



MASSACHUSETTS Energy Code Technical Support

Changes to the Commercial Energy Provisions in the 9th Edition of the MA State Building Code

Major Changes from 2012 to 2015 IECC¹

Section	Changes
Table C402.1.2	U- and F-factor changes for: insulation entirely above roof deck (decrease), Mass walls (increase), heated slab-on-grade floors (increase)
C403.2.3 (and associated Tables)	HVAC equipment performance requirements were increased for several equipment types: air-cooled unitary air conditioners (single package, size category of <65,000 Btu/h) <ul style="list-style-type: none"> air-cooled unitary heat pumps (single package, heating and cooling modes, <65,000 Btu/h) water-to-air water loop heat pumps (cooling mode, size categories of <17,000 Btu/h, 17-65,000 Btu/h, and 65-135,000 Btu/h) water-to-air water loop heat pumps (heating mode, size category of <135,000 Btu/h) packaged terminal air conditioners (all sizes) hot water boilers (gas-fired, size category of <300,000 Btu/h) air-cooled chillers (all sizes) water-cooled chillers (all sizes) axial fan for open-circuit cooling tower (all sizes)
C403.2.5 (NEW)	Introduces new requirement that hot water boilers shall have a control that can automatically lower the boiler water temperature setpoint based on the outdoor air temperature.
C403.2.7	Specifies the energy recovery ventilator (ERV) requirements by climate zone for different outdoor air fraction and design supply fan size thresholds. These requirements are for systems with outdoor air fractions above 30%. The changes from the 2012 to 2015 IECC, in Table C403.2.7(1) in Section C403.2.7, reduced the fraction threshold to 10% in climate zone 5A (all of MA). Table C403.2.7(2) also adds a new set of requirements for ventilation systems operating more than 8,000 hours per year.
C403.2.8 (NEW)	Introduces new requirements for all kitchen exhaust systems.
Table C403.2.12.1(2)	Adds new deductions to the Fan Power Limitation Drop Adjustment table. With this code change, systems without a central cooling coil are required to deduct 0.6 in. w.c. from their fan power limits. Systems without a central heating coil are required to deduct 0.3 in. w.c. Finally, systems with a central electric resistance heating element are required to deduct 0.2 in. w.c.
C403.2.14 (NEW)	New performance requirements for refrigeration equipment reflect changes to national manufacturing standards (10 Code of Federal Regulations (CFR) part 431) which went into effect on January 1, 2012.
C403.2.15 (NEW)	Adds requirement for walk-in coolers and freezers, and refrigerated warehouse coolers and freezers. The requirements are for cover doors, insulation, evaporator fan motor, lighting, anti-sweat heater, condenser fan motor, and their controls.
C403.3	Changes to economizer requirements including capacity threshold increase, water economizer requirements, and combined requirements for simple and complex systems (previously separate in the 2012 IECC).

¹ Information taken from *Energy and Energy Cost Savings Analysis of the 2015 IECC for Commercial Buildings*, PNNL, August 2015. Focus is on changes with energy impact, and does not include all administrative details.

(https://www.energycodes.gov/sites/default/files/documents/2015_IECC_Commercial_Analysis.pdf)



