

# MASSACHUSETTS Energy Code Technical Support



## 2021 IECC Changes and New Massachusetts Stretch Code Amendments – Commercial Buildings<sup>1,2</sup>

Code Section	Topic	Description of Change
<b>Chapter 1 – Scope and Administration</b>		
[MA] C103.2	<b>Information on Construction Documents</b>	<p>Solar-ready zones (Appendix CB) or potential solar zone area (Appendix CC) and EV Ready Space (C405.13) must be shown on the construction documents.</p> <p>If following the relative performance pathway (C407.2), mechanical equipment schedules must also be shown on construction documents and provide information on total design outdoor airflow and air riser details.</p> <p>If using a mixed fuel building in accordance with Appendix CC, electric HVAC retrofit design prepared by the HVAC engineer must also be shown on construction documents.</p> <p>The 2021 IECC adds energy compliance path and air barrier details, including location, to the list of information required on construction documents.</p>
[MA] C103.2.2	<b>COMcheck Submittal</b>	<p>The construction documents submitted with the application for permit shall be accompanied by completed COMcheck Envelope, Lighting and Mechanical Compliance Certificates, and a Plan Review Inspection Checklist for the purposes of demonstrating compliance with the stretch code, unless following Section C407.2 which shall follow the applicable reporting requirements of ASHRAE 90.1 Appendix G.</p>
<b>Chapter 2 – Definitions</b>		
[MA] C202	<b>General Definitions</b>	<p>Adds new definitions for: All-Electric Building, Automatic Load Management Systems (ALMS), Class 3 Exhaust, Class 4 Exhaust, Clean Biomass Heating System, Combustion Equipment, Dedicated Outdoor Air System (DOAS), Electric Vehicle, Electric Vehicle Supply Equipment (EVSE), Electric Vehicle Ready Parking Space (“EV Ready Space”), Enthalpy Recovery Ratio, Exempt Exhaust, Exhaust Source Heat Pump, Fuel Gas, Fuel Oil, Glazed Wall System, Mixed-Fuel Building, Other Exhaust, Sensible Energy Recovery Ratio, Spandrel Section, Tenant Space Fit Out Zone, Thermal Bridge: Clear Field, Linear, Point.</p>

<sup>1</sup> This summary of energy code changes does not include every code change, and descriptions of changes do not necessarily represent the entire scope of the changes.

<sup>2</sup> “[MA]” denotes Massachusetts specific amendments (see “Code Section” column)

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<b>Chapter 3 – General Requirements</b>		
<b>C303.1.2</b>	<b>Insulation Mark Installation</b>	Clarifies that the installer certificate documenting the R-value of unmarked insulation products must be posted immediately after being installed in a conspicuous location on the job site.
<b>Chapter 4 – Commercial Energy Efficiency</b>		
<b>C401 General</b>		
<b>[MA] C401.2</b>	<b>Application</b>	Specifies different compliance pathways to be used for specific building types and sizes, with both Prescriptive and Performance Compliance options, as well as Certified Performance Standard Compliance.
<b>[MA] C401.2.1</b>	<b>Prescriptive and Performance Compliance</b>	Specifies three pathways: <ol style="list-style-type: none"> <li>1. Prescriptive Compliance, which may only be used for any nonresidential building up to 20,000 ft<sup>2</sup>.</li> <li>2. Targeted performance compliance, which shall be used for dormitory, fire station, library, office, school, police station, post office, and town hall buildings, over 20,000 ft<sup>2</sup> which have average ventilation at full occupancy of 0.5 cfm/ft<sup>2</sup> or less.</li> <li>3. Relative performance compliance, which may be used by commercial high ventilation buildings greater than 20,000 ft<sup>2</sup> that have a ventilation rate greater than 0.5 cfm/ft<sup>2</sup>.</li> </ol>
<b>[MA] C401.2.2</b>	<b>Certified Performance Standard Compliance</b>	Adds two additional pathways: <ol style="list-style-type: none"> <li>1. Passive House Compliance, which can be used for any building of any size.</li> <li>2. HERS Compliance, which can be used for any Group R building with multiple individual dwelling units.</li> </ol>
<b>[MA] C401.2.4</b>	<b>Mixed Use Buildings</b>	Where different building use types within a new building require different Compliance Pathways, each use type shall separately and individually show compliance for that respective use type.
<b>C401.3</b>	<b>Thermal Envelope Certificate</b>	Adds requirement for a permanent certificate to be posted onsite listing predominant thermal envelope R-values, U-factors, and results from any air leakage tests performed.

