAL WARMING POTENTIAL VALUES

All values are from Building Emissions Accounting for Materials (BEAM)[a], unless noted.

Insulation Material	**Default Global Warming Potential (GWP) in Kg CO^2e/ sq.m. RSI-1**
Cellular glass – Aggregate	3.93[b]
Cellulose – Densepack	-2.00
Cellulose – Blown/loosefill	-0.90
Cork – Board	-4.30
EPS/graphite – Board, unfaced, Type II – 15 psi	2.30
EPS/graphite – Board, unfaced, Type IX – 25 psi	3.10
EPS – Board, unfaced, Type I – 10 psi	2.50
EPS – Board, unfaced, Type II – 15 psi	3.40
EPS – Board, unfaced, Type IX – 25 psi	4.30
Fiberglass – Batt, unfaced	1.00
Fiberglass – Blown/loosefill	1.00
Fiberglass – Blown/spray	1.93[c]
Hemp – Batt	-0.50
HempCrete	-4.10
Mineral wool – Batt, unfaced	1.50
Mineral wool – Blown loose fill	1.90
Mineral wool – Board, unfaced, “light” density	2.70[f]
Mineral wool – Board, unfaced, “heavy” density	6.90[f]
Phenolic foam – Board	1.54[d]
Polyiso – Wall Board	4.10[e]
Polyiso – Roof Board (GRF facer)	2.11[e]
Polyiso – Roof Board (CGF facer)	2.95[e]
SPF – Spray, open cell	1.40

SPF – Spray, closed cell HFO	3.50
SPF – Spray, high density HFO	4.00
SPF – Spray, closed cell HFC	13.10
SPF – Spray, high density HFC	17.00
Straw - Panel	-5.45
Vacuum Insulated Panel	7.40
Wood fiber – Board unfaced, European	-4.38
Wood fiber – Board unfaced, North America	-10.30
Wood fiber – Batt, unfaced	-1.60
Wool (Sheep) - Batt	0.20
Wool (Sheep) - Loosefill	0.80
XPS – Board, 25psi HFC	55.5
XPS – Board, 25psi "Low GWP" (HFO/HFC)	5.50

[a]https://www.buildersforclimateaction.org/beam-estimator.html
[b]EPD Declaration Number
[c]EPD Declaration Number
[d]EPD Declaration Number EPD-KSI-20190072-IBC1-EN
[e]PIMA published ISO-compliant EPDs for polyiso products at:
https://www.polyiso.org/page/EPDs
[f]NAIMA value

R406.5.4 *Add Subsection R406.5.4 as follows:*

R406.5.4 Documentation for low GWP concrete mix credit. In order to apply the low GWP concrete mix credit for one or more new dwelling units, the HERS rater of the unit must submit specific EPDs for concrete used in the unit. Where multiple concrete mixes are used, a complete calculation to summarize estimated embodied carbon emissions from at least 90% of all concrete materials used in the project is required. The output metric for this measure shall be global warming potential (GWP) per cubic meter as supplied, with the EPD verified by the concrete ready-mix provider. The 3 HERS point credit shall be applied when the GWP per cubic meter is demonstrated to be less than the Maximum GWP per cubic meter value shown in Table R406.5.4. for at least 90% of all concrete used for that unit or building as appropriate.

Table R406.5.4 *Add Table R406.5.4 as follows:*

TABLE R406.5.4 DEFAULT CONCRETE GLOBAL WARMING POTENTIAL VALUES

Maximum GWP (kg CO_2e) Limits for Concrete	
NORMAL WEIGHT CONCRETE	
Specified Compressive Strength (f'c in psi)	**Maximum GWP per cubic meter[a]**
0-2500	240

2501-3000	264
3001-4000	314
4001-5000	378
5001-6000	399
6001-8000	472
LIGHT WEIGHT CONCRETE	
Specified Compressive Strength (f'c in psi)	**Maximum GWP per cubic meter[a]**
0-3000	517
3001-4000	573
4001-5000	628
[a]These numbers are 100% of the Eastern Region average GWP figures from the National Ready Mix Concrete Associations' "A Cradle-to-Gate Life Cycle Assessment of Ready-Mixed Concrete Manufactured by NRMCA Members, Version 3.2," (July 2022), pg. 65. NRMCA_LCAReportV3-2_20220224.pdf	

R406.6 *Revise Section R406.6 as follows:*

R406.6 Verification by approved agency. Verification of compliance with Section R406 as outlined in Sections R406.4 and R406.5 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.

