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**Patrick C. Woodcock**  
Commissioner

VIA EMAIL

September 22, 2022

To: Clerk of the House of Representatives  
CC: Chairs of the Joint Committee on Telecommunications, Utilities, and Energy  
RE: Submission of amended Stretch Energy Code – 225 CMR 22.00 and 225 CMR 23.00 to  
General Court

Dear Clerk:

Pursuant to M.G.L. Chapter 25A Section 12, please find enclosed:

- 225 CMR 22.00 and 23.00 – Stretch Energy Code Regulations
- Summary of the amended Regulations in layperson's terms

In the development of 225 CMR 22.00 and 225 CMR 23.00, the pertinent provisions of Chapter 30A, except section five, have been complied with.

In addition to the requirements of Section 12, the Department of Energy Resources has made additional information, including a red-line version of the regulations, available to the public. That information is accessible through the Department's website:

<https://www.mass.gov/info-details/stretch-energy-code-development-2022>

Please direct questions and comments on this regulation to:

Johannes Buchanan  
Assistant Secretary for Government Affairs and Community Relations, Executive Office of  
Energy and Environmental Affairs  
Johannes.K.Buchanan2@mass.gov

Sincerely,

*s/Patrick C. Woodcock*

Patrick C. Woodcock  
Commissioner

## Summary of Proposed New 225 CMR 22.00 and 23.00 (Updated September 22, 2022)

### 2023 Stretch Energy Code Update and Municipal Opt-in Specialized Code

#### 1. Background

The Stretch energy code (Stretch Code) regulations have since 2009 been published in MA 780CMR chapters 115.aa and previously 780 CMR 110.aa under the jurisdiction of the Board of Building Regulations and Standards. The climate act of 2021 moved the authority for the Stretch Code promulgation to the Department of Energy Resources (DOER) and at the same time required the development of a new Municipal Opt-in Specialized energy code (Specialized Code). These appear as new regulations in 225 CMR 22.00 and 225 CMR 23.00.

- CMR 22.00 covers Residential low-rise construction and
- CMR 23.00 covers Commercial and all other construction (including most multi-family).

This document provides an overview and explanation of these draft regulations. In the following sections, this document summarizes:

- **Section 1: Background and Timeline.**
- **Section 2: Structure.**
- **Section 3: Stretch Code.** The modifications to the Base Energy Code that form the Stretch Code amendments in Residential Low Rise (Section 3.A) and Commercial and all other buildings (Section 3.B).
- **Section 4: Specialized Opt-in Code.** The modifications to the Stretch Code that form the Specialized Code appendices in Residential Low Rise (Section 4.C) Commercial and all other buildings (Section 4.D).

#### 1.1 Timeline for Stretch and Specialized Code adoption

The Stretch code has been available since late 2009 and has already been widely adopted by cities and towns in Massachusetts. As a result, the update to the Stretch code will not require an additional bylaw vote in those existing Stretch code municipalities, some of whom are on their 3<sup>rd</sup> update already. The Specialized code is a new option and is adopted as a municipal opt-in code similar to the Stretch code process. Cities and towns seeking to adopt will require an active vote by City council or Town meeting to opt-in to the Specialized Code.

#### 1.2 Energy code options

The current energy code options in Massachusetts are as follows:

- **Current Base Energy Code** = IECC 2018 with MA amendments
- **Current Stretch Code** = IECC 2018 with MA amendments + Stretch Code amendments

The current Base Energy Code is being updated along with the rest of the BBRs regulated building codes to a 10<sup>th</sup> edition MA code that will be based on the International Code Council (ICC) 2021 edition. Combined with the Stretch Code update and new Specialized Code

contained in DOER's proposed regulations, this results in a tiered set of 3 energy code options for municipalities as follows:

- **Updated Base Energy Code** = IECC 2021 with MA amendments
- **Updated Stretch Code** = IECC 2021 with MA amendments + Stretch Code amendments
- **Specialized Code** = IECC 2021 with MA amendments + Stretch Code amendments + Specialized Code appendices

## **2. Structure**

The updated Stretch Code as newly incorporated into DOER regulations (225 CMR) is divided into 2 chapters, following the format of the IECC.

- A. 225 CMR 22 - Residential Low-rise Construction Stretch Energy Code
- B. 225 CMR 23 - Commercial (and all other) Construction Stretch Energy Code

The Specialized Code includes additional requirements that form an Appendix to each of the chapters of the Stretch Code.

- C. 225 CMR 22 Appendix RC – Residential Low-rise Construction Specialized Code
- D. 225 CMR 23 Appendix CC – Commercial (and all other) Construction Specialized Code

### 3. Stretch Code Summary

#### A. 225 CMR Chapter 22: Residential Low-Rise Construction Stretch Code Code Compliance Pathways

The current Base Energy Code for residential low-rise construction allows 3 different pathways for code compliance. The current Stretch Code requires code compliance through 2 of those pathways:

- A1. Home Energy Rating Scores (HERS) index certification
- A2. Passive house certification

The updated Stretch Code maintains these 2 pathways for compliance, but amends certain requirements in the HERS (Section R406) and Passive house (Section R405)<sup>1</sup> pathways.

#### A1. HERS Pathway (Section R406)

The updated Stretch Code lowers the maximum allowable HERS ratings to reflect improvements in energy efficiency as shown in Table 1 below.

**TABLE 1: CHANGES TO MAXIMUM HERS INDEX (SEE TABLE R406.5)**

On-site Clean Energy Application	Maximum HERS Index score (before renewable energy credit)				
	New construction			Alterations, Additions and Change of use	
	Updated Stretch Code July 1, 2024	Updated Stretch Code (Same as base code)	Current Stretch Code	Updated Stretch Code	Current Stretch Code
None (Fossil fuels)	42	52	55	52	65
Solar		55	60	55	70
All-Electric	45	55	60	55	70
Solar & All-Electric		58	65	58	75

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<sup>1</sup> Key sections of the Stretch Code and Specialized Code are referenced in parentheses based on their IECC section number. For example: Updated HERS ratings (Section R406).

As shown in Table 1, the current Stretch Code allows a 5-point higher HERS rating for homes using heat pumps for space and water heating compared to homes using fossil fuels (natural gas, propane or heating oil) for space heating.

The updated Stretch Code maintains differential HERS ratings, and after a phase-in period until July 1, 2024 requiring HERS 45 for all-electric homes and HERS 42 for homes with any use of fossil fuels (Section R406.5). The updated Stretch Code is simplified and emphasizes energy efficiency and electrification by dropping the 5 HERS point credit for rooftop solar and 2 HERS point credit for solar thermal in the current Stretch Code.

The updated Stretch Code also updates HERS requirements for alterations, additions and change of use for existing homes. Additional detail on alterations, additions and change of use can be found in A5 below (Section R503.1.5).

## **A2. Passive House Pathway (Section R405)**

Passive House certification is an optional code compliance pathway in the Base Energy Code and the current Stretch Code. The current Base Energy Code and current Stretch Code allow certification through the Passive House Institute US (Phius) Phius+ 2018 standard or the Passive House International (PHI) standard. The updated Base Energy Code and updated Stretch Code will align with the most recent Phius standards, allowing the Phius CORE 2021 standard (efficiency) or the Phius ZERO 2021 standard (efficiency and renewables). The PHI standard remains unchanged as an option.

## **New Residential Stretch Code Requirements**

### **A3. Energy or heat recovery ventilation (Section R403.6.1)**

The updated Stretch Code adds ventilation requirements through either heat recovery or energy recovery to the HERS Pathway. There is no change to the Passive house Pathway because heat or energy recovery is already required.

### **A4. Wiring for Electric Vehicle (EV) charging (Section R404.4)**

The proposed updated Base Energy Code requires at least 1 space per home or a minimum of 10% of spaces in a new multi-family parking lot be provided with electric wiring to allow for future EV charging. The updated Stretch Code requires the same 1 space per home and increases the requirement to a minimum of 20% of spaces in a new multi-family parking lot.

### **A5. Existing buildings: Alterations, Additions and Changes of use (Section R503.1.5)**

The updated Stretch Code clarifies when alterations to existing homes trigger compliance with different requirements. The requirements are as follows:

- Additions over 1,000 square feet (sf) must follow the HERS Pathway and meet the HERS requirements for Additions in Table 1 above. Additions under 1,000 square feet will continue to follow Base Energy Code.
- Additions that exceed 100% of the conditioned floor area of the existing dwelling unit (ie. more than double the size of the house) must follow the HERS Pathway and meet the HERS requirements for Additions in Table 1 above.
- Level 3 Alterations (over 50% of the home is renovated and reconfigured) as defined in the International Existing Building Code (IEBC 2021) must meet the HERS requirements in Table 1 above. Level 1 and Level 2 alterations will continue to follow the Base Energy Code.