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Code Section	Topic	Description of Change
[MA] C401.4	<b>Building Electrification</b>	Specifies requirements for building electrification for high ventilation buildings (where average ventilation at full occupancy is greater than 0.5 cfm/ft <sup>2</sup> ) and for high glazed wall systems (where more than 50% of the total, above-grade wall area of the building thermal envelope is a glazed wall system)
[MA] C401.4.1	<b>Partial Space Heating Electrification</b>	This provision is only applicable to high ventilation buildings following the relative performance compliance pathway. This provision requires electric air source, exhaust source, or ground source heat pump systems to supply 25% of the building's peak space heating and ventilation air heating load at the ASHRAE 99.6% winter climatic design condition.
[MA] C401.4.2	<b>Full Space Heating Electrification</b>	This provision is only applicable to high glazed wall systems. It requires electric air source, exhaust source, or ground source heat pump systems to supply 100% of the building's peak space heating and ventilation air heating load at the ASHRAE 99.6% winter climatic design condition. It also specifies that no fossil fuel heating equipment shall be used for space heating or ventilation air heating.
[MA] C401.4.3	<b>Full Space and Water Heating Electrification</b>	This provision is only applicable to buildings following the All-Electric Pathway of the Municipal Opt-In Specialized Code and requires full space and water heating electrification. In addition to the requirements specified in C401.4.2, it also requires electric air source, ground source, electric resistance, or solar thermal systems to supply 100% of the building's service water.
[MA] C401.4.4	<b>Heat Pump Requirements</b>	Outlines the required efficiencies of heat pump systems and additionally provides specific guidance for buildings with multiple heating systems, and for exhaust source heat pump systems.
<b>C402 Building Envelope Requirements</b>		
C402.1.1.1	<b>Greenhouses</b>	Adds limitations to the exception to building thermal envelope requirements for greenhouses.
[MA] Table C402.1.3	<b>Insulation Component R-Value-Based Method</b>	This table has been deleted and reserved. The commercial stretch code no longer allows for R-value based compliance and now requires compliance based on assembly U-, C-, and F-Factors.
[MA] C402.1.5	<b>Component Performance Alternative</b>	Provides alternative compliance options for above grade wall and fenestration values for low glazed wall systems and high glazed wall system buildings. Buildings following ASHRAE 90.1 2019 Appendix G shall comply with this section.

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[MA] C402.2.8	<b>Fireplaces</b>	New combustion fireplaces shall have tight-fitting flue dampers or doors, and outdoor combustion air.
[MA] C402.3	<b>Solar-Ready Zone</b>	Rooftop Solar Readiness (Mandatory) Appendix changes the naming convention from Appendix CA to Appendix CB to better align with the 2021 IECC.
[MA] Table C402.4	<b>Building Envelope Fenestration Max. U-Factor &amp; SHGC</b>	Reduced vertical fenestration U-factors to 0.30 for fixed fenestration and to 0.32 for operable fenestration.
[MA] C402.4.6	<b>Fenestration Documentation</b>	Fenestration performance is documented by an NFRC Label or by a thermal simulation report prepared by a registered design professional when the product is outside the scope of the NFRC.
[MA] C402.5	<b>Air Leakage-Thermal Envelope</b>	Requires compliance with Sections C402.5.1 through C402.5.10.1.
[MA] C402.5.1	<b>Air Barriers</b>	A continuous air barrier shall be provided throughout the building thermal envelope.
[MA] C402.5.1.1	<b>Air Barrier Design and Documentation Requirements</b>	This section describes the required documentation and design of the continuous air barrier.
[MA] C402.5.1.2.1	<b>Electrical and Communication Boxes</b>	Electrical and communication boxes that penetrate the air barrier of the building thermal envelope shall be caulked, taped, gasketed, or otherwise sealed to the air barrier element being penetrated. When using an air sealed box, they shall be marked in accordance with NEMA OS 4 and installed in accordance with manufacturer's instructions.
[MA] C402.5.2	<b>Air Leakage Compliance</b>	New requirement to test the air leakage of the building thermal envelope by an approved third party. The measured air leakage rate shall not be greater than 0.35 cfm/ft <sup>2</sup> (@ 75 Pa), with two exceptions.
[MA] C402.5.2.1	<b>Whole Building Test Method and Reporting</b>	The building thermal envelope shall be tested for air leakage in accordance with ASTM E3158 or an equivalent approved method. A report that includes the tested surface area, floor area, air by volume, stories above grade, and leakage rates shall be submitted to the code official and the building owner. There are exceptions that apply to different sized buildings that specify alternate testing methods.