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C403.3.1 (NEW)	Introduces a new staged cooling requirement for DX units. According to item 2 under Section C403.3.1, for DX units that control 75,000 Btu/h or greater of rated capacity directly based on occupied space temperature (usually serving a single zone), a minimum of two stages of mechanical cooling capacity are required. Another related new code requirement in Table C403.4.1.1 of the 2015 IECC requires a two-stage fan control for DX units with cooling capacity over 65,000 Btu/h (after January 1, 2016). In practice, a DX unit would either have both staged cooling and staged fan controls together or neither of them.
C403.4.1.1 and Table C403.4.1.1 (NEW)	Requires two stages of fan control for DX units (capacity larger than 65,000 Btu/h) that control cooling capacity directly based on space temperature (usually serving a single zone). The requirement states that low or minimum fan speed shall not be greater than 66% of full speed. Also requires that units with air economizers shall have a minimum of two speeds of fan control during economizer operation.
C403.4.2.4	Changes requirements for part-load controls of hydronic heating and cooling systems by: <ul style="list-style-type: none"> raising capacity threshold from 300,000 to 500,000 Btu/h, requiring <u>both</u> supply-water temperature reset and variable flow (had previously been either/or), adding requirement for a variable (or stepped) pumping control
C403.4.2.5 (NEW)	Adds a boiler turndown requirement that boiler systems with design input of 1,000,000 Btu/h or more comply with different turndown ratios, per Table C403.2.5, using multiple single input boilers, one or more modulating boilers, or a combination of single input and modulating boilers.
C403.4.3.2.1 and C403.4.3.2.2	Changes in heat rejection equipment requirements of fan control for multi-cell heat rejection equipment and open-circuit cooling tower fan flow turndown (including new requirement that the maximum number of fans to operate in multi-cell heat rejection equipment to minimize energy).
C403.4.4	Adds exception to the 30% supply air limit of multiple zone VAV systems if it can be demonstrated to reduce overall system annual energy use by offsetting reheat/recool energy losses through a reduction in outdoor air intake for the system. Also, removes Exception 1 of 2012 IECC related to cross contamination (e.g. in healthcare facilities) and instead provides an allowance to the airflow rate that can be reheated to achieve reasonable energy savings in these types of spaces, while not compromising health and safety.
C403.4.4.4 (NEW)	Requires motors from 1/12 horsepower (hp) to under 1 hp to be EC motors or have a minimum efficiency of 70%. The intention is to replace standard permanent-split capacitor (PSC) motors having efficiencies in the range of 15% to 65% with more-efficient EC motors. The intended applications are toilet exhaust fans, small kitchen exhaust fans, series fan-powered VAV boxes, and fan-coil units. The following motors are exempt under the new requirement: motors in an airstream where only heating is provided, motors in packaged equipment, poly-phase small motors, and capacitor-start capacitor-run and capacitor-start induction-run motors that are covered by Table C405.8(3) and Table C405.8(4) in the 2015 IECC.
C403.4.4.6 (NEW)	Requirement for multiple-zone VAV system ventilation optimization controls to reduce outdoor air intake flow from the design rates in response to dynamic system ventilation efficiency as defined by the 2015 International Mechanical Code (IMC) (ICC 2015b).
C404.6.1	Adds new control requirements for recirculated Service Water Heating systems to automatically turn off the circulation pumps when the water temperature in the circulation loop is either at or above the desired setpoint or when there is no hot water demand.

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C406	Modifies the three Additional Efficiency Package Options from 2012 IECC and adds three more. The six options are: <ol style="list-style-type: none"> 1. More efficient HVAC performance (Section C406.2), 2. Reduced lighting power density (LPD) system (Section C406.3), 3. Enhanced lighting controls (Section C406.4) (NEW), 4. On-site supply of renewable energy (Section C406.5), 5. Provision of a dedicated outdoor air system for certain HVAC equipment (Section C406.6) (NEW), 6. High-efficiency service water heating (Section C406.7) (NEW)
C405.2.1	Extends the occupancy sensor control requirements to copy/print rooms, lounges, locker rooms, and warehouses.
C405.2.3 (NEW)	Requires automatic daylight responsive controls for sidelight daylight area as opposed to manual controls (an allowed option in the 2012). Specifies 150 Watts of general lighting within sidelight daylight zone as the minimum threshold to apply the control requirement, and include exceptions for some building and space types. Also specifies control settings.
C402.4.2	The size threshold of a top lit zone for which daylight responsive controls are required was reduced from 10,000 ft ² to 2500 ft ² .
C405.2.3.1	Specifies continuously dimming control from full light output for offices, classrooms, laboratories, and library reading rooms.
C405.2.4	For hotel and motel sleeping units and guest suites, the requirement changed from manual control to automatically switching off all installed luminaires and switched receptacles within 20 minutes after all occupants leave the room.
C405.2.5	Requires exterior façade and landscape lighting to be automatically turned off as a function of dawn/dusk and a set business opening and closing time. Exterior lighting not specified as façade or landscape lighting is to be automatically reduced by 30% of its peak power from between no later than midnight to 6 a.m., or from 1 hour after business closing to 1 hour before business opening, or during any period when activity has not been detected for a time longer than 15 minutes.
C405.4	Lighting Power Allowances (using either the Building Area or Space-by-Space method) were reduced. This change also affects C406.3 (Additional Efficiency Package Options) where LPA is newly defined as 90% of the value in the C405 tables.
C405.4.1	Exception 1.2, which exempted sleeping unit lighting in hotels, motels, and boarding houses from the lighting power limits, is modified to require that 75% of permanently installed light fixtures must be fitted with high-efficacy lamps.
Table C405.5.2(2)	Reduces building façade lighting power allowance in lighting zones 2 through 4.
C405.9.1 (NEW)	Adds three new requirements for elevators: <ul style="list-style-type: none"> • the cab lighting to have efficacy of not less than 35 lumens per Watt, • ventilation fans in elevators without air-conditioning systems shall not consume more than 0.33 watts/cfm at the maximum fan speed, • cab lighting and ventilation should be off when the elevator is not used for over 15 minutes
C405.9.2 (NEW)	Requires that speed of escalators and moving walkways be reduced when not conveying passengers.