**B. 225 CMR chapter 23: Commercial (all other) Stretch Code amendments**  
**Code Compliance Pathways**

The current Base Code for commercial construction has multiple code compliance pathways from the IECC as well as the ASHRAE 90.1 standard. The current Stretch Code requires a 10% improvement over the ASHRAE 90.1 Appendix G pathway for buildings over 100,000-sf (limit is 40,000-sf for labs, hospitals, supermarkets, refrigerated warehouses and data centers) but allows smaller commercial buildings to choose from the other Base Code IECC pathways.

The updated Stretch Code includes 5 code pathways for new construction. These new requirements will go into effect on the following schedule:

1. All non-residential commercial buildings: any building applying for permit on or after July 1, 2023 subject to updated stretch code provisions
2. Multi-family commercial buildings follow schedule below:

	<b>Updated Stretch Code July 1, 2023 through June 30, 2024</b>	<b>Updated Stretch Code Beginning July 1, 2024</b>
Targeted Performance	Optional	Optional
HERS	Optional HERS 52/55	Optional HERS 42/45
Passive House	Optional	Optional
Relative Performance	Optional	Not allowed

Allowable use of each pathway is based on the type of building, with 4 major categories of buildings:

**B1. TEDI Pathway: Offices, residential, and schools** over 20,000-sf are required to use a new Thermal Energy Demand Intensity (TEDI) Pathway. The updated Stretch Code sets forth specific TEDI limits by building type. This uses the same energy software tools as the current ASHRAE 90.1 Appendix G pathway but with significantly more focus on heating, cooling and the building envelope. Building uses adjacent to office and residential use, such as post offices, town hall, and other similar buildings are also covered under this pathway.

**B2. 10% better than ASHRAE Appendix G: High ventilation buildings** such as labs and hospitals can continue to use a 10% better than ASHRAE appendix G pathway or opt to use the TEDI pathway. Multi-family buildings may follow the ASHRAE appendix G pathway until July 1, 2024. The updated Base Code and updated Stretch Code change the underlying ASHRAE standard 90.1 to the more recent 2019 edition.

**B3. Prescriptive pathway: Small commercial buildings** (any building use except multi-family) under 20,000-sf will be able to continue to comply through an updated prescriptive pathway, or can opt to use the TEDI pathway. The prescriptive pathway is being updated in the Base Energy Code, and the updated Stretch Code includes additional amendments to improve efficiency beyond Base Energy Code for small buildings.

**B4. HERS and Passive House: Multi-family buildings** larger than those covered by the residential low-rise code can choose between HERS and Passive House pathways that contain the same energy efficiency requirements as the updated Residential low-rise Stretch Code. The Passive House certification options remain available as an option for all building types.

Mixed-use buildings can use a combination of code pathways as appropriate for different portions of the building, or choose a whole-building approach through the TEDI or Passive House pathways.

#### **Additional Commercial energy efficiency requirements:**

##### **B5. Efficient electrification** (Section C401.4)

The updated Stretch Code mandates partial electrification of space heating for highly ventilated buildings which follow the ASHRAE Appendix G compliance pathway. The updated Stretch Code mandates full electrification of space heating for buildings not following the ASHRAE pathway which choose to utilize the less stringent curtainwall envelope UA<sup>2</sup> performance option (See B6 below).

##### **B6. Mandatory envelope “Area-weighted U value<sup>2</sup> (Section C402.1.5) (btu/hr-sf-F) of an envelope section**

The proposed Base Code and updated Stretch Code updates and simplifies the existing mandatory envelope UA provisions that are currently in the MA Base Code and Stretch Code. Mandatory area-weighted U value provisions replace UA provisions and are simplified and strengthened compared to existing provisions for all buildings not using curtain wall. Mandatory area-weighted U value provisions remain at the same stringency as existing provisions for

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<sup>2</sup> ‘Area-weighted U value’ designates the average effective insulation level measured by the ‘U’ value across an exterior area ‘A’ of multiple elements (walls, windows, doors, etc).



curtain wall buildings. However, buildings which opt for the curtainwall U value limit are required to have full efficient electrification of space heating (see B5 above).

#### **B7. Air leakage** (Section C402.5)

The updated Stretch Code strengthens the air leakage limit compared to the updated Base Energy Code. Code language of this section adopts proposed IECC 2024 language which clarifies requirements.

#### **B8. Thermal bridges** (Section C402.7)

Thermal bridge accounting is added to the updated Stretch Code to more accurately represent the insulation performance of a fully constructed wall or building envelope. Prescriptive and tailored accounting approaches are available.

#### **B9. Economizers** (Section 403.5)

Economizer requirements (which permit the use of outside air for free night-time cooling) are expanded in the updated Stretch Code compared to the updated Base Energy Code.

#### **B10. Ventilation energy recovery** (Section C403.7)

Ventilation energy recovery requirements are strengthened in the updated Stretch Code compared to the updated Base Energy Code. New provisions are also added to better accommodate high ventilation buildings and toxic exhaust requirements.

#### **B11. Wiring for Electric Vehicle (EV) charging** (Section C405.13)

The updated Base code requires wiring for future EV charging to 10% of new parking spaces. The updated Stretch Code raises the minimum number of spaces requiring EV wiring to 20% in Group R and B occupancies<sup>3</sup>, with 10% for all other occupancies. EV charging can be met with either dedicated electric branch circuits, or with an automatic load management service (ALMS) that allows multiple spaces to be served by a higher amperage circuit, thus improving overall charging capacity at a lower installed cost.

#### **B12. Additional efficiency requirement** (Section C406)

Section C406 in the base code mandates certain additional efficiency measures, allowing designers to choose from a number of equivalent efficiency options. The updated Stretch Code modifies the existing IECC 2021 language to further incentivize efficient electrification, primarily by removing fossil fuel options from contributing toward the C406 points system.

#### **B13. Existing buildings**

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<sup>3</sup> Group R = Residential use, Group B = Business use – as defined in International Building Code (IBC) chapter 3

### **Additions (Section C502)**

The updated Stretch Code allows building additions which are less than 20,000-sf to continue to follow Base Energy Code. Additions greater than 20,000-sf will be required to meet applicable Stretch Code requirements for that building type and size.

### **Alterations (Section C503)**

The current Stretch Code requires commercial building alterations to meet Base Energy Code prescriptive requirements because there is no prescriptive commercial pathway in the current Stretch Code. The updated Stretch Code will require commercial building alterations to follow the new Stretch Code prescriptive pathway but allow for 10% reduced envelope requirement for alterations compared to true new construction.

The updated Stretch Code eliminates an existing exception in Base Energy Code which allows exterior walls which have any amount of insulation to remain non-code compliant, even when the alteration scope includes alterations to the exterior walls. The updated Stretch Code will require that any altered walls be brought up to prescriptive stretch code, although historic buildings remain exempt from these provisions.

### **Change of use Occupancy (Section C503)**

The current Stretch Code requires buildings going through change of use or occupancy to meet Base Energy Code prescriptive requirements because there is no prescriptive commercial pathway in the current Stretch Code. The updated Stretch Code will require buildings of any size which undergo change of use or occupancy to follow the new Stretch Code prescriptive pathway, but allows for a 10% reduced envelope requirement for change of use compared to true new construction.

### **Historic Buildings (R501.6)**

The Stretch Code will maintain R501.6 from Base Code: Provisions of this code relating to the construction, repair, alteration, restoration and movement of structures, and change of occupancy shall not be mandatory for historic buildings provided that a report has been submitted to the code official and signed by the owner, a registered design professional, or a representative of the State Historic Preservation Office or the historic preservation authority having jurisdiction, demonstrating that compliance with that provision would threaten, degrade or destroy the historic form, fabric or function of the building.

## **4. Specialized Code Summary**

### **Background**

#### **4.1 Timeline for Specialized Code adoption**

Cities and towns will require an active vote by City council or Town meeting to opt-in to the Specialized Code. The Specialized Code must be available for adoption by December 24, 2022. When a municipality votes to adopt the Specialized Code, DOER recommends that the requirements take effect for new building permit applications beginning on the next January 1<sup>st</sup> or July 1<sup>st</sup>, whichever is a minimum of 6 months after the municipal vote. This phase-in period, also utilized by new Stretch Code municipalities, allows an orderly transition for developers, designers and builders as well as additional training time for municipal code officials.