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[MA] C402.6	<b>Approved Calculation Software Tools</b>	COMcheck software must be used to demonstrate Compliance with the prescriptive paths outlined in C401.2.1 and for Section C402.7 relating to derating and thermal bridges.
[MA] C402.7	<b>Derating and Thermal Bridges</b>	This new section provides requirements intended to mitigate thermal bridging.
<b>C403 Building Mechanical Systems</b>		
<b>C403.1</b>	<b>General</b>	Data Center Systems are exempt from sections C403.4 (heating and cooling system controls) and 403.5 (economizers).
<b>C403.1.2</b>	<b>Data Centers</b>	Requires data centers to comply with Sections 6 and 8 of ASHRAE 90.4 (Energy Standard for Data Centers) with some modifications.
<b>C403.2.3</b>	<b>Building Mechanical Systems</b>	Requires HVAC fault detection and diagnostic (FDD) systems for new buildings $\geq 100,000$ ft <sup>2</sup> and lists required FDD functions.
<b>C403.3.2</b>	<b>HVAC Equipment Performance</b>	IECC increased the number of equipment efficiency tables from nine to sixteen to incorporate additional equipment types. Many minimum efficiencies are updated to reflect new federal testing standards.
<b>C403.4.1.1</b>	<b>Heat Pump Supplementary Heat</b>	Limits operation of supplemental electric resistance heat to four specific operating conditions.
[MA] C403.5	<b>Economizers</b>	Add dedicated outdoor air systems (DOAS) as an option for where air or water economizers shall be provided.
<b>C403.7.1</b>	<b>Demand Control Ventilation</b>	Decreases the average occupant load threshold from 25 to 15 people per 1,000 ft <sup>2</sup> , resulting in more space types requiring DCV.
<b>C403.7.2</b>	<b>Parking Garage Ventilation Controls</b>	Requires enclosed parking garage ventilation controls to employ carbon monoxide and nitrogen dioxide detectors.
[MA] C403.7.4	<b>Energy Recovery Systems</b>	Improves the requirements for ventilation systems, relating to the sensible recovery ratio, enthalpy recovery ratio and heating design condition percentages.
<b>C403.8.2</b>	<b>Fan Motor Sizing and Selection</b>	Adds exceptions to fan size limits for fans with electronic speed control devices and fans with a nameplate electrical input power of less than 0.89 kW.
<b>C403.8.3</b>	<b>Fan Efficiency</b>	Replaces fan efficiency grade (FEG) with fan energy index (FEI) and requires an FEI of 1.00 for constant volume systems and 0.95 for variable-air-volume systems.

