

CHAPTER 13: ENERGY EFFICIENCY

1300.1 Add the following sections as follows:

1300.1 Adoption. Buildings shall be designed and constructed in accordance with the *International Energy Conservation Code 2015* (IECC), as amended by Chapter 13 of 780 CMR *et seq.*

Exception. Applications for building permits and related construction and other documents filed through January 1, 2017, may comply either with amended Chapters 11, 51 and Appendix 115.AA of this code effective _____, or with the Eighth Edition versions of those provisions in effect immediately prior to amendment, but not a mix of both. After January 1, 2017, concurrency with the Eighth Edition ends, and all applications for building permits and related construction and other documents must comply with the amended provisions only.

1301.1.1 Revise subsection as follows:

[E] 1301.1.1 Criteria. Buildings shall be designed and constructed in accordance with the 2015 *International Energy Conservation Code* (IECC) with Massachusetts Amendments contained herein. These amendments are intended to expressly apply to the IECC, and are also to be applicable, in intent, to ANSI/ASHRAE/IESNA 90.1--2013.

Exception. Temporary structures, as regulated by Section 3103, do not need to comply with the building envelope requirements of Chapter 13.

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.
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 percent of the *standard reference design* building. Source energy calculations shall comply with C401.2.2.1
4. Residential use buildings up to 5 stories may elect to comply with the energy provisions of Section N1106 found in the Residential Volume of 780 CMR, 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	*

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

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 4 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 percent of daylight hours annually.

C402.3.1 Construction document requirements for solar ready zone.

Construction documents shall indicate the solar ready zone.

C402.3.2 Solar-ready zone area. The total solar-ready zone area shall be 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 the MA Fire Code.

C402.3.3 Obstructions. Solar-ready zones shall be free from obstructions, including but not limited to vents, chimneys, and roof-mounted equipment.

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."

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:

1. **COMcheck:** Version 4.0.2, or later. Can be accessed at:
<https://www.energycodes.gov/>
2. Any other software tool *approved* by the Board of Building Regulations and Standards.

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 C405.2 through C405.5, 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 Add section as follows:

C405.10 Electric Vehicle Service Equipment Capable (Mandatory). In accordance with 527 CMR and this section, Group A-1, B, E, I, M and R buildings with more than 3 dedicated parking spaces shall provide sufficient electrical capacity and physical capacity at the service panel to accommodate future simultaneous vehicle charging at a minimum of 4% of parking spaces and in no case less than one space. Calculated spaces shall be rounded up to the nearest whole number. A minimum 40-ampere branch circuit shall be installed to terminate in close proximity to each proposed locations of future installation of Society of Automotive Engineers (SAE) standard J1772-approved Level 2 electric vehicle service equipment. The circuits shall have no other outlets. A permanent and visible label stating “EV READY” shall be posted in a conspicuous place at both the service panel and the circuit termination point. The location and number of “EV READY” parking spaces shall be identified on construction documents.

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 must 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/m^2) of conditioned floor area.
2. Provide not less than 3 percent 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 percent 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, §11F 1/2 (Massachusetts alternative energy portfolio standard).
4. Provide not less than 65 percent 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 5 stories *above grade plane*, and with independent unit-level heating and cooling systems, a HERS rater verified index 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 If C402.4, C403.2, C404 and C405 are met.
2. **Passive House Institute US (PHIUS) Approved Software.** PHIUS+ 2015: Passive Building Standard – North America, or another *approved* software by PHIUS, where Specific Space Heat Demand, as modeled by a Certified Passive House Consultant, is less than or equal to $10 \text{ kBTU/ft}^2/\text{year}$. Compliance with this section requires that the criteria If 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 Board of Building Regulations and Standards.

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 must be provided to the *Building Official*:
 - i. a HERS compliance report which includes a proposed HERS index of 55 or lower;
 - ii. a description of the unit's energy features; and
 - iii. a statement that the rating index is "based on plans"
 - b. Prior to the issuance of a certificate of occupancy, the following items must be provided to the *building official*:
 - i. a copy of the final certificate indicating that the HERS rating index 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 of the *dwelling unit*.
2. If using the PHIUS software:
 - a. Prior to the issuance of a building *permit*, the following items must 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"
 - b. Prior to the issuance of a certificate of occupancy, the following item must 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 must 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 item(s) must 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 must 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 (0). Each integer value on the scale shall represent a one (1) percent 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 Home Energy Rating System (HERS) index is the *approved* ERI approach in Massachusetts.

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 onsite 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 rating for each unit separately served by any combination of the following:

1. Solar photovoltaic array, rated at 2.5kW or higher, shall offset 5 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 5 HERS points; and
3. Solar thermal array for primary domestic hot water heating or *Clean Biomass Stove* shall offset 2 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	
	New construction	Whole house renovations; additions
None	55	65
Solar PV > 2.5kW; Renewable primary heating system	60	70
Solar PV; Renewable primary	62	72

heating & solar thermal DHW		
Solar PV & Renewable primary heating & solar thermal DHW	67	77

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 rating or ENERGY STAR for Homes 3.1 certification, verification of compliance shall be completed by a certified HERS rater. For compliance with PHIUS+ 2015, compliance shall be completed by a certified Passive House consultant.