#### **4.2 Designed to achieve Massachusetts GHG emission limits and sub-limits**

The Specialized Code is required by statute (*MGL Session Laws of 2021 Chapter 8: Section 31*) to be designed to achieve MA GHG emission limits and sub-limits set every five years from 2025 to 2050. As a result, all compliance pathways under the Specialized Code are designed to ensure new construction that is consistent with a net-zero Massachusetts economy in 2050, primarily through deep energy efficiency, reduced heating loads, and efficient electrification.

Regardless of the on-site renewable potential, the largest emissions impact for many buildings stems from the heating loads and choice of heating fuel for the building. Buildings reliant on fossil fuel combustion equipment have no clear path to zero emissions, while electrically heated buildings do due to the steady increase in renewable and clean energy sources on the ISO-NE electric grid. In drafting the Specialized Code, DOER recognizes that many building construction sites and high-rise building structures do not currently lend themselves to achieving net-zero energy or emissions on-site. For example, urban infill multi-family housing close to transit can greatly assist in achieving a net-zero economy in 2050 while not meeting a net-zero on-site building definition at the building level. Where on-site renewable energy generation is not practical, or is limited relative to the building load and available solar access, there is still potential for siting additional renewable energy in the community, however as renewable sites and procurements become distant from the building site it stretches the feasibility of local building officials to regulate them under the energy code. Accordingly, the Specialized Code requires all new buildings to be designed with electric service and wiring sufficient for future electrification of space and water heating as well as any combustion equipment appliance loads.

#### **4.3 Definition of net-zero building and net-zero building performance standards**

The statute stipulates that the specialized code must include both

- a) A definition of net-zero building
- b) net-zero building performance standards

The Specialized Code appendices are a set of **net-zero building performance standards** that adopts a broad **Net-zero Building** definition intended to cover all new buildings in the Specialized Code that is consistent with Executive Office of Energy and Environmental Affairs

2050 Roadmap Study and Buildings Technical Report, which utilized the following definition net zero new construction.

*Net Zero new construction is defined as being consistent with the electrification and deep efficiency benchmarks described in the All Options pathway, discussed in the Energy Pathways Report – that is, that the new construction is compatible, as-built, with the Commonwealth’s net-zero emissions economy in 2050. Its focus is on-site emissions; it does not necessitate onsite or offsite renewables, nor the assumption that a building is net-zero energy...These assumptions include enhanced energy efficiency compared to current code and effective elimination of on-site emissions from space heating, domestic hot water, cooking and other process uses. ([Buildings Technical Report](#), p. 39)*

Therefore, the Specialized Code adopts a definition of **Net-zero Building** as follows:

*A building which is consistent with achievement of MA 2050 net zero emissions, through a combination of highly energy efficient design together with being an all-electric or Zero Energy Building, or where fossil fuels are utilized, a building fully pre-wired for future electrification and that generates solar power on-site from the available Potential Solar Zone Area.*

Appendix RC and Appendix CC, which together form the Specialized Code, are Net-zero building performance standards and are summarized in sections C and D below.

## **C. 225 CMR 22 Appendix RC: Residential low-rise Construction Specialized Code**

### **C1. Requirements by residential building size and fuel.**

The Residential low-rise Specialized Code offers 3 pathways to demonstrate energy code compliance with varying sets of additional requirements over and above the updated Stretch code:

- 1. Zero Energy pathway:** (Section RC102)
- 2. All-Electric pathway:** (Section RC103)
- 3. Mixed-Fuel pathway:** (Sections RC104 and RC105)

New homes up to 4,000 sf in size may follow any of the three pathways. New homes over 4,000 sf in size shall follow either pathway 1 or pathway 2. Table 2 below summarizes the low-rise residential Specialized Code requirements by home size and fuel use. All buildings are required to install wiring for electric vehicle (EV) charging in a minimum of 20% of new parking spaces, and one space per home in one and two family homes. Buildings with any combustion equipment designed for fossil fuel use are termed ‘mixed-fuel’ buildings.

**TABLE 2: Residential Specialized code requirements summary by building/dwelling unit size**

Building Size	Fuel Type	Minimum Efficiency	Electrification	Min. EV wiring	Renewable Generation
Dwelling units up to 4,000 sf	All Electric	HERS 45 or Phius CORE or PHI	Full	1 parking space	Optional
Dwelling units up to 4,000 sf	Mixed-fuel	HERS 42 or Phius CORE or PHI	Pre-wiring	1 parking space	Solar PV (except shaded sites)
Dwelling units > 4,000 sf	All Electric	HERS 45 or Phius CORE or PHI	Full	1 parking space	Optional
Dwelling units > 4,000 sf	Mixed-fuel	HERS 0 or Phius ZERO	Pre-wiring	1 parking space	Solar PV or other renewables
Multi-family >12,000 sf	All Electric	Phius CORE or PHI	Full	20% of spaces	Optional
Multi-family >12,000 sf	Mixed-fuel	Phius CORE or PHI	Pre-wiring	20% of spaces	Optional

**C1.2 All Electric building performance standard (Section RC103)**

All electric buildings are defined in the updated Stretch Code, and comply with the 2050 net-zero emissions performance standard by meeting the minimum efficiency standards of either HERS 45 or the Passive house pathway and using either air source or ground source heat pumps for primary space heating and heat pump or solar thermal water heating, as well as all electric appliances. All electric buildings are not required to install on-site solar panels but roofs must be solar-ready in accordance with the base and stretch code requirements. This pathway is laid out in Section RC103.

**C1.3 Mixed-fuel building performance standard (Sections RC104 & RC105)**

**C.1.3a Homes and Units less than 4,000-sf**

New low-rise buildings using fossil fuels for any on-site use including space heating, water heating, cooking or drying must meet minimum efficiency requirements of HER 42 or the Passive House pathway. In order to demonstrate alignment with the 2050 net-zero emissions mandate, all homes or units using fossil fuels for space heating, water heating, cooking, or drying must install sufficient electrical service, space and wiring to allow for future conversion to all electric buildings.

These mixed-fuel homes and buildings utilizing the HERS pathway are also required to install solar panels that provide no less than 4kw for single family and not less than 0.75 W/ft2 for multi-family, to mitigate these near-term emissions, with an exemption for shaded sites. Homes and buildings utilizing the Passive House pathway are exempt from additional solar install

requirements, but must have solar-ready roofs consistent with both the stretch and base code provisions. These requirements are set forth in Sections RC104, and RC105.

### **C.1.3b Homes and Units greater than 4,000-sf**

New low-rise buildings containing one or more dwelling units over 4,000 sf and using fossil fuels for any on-site use including space heating, water heating, cooking, or drying must meet HERS 0 or Phius ZERO requirements described in C1.4 below.

## **C1.4 Zero Energy Buildings**

The Specialized Code also contains a definition of **Zero Energy Building** based on how this term is used in the IECC 2021 in the appendices for both residential and commercial chapters, as follows:

*A building which through a combination of highly energy efficient design and onsite renewable energy generation is designed to result in net zero energy consumption over the course of a year as measured in MMBtus or  $KWh_{eq}$ , on a site energy basis, excluding energy use for charging vehicles.*

This definition is intended to cover exemplary buildings, and building uses for which achieving zero energy on-site is feasible.

### **C1.4a HERS 0 performance standard (Section RC 102)**

For the HERS index pathway, the Specialized Code adopts and modifies the definition of zero energy building published in the IECC 2021 Appendix RC – Residential building Provisions.

Appendix RC uses the HERS rating scale to set a zero energy building at HERS 0 or lower after on-site solar generation is factored in. The required minimum level of energy efficiency without solar in the IECC is currently HERS 47, the Specialized Code adjusts the required minimum energy efficiency level down to HERS 42. The gap between HERS 42 and HERS 0 is made up with renewable energy from on-site power production (OPP) typically with solar panels.

### **C1.4b Phius ZERO performance standard (Section RC 102)**

For the Passive House pathway, the Specialized Code adopts the Phius ZERO building performance standard for zero energy buildings. Phius ZERO certification includes the Phius CORE efficiency requirements while adding a requirement to net out energy use on an annual basis with renewable energy. The Specialized Code excludes contracts for Renewable Energy Credits (RECs) or off-site Renewable Energy Sources which are otherwise allowed under the Phius ZERO certification.