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MA Amendments to 2015 IECC

Code Section(s) Affected ²	Changes
C401.2	Adds option for residential buildings up to 5 stories to follow the residential energy efficiency provisions, and makes other administrative changes to allow for Massachusetts-specific compliance paths.
C401.2.2	Adds allowance for using source energy method when demonstrating compliance via ASHRAE 90.1 Appendix G, and provides details on calculating combined heat and power systems.
C402.2.5 (DELETED)	Deletes the exception in 2015 IECC that allows no perimeter insulation in slab-on-grade floors greater than 24" below finished exterior grade.
C402.3.1-6 (NEW)	Rooftop Solar Readiness. New low-rise commercial buildings and additions must include a Solar-Ready Zone, provide associated documentation, and prepare for future solar installations. Note that there are explicit exceptions based on building size, orientation, and solar access.
C402.6 (NEW)	Notes which compliance tools are approved for demonstrating compliance.
C405.1	Also adds lighting requirements for walk-in coolers and freezers, refrigerated warehouse coolers and freezers.
C406.1	<ul style="list-style-type: none"> • Requires <u>two</u> Additional Efficiency Package Options (vs only one option needed in IECC). • Add two exceptions to the Additional Efficiency Package Options: <ul style="list-style-type: none"> ○ Buildings in municipalities not served by a participating Mass Save utility provider must comply with at least one option. ○ Projects using ASHRAE 90.1 must comply with option #2 and at least one other item.
C406.5	Add two compliance options to the on-site renewable energy ratings requirements.
C407.6.1.1 through C407.6.1.5	Adds alternative Energy Performance Methods of HERS, Passive House, and ENERGY STAR Homes.

Major Changes from ASHRAE 90.1-2010 to ASHRAE 90.1-2013³

Section	Changes
Envelope	
<i>Chapter 5</i>	Changes references from clerestory to roof monitor Modifies daylighting definitions
5.1.3	Adds low-e requirements for storm window retrofits
5.1.3	Clarifies roof insulation requirements, differentiating between roof recovering (on top of existing roof covering) and replacement of roof covering
5.4.3.2	Relaxes air leakage requirements for high-speed doors for vehicle access and material transport
5.4.3.4	Adds specific vestibule requirements for large spaces
5.5.3.1	Requires roof solar reflectance and thermal emittance testing to be in accordance with CRRC-1 Standard
5.5.4.2.2	Reduces the area threshold at which skylights and daylighting controls are required

² Code sections refer to the MA-specific amendments

³ Information from USDOE Building Energy Codes Program https://www.energycodes.gov/sites/default/files/becu/90.1-2013_Change_Highlights_BECU.pdf