R407 *Reserve this Section:*

SECTION R407 RESERVED

R408 *Revise Section R408 as follows:*

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 90% 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 ~~10 HSPF/16 SEER air source heat pump.~~ 8.1 HSPF2 and 15.2 SEER2 for ducted heat pumps and 8.5 HSPF2 and 16 SEER2 for ductless heat pumps.

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

Chapter 5: [RE] EXISTING BUILDINGS

SECTION R501 GENERAL.

R501.2 *Amend Section R501.2 to add an exception as follows:*

R501.2 Compliance. Additions, alterations, repairs or changes of occupancy to, or relocation of, an existing building, building system or portion thereof shall comply with Section R502, R503, R504 or R505, respectively, in this code. Changes where unconditioned space is changed to conditioned space shall comply with Section R502.

Exception: Projects that elect to follow Section R506 EnerPHit Standard.

SECTION R502 ADDITIONS.

R502.1 *Revise Section R502.1 as follows:*

R502.1 General. *Additions* to an existing *building*, *building* system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portion of the existing *building* or *building* system to comply with this code. *Additions* shall not create an unsafe or hazardous condition or overload existing *building* systems. An *addition* shall be deemed to comply with this code where the *addition* alone complies, where the existing *building* and *addition* comply with this code as a single building, or where the ~~building~~ *dwelling unit* with the *addition* achieves a certified HERS rating in accordance with Table R406.5. *Additions* shall be in accordance with Section R502.1.1, R502.2 or R502.3.

R502.1.1 *Add Subsection R502.1.1 as follows:*

R502.1.1 Large additions. *Additions* to a *dwelling unit* exceeding 1,000 sq ft or exceeding 100% of the existing *conditioned floor area*, shall require the combined *dwelling unit* to comply with the maximum HERS ratings for alterations, additions or change of use shown in Table R406.5.

> **Exception:** *Additions* that add existing basement or attic spaces to the *conditioned floor area* of an existing *dwelling unit* due to changing the thermal boundary but not changing the building footprint or roofline do not require a HERS rating.

R502.2 *Revise Section R502.2 by deleting the Exceptions:*

R502.2 Change in space conditioning. Any unconditioned or low-energy space that is altered to become *conditioned space* shall be required to be brought into full compliance with Chapter 5, as appropriate.

R502.3.1 *Revise the Exception in Subsection R502.3.1 as follows:*

R502.3.1 Building envelope. New *building* envelope assemblies that are part of the *addition* shall comply with Sections R402.1, R402.2, R402.3.1 through R402.3.5, and R402.4.

> **Exception:** New envelope assemblies in additions of less than 1,000 sq. ft. are exempt from the requirements of Section R402.4.1.2.

SECTION R503 ALTERATIONS

R503.1.1 *Revise Exception 2 as follows:*

Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation with a minimum of R-3.7 per inch for the depth of the cavity.

R503.1.5 *Add new Subsection R503.1.5 as follows:*

R503.1.5 Extensive Alterations and Level 3 Alterations. Alterations that meet either of the following criteria shall require the building or *dwelling unit* to comply with the maximum HERS ratings for alterations, additions or change of use shown in Table R406.5:

1) Meet the IRC definition for *Extensive Alteration* and that exceeds 1000 sq ft or 100% of the existing conditioned floor area of the dwelling unit for one- and two-family dwellings and multiple single-family dwellings(townhouses).
2) Meet the IEBC definition for *Level 3 Alteration* and that exceeds 1000 sq ft or 100% of the existing conditioned floor area of the building area for Group R-2, R-3, and R-4 buildings with three stories or less in height above grade plane, other than one- and two-family dwellings and multiple single-family dwellings(townhouses).

