

780 CMR: MASSACHUSETTS AMENDMENTS TO THE *INTERNATIONAL BUILDING CODE 2015***CHAPTER 13: ENERGY EFFICIENCY**

1300.1 Add the following sections as follows:

1301.1.1 Revise subsection as follows:

[E] 1301.1.1 Criteria. Buildings shall be designed and constructed in accordance with the *International Energy Conservation Code-2015* ("IECC") as amended by 780 CMR 13.00. These amendments are intended to expressly apply to the IECC, and are also applicable, in intent, to ANSI/ASHRAE/IESNA 90.1.

Exception: Temporary structures, as regulated by section 3103, do not need to comply with the building envelope requirements of 780 CMR 13.00.

C401.2 Revise section as follows:

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1-2013, as modified by C401.2.2 and C406.1 if following Appendix G.
2. The requirements of sections C402 through C405. In addition, commercial buildings shall comply with section C406 and tenant spaces shall comply with section C406.1.1.
3. The requirements of sections C402.5, C403.2, C404, C405.2, C405.3, C405.4, C405.6 and C407. The building energy cost, or the total annual energy use on either a site or source energy basis, shall be equal to or less than 85% of the standard reference design building. Source energy calculations shall comply with C401.2.2.1.
4. Residential use buildings up to five stories may elect to comply with the energy provisions of section N1106 (R406) found in 780 CMR 51.00: *Massachusetts Residential Code*, provided all units are separately rated, separately metered, individually heated and cooled, and have kitchens.

C401.2.2 through C401.2.2.2 Add subsection as follows:

C401.2.2 Performance Rating Method for Source Energy. Add exception to ANSI/ASHRAE/IESNA 90.1 APPENDIX G PERFORMANCE RATING METHOD, section G1.1.

Exception: When Appendix G is used for the comparison of building energy consumption only, the comparison may be performed on site energy and/or on a source energy basis.

C401.2.2.1 Source Energy Method. For the purpose of quantifying the projected Source Energy consumption of a building, the Site to Source Fuel Conversion factors in Table 401.2.2 shall apply.

Table 401.2.2 Site to Source Fuel Conversion Factors

Load Type	Factor
Electric power use at the utility meter	3.01
Natural Gas	1.09
Fuel Oil	1.13
LPG	1.12
Purchased District Heating	
Hot Water	1.35
Steam	1.45
Purchased District Cooling	0.99
Fossil fuels not listed	1.1
Purchased Combined Heat and Power District Heat	0

Note: A source fuel conversion for purchased district heat supplied by a combined heat and power central utility will be published by the Massachusetts Department of Energy Resources on a per district system basis.

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C401.2.2.2 Approved Software for Source Energy Calculation with Combined Heat and Power.

1. Determination of the source energy consumption and usage intensity, when using purchased combined heat and power district heat, shall be performed as an exceptional calculation using the Department of Energy Resources ("DOER") approved Excel worksheet.
2. Determination of the source energy consumption and usage intensity for heat generated by a combined heat and power system located on-site shall be performed using software meeting the requirements of ASHRAE 90.1 Normative Appendix G Performance Rating Method, section G 2.2 Simulation Program, and has an explicitly stated capability to determine both the site and source energy use intensity for combined heat and power systems without the requirement for exceptional calculations as defined in ASHRAE 90.1 Appendix G section G2.5.

C402.2.5 Delete the exception.

C402.3 through C402.3.1 Delete the section and subsection, and replace with the following sections C402.3 through C402.3.6:

C402.3 Rooftop Solar Readiness. New low-rise commercial buildings and additions of less than four stories above grade, with not less than 2,400 square feet of roof area that is either flat or oriented between 110 degrees and 270 degrees of true north, shall comply with sections C402.3.1 through C402.3.6.

Exceptions:

1. Assembly Group A-2 and A-3, and High Hazard Group H buildings.
2. Buildings with a permanently installed on-site renewable energy system.
3. Flat roof areas designed for rooftop vehicle parking facilities.
4. Buildings with a solar-ready zone that is shaded for more than 50% of daylight hours annually.
5. Buildings and structures, as designed and shown in construction documents, that do not meet the conditions for a solar-ready zone area are exempt from the requirements of C402.3.

C402.3.1 Construction Document Requirements for Solar-ready Zone. Construction documents shall indicate the solar-ready zone where applicable.

C402.3.2 Solar-ready Zone Area. The total solar-ready zone area shall consist of an area not less than 1,600 square feet, or 50% of the roof area that is either flat or oriented between 110 degrees and 270 degrees of true north, exclusive of mandatory access or set back areas as required by 527 CMR: *Board of Fire Prevention Regulations* (also known as the Massachusetts Fire Code).