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HVAC

Equipment Efficiencies	<ul style="list-style-type: none"> Added commercial refrigerators, freezers, and refrigeration equipment Modified minimum efficiency standards for water-to-air heat pumps (water loop, ground water, and ground loop). Proposed cooling EERs and heating COPs are more stringent. Increased minimum efficiency standards for single-package vertical air conditioners and single-package vertical heat pumps Modified minimum efficiency requirements for evaporatively cooled air conditioners greater than or equal to 240,000 Btu/h and less than 760,000 Btu/h and heating type-other Increases the minimum efficiency of open circuit axial fan cooling towers and adds a requirement for all types of cooling towers (minimum efficiency requirements apply to the tower including the capacity effect of accessories which affect thermal performance) Increases SEER and HSPF for air-cooled three-phase commercial air conditioners and heat pumps below 65,000 Btu/h (effective 1/1/2015) Increases cooling efficiency for PTACs Adds efficiency requirements for evaporative condensers with ammonia refrigerants Increases air- and water-cooled chiller efficiencies and exempts water-cooled positive displacement chillers with leaving condenser temperature $\geq 115^{\circ}\text{F}$ Increases IEER requirements for air-cooled air conditioners and heat pumps and EER requirements for water and evaporatively cooled air conditioners and heat pumps Re-establishes product class for SDHV air conditioners and heat pumps and adds efficiency requirements at $<65,000$ Btu/h below level of current federal standards Increases boiler efficiency for residential sized (NAECA covered) equipment, $<3,000$ Btu/h
6.4.3.3.3	Changes optimum start requirement from $> 10,000$ cfm to any DDC system and adds a requirement that outside air temperature be used in optimum algorithms
6.4.3.6	Establishes limits on using electric or fossil fuel to humidify or dehumidify between 30% and 60% RH except certain applications and requires deadband on humidity controls
6.4.3.8	Reduces occupancy threshold for demand controlled ventilation from greater than 40 people per 1000 ft ² to equal to or greater than 25 people per 1000 ft ² with exemptions for certain occupancies Reduces the system size and outdoor air thresholds at which energy recovery is required
6.4.3.9	Adds control requirements for heating systems in vestibules
6.4.3.10	Eliminates contingency on DDC system existence for setpoint overlap restrictions, humidification and dehumidification controls, VAV fan control setpoint reset, multiple-zone VAV system ventilation optimization control, hydronic system differential pressure reset by valve position. Instead, it specifies for what system types or sizes DDC is required and minimal functional requirements for DDC systems.
6.4.5 and 6.4.6	Adds mandatory and prescriptive requirements for walk-in coolers and freezers and refrigerated display cases
6.5.1.1.3	Revises high limit shutoff for air economizers
6.5.1.1.6	Adds air economizer sensor accuracy requirements
6.5.1.2.1	Relaxes design requirements for waterside economizers for computer rooms
6.5.2.4	Requires humidifiers mounted in the airstream to have an automatic control valve shutting off preheat when humidification is not required, and insulation on the humidification system dispersion tube surface ()
6.5.3.1.3	Added new definition (FEG = Fan Efficiency Grade) and requires each fan has an FEG of 67 or higher as defined by AMCA 205-10

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6.5.3.2.2	Modified requirement for static pressure sensor location and control requirements for setpoint reset for systems with DDC of individual zones
6.5.3.5	Requires fractional horsepower motors $\geq 1/12$ hp to be electronically-commutated motors or have a minimum 70% efficiency in accordance with 10 CFR 4321 and requires adjustable speed or other method to balance airflow
6.5.4.1	Establishes minimum turndown for boilers and boiler plants with design input power of at least 1,000,000 Btu/h
6.5.4.3	Expands the requirements for fan speed control for both chilled water and unitary direct expansion systems and enhances the requirements for integrated economizer control and defines DX unit capacity staging requirements
6.5.3.1	Addresses fan power limitation pressure drop adjustment credits and adds deductions from allowed fan power for systems without any central heating or cooling as well as systems with electric resistance heating. Sound attenuation credit is modified to be available only when there are background noise criteria requirements.
6.5.4.3	Establishes chiller and boiler fluid flow isolation requirements so there is no flow through the equipment when not in use
	Revises night setback requirements and removes exceptions for climate zones
	Requires VAV dual maximum damper position when DDC system is present and clarifies dual maximum sequence
Table 6.5.4.6	Deletes sizing requirements for pipes >24 inches in diameter
6.5.5.4	Modified heat rejection equipment (cooling tower) requirements to require that VSD controlled fans operate all fans at the same speed instead of sequencing them, and that open-circuit towers with multiple cells operate all cells in parallel down to 50% of design flow
6.5.6.1	Reduces design supply fan air flow rate for which energy recovery is required for systems that operate more than 8000 hours per year
6.5.9	Reduces the limits on hot gas bypass as a means of cooling capacity control
6.5.10	Adds requirements for door switches to disable or reset mechanical heating or cooling when doors without automatic door closers are left open
6.6.1	Added power usage effectiveness (PUE) as an alternative compliance methodology for data centers