SECTION R505 CHANGE OF USE OR OCCUPANCY

R505.1 *Delete the Exception in Section R505.1.*

R506 Add Section R506 as follows:

SECTION R506 ENERPHIT STANDARD COMPLIANCE PATHWAY

R506 EnerPHit Standard. This option requires compliance with Section R506.1 and R506.2.

R506.1 Compliance. Buildings shall be pre-certified as meeting the EnerPHit Retrofit Plan standard using the approved Passive House certification software and program criteria by the Passive House Institute (PHI), where PHI certification is demonstrated by a PHI-accredited Certifier.

R506.2 Documentation.

1. Prior to the issuance of a building permit, the following items must be provided to the Building Official:
    a. A PHPP compliance report with results from the approved Passive House certification software which demonstrates project compliance with current PHI performance requirements;
    b. A statement from the PHI-accredited Certifier that the approved Passive House certification software results and compliance report accurately reflect the plans submitted;
    c. Evidence of project registration from a PHI-accredited Certifier.
    OR
    a. A Design State Conditional Assurance Letter from a PHI-accredited Certifier.

2. Prior to the issuance of a final certificate of occupancy, the following items must be provided to the building official:
    a. A Design State Conditional Assurance Letter from a PHI-accredited Certifier.
    b. An updated compliance report with results from the approved Passive House certification software which reflects "as-built" conditions and test results (blower door and ventilation results) that demonstrates project compliance with PHI performance requirements;
    c. A copy of both the air leakage test results and report on the commission settings and performance of the building's ventilation system;
    d. A statement from the Certified Passive House Consultant or Certified Passive House Designer that the project test results meet the model performance requirements, all the mandatory limits and any other mandatory requirements.

    OR
    a. A Final Certification Letter from a PHI-accredited Certifier.

Appendix RB *revise the Appendix RB title as follows:*

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

RB101.1 *Revise Section RB101.1 as follows:*

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

> **Exception:** Buildings and *dwelling units* complying with Appendix RC Sections RC102 or RC105.

RB103.1 *Replace Section RB103.1 as follows:*

RB103.1 General. New R-use buildings including, but not limited to, detached one- and two-family dwellings, and townhouses with not less than 600 sq. ft. (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% of daylight hours annually.

RB103.3 *Replace ~~International Fire Code with Massachusetts Fire Code in~~ Section RB103.3 as follows:*

RB103.3 Solar-ready zone area. The total solar-ready zone area shall be not less than 300 square feet (27.87 m2) exclusive of mandatory access or setback areas as required by the ~~International~~ Massachusetts 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 m2) per ~~dwelling~~ *dwelling unit* shall have a solar-ready zone area of not less than 150 square feet (13.94 m2). 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 m2) exclusive of access or setback areas as required by the ~~International~~ Massachusetts Fire Code.

Appendix RC *Revise the Appendix RC title and notes as follows:*

APPENDIX RC – MASSACHUSETTS MUNICIPAL OPT-IN SPECIALIZED STRETCH CODE ~~2023~~2024

RESIDENTIAL LOW-RISE BUILDING PROVISIONS

The provisions contained in this appendix together with referenced sections from the Stretch energy code constitute the Specialized opt-in code for residential low-rise buildings, and may be adopted by a city or town together with the Commercial Specialized code Appendix CC as their stretch energy code. When adopted by the local municipality, the provisions in this appendix are mandatory in combination with the IECC2021 with Massachusetts Stretch code amendments.

User Note:

About this appendix: *This appendix provides requirements for residential buildings. Where adopted by ordinance as a requirement, Section RC101 language is intended to replace Section R401.2.*

SECTION RC101 COMPLIANCE

RC101 *Replace Section RC101 as follows:*

RC101.1 Compliance. Existing residential buildings shall comply with Chapter 5 of the stretch energy code. New residential buildings shall be *Net Zero Buildings* and comply with Section R404.4 (EV wiring) and either Section R405 (Passive House) or Section R406 (HERS) in accordance with RC101.2, as well as one of the following Specialized code pathways:

1. Section RC102 Zero Energy pathway
2. Section RC103 All-Electric pathway
3. Sections RC104 and RC105 Mixed-Fuel pathway

RC101.2 Application. New *dwelling units* over 4,000 sq.ft. in *conditioned floor area* shall comply with either RC101.1 option 1. Zero Energy pathway or option 2. All-Electric pathway, and follow either Section RC102 or Section RC103.