## **D. 225 CMR 23 Appendix CC: Commercial Construction Specialized Code**

### **D1.1 Energy Efficiency Requirements**

The Specialized Code maintains the same energy efficiency requirements as the Updated Stretch Code for all building types except multi-family, including adoption of the ASHRAE 90.1-2019 pathway for high ventilation buildings, TEDI requirements for offices and schools, and a new prescriptive path for small buildings.

Multi-family buildings built to the Commercial Specialized Code must achieve precertification to Passive House standards (either from PHI or Phius). These requirements are phased-in for buildings up to 5 stories required to meet Passive House requirements if applying for permits after January 2023, and taller buildings 6 stories and above required to meet Passive House for permit applications beginning in January 2024.

### **D1.2. All Electric Building Performance Standard (Section CC104)**

This is the simplest compliance pathway under the Specialized Code, requiring the energy efficiency requirements described in D1.1, and requiring that all space heating, water heating, cooking equipment and drying equipment is powered by electricity and meets minimum efficiency standards.

### **D1.3. Mixed-Fuel Building Performance Standard (Sections CC105 and CC106)**

This pathway establishes minimum requirements for new buildings designed with any space heating systems, water heating systems or appliances capable of using fossil fuels such as natural gas, heating oil or propane fuel. While allowing these fossil-fired systems, the Specialized Code requires mitigation of these emissions with the following requirements:

- a) Minimum efficiency requirements for space and water heating, including both fossil fuel and clean biomass boilers and furnaces systems.
- b) Solar development of the available on-site solar potential, specifically through one of 2 options:
  - i. *Not less than 1.5W/ft<sup>2</sup> for each sq foot of the 3 largest floors (the threshold proposed in solar requirements in the forthcoming IECC2024),*  
or
  - ii. *not less than 75% of the Potential Solar Zone Area*
- c) Pre-wiring and electrical service provision to the building to allow for future electrification of space and water heating and cooking and drying equipment.

### **D1.4 Zero Energy Building Performance Standard (Section CC103)**

This is the most stringent of the 3 pathways in that it requires net zero energy on an annual basis from the 1<sup>st</sup> year of construction. The Specialized Code amends the IECC commercial appendix CC: Zero Energy Commercial Building Provisions by simplifying the allowable renewable options. As a result, zero energy may be demonstrated only with on-site generation (typically

solar PV), and all buildings must meet minimum energy efficiency requirements prior to renewable offsets.

The option to show compliance using HERS 0 or PPlus ZERO certification as used in the low-rise residential Specialized Code is also eligible under the Zero Energy pathway for multi-family residential buildings.



**HOUSE . . . . . No. 5318**

Communication from the Division of Energy Resources of the Executive Office of Energy and Environmental Affairs (under the provisions of section 12 of Chapter 25A of the General Laws) submitting amendments to 225 CMR 22.00 and 23.00, Stretch Energy Code Regulations. Telecommunications, Utilities and Energy.

The Commonwealth of Massachusetts

In the One Hundred and Ninety-Second General Court  
(2021-2022)

1 **225 CMR 22: MASSACHUSETTS RESIDENTIAL STRETCH ENERGY CODE**  
2 **AND MUNICIPAL OPT-IN SPECIALIZED CODE 2023**

3  
4 **Massachusetts Stretch Code and Specialized Code for Low-Rise Residential**

5 **(Note: please see 225 CMR 23 for Commercial, Multi-family and all other construction)**

6 The Massachusetts Stretch energy code (Stretch Code) first became available for municipal  
7 adoption in 2009 as Appendix 110.aa and then 115.aa as part of the building code in 780 CMR.  
8 In 2021 the Massachusetts legislature passed new legislation moving authority for updates to the  
9 Stretch Code to the Department of Energy Resources and 225 CMR.

10 This code takes effect on January 1, 2023 and is designed to align with the forthcoming MA 10<sup>th</sup>  
11 edition building code promulgated under 780 CMR. Building permit applications for projects  
12 received on or after Jan. 1, 2023 in Stretch Code communities shall comply with this code.

13 As with the 10<sup>th</sup> edition building code, this energy code is based on modified versions of the  
14 2021 code books as published by the International Code Council (ICC). Specifically, the 2021  
15 International Energy Conservation Code (IECC 2021) as amended.

16 This section (225 CMR 22) covers low-rise residential buildings. All other buildings are covered  
17 by 225 CMR 23. 225 CMR 22 and 23 in combination form the Stretch Code – and must be  
18 adopted together and not in part.

19 Municipalities may also elect to adopt the combination of Appendix RC of 225 CMR 22 (Low  
20 rise residential) and Appendix CC of 225 CMR 23 (all other buildings) which together form the  
21 Municipal Opt-in Specialized code (Specialized Code).

22 For communities that have adopted the Stretch Code, the following 225 CMR 22 amendments to  
23 the IECC 2021 apply together with 225 CMR 23 for all other buildings.

24 For communities that adopt the Specialized Code, the following 225 CMR 23 amendments apply  
25 in combination with Appendix RC, along with 225 CMR 23 and Appendix CC for all other  
26 buildings.

27 In both the Stretch Code and the Specialized Code these amendments to the IECC 2021 replace  
28 Chapter 13 – Energy Efficiency of 780 CMR in the Base energy code.

29 Please remember that the Massachusetts amendments posted online are *unofficial versions* that  
30 are made available for convenience. Official versions of the Massachusetts amendments may be  
31 purchased from the State House Bookstore at [www.sec.state.ma.us/spr/](http://www.sec.state.ma.us/spr/) and the IECC 2021 can  
32 be purchased from the ICC at [www.iccsafe.org](http://www.iccsafe.org)

33

34 **225 CMR 22: MASSACHUSETTS FRONT-END AMENDMENTS TO THE**  
35 **INTERNATIONAL ENERGY CONSERVATION CODE 2021**

36 **MASSACHUSETTS STRETCH ENERGY CODE – 2023 Residential low-rise amendments**  
37 **to IECC2021**

38 **IECC 2021 and IRC 2021 CHAPTER 11: ENERGY EFFICIENCY**

39  
40 **CHAPTER 1 [RE] SCOPE AND ADMINISTRATION**

41  
42 **SECTION R103 CONSTRUCTION DOCUMENTS**

43  
44 *R103.2 Insert after Subsection R103.2(8) the following:*

- 45 10. EV Ready Space locations in accordance with Section R404.4.
- 46 11. Solar-Ready Zone in accordance with Appendix RB, or Solar Zone Area when  
47 complying with Appendix RC for fossil-fuel heated homes.

48  
49  
50 **CHAPTER 2 [RE] DEFINITIONS**

51  
52 **R202 GENERAL DEFINITIONS**

53 *R202 Add the following definitions:*

54 **ALL-ELECTRIC BUILDING.** A building with no on-site *combustion equipment* for fossil fuel  
55 use or capacity including fossil fuel use in space heating, water heating, cooking, or drying  
56 appliances.

57

58 **CLEAN BIOMASS HEATING SYSTEM.** Wood-pellet fired central boilers and furnaces  
59 where the equipment has a thermal efficiency rating of 85% (higher heating value) or greater;  
60 and a particulate matter emissions rating of no more than 0.08 lb PM<sub>2.5</sub>/MMBtu heat output.

61  
62 **COMBUSTION EQUIPMENT.** Any *equipment* or *appliance* used for space heating, *service*  
63 *water heating*, cooking, clothes drying and/or lighting that can use *fuel gas*, *fuel oil* or solid fuel  
64 and that is not a *clean biomass heating system*.

65 **ELECTRIC VEHICLE.** An automotive-type vehicle for on-road use, such as passenger  
66 automobiles, buses, trucks, vans, neighborhood electric vehicles, electric motorcycles, and the  
67 like, primarily powered by an electric motor that draws current from a rechargeable storage  
68 battery, fuel cell, photovoltaic array, or other source of electric current.  
69 *Informational Note: defined as in 527 CMR 12.00: Massachusetts Electrical Code (Amendments)*  
70 *section 625.2.*

71  
72 **ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE).** The conductors, including the  
73 ungrounded, grounded, and equipment grounding conductors, and the *Electric Vehicle*  
74 connectors, attachment plugs, and all other fittings, devices, power outlets, or apparatus installed  
75 specifically for the purpose of transferring energy between the premises wiring and the *Electric*  
76 *Vehicle*.  
77 *Informational Note: defined as in 527 CMR 12.00: Massachusetts Electrical Code (Amendments) section*  
78 *625.2.*

79  
80 **ELECTRIC VEHICLE READY PARKING SPACE (“EV Ready Space”).** A designated  
81 parking space which is provided with wiring and electrical service sufficient to provide AC level  
82 II or equivalent EV charging, as defined by Standard SAE J1772 for *EVSE* servicing light duty  
83 *Electric Vehicles*.