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Code Section	Topic	Description of Change
<b>C403.8.5</b>	<b>Low-Capacity Ventilation Fans</b>	Adds minimum efficacy requirements for small ventilation fans like those used in dwelling units.
<b>C403.9</b>	<b>Large-Diameter Ceiling Fans</b>	Requires large-diameter ceiling fans be tested and labeled in accordance with AMCA 230.
<b>C403.11</b>	<b>Refrigeration Equipment Performance</b>	Updated minimum efficiency tables for commercial refrigerators, freezers, refrigerator-freezers, walk-in coolers, walk-in freezers, and refrigeration equipment.
<b>C403.14</b>	<b>Operable Interlocking Controls</b>	Adds requirement for interlocking heating and cooling system setback controls associated with cargo and loading door openings.
<b>C404 Service Water Heating (Mandatory)</b>		
<b>C404.5.2.1</b>	<b>Internal Volume of Piping Materials</b>	Breaks down the internal volume of piping by size and type of material, not just size.
<b>C405 Electrical Power and Lighting Systems</b>		
<b>C405.1.1</b>	<b>Lighting for Dwelling Units</b>	The minimum proportion of high-efficacy lamps in dwelling units increases from 75% to 90% to mirror R405.
<b>C405.2.1</b>	<b>Occupant Sensor Controls</b>	Corridors are added to the list of spaces requiring occupant sensor controls.
<b>C405.2.1.2</b>	<b>Occupant Sensor Controls Function in Warehouse Storage Areas</b>	Lists lighting control requirements for warehouse storage areas.
<b>C405.2.1.4</b>	<b>Occupant Sensor Control Function in Corridors</b>	Occupant sensor controls in corridors shall uniformly reduce lighting power to not more than 50% of full power, within 20 minutes of all occupants leaving the space.
<b>C405.2.3</b>	<b>Light Reduction Controls</b>	Adds exceptions to the requirement for general lighting to have a manual light reduction control to reduce the lighting load by at least 50%. These include luminaires controlled by daylight responsive controls and specific application controls, as well as spaces with only one luminaire or a low lighting power density and four specific space types.
<b>C405.2.3.1</b>	<b>Light Reduction Control Function</b>	Adds continuous dimming with specific requirements as an option to achieve a 50% lighting load reduction.

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Code Section	Topic	Description of Change
[MA] C405.2.4	<b>Daylight Responsive Controls</b>	This section now distinguishes between primary and secondary daylight zones and increases the floor area in which daylight responsive controls may be required. It also establishes daylight zones for multistory atriums. Massachusetts additionally modifies the wattage for items 1 and 3 from 150 watts to 100 watts.
C405.2.4.2	<b>Sidelight Daylight Zone</b>	Outlines specific compliance requirements for a side lit daylight zone, which is the floor area adjacent to vertical fenestration.
C405.2.8	<b>Parking Garage Lighting Controls</b>	Parking garage lighting must be controlled by an occupant sensor or time-switch to allow for various automatic lighting reductions.
C405.3.2	<b>Interior Lighting Power Allowance</b>	Lighting power densities are reduced for nearly every building area and space use type.
C405.4	<b>Lighting for Plant Growth and Maintenance</b>	Adds section for minimum photon efficiency for lighting used for plant growth and maintenance.
C405.9.2.1	<b>Energy Recovery</b>	Requires escalators to recover electrical energy when braking, regardless of the weight being conveyed.
C405.10	<b>Voltage Drop</b>	Clarifies that the maximum voltage drop requirement only applies to customer-owned equipment.
C405.11	<b>Automatic Receptacle Control</b>	Adds a requirement for automatic receptacle control for 50% of receptacles in certain space types. These controls will turn off receptacle power based on time of day or occupancy.
C405.12	<b>Energy Monitoring</b>	A new section requiring energy monitoring, including various metering, data storage, and reporting capabilities for buildings 25,000 ft <sup>2</sup> or larger.
[MA] C405.13	<b>Electric Vehicle Ready Parking Spaces (Mandatory)</b>	A minimum of 20% of new Group R and Group B parking spaces shall be EV Ready Spaces, and all other occupancies shall provide a minimum of 10 percent EV Ready parking Spaces.
<b>C406 Additional Efficiency Requirements</b>		
[MA] C406.1	<b>Requirements</b>	Increases the required number of additional energy efficiency credits from 10 to 15. Removes the options for heating efficiency improvement and efficient fossil fuel water heater from relevant tables and adds two new options for renewable space heating and heavy timber construction to relevant tables.