R-use buildings with total *conditioned floor area* greater than 12,000 sq.ft. shall comply with the provisions of Section R405 Passive House Building Certification Option, and any of the pathways in Section RC101.1.

Exception: Residential *Group R-1* occupancies containing *sleeping units* where the occupants are primarily *transient* in nature such as hotels (*transient*) and motels (*transient*) may comply with R401.2.1 Prescriptive compliance option including R401.2.5 Additional Energy Efficiency.

RC101.3 Definitions.

NET ZERO BUILDING. A building which is consistent with achievement of MA 2050 net zero emissions, through a combination of highly energy efficient design together with being either a *Zero Energy Building*, or an *All-Electric Building*, or where fossil fuels are utilized, a building fully pre-wired for future electrification and that generates solar power on-site from the available *Potential Solar Zone Area*.

ZERO ENERGY BUILDING. A building which through a combination of highly energy efficiency design and onsite renewable energy generation is designed to result in net zero energy consumption over the course of a year as measured in MMBtus or KWh_{eq}, on a site energy basis, excluding energy use for charging vehicles.

RC102 *Replace Section RC102 and Table RC102.2 as follows:*

SECTION RC102 ZERO ENERGY PATHWAY

RC102.1 General. New *zero energy buildings* shall comply with Section RC102.2 and demonstrate a certified HERS rating of 0 or less and comply with Section R406, or complete Design Certification to the Phius ZERO standard and comply with Section R405.

RC102.2 Energy Rating Index zero energy score. Compliance with this section requires that the final HERS rated design be shown to have a score less than or equal to the values in Table RC102.2 when compared to the HERS reference design determined in accordance with ANSI/RESNET/ICC 301 for both of the following:

1. HERS value not including on-site power production (OPP) calculated in accordance with ANSI/RESNET/ICC 301.
2. HERS value including on-site power production calculated in accordance with RESNET/ICC 301 with the OPP in Equation 4.1.2 of ANSI/RESNET/ICC 301.

TABLE RC102.2 MAXIMUM HERS RATING INDEX[a]

FUEL USAGE	HERS INDEX not including OPP	HERS INDEX not including OPP, with embodied carbon credit[b]	Accessory Dwelling Unit HERS INDEX not including OPP	HERS INDEX including OPP
All Electric	45	48	55	0
Mixed-Fuel	42	45	52	0

a. The ~~building~~ *dwelling unit* shall meet the mandatory requirements of Section R406.2 ~~and the building thermal envelope shall be greater~~

~~than or equal to the levels of efficiency and SHGC in Table R402.1.2 or R402.1.3~~.

b. Embodied carbon credit in accordance with R406.5.2, and R406.5.3 or R406.5.4.

RC103 *Add Section RC103 and Table RC103.2 as follows:*

SECTION RC103 ALL ELECTRIC PATHWAY

RC103.1 General. New *all electric buildings* shall comply with Section R401.2.5 and either Section RC103.2 to demonstrate a certified final HERS rating for each *dwelling unit* ~~of 45 or less~~, or Section R405 and be pre-certified to the PHI or Phius CORE standard.

All new buildings shall comply with Appendix RB solar ready provisions and Section R404.4 Wiring for Electric Vehicle Charging Spaces.

RC103.2 All Electric HERS Rating Index score. Compliance with this section requires that the rated design for each *dwelling unit* be shown to have a certified HERS Index score less than or equal to the values in Table RC103.2 when compared to the HERS reference design determined in accordance with ANSI/RESNET/ICC 301 ~~and the following~~:

~~1. HERS value not including on-site power production (OPP) calculated in accordance with RESNET/ICC 301.~~

TABLE RC103.2 MAXIMUM HERS RATING INDEX[a]

FUEL USAGE	HERS INDEX not including OPP	HERS INDEX not including OPP, with embodied carbon credit[b]	Accessory Dwelling Unit HERS INDEX not including OPP
All Electric	45	48	55

a. The ~~building~~ *dwelling unit* shall meet the mandatory requirements of ~~Table~~ Section R406.2 ~~and the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or R402.1.3~~.

b. Embodied carbon credit in accordance with R406.5.2, and R406.5.3 or R406.5.4.