84  
85 **ENTHALPY RECOVERY RATIO.** Change in the enthalpy of the outdoor air supply divided  
86 by the difference between the outdoor air and entering exhaust air enthalpy, expressed as a  
87 percentage.

88  
89 **HIGH-EFFICACY LAMPS.** Light-emitting diode (LED) lamps with an efficacy of not less  
90 than the following:  
91 1. 60 lumens per watt for lamps over 40 watts.  
92 2. 50 lumens per watt for lamps over 15 watts to 40 watts.  
93 3. 45 lumens per watt for lamps 15 watts or less.

94  
95 **MIXED-FUEL BUILDING.** A *building* that contains *combustion equipment* or includes piping  
96 for such *equipment*.

97 **POTENTIAL SOLAR ZONE AREA.** The combined area of any low-sloped roofs and any  
98 steep-sloped roofs oriented between 90 degrees and 300 degrees of true north where the annual  
99 solar access is 70 percent or greater. Annual solar access is the ratio of “annual solar insolation  
100 with shade” to the “annual solar insolation without shade”. Shading from obstructions located on

101 the roof or any other part of the building shall not be included in the determination of annual  
102 solar access.

103

## 104 CHAPTER 3 [RE] GENERAL REQUIREMENTS

105

### 106 SECTION R301 CLIMATE ZONES

107

108 *R301 Replace Section R301 as follows:*

109 **R301.1 General.** Massachusetts is in *climate zone 5A*

110

## 111 CHAPTER 4 [RE] RESIDENTIAL ENERGY EFFICIENCY

112

### 113 SECTION R401 GENERAL

114

115 *R401 Replace Section R401 as follows:*

116

117 **R401.1 Scope.** This chapter applies to *residential buildings*. Municipalities which have adopted  
118 the Stretch Energy Code shall use the energy efficiency requirements of this chapter, or Chapter  
119 51 where applicable for existing buildings. Municipalities which have adopted the Municipal  
120 Opt-in Specialized Stretch energy code shall comply with R401.2.4 including both the  
121 requirements of Appendix RC and this chapter.

122

123 **R401.2 Application.** Residential buildings shall comply with Section R401.2.5 and either  
124 Sections R401.2.2, R401.2.3 or R401.2.4. R-use buildings without individually separate dwelling  
125 units (such as single-room occupancy buildings) may comply with Section R401.2.1. The option  
126 selected for compliance shall be identified in the certificate required by Section R401.3.

127 **Exception:** Additions under 1,000 sf, *level 1 and level 2 alterations*, and repairs to  
128 existing buildings complying with Chapter 5 [RE].

129

130 **R401.2.1 Prescriptive Compliance Option.** The Prescriptive Compliance Option  
131 requires compliance with Sections R401 through R404 and R408.

132

133 **R401.2.2 Passive House Building Certification Option.** The Passive House Building  
134 Certification Option requires compliance with Section R405 and R404.4.

135

136 **R401.2.3 Energy Rating Index Option.** The Energy Rating Index (ERI) Option requires  
137 compliance with Section R406, R403.6 and R404.4.

138

139 **R401.2.4 Appendix RC.** Residential Buildings and dwelling units covered by this  
140 chapter may elect to comply with the requirements of IECC Appendix RC and R404 as  
141 amended.

142

**R401.2.5 Additional energy efficiency.** This section establishes additional requirements applicable to all compliance approaches to achieve additional energy efficiency.

1. For buildings complying with Section R401.2.1, two of the additional efficiency package options shall be installed according to Section R408.2.
2. For buildings electing to be *all-electric buildings*, both R408.2.2 and R408.2.3 shall apply for primary space heating and domestic hot water supply.

**R402.1.5.1** Add Subsection R402.1.5.1 as follows:

**R402.1.5.1 Approved software for Total UA alternative:** The following software is approved for demonstrating Total UA compliance:

REScheck-Web for IECC2021 Massachusetts stretch code available at <http://www.energycodes.gov/rescheck>

**R402.4.1.1** Modify Table R402.4.1.1 to amend the Insulation Installation Criteria as follows:

**TABLE R402.4.1.1 AIR BARRIER AND INSULATION INSTALLATION**

COMPONENT	INSULATION INSTALLATION CRITERIA
General requirements	All insulation shall be installed at Grade I quality in accordance with ICC/RESNET 301. Air-permeable insulation shall not be used as a sealing material.

**R403.3.5** Insert the following to the end of Subsection R403.3.5:

Postconstruction or rough-in testing and verification shall be done by a HERS Rater, HERS Rating Field Inspector, or an applicable BPI Certified Professional. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*.

**R403.6** Replace Section R403.6 as follows:

**R403.6 Mechanical ventilation.**

Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the *ventilation* system is not operating.

Each dwelling unit of a residential building shall be provided with a continuously operating mechanical balanced ventilation system that has been site verified to meet a minimum airflow per:

1. RESNET HERS Index in accordance with RESNET/ICC Standard 301
2. ASHRAE Standard 62.2-2019 or 62.2-2022
3. the following formula for one- and two-family dwellings and townhouses of three or less stories above grade plane:

$$Q = .03 \times CFA + 7.5 \times (N_{br} + 1) - 0.052 \times Q_{50} \times S \times WSF$$

181 Where: CFA is the conditioned floor area in sq ft  
 182  $N_{br}$  is the number of bedrooms  
 183  $Q_{50}$  is the verified blower door air leakage rate in cfm measured at  
 184 50 Pascals  
 185 S is the building height factor determined by this table:  
 186

stories above grade plane	1	2	3
S	1.00	1.32	1.55

187  
 188 WSF is the shielded weather factor as determined by this table:  
 189

County	WSF
Barnstable	0.60
Berkshire	0.52
Bristol	0.54
Dukes	0.59
Essex	0.58
Franklin	0.52
Hampden	0.49
Hampshire	0.59
Middlesex	0.55
Nantucket	0.61
Norfolk	0.52
Plymouth	0.53
Suffolk	0.66
Worcester	0.59

190  
 191 **R403.6.1** Replace Subsection R403.6.1 and Subsections R403.6.1.1 and R403.6.1.2 as follows:  
 192

193 **R403.6.1 Heat or Energy Recovery Ventilation.**

194 Heat or energy recovery balanced ventilation systems shall be provided for dwelling units  
 195 as specified in either Section R403.6.1.1 or R403.6.1.2, as applicable.  
 196

197 **R403.6.1.1 Large Systems.** Systems with a rated airflow exceeding 300\_cfm shall have  
 198 an enthalpy recovery ratio of not less than 50 percent at cooling design condition and not  
 199 less than 60 percent at heating design condition, determined in accordance with AHRI  
 200 1060 at an airflow not less than the design airflow.  
 201

202 **R403.6.1.2 Other Systems.** Systems with a rated airflow of 300 cfm or less shall have a  
 203 sensible recovery efficiency (SRE) of not less than 65 percent at 32°F (0°C) at an airflow  
 204 not less than the design airflow. SRE shall be determined in accordance with CAN/CSA-  
 205 C439 and shall be listed. Linear interpolation of listed values for SRE shall be permitted.  
 206

207 **R403.6.3** Replace Subsection R403.6.3 as follows:

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**R403.6.3 Testing and Verification.** Installed performance of the mechanical ventilation system shall be tested and verified by a HERS Rater, HERS Rating Field Inspector, or an applicable BPI Certified Professional, and measured using a flow hood, flow grid, Residential IAQ Fault Indicator Display certified to the California Energy Commission, or other airflow measuring device in accordance with either RESNET Standard 380 or ACCA Standard 5.