C402.3.3 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 C402.3.3 shall require any construction documents to be redesigned or reconfigured so as to create a solar-ready zone area.

C402.3.4 Roof Load Documentation. The structural design loads for roof dead load and roof live load shall be clearly indicated on the construction documents.

C402.3.5 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.

C402.3.6 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".

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C402.5.1.2 Delete clay or shale masonry as a prescribed air barrier material or assembly as follows:

C402.5.1.2 Air Barrier Compliance Options. A continuous air barrier for the opaque building envelope shall comply with section C402.5.1.2.1 or C402.5.1.2.2.

C402.5.1.2.1 Materials. Materials with an air permeability not greater than 0.0004 cfm/ft² under a pressure differential of 0.3 inch water gauge (75 Pa) when tested in accordance with ASTM E 2178 shall comply with this section. Materials in Items 1 through 15 shall be deemed to comply with this section, provided joints are sealed and materials are installed as air barriers in accordance with the manufacturer's instructions.

C402.5.1.2.2 Assemblies. Assemblies of materials and components with an average air leakage not greater than 0.04 cfm/ft² under a pressure differential of 0.3 inch of water gauge (75 Pa) when tested in accordance with ASTM E 2357, ASTM E 1677 or ASTM E 283 shall comply with this section. Assemblies listed in Items 1 through 2 shall be deemed to comply, provided joints are sealed and the requirements of section C402.5.1.1 are met.

C402.6 Add section as follows:

C402.6 Approved Calculation Software Tools. The following software tools are sufficient to demonstrate compliance with section C401.2 options 1 or 2:

1. **COMcheck:** Version 4.0.6, or later, which can be accessed at: <https://www.energycodes.gov/>.
2. Any other software tool approved by the BBRB.

C405.1 Revise section as follows:

C405.1 General (Mandatory). This section covers lighting systems controls, the maximum lighting power for interior and exterior applications and electrical energy consumption.

Exception: Dwelling units within commercial buildings shall not be required to comply with sections 405.2 through 405.5, provided that they comply with sections R404.1 and R404.2.

Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with section C403.2.15 or C403.2.16.

C405.10 Reserved

C406.1 Revise section as follows:

C406.1 Requirements. Buildings shall comply with at least two of the following:

1. More efficient HVAC performance in accordance with section C406.2.
2. Reduced lighting power density system in accordance with section C406.3.
3. Enhanced lighting controls in accordance with section C406.4.
4. On-site supply of renewable energy in accordance with section C406.5.
5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with section C406.6.
6. High-efficiency service water heating in accordance with section C406.7.

Exception 1: Buildings in municipalities not served by a participating Mass Save investor-owned gas or electric utility provider shall comply with at least one of the requirements in section C406.1.

Exception 2: Buildings being designed utilizing ANSI/ASHRAE/IESNA 90.1-2013 shall comply with Item 2 of C406.1 as well as at least one of the remaining items listed in C406.1.

C406.5 Revise section as follows:

C406.5 On-site Renewable Energy. Total minimum ratings of on-site renewable energy systems shall comply with one of the following:

1. Provide not less than 0.50 watts per square foot (5.4 W/m²) of conditioned floor area.

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2. Provide not less than 3% of the design energy used within the building for building mechanical and service water heating equipment and lighting regulated in chapter 4.
3. Provide not less than 65% of the total annual energy used within the building for building space and service water heating with biomass fuel using direct vented combustion mechanical equipment rated at a minimum of 80 AFUE. The biomass fuel shall meet the eligible fuel and emission criteria under M.G.L. c. 25A, § 11F½ (Massachusetts alternative energy portfolio standard).
4. Provide not less than 65% of the total annual energy used within the building for building space and service water heating using a geothermal heat pump system with a coefficient of performance of not less than 4.

C407.6.1.1 through C407.6.1.5 Add subsections as follows:

C407.6.1.1 Approved Alternative Energy Performance Methods. The requirements of this section are approved performance methods to demonstrate compliance with section C407 without calculation of a standard reference design:

1. **RESNET Approved Software for Home Energy Rating System ("HERS").** For residential units within a building up to five stories above grade plane, and with independent unit-level heating and cooling systems, a HERS rater verified index score of 55 or less for the finished units together with a completed and HERS rater verified ENERGY STAR Thermal Enclosure Checklist may be used. Compliance with this section requires that the criteria of C402.4, C403.2, C404 and C405 are met.
2. **Passive House Institute US ("PHIUS") or Passive House Institute ("PHI") Approved Software.** PHIUS+ 2015: Passive Building Standard – North America, or another approved software by PHIUS or PHI, where Specific Space Heat Demand, as modeled by a Certified Passive House Consultant, is less than or equal to tenkBTU/ft²/year. Compliance with this section requires that the criteria of C402.4, C403.2, C404 and C405 are met.
3. **ENERGY STAR Homes 3.1 Path.** New residential structures, or additions to existing residential structures, or portions thereof, as certified to conform with the ENERGY STAR Certified Homes standard, Version 3.1.
4. Any other software approved by the BBRs.