RC104 *Add Section RC104 and Table RC104.2 as follows:*

SECTION RC104 MIXED-FUEL PATHWAY

RC104.1 General. This section establishes requirements for new *residential mixed-fuel buildings* with any space heating systems, water heating systems or appliances capable of using fossil fuels such as natural gas, heating oil or propane fuel. All buildings or *dwelling units* shall comply with either:

1. HERS certification: Sections RC104.2 through RC104.5 and RC105

2. Passive House pre-certification: Section R405 and Section RC104.3

RC104.1.1 Biomass heating. New *residential buildings* using *clean biomass heating systems* may comply with this section. Biomass heating that does not meet the performance standards of *clean biomass heating systems* shall not be permitted as a primary heating system.

RC104.2 HERS Rating Index score. Compliance with this section requires that the rated design be shown to have a HERS Index score less than or equal to the values in Table RC104.2 ~~RC103.2~~ when compared to the HERS reference design determined in accordance with ANSI/RESNET/ICC 301 ~~for both of the following~~:

~~1. HERS value not including on-site power production (OPP) calculated in accordance with RESNET/ICC 301.~~

TABLE RC104.2 MAXIMUM HERS RATING INDEX[a]

FUEL USAGE	HERS INDEX not including OPP	HERS INDEX not including OPP, with embodied carbon credit[b]	Accessory Dwelling Unit HERS INDEX not including OPP
Mixed-Fuel building	42	45	52

a. The ~~building~~ *dwelling unit* shall meet the mandatory requirements of ~~Table~~ Section R406.2 ~~and the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or R402.1.3~~.

b. Embodied carbon credit in accordance with R406.5.2, and R406.5.3 or R406.5.4.

RC104.3 Electric readiness. Any installed gas, fuel oil or propane furnaces, boilers, water heaters, dryers, or cooking equipment shall comply with the requirements of Sections RC104.3.1 through RC104.3.4. Capacity for the future electric circuits required in this section shall be included in the load calculations of the original installation of electric service to the building and each *dwelling unit*.

RC104.3.1 Space heating. The building and each *dwelling unit* shall be provided with a designated exterior location(s) in accordance with the following:

1. Natural drainage for condensate from cooling equipment operation or a condensate drain located within 3 ft. (914 mm), and
2. A dedicated branch circuit in compliance with IRC Section E3702.11 based on heat pump space heating equipment sized in accordance with R403.7 and terminating within 3 ft. (914 mm) of the location with no obstructions. Both ends of the branch circuit shall be labeled “For Future Heat Pump Space Heater.”

Exception: Where an electrical circuit in compliance with IRC Section E3702.11 exists for space cooling equipment based on heat pump space heating equipment sized in accordance with R403.7.

RC104.3.2 Household ranges and cooking appliances. An individual branch circuit outlet with a minimum rating of 250-volts, 40-amperes shall be installed within 3 ft. of each gas or propane range or permanently installed cooking appliance.

RC104.3.3 Household clothes dryers and water heaters. An individual branch circuit outlet with a minimum rating of 250-volts, 30-amperes shall be installed within 3 ft. of each gas or propane household clothes dryer and water heater.

RC104.3.4 Water heating space. Any permanently installed domestic hot water heating equipment shall be installed in an indoor space:
A) with a minimum volume of 700 cu. ft. (20,000 L) or the equivalent of one 16-inch (406 mm) by 24-inch (610 mm) grill to a heated space and one 8-inch (203 mm) duct of no more than 10 ft. (3048 mm) in length for cool exhaust air.
B) that is at least 3 ft. (914 mm) by 3 ft. (914 mm) by 7 ft. (2134 mm) high surrounding or within 3 ft. (914 mm) of the installed water heater.

