Section R501 General

R501.1 Scope

The provisions of this chapter shall control the *alteration*, *repair*, *addition* and change of occupancy of existing *buildings* and structures.

R501.1.1 General

Except as specified in this chapter, this code shall not be used to require the removal, *alteration* or abandonment of, nor prevent the continued use and maintenance of, an existing *building* or *building* system lawfully in existence at the time of adoption of this code. Unaltered portions of the existing *building* or *building* supply system shall not be required to comply with this code.

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 General

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 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 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.

TABLE R406.5
MAXIMUM ENERGY RATING INDEX

	Maximum HERS Index score [a,b]			
	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	42	45	52	65
Solar Electric Generation	42	45	55	70
All-Electric Building	45	48	55	70
Solar Electric & *All-Electric Building*	45	48	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.

[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, additions or change of use.*

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 Prescriptive Compliance

Additions shall comply with Sections R502.3.1 through R502.3.4.

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.

R502.3.2 Heating and Cooling Systems

HVAC ducts newly installed as part of an *addition* shall comply with Section R403.

Exception: Where ducts from an existing heating and cooling system are extended to an *addition*.

R502.3.3 Service Hot Water Systems

New service hot water systems that are part of the *addition* shall comply with Section R403.5.

R502.3.4 Lighting

New lighting systems that are part of the *addition* shall comply with Section R404.1.

Section R503 Alterations

R503.1 General

Alterations to any building or structure shall comply with the requirements of the code for new construction, without requiring the unaltered portions of the existing building or building system to comply with this code. *Alterations* shall be such that the existing building or structure is not less conforming to the provisions of this code than the existing *building* or structure was prior to the *alteration*.

Alterations shall not create an unsafe or hazardous condition or overload *existing* building systems. *Alterations* shall be such that the existing *building* or structure does not use more energy than the existing building or structure prior to the *alteration*. *Alterations* to existing *building*s shall comply with Sections R503.1.1 through R503.1.4.

R503.1.1 Building Envelope

Building envelope assemblies that are part of the *alteration* shall comply with Section R402.1.2 or R402.1.3,
Sections R402.2.1 through R402.2.12, R402.3.1, R402.3.2, R402.4.3 and R402.4.5.

Exception: The following alterations shall not be required to comply with the requirements for new construction provided that the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.

2. 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.
3. Construction where the existing roof, wall or floor cavity is not exposed.
4. Roof recover.
5. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
6. Surface-applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provided that the code does not require the glazing or fenestration assembly to be replaced.

R503.1.1.1 Replacement Fenestration

Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for *U*-factor and SHGC as specified in Table R402.1.3. Where more than one replacement fenestration unit is to be installed, an area-weighted average of the *U*-factor, SHGC or both of all replacement fenestration units shall be an alternative that can be used to show compliance.

R503.1.2 Heating and Cooling Systems

HVAC ducts newly installed, as part of an *alteration* shall comply with Section R403.

Exception: Where ducts from an existing heating and cooling system are extended.

R503.1.3 Service Hot Water Systems

New service hot water systems that are part of the *alteration* shall comply with Section R403.5.

R503.1.4 Lighting

New lighting systems that are part of the *alteration* shall comply with Section R404.1.

Exception: *Alterations* that replace less than 10 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.

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).

R402.1.3 R-Value Alternative

Assemblies with *R*-value of insulation materials equal to or greater than that specified in Table R402.1.3 shall be an alternative to the *U*-factor in Table R402.1.2

TABLE R402.1.3

INSULATION MINIMUM *R*-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b, i]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b, e]	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE[g]	MASS WALL *R*-VALUE[h]	FLOOR *R*-VALUE	BASEMENT[c,g] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c,g] WALL *R*-VALUE
0	NR	0.75	0.25	30	13 or 0& 10ci	3/4	13	0	0	0
1	NR	0.75	0.25	30	13 or 0& 10ci	3/4	13	0	0	0
2	0.40	0.65	0.25	49	13 or 0& 10ci	4/6	13	0	0	0
3	.30	0.55	0.25	49	20 or 13& 5ci[h] or 0& 15ci[h]	8/13	19	5ci or 13[f]	10ci, 2 ft	5ci or 13[f]
4 except Marine	.30	0.55	0.40	60	30 or 20&5ci[h] or 13& 10ci[h] or 0&20ci[h]	8/13	19	10ci or 13	10ci, 4 ft	10ci or 13
5 and Marine 4	0.30[i]	0.55	NR	49	30 or 20&5ci[h] or 13& 10ci[h] or 0&20ci[h]	13/17	30	15ci or 19 or 13+5ci	10ci, 4 ft	15ci or 19 or 13+5ci
6	0.30[i]	0.55	NR	60	30 or 20&5ci[h] or 13& 10ci[h] or 0&20ci[h]	15/20	30	15ci or 19 or 13& 5ci	10ci, 4 ft	15ci or 19 or 13& 5ci
7 and 8	0.30[i]	0.55	NR	60	30 or 20&5ci[h] or 13&10ci[h] or 0&20ci[h]	19/21	38	15ci or 19 or 13& 5ci	10ci, 4 ft	15ci or 19 or 13& 5ci

For SI: 1 foot = 304.8 mm.

NR = Not Required.

ci = continuous insulation.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. "5ci or 13" means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13&5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs. as indicated in the table. The slab-edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in Warm Humid locations as defined by Figure R301.1 and Table R301.1.

g. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, "13&5" means R-13 cavity insulation plus R-5 continuous insulation.

h. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

i. A maximum *U*-factor of 0.32 shall apply in Climate Zones 3 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4,000 feet in elevation, or
2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the *International Residential Code*.

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

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 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.

RB103.2 Construction Document Requirements for Solar-Ready Zone

Construction documents shall indicate the solar-ready zone.

RB103.3 Solar-ready zone area.

The total solar-ready zone area shall be not less than 300 sq. ft. (27.87 m2) exclusive of mandatory access or setback areas as required by the 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 sq. ft. (185.8 m2) per dwelling unit shall have a solar-ready zone area of not less than 150 sq. ft. (13.94 m2). The solar-ready zone shall be composed of areas not less than 5 ft. (1524 mm) in width and not less than 80 sq. ft. (7.44 m2) exclusive of access or setback areas as required by the Massachusetts Fire **Code.**

RB103.4 Obstructions

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

RB103.5 Shading

The solar-ready 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.

RB103.6 Capped Roof Penetration Sleeve

A capped roof penetration sleeve shall be provided adjacent to a solar-ready zone located on a roof slope of not greater than 1 unit vertical in 12 units horizontal (8-percent slope). The capped roof penetration sleeve shall be sized to accommodate the future photovoltaic system conduit, but shall have an inside diameter of not less than $1^1/_4$ inches (32 mm).

RB103.7 Roof Load Documentation

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

RB103.8 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.

RB103.9 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.

RB103.10 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.