*R403.6.4 – R403.6.7 Add Subsections R403.6.4 – R403.6.7 as follows:*

**R403.6.4 Air-moving equipment, selection and installation.** As referenced in ASHRAE Standard 62.2, Section 7.1, ventilation devices and equipment shall be tested and certified in accordance with HVI 920 (Home Ventilating Institute), or equivalent and the certification label shall be found on the product. Installation of systems or equipment shall be carried out in accordance with manufacturers’ design requirements and installation instructions. Where multiple duct sizes and/or exterior hoods are standard options, the minimum size shall not be used.

**R403.6.5 Sound Rating.** Sound ratings for fans used for whole building ventilation shall be rated at a maximum of 1.0 sone.

**Exception:** HVAC air handlers and remote-mounted fans need not meet sound requirements. There must be at least 4ft of ductwork between the remote-mounted fan and intake grille.

**R403.6.6 Documentation.** The owner and the occupant of the dwelling unit shall be provided with information on the ventilation design and systems installed, as well as instructions on the proper operation and maintenance of the ventilation systems. Ventilation controls shall be labeled with regard to their function, unless the function is obvious or unless the function is communicated through a digital user interface provided with the control.

**R403.6.7 Air Inlets and Exhausts.** All ventilation air inlets shall be located a minimum of 10ft from vent openings for plumbing drainage systems, appliance vent outlets, exhaust hood outlets, vehicle exhaust, or other known contamination sources; and shall not be obstructed by snow, plantings, or any other material. Outdoor forced air inlets shall be covered with rodent screens having mesh openings not greater than ½ inch. A whole house mechanical ventilation system shall not extract air from an unconditioned basement unless approved by a registered design professional. Where wall inlet or exhaust vents are less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, a metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the vent terminal. The sign shall read, in print size no less than one-half (1/2) inch in size, "MECH. VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS".

- 254           **Exceptions:**  
 255           1. Ventilation air inlets in the wall  $\geq$  3 ft. from dryer exhausts and contamination  
 256           sources exiting through the roof.  
 257           2. No minimum separation distance shall be required between local exhaust outlets  
 258           in kitchens/bathrooms and windows.  
 259           3. Vent terminations that meet the requirements of the National Fuel Gas Code  
 260           (NFPA 54/ ANSI Z223 .1) or equivalent.  
 261

262 **R404.4** Add Section R404.4 and Table R404.4 as follows:  
 263

264 **R404.4 Wiring for Electric Vehicle Charging Spaces (“EV Ready Spaces”).** *EV Ready*  
 265 *Spaces* shall be provided in accordance with Table R404.4. The dedicated branch circuit shall be  
 266 identified as “EV READY” in the service panel or subpanel directory, and the termination  
 267 location shall be marked as “EV READY”. The circuit shall terminate in a NEMA receptacle or  
 268 a Society of Automotive Engineers (SAE) standard J1772 electrical connector for *EVSE*  
 269 servicing *Electric Vehicles*, located within 6 feet (1828 mm) of each *EV ready space*. Conductors  
 270 and outlets for *EVSE* shall be sized and installed in accordance with the MA electrical code.

271           **TABLE R404.4 EV READY SPACE REQUIREMENTS**

Type of Building	Number of parking spaces
1 & 2 family dwellings and town homes	At least 1 50-amp branch circuit per dwelling unit to provide for AC Level II charging
All other R-use buildings	At least 20% of all installed spaces served with a 40-amp, 208/240-volt circuit with a minimum capacity of 9.6 kVA.

272           **Exceptions:**

- 273           1. In no case shall the number of required *EV Ready Spaces* be greater than the number  
 274           of parking spaces installed.  
 275           2. This requirement will be considered met if all spaces which are not *EV Ready* are  
 276           separated from the premises by a public right-of-way.  
 277           3. R-2 multi-family properties may elect to comply with Commercial EV ready  
 278           requirements in C405.13  
 279           4. One or more SAE Level II spaces may be substituted with multiple SAE Level I  
 280           spaces provided with wiring for a minimum 20amp, 120-volt EVSE, with a ratio of at  
 281           least 3 Level I spaces for each Level II space required.  
 282

283 **R405.** Replace Section R405 in its entirety as follows:  
 284

285 **R405 Passive House Building Certification Option.** Projects may document compliance with  
 286 either Phius certification in accordance with R405.2 or PHI certification in accordance with  
 287 R405.3.  
 288



289 **R405.1 Compliance.** Projects pre-certified as meeting the Phius CORE 2021 or Phius ZERO  
290 2021 Passive Building Standard – North America, or newer, demonstrated using approved  
291 software by Phius, where Phius Design-certification is demonstrated by Phius and a Certified  
292 Passive House Consultant (CPHC); or,  
293 Projects pre-certified as meeting the Certified Passive House standard using the current software  
294 and program criteria by the Passive House Institute (PHI), where PHI certification is  
295 demonstrated by a Certified Passive House Designer and a Certified Passive House Certifier.  
296

297 **R405.2 Phius Documentation.** When using WUFI Passive or other Phius approved software:

298 1. Prior to the issuance of a building permit, the following items must be provided to the  
299 Building Official:

- 300 a. A Phius 2021 (or newer) Verification Report which demonstrates project  
301 compliance with Phius 2021 (or newer) performance requirements.
- 302 b. A statement from the CPHC that the verification report results accurately  
303 reflect the plans submitted.
- 304 c. Evidence of project registration from Phius.

305 OR

- 306 a. A Design Certification Letter from Phius.

307

308 2. Prior to the issuance of a certificate of occupancy, the following item(s) must be  
309 provided to the building official:

- 310 a. Design Certification Letter from Phius.
- 311 b. An updated Verification Report by the CPHC which reflects “as-built”  
312 conditions and test results that demonstrate project compliance with Phius (blower  
313 door and ventilation results).
- 314 c. A statement from the CPHC that the envelope meets the Phius hygrothermal  
315 requirements found in Appendix B of the Phius 2021 Certification guidebook
- 316 d. A statement from the Phius Certified Verifier or Rater that the project test  
317 results and other Phius verification requirements are met.
- 318 e. A copy of the Phius workbook listing all testing results and as-built  
319 conditions.

320 OR

- 321 a. A Project Certificate demonstrating final certification awarded by Phius.

322 AND

- 323 f. A statement from the Phius Verifier or Rater of compliance with R404.4: EV  
324 ready, and Appendix RB: Solar Ready Provisions.

325

326 **R405.23 Passive House International (PHI) Documentation.**

327 1. If using PHI Passive House software, prior to the issuance of a building permit, the  
328 following items must be provided to the Building Official:

- 329 a. A PHPP compliance report which demonstrates project compliance with  
330 current PHI performance requirements;
- 331 b. A statement from the Certified Passive House Consultant/Designer (CPHC/D)  
332 that the PHPP results and compliance report accurately reflect the plans  
333 submitted;
- 334 c. Evidence of project registration from a Certified Passive House Certifier.

- 335 OR
- 336 a. A Design Certification Letter from a Certified Passive House Certifier.
- 337
- 338 2. Prior to the issuance of a certificate of occupancy, the following item(s) must be
- 339 provided to the building official:
- 340 a. A Design Certification Letter from a Certified Passive House Certifier.
- 341 b. An updated PHPP compliance report which reflects “as-built” conditions and
- 342 test results (blower door and ventilation results) that demonstrates project
- 343 compliance with PHI performance requirements;
- 344 c. A copy of the Passive House Verifier’s or Rater’s test results;
- 345 d. A statement from the CPHD that the project test results meet the model
- 346 performance requirements, all the mandatory limits and any other mandatory
- 347 requirements.

- 348 OR
- 349 a. A Final Certification Letter from a Certified Passive House Certifier;
- 350 AND
- 351 e. A statement from the Passive House Verifier or Rater of compliance with
- 352 R404.4, and Appendix RB: Solar Ready Provisions.
- 353

354 **R406.2** *Revise TABLE R406.2 as follows:*

355 *Delete*

R401.2.5	Additional efficiency packages
----------	--------------------------------

356 *And replace with:*

R403.6.1	Heat or Energy Recovery Ventilation
----------	-------------------------------------

357 *Delete*

R406.3	Building thermal envelope
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358 *And replace with:*

R404.4	Wiring for Electric Vehicle Charging Spaces
--------	---

359

360 **R406.3** *Reserve this section:*

361

362 **R406.3 Building thermal envelope.** Reserved.

363

364 **R406.4** *Replace Section R406.4 with the following:*

365

366 **R406.4 Energy Rating Index.** The Energy Rating Index (ERI) shall be the RESNET certified

367 HERS index determined in accordance with RESNET/ICC 301. Energy used to recharge or

368 refuel a vehicle used for transportation on roads that are not on the building site shall not be

369 included in the *ERI reference design* or the *rated design*.