RC104.4 On-site renewable energy
New buildings shall comply with either RC104.4.1 or RC104.4.2. Buildings with d*welling units* following HERS certification shall comply with the requirements of RC105 solar-roof zone. Buildings following the Passive House pre-certification shall comply with Appendix RB solar ready provisions.

RC104.4.1 One- and two- family dwellings and townhouses. One- and two- family dwellings and townhouses shall install an on-site renewable energy system with a nameplate DC power rating measured under standard test conditions, of not less than 4kW per *dwelling unit.*

Exception:
1. A building or where the *potential solar zone area* is less than 300 sq.ft.

RC104.4.2 Other group R occupancies. Buildings in Group R-2, R-3 and R-4 shall install an on-site renewable energy system with a rated capacity of not less than 0.75 W/ft^2 multiplied by the gross conditioned floor area.

Exceptions:
1. A building with a permanently installed domestic solar water heating system with a minimum solar savings fraction of 0.5.
2. A building where the *potential solar zone area* is less than 300 sq.ft.

RC104.5 Electric vehicle readiness. All buildings shall comply with Section R404.4 Wiring for electric vehicle charging spaces.

RC105 *Add Section RC105 as follows:*

SECTION RC105 SOLAR-ROOF ZONE

RC105.1 General. New detached one- and two-family dwellings, and townhouses with not less than 600 sq.ft. (55.74 m^2) of roof area oriented between 110 degrees and 270 degrees of true north shall comply with Sections RC105.2 through RC105.10.

> **Exception:** A building where all areas of the roof that would otherwise meet the requirements of Section RC105 are in full or partial shade for more than 70% of daylight hours annually.

RC105.2 Construction document requirements for solar zone. Construction documents shall indicate the solar zone.

RC105.3 Solar zone area. The total solar zone area shall be not less than 300 sq.ft. (27.87 m^2) exclusive of mandatory access or setback 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 sq.ft. (185.8 m^2) per *dwelling unit*-shall have a solar zone area of not less than 150 sq.ft. (13.94 m^2). The solar zone shall be composed of areas not less than 5 feet (1524 mm) in width and not less than 80 sq.ft. (7.44 m^2) exclusive of access or setback areas as required by the *MA Fire Code*.

RC105.4 Obstructions. Solar zones shall be free from obstructions, including but not limited to vents, chimneys, and roof-mounted equipment.

RC105.5 Shading. The solar zone shall be set back from any existing or new permanently affixed object on the building or site that is located south, east or west of the solar zone a distance not less than two times the object's height above the nearest point on the roof surface. Such objects include, but are not limited to, taller portions of the building itself, parapets, chimneys, antennas, signage, rooftop equipment, trees and roof plantings.

RC105.6 Capped roof penetration sleeve. A capped roof penetration sleeve shall be provided adjacent to a solar zone located on a roof slope of not greater than 1 unit vertical in 12 units horizontal (8% slope). The capped roof penetration sleeve shall be sized to accommodate photovoltaic system conduit and shall have an inside diameter of not less than $1^1/4$ inches (32 mm).

RC105.7 Roof load documentation. The structural design loads for roof dead load and roof live load shall be clearly indicated on the construction documents.

RC105.8 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.

RC105.9 Electrical service reserved space. The main electrical service panel shall have space to allow installation of a dual pole circuit breaker for solar electric installation.

RC105.10 Construction documentation certificate. A permanent certificate, indicating the

solar PV system size in AC and DC KW and or solar thermal size in KW equivalent 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.

CHAPTER 6 [RE] REFERENCED STANDARDS

REFERENCED STANDARDS *Add the following Referenced Standards:*

AHRI	Air-Conditioning, Heating & Refrigeration Institute
	2311 Wilson Blvd., Suite 400,
	Arlington, VA 22201
1060-2018.	Performance Rating of Air-To-Air Exchangers for Energy Recovery
	Ventilation Equipment.
CSA	CSA Group
	8501 East Pleasant Valley Road,
	Cleveland, OH 44131-5516
CAN/CSA-C439-18.	Laboratory methods of test for rating the performance of heat/energy recovery ventilators.

REGULATORY AUTHORITY

M.G.L. c. 25A, §. 6; St. 2021, c. 8.