C407.6.1.2 Documentation. The following documentation is required for energy code compliance under subsection C407.6.1.1, Item 1:

1. If using the HERS software:
 - a. Prior to the issuance of a building permit, the following items shall be provided to the building official:
 - i. a HERS compliance report which includes a proposed HERS index score of 55 or lower;
 - ii. a description of the unit's energy features; and
 - iii. a statement that the rating index score is "based on plans."
 - b. Prior to the issuance of a certificate of occupancy, the following items shall be provided to the building official:
 - i. a copy of the final certificate indicating that the HERS rating index score for each unit is verified to be 55 or less, with a completed HERS rater verified ENERGY STAR Thermal Enclosure Checklist, is to be submitted to the building official. The HERS rating compliance shall be determined before electrical renewable energy systems are credited.
 - ii. a certificate, as required by section R401.3, is required for each unit and will list the HERS index score of the dwelling unit.
2. If using the PHIUS or PHI software:
 - a. Prior to the issuance of a building permit, the following items shall be provided to the Building Official:
 - i. A list of compliance features; and
 - ii. A statement that the estimated Specific Space Heat Demand is "based on plans".

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- b. Prior to the issuance of a certificate of occupancy, the following item shall be provided to the Building Official:
 - i. A copy of the final report, submitted on a form that is approved to document compliance with PHIUS+ 2015 standards. Said report shall indicate that the finished building achieves a Certified Passive House Consultant-verified Specific Space Heat Demand of less than or equal to 10kBTU/ft²/year.
- 3. If using ENERGY STAR Homes, Version 3.1 path:
 - a. Prior to the issuance of a building permit, the following items(s) shall be provided to the Building Official:
 - i. A copy of the preliminary HERS rating, based on plans.
 - b. Prior to the issuance of a certificate of occupancy, the following items shall be provided to the Building Official:
 - i. A copy of the final ENERGY STAR Homes certificate;
 - ii. A copy of the certified HERS rating; and
 - iii. A copy of the signed ENERGY STAR Thermal Enclosure System Checklist.

C407.6.1.3 Energy Rating Index. The Energy Rating Index ("ERI") shall be a numerical integer value that is based on a linear scale constructed such that the ERI reference design has an Index value of 100 and a residential building that uses no net purchased energy has an Index value of zero. Each integer value on the scale shall represent a 1% change in the total energy use of the rated design relative to the total energy use of the ERI reference design. The ERI shall consider all energy used in the residential building. The RESNET HERS index is the approved ERI approach in the Commonwealth.

C407.6.1.4 ERI-based Compliance. Compliance based on an ERI analysis requires that the rated design be shown to have an ERI less than, or equal to, the appropriate value listed in Table C407.6.1.4, when compared to the ERI reference design prior to issuance of any credit for on-site renewable electric generation.

C407.6.1.4.1 Trade-off for Onsite Renewable Energy Systems. New construction following C407.6.1.3 and existing buildings and additions following C501.4 may use any combination of the following renewable trade-offs to increase the maximum allowable HERS index score for each unit separately served by any combination of the following:

1. Solar photovoltaic array rated at 2.5kW or higher shall offset five HERS points;
2. Clean Biomass Heating System, solar thermal array, or geothermal heat pump, or a combination of these systems, operating as the primary heating system shall offset five HERS points; and
3. Solar thermal array for primary domestic hot water heating or Clean Biomass Stove shall offset two HERS points.

Note: a Clean Biomass Stove offset may not be combined with a primary heating system offset.

Table C407.6.1.4 Maximum HERS Ratings with Onsite Renewable Energy Systems.

Renewable Energy Source	Maximum HERS Index Score ^a	
	New construction	Whole house renovations; additions
None	55	65
Solar PV > 2.5kW; Renewable primary heating system	60	70
Solar PV; Renewable primary heating & solar thermal DHW	62	72
Solar PV & Renewable primary heating & solar thermal DHW	67	77

^a Maximum HERS index score prior to onsite electric renewable generation in accordance with C407.6.1.4.

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C407.6.1.5 Verification by Approved Agency. Verification for compliance with section C407.6.1 through C407.6.1.4.1 shall be completed by an approved third party. For compliance using a HERS Index Score or ENERGY STAR for Homes 3.1 certification, verification of compliance shall be completed by a certified HERS rater. For compliance with PHIUS+ 2015 or PHI, compliance shall be completed by a certified Passive House consultant.