Power and Lighting

8.4.2	Increases the spaces where plug shutoff control is required. Clarifies the application of this requirement for furniture systems, lowers the threshold for turn off from 30 to 20 minutes, states a labeling requirement to distinguish controlled and uncontrolled receptacles and restricts the use of plug-in devices to comply with this requirement
8.4.3	Specifies requirements for installation of basic electrical metering of major end uses to provide basic reporting of energy consumption data to building occupant
8.4.4	Nominal efficiencies established in accordance with 10 CFR 431 test procedure for low-voltage dry-type transformers
9.1.2	Adds control requirements for lighting alterations for interior and exterior applications
9.2.2.3	Eliminates the exception for wattage used in spaces where lighting is specifically designed for those with age-related eye conditions or other medical conditions related to the eye, where special lighting or light levels might be needed

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9.4.1.1	<ul style="list-style-type: none"> Changes the criterion for applying automatic daylighting control for sidelighting and toplighting to a controlled lighting power basis and provides characteristics for the required photo controls Adds control requirements for secondary sidelighting areas Requires the use of certain lighting controls in more space types Reduces the amount of time after occupants vacate a space for lights to be automatically reduced or shut off
9.4.1.3	Modifies requirements for automatic lighting control for guestroom type spaces. Exceptions to this requirement are lighting and switched receptacles controlled by captive key systems.
Table 9.4.2.2	Includes loading docks as a tradable surface
9.4.3	Adds more specific requirements for the functional testing of lighting controls, specifically occupancy sensors, automatic time switches and daylight controls
Tables 9.5.1 and 9.6.1	Updates LPDs for Building Area Method and Space-by-Space Method
Table 9.6.2	Modifies table to include continuous dimming in secondary sidelighted areas, which is now based on an installed wattage rather than area of the space. Eliminates the need for effective aperture calculation.
9.7	Adds a section for submittals
Terms	Deletes the term clerestory and adds roof monitor and clarifies the definition and changes references from clerestory to roof monitor. Revises several definitions related to daylighting.

New MA Stretch Code

Section	Changes
AA103.2	Large area and high energy use buildings. All buildings over 100,000 sq. ft., and new supermarkets, laboratories and conditioned warehouses over 40,000 sq. ft. shall comply with 780 CMR 13: <i>Energy Efficiency</i> and shall demonstrate energy use per square foot at least 10% below the energy requirements of ANSI/ASHRAE/IESNA 90.1-2013 APPENDIX G Performance Rating Method on either a site or source energy basis.
AA103.3	Other new buildings. New buildings not covered in AA103.1 and AA103.2 shall comply with 780 CMR 13: <i>Energy Efficiency</i> or 780 CMR 51.00: <i>Massachusetts Residential Code</i> , Sections N1100.1 through N1111.2, as amended, as applicable based on the use and occupancy of the building.
AA104	Existing buildings. For alterations, renovations, additions or repairs of existing buildings in these municipalities the energy efficiency requirements of 780 CMR 13.00: <i>Energy Efficiency</i> or 780 CMR 51.00: <i>Massachusetts Residential Code</i> , Sections N1100.1 through N1111.2, as amended, shall be used as applicable based on the use and occupancy of the building.

(10/9/17)

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