370

371 **R406.5** *Replace Section R406.5 and Table R406.5 with the following:*

372

373 **R406.5 ERI-based compliance.** Compliance based on an ERI analysis requires that the *rated*

374 *proposed design* and confirmed built dwelling be shown to have an HERS index rating less than

375 or equal to the appropriate value indicated in Table R406.5 when compared to the *HERS index*  
 376 *reference design* for each dwelling unit prior to credit for onsite renewable electric generation.

377  
 378

**TABLE R406.5 MAXIMUM ENERGY RATING INDEX**

<b>Clean Energy Application</b>	<b>Maximum HERS Index score<sup>a, b</sup></b>		
	New construction until June 30, 2024	New construction permits after July 1, 2024	Major-alterations, additions, or Change of use <sup>c</sup>
<i>Mixed-Fuel Building</i>	52	42	52
Solar Electric Generation	55	42	55
<i>All-Electric Building</i>	55	45	55
Solar Electric & <i>All-Electric Building</i>	58	45	58

379 <sup>a</sup> Maximum HERS rating prior to onsite renewable electric generation in accordance with Section R406.5  
 380 <sup>b</sup> The building shall meet the mandatory requirements of Section R406.2, and the building thermal  
 381 envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table  
 382 R402.1.4 of the 2015 International Energy Conservation Code.  
 383 <sup>c</sup> Alterations, Additions or Change of use covered by Section R502.1.1 or R503.1.5 are subject to this maximum  
 384 HERS rating.

385  
 386

**R406.5.1** Add Subsection R406.5.1, as follows:

387

**R406.5.1 Trade-off for Clean energy systems.** New construction following Section R406 or existing buildings and additions following IECC chapter 5[RE] may use clean energy trade-offs to increase the maximum allowable HERS rating for each unit separately served by any combination of the following:

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 389  
 390  
 391  
 392  
 393  
 394  
 395  
 396  
 397

1. Solar Electric Generation: Solar photovoltaic array rated at 4kW or higher shall offset 3 HERS points for Level 3 alterations, Change of use to Residential R-use categories or for fully attached additions.
2. *All-Electric Buildings* shall offset 3 HERS points for each dwelling unit in new construction, Level 3 alterations, change of use to Residential R-use categories and fully attached additions.

398

**R406.6** Revise Section R406.6 by replacing the reference to Section R406.6 in the first sentence with reference to Section R406.5.

399  
 400

**R407** Reserve this Section:

401  
 402

**SECTION R407** Reserved.

403  
 404

**R408.2.1** Revise the first sentence of Subsection R408.2.1 by replacing 95 percent with 90 percent to read as follows:

405  
 406  
 407

**R408.2.1** Enhanced envelope performance option.

408  
 409

410 The total *building thermal envelope* UA, the sum of *U*-factor times assembly area, shall be less  
411 than or equal to 90 percent of the total UA resulting from multiplying the *U*-factors in Table  
412 R402.1.2 by the same assembly area as in the proposed building.

413  
414 **R408.2.2** Delete option 1. of Subsection R408.2.2 and renumber option 2. As option 1., and  
415 option 3 as option 2.

416  
417 **R408.2.3** Delete option 1. of Subsection R408.2.3 and renumber option 2. As option 1., and  
418 option 3 as option 2.

419

## 420 CHAPTER 5 [RE] EXISTING BUILDINGS

421

### 422 R502 ADDITIONS.

423

424 **R502.1** Revise Subsection R502.2 by replacing the third and fourth sentence as follows:

425

426 An *addition* shall be deemed to comply with this code where the *addition* alone complies, where  
427 the existing *building* and *addition* comply with this code as a single building, or where the  
428 *building* with the *addition* achieves a certified HERS rating in accordance with Table R406.5.  
429 *Additions* shall be in accordance with Section R502.1.1, R502.2 or R502.3.

430

431 **R502.1.1** Add Subsection R502.1.1 as follows:

432

433 **R502.1.1 Large additions.** *Additions* to a *dwelling unit* exceeding 1,000 sq ft or exceeding  
434 100% of the existing *conditioned floor area*, shall require the *dwelling unit* to comply with the  
435 maximum HERS ratings for alterations, additions or change of use shown in TABLE R406.5.

436

437 **R502.2** Delete the Exceptions in Subsection R502.2.

438

439 **R502.3.1** Replace the Exception in Subsection R502.3.1 as follows:

440

441 **Exception:** New envelope assemblies in additions of less than 1,000 sq ft are exempt  
442 from the requirements of Section R402.4.1.2.

443

444 **R503.1.5** Add new subsection as follows:

445

446 **R503.1.5 Level 3 Alterations or Change of Use.** Alterations that meet the IEBC definition for  
447 *Level 3 Alteration*, exceeding 1,000 sq ft or exceeding 100% of the existing *conditioned floor*  
448 *area*, shall require the *dwelling unit* to comply with the maximum HERS ratings for alterations,  
449 additions or change of use shown in TABLE R406.5.

450

451 **R505.1** Delete the Exception in Section R505.1.

452

453 *Appendix RB* revise the *Appendix RB* title as follows:

454 **Appendix RB: Solar-ready Provisions – Detached One- and Two-family Dwellings, Low-**  
455 **rise Residential buildings and Townhouses (Adopted as amended)**

456

457 *RB101.1* Replace Section *RB101.1* as follows:

458

459 **RB101.1 General.** These provisions shall be applicable for new construction, except additions  
460 under 1,000 sq ft.

461 **Exception:**

462 Buildings and *dwelling units* complying with Appendix RC Sections RC102 or RC105

463

464 *RB103.1* Replace Section *RB103.1* as follows:

465

466 **RB103.1 General.** New R-use buildings including, but not limited to, detached one- and two-  
467 family dwellings, and townhouses with not less than 600 square feet (55.74 m<sup>2</sup>) of roof area  
468 oriented between 110 degrees and 270 degrees of true north shall comply with Sections RB103.2  
469 through RB103.8.

470 **Exceptions:**

471 1. New residential buildings with a permanently installed on-site renewable  
472 energy system.

473 2. A building with a solar-ready zone that is shaded for more than 70 percent of  
474 daylight hours annually.

475

476 *RB103.3* Replace *International Fire Code* with *Massachusetts Fire Code* in Section *RB103.3*

477 *Appendix RC* revise the *Appendix RC* title and notes as follows:

478 **APPENDIX RC**

479 **MASSACHUSETTS MUNICIPAL OPT-IN SPECIALIZED STRETCH CODE 2023**

480 **RESIDENTIAL LOW-RISE BUILDING PROVISIONS**

481 *The provisions contained in this appendix together with referenced sections from the Stretch*  
482 *energy code constitute the Specialized opt-in code for residential low-rise buildings, and may be*  
483 *adopted by a city or town together with the Commercial Specialized code Appendix CC as their*  
484 *stretch energy code. When adopted by the local municipality, the provisions in this appendix are*  
485 *mandatory in combination with the IECC2021 with Massachusetts Stretch code amendments.*

486

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487 **User Note:**

488 *About this appendix: This appendix provides requirements for residential buildings.*  
489 *Where adopted by ordinance as a requirement, Section RC101 language is intended to*  
490 *replace Section R401.2.*

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491

492 **SECTION RC101 COMPLIANCE**

493

494 *RC101* Replace Section RC101 as follows:

495 **RC101.1 Compliance.** Existing residential buildings shall comply with Chapter 5 of the stretch  
496 energy code. New residential buildings shall be *Net Zero Buildings* and comply with Section  
497 R404.4 (EV wiring) and either Section R405 (Passive House) or Section R406 (HERS) in  
498 accordance with RC101.2, as well as one of the following Specialized code pathways:

- 499 1. Section RC102 Zero Energy pathway  
500 2. Section RC103 All-Electric pathway  
501 3. Sections RC104 and RC105 Mixed-Fuel pathway.

502

503 **RC101.2 Application.** New *dwelling units* over 4,000 square feet in *conditioned floor area* shall  
504 comply with either RC101.1 option 1. Zero Energy pathway or option 2. All-Electric pathway,  
505 and follow either Section RC102 or Section RC103.

506 R-use buildings with total *conditioned floor area* greater than 12,000 square feet shall comply  
507 with the provisions of Section R405 Passive House Building Certification Option, and any of the  
508 pathways in Section RC101.1.