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Code Section	Topic	Description of Change
[MA] C406.2.3	<b>Renewable Space Heating</b>	To receive this credit worth 15 points, all space heating shall be provided by a cold climate air source heat pump with a COP of 1.75 at 5°F, or ground source heat pumps.
[MA] C406.9	<b>Reduced Air Leakage</b>	To receive this credit (worth various points depending on the occupancy type), air leakage must be tested and shall not exceed 0.20 cfm/ft <sup>2</sup> (75Pa) of the building thermal envelope.
[MA] C406.12	<b>Heavy Timber Construction</b>	This credit worth 8 points applies to buildings with 4 stories or more of Type IV heavy timber construction either above grade, or above a podium.
<b>C407 Building Performance Certification Methods</b>		
[MA] C407.1	<b>Targeted Performance</b>	This section describes the criteria required for buildings following the targeted performance path, which apply to dormitory, fire station, library, office, school, police station, post office, and town hall buildings, over 20,000 ft <sup>2</sup> which have average ventilation at full occupancy of 0.5 cfm/ft <sup>2</sup> or less. Building performance modeling shall be used to show compliance with the thermal energy demand intensity (TEDI) limits. Modeling criteria are based on ASHRAE 90.1-2019 Appendix G.
[MA] C407.1.1.5	<b>TEDI Limits</b>	Performance modeling shall show that the building's heating thermal energy demand intensity and cooling thermal energy demand intensity are less than or equal to the values in Table C407.1.1.5 which are determined based on both size and occupancy time.
[MA] C407.2	<b>Relative Performance</b>	This section describes the criteria required for buildings following the relative performance path, which apply to commercial high ventilation buildings greater than 20,000 ft <sup>2</sup> that have a ventilation rate greater than 0.5 cfm/ft <sup>2</sup> . Buildings using this path shall comply with ASHRAE 90.1-2019 Section 4.2 using the Appendix G pathway as modified in the Massachusetts Stretch Code in Section C407.2.2.1.

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Code Section	Topic	Description of Change
<b>[MA] C407.3</b>	<b>Passive House</b>	This section describes the criteria required for buildings following the passive house compliance path, which can apply to any commercial building, regardless of size or type. To comply with this section, buildings shall be pre-certified as meeting the Phius CORE 2021 or Phius ZERO 2021 Passive Building Standard – North America, or newer; or meet the Certified Passive House standard using the current software and program criteria by the Passive House Institute (PHI). Each project must use approved software tools to demonstrate compliance and be verified by a third-party inspector who has credentials for the applicable passive house certification program.
<b>[MA] C407.4</b>	<b>HERS Index for Multi Family Buildings</b>	This section describes the criteria required for buildings following the HERS Index path, which can be used for any Group R building with multiple individual dwelling units. To follow this path, each dwelling unit shall have a certified HERS Index (HERS) rating less than or equal to the appropriate value indicated in Table C407.4.

### Chapter 5 – Existing Buildings

<b>[MA] C502.1</b>	<b>Additions</b>	Additions to an existing building where the addition is up to 100% of the size of the existing building and less than 20,000 ft <sup>2</sup> shall comply with Sections C401.3, C402 through C406, and Section C408. Additions which exceed either of these limits shall comply with the applicable pathway for new construction in C401.2.
<b>C502.3.3</b>	<b>Mechanical Systems Commissioning for Additions</b>	Clarifies that the mechanical systems commissioning requirements of C408 apply to additions in the same manner as new construction.
<b>C502.3.6</b>	<b>Lighting Functional Testing for Additions</b>	Clarifies that the lighting functional testing requirements of C408 apply to additions in the same manner as new construction.
<b>[MA] C503.1</b>	<b>Alterations</b>	Specifies that alterations must comply with Sections C503, as well as Sections C402, C403, C404, and C405.
<b>C503.3</b>	<b>Mechanical Systems Commissioning for Alterations</b>	Clarifies that the mechanical systems commissioning requirements of C408 apply to alterations in the same manner as new construction.
<b>C503.4</b>	<b>Service Hot Water Systems Commissioning for Alterations</b>	Clarifies that the mechanical systems commissioning requirements of C408 apply to alterations in the same manner as new construction.

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<b>C503.5</b>	<b>Lighting Functional Testing for Alterations</b>	Clarifies that the lighting functional testing requirements of C408 apply to alterations in the same manner as new construction.
<b>[MA] C505.1</b>	<b>Change of Occupancy or Use</b>	Specifies that change of occupancies or uses shall comply with Sections C401.3, C402 through C406, and Section C408.
<b>Appendix CB – Solar-Ready Zone-Commercial</b>		
<b>Appendix CB</b>	<b>Solar-Ready Zone-Commercial</b>	Massachusetts has adopted Appendix CB of the 2021 IECC unamended.
<b>Appendix CC – Massachusetts Municipal Opt-In Specialized Energy Code 2023</b>		
<b>[MA] CC101.1</b>	<b>Purpose</b>	Establishes Appendix CC as the Massachusetts Municipal Opt-in Specialized Code.
<b>[MA] Table CC101.2</b>	<b>Multi-Family and R-Use Compliance</b>	Specifies the compliance path options for R-use buildings over 12,000 ft <sup>2</sup> . As of January 1, 2024, the passive house compliance option is required for buildings 6 stories and higher. Until then, the targeted performance and HERS index option may be used. For R-use buildings up to 5 stories, the passive option is required as of January 1, 2023.
<b>[MA] CC101.3</b>	<b>Compliance</b>	Notes the three compliance pathways of the opt-in code, as well as the specific section that each path must follow: Zero Energy (CC103 and CC105-if mixed fuel), All-Electric (CC104), and Mixed Fuel (CC105 and CC106).
<b>[MA] CC101.4</b>	<b>Minimum Building Energy Efficiency</b>	Specifies that at a minimum, buildings following the opt-in code must comply with the requirements outlined in the commercial stretch code.
<b>[MA] CC101.5</b>	<b>Minimum Electric Vehicle Ready Parking Requirements</b>	Specifies that at a minimum, buildings following the opt-in code must comply with the requirements of Section C405.13 of the commercial stretch code relating to EV readiness.
<b>[MA] CC102</b>	<b>Definitions</b>	Adds definitions for: net zero emissions building, potential solar zone area, and zero energy building.

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[MA] CC103	<b>Zero Energy Pathway Minimum Renewable Energy</b>	<p>Adds equation for CC-1, where: annual site energy production from on-site renewable energy systems must be greater than building energy use without consideration of renewable energy systems, onsite energy storage, on-site back-up generators, or on-site refueling of vehicles or outdoor equipment.</p> <p>When following the prescriptive path, building energy shall be determined by multiplying the gross conditioned floor area plus the gross semi-heated floor area of the proposed building by an EUI selected from Table CC103.1.</p> <p>When following any other pathway, building site energy use shall be determined from energy simulations.</p> <p>Commercial R-use buildings may comply using the Zero Energy Buildings pathways in Appendix RC by certifying that all units meet HERS 0 or lower with on-site renewable generation or by following the on-site renewable energy calculation used in the Phius ZERO certification standard when following the Passive House compliance pathway.</p>
[MA] CC104	<b>All Electric Pathway</b>	<p>Specifies the compliance path options for new all-electric buildings, which is defined as “A building with no on-site combustion equipment for fossil fuel use or capacity for including fossil fuel use in space heating, water heating, cooking, or drying appliances.”</p>
[MA] CC105	<b>Mixed-Fuel Building Pathway</b>	<p>Specifies the additional requirements for new mixed-fuel buildings, defined as “A building that contains combustion equipment or includes piping for such equipment.”</p> <p>The additional requirements for Mixed Fuel buildings include:                      Electric readiness (as described in Section CC106)                      Onsite renewable energy generation (As outlined in Section CC105.2)                      Additional efficiency requirements, specifically more efficient HVAC equipment performance and reduced energy use in service water heating (as outlined in Section CC105.3)</p> <p>New Buildings using clean biomass heating systems may comply with this section without meeting the additional efficiency requirements of Section CC105.3 (if they meet the performance standards of a clean biomass heating system). Other biomass systems that do not meet the performance standards must comply with this section in full.</p>

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## 2021 IECC Changes and New Massachusetts Stretch Code Amendments - Commercial Buildings

Code Section	Topic	Description of Change
[MA] CC106	<b>Wiring for Future Electrification</b>	Specifies that a dedicated branch circuit outlet with different capacities and space requirements (depending on the equipment use) shall be installed near any current combustion water heating equipment (CC106.1.2), cooking ranges, ovens and cooktops (CC106.1.3), and clothes dryers (CC106.1.4). Other combustion equipment in buildings with average ventilation at full occupancy of 0.5 cfm/ft <sup>2</sup> or less shall follow CC106.1.5 and combustion equipment in highly ventilated buildings shall follow CC106.1.6. Individual dwelling and sleeping units shall comply with the residential electric readiness requirements outlined in RC104.3 (CC106.1.1).

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