509

510 **RC101.3 Definitions.**

511

512 **NET ZERO BUILDING.** A building which is consistent with achievement of MA 2050 net  
 513 zero emissions, through a combination of highly energy efficient design together with being  
 514 either a *Zero Energy Building*, or an *All-Electric Building*, or where fossil fuels are utilized, a  
 515 building fully pre-wired for future electrification and that generates solar power on-site from the  
 516 available *Potential Solar Zone Area*.

517 **ZERO ENERGY BUILDING.** A building which through a combination of highly energy  
 518 efficiency design and onsite renewable energy generation is designed to result in net zero energy  
 519 consumption over the course of a year as measured in MMBtus or KWh<sub>eq</sub>, on a site energy basis,  
 520 excluding energy use for charging vehicles.

521 *RC102 Replace Section RC102 and Table RC102.2 as follows:*

522 **SECTION RC102 ZERO ENERGY PATHWAY**

523 **RC102.1 General.** New *zero energy buildings* shall comply with Section RC102.2 and  
 524 demonstrate a certified HERS rating of 0 or less and comply with Section R406, or complete  
 525 Design Certification to the Phius ZERO standard and comply with Section R405.

526 **RC102.2 Energy Rating Index Zero Energy Score.** Compliance with this section requires that  
 527 the final HERS rated design be shown to have a score less than or equal to the values in Table  
 528 RC102.2 when compared to the Energy Rating Index (ERI) reference design determined in  
 529 accordance with RESNET/ICC 301 for both of the following:

- 530 1. ERI value not including on-site power production (OPP) calculated in accordance  
 531 with RESNET/ICC 301.
- 532 2. ERI value including on-site power production calculated in accordance with  
 533 RESNET/ICC 301 with the OPP in Equation 4.1.2 of RESNET/ICC 301.

534  
 535 **TABLE RC102.2 MAXIMUM ENERGY RATING INDEX<sup>a</sup>**

FUEL USAGE	ENERGY RATING INDEX NOT INCLUDING OPP	ENERGY RATING INDEX INCLUDING OPP
All Electric	45	0
Mixed-Fuel	42	0

537 a. The building shall meet the requirements of Table R406.2, and the building thermal envelope shall  
 538 be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or R402.1.3.

539 *RC103 Add Section RC103 and Table RC103.2 as follows:*

540 **SECTION RC103 ALL ELECTRIC PATHWAY**

541  
 542 **RC103.1 General.** New *all electric buildings* shall comply with Section R401.2.5 and either  
 543 Section RC103.2 to demonstrate a certified final HERS rating of 45 or less, or Section R405 and  
 544 be pre-certified to the PHI or Phius CORE standard.

545 All new buildings shall comply with Appendix RB solar ready provisions and Section R404.4  
 546 Wiring for Electric Vehicle Charging Spaces

547

548 **RC103.2 All Electric Energy Rating Index score.** Compliance with this section requires that the  
 549 rated design be shown to have a certified HERS Index score less than or equal to the values in  
 550 Table RC103.2 when compared to the Energy Rating Index (ERI) reference design determined in  
 551 accordance with RESNET/ICC 301 and the following:

1. ERI value not including on-site power production (OPP) calculated in accordance with RESNET/ICC 301.

552  
 553  
 554  
 555 **TABLE RC103.2 MAXIMUM ENERGY RATING INDEX<sup>a</sup>**

FUEL USAGE	ENERGY RATING INDEX NOT INCLUDING OPP
All Electric	45

556 a. The building shall meet the requirements of Table R406.2, and the building thermal envelope shall  
 557 be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or R402.1.3.

558  
 559 **RC104 Add Section RC104 and Table RC104.2 as follows:**

560 **SECTION RC104 MIXED-FUEL PATHWAY**

561  
 562 **RC104.1 General.** This section establishes requirements for new *residential mixed-fuel*  
 563 *buildings* with any space heating systems, water heating systems or appliances capable of using  
 564 fossil fuels such as natural gas, heating oil or propane fuel. All buildings shall comply with  
 565 either:

1. HERS certification: Sections RC104.2 through RC104.5 and RC105
2. Passive House pre-certification: Section R405 and Section RC104.3

566  
 567  
 568  
 569 **RC104.1.1 Biomass heating.** New *residential buildings* using *clean biomass heating*  
 570 *systems* may comply with this section. Biomass heating that does not meet the  
 571 performance standards of *clean biomass heating systems* shall not be permitted as a  
 572 primary heating system.  
 573

574 **RC104.2 Energy Rating Index score.** Compliance with this section requires that the rated design  
 575 be shown to have a HERS Index score less than or equal to the values in Table RC103.2 when  
 576 compared to the Energy Rating Index (ERI) reference design determined in accordance with  
 577 RESNET/ICC 301 for both of the following:

1. ERI value not including on-site power production (OPP) calculated in accordance with RESNET/ICC 301.

578  
 579  
 580  
 581 **TABLE RC104.2 MAXIMUM ENERGY RATING INDEX<sup>a</sup>**

FUEL USAGE	HERS RATING INDEX NOT INCLUDING OPP
Mixed-Fuel building	42

582 a. The building shall meet the requirements of Table R406.2, and the building thermal envelope shall  
 583 be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or R402.1.3.



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**RC104.3 Electric Readiness.** Any installed gas, fuel oil or propane furnaces, boilers, water heaters, dryers, or cooking equipment shall comply with the requirements of Sections RC104.3.1 through RC104.3.4. Capacity for the future electric circuits required in this section shall be included in the load calculations of the original installation of electric service to the building and each *dwelling unit*.

**RC104.3.1 Space Heating.** The building and each *dwelling unit* shall be provided with a designated exterior location(s) in accordance with the following:

1. Natural drainage for condensate from cooling equipment operation or a condensate drain located within 3 feet (914 mm), and
2. A dedicated branch circuit in compliance with IRC Section E3702.11 based on heat pump space heating equipment sized in accordance with R403.7 and terminating within 3 feet (914 mm) of the location with no obstructions. Both ends of the branch circuit shall be labeled “For Future Heat Pump Space Heater.”

**Exception:** Where an electrical circuit in compliance with IRC Section E3702.11 exists for space cooling equipment based on heat pump space heating equipment sized in accordance with R403.7.

**RC104.3.2 Household Ranges and Cooking Appliances.** An individual branch circuit outlet with a minimum rating of 250-volts, 40-amperes shall be installed within three feet of each gas or propane range or permanently installed cooking appliance.

**RC104.3.3 Household Clothes Dryers and Water Heaters.** An individual branch circuit outlet with a minimum rating of 250-volts, 30-amperes shall be installed within three feet of each gas or propane household clothes dryer and water heater.

**RC104.3.4 Water Heating Space.** Any permanently installed domestic hot water heating equipment shall be installed in an indoor space:

- A) with a minimum volume of 700 cubic feet (20,000 L) or the equivalent of one 16-inch (406 mm) by 24-inch (610 mm) grill to a heated space and one 8-inch (203 mm) duct of no more than 10 feet (3048 mm) in length for cool exhaust air.
- B) that is at least 3 feet (914 mm) by 3 feet (914 mm) by 7 feet (2134 mm) high surrounding or within 3 feet (914 mm) of the installed water heater.

**RC104.4 On-site Renewable Energy**

New buildings shall comply with either RC104.4.1 or RC104.4.2. Buildings following HERS certification shall comply with the requirements of RC105 solar-roof zone. Buildings following the Passive House pre-certification shall comply with Appendix RB solar ready provisions.

**RC104.4.1 One- and two- family dwellings and townhouses.** One- and two- family dwellings and townhouses shall install an on-site renewable energy system with a nameplate DC power rating measured under standard test conditions, of no less than 4kW per dwelling unit.

629                   **Exception:**  
630                   1. A building where the *potential solar zone area* is less than 300 square feet.

631  
632                   **RC104.4.2 Other Group R Occupancies.** Buildings in Group R-2, R-3 and R-4 shall  
633                   install an on-site renewable energy system with a rated capacity of not less than 0.75  
634                   W/ft<sup>2</sup> multiplied by the gross conditioned floor area.

635                   **Exceptions:**  
636                   1. A building with a permanently installed domestic solar water heating system with a  
637                   minimum solar savings fraction of 0.5.  
638                   2. A building where the *potential solar zone area* is less than 300 square feet.

639  
640                   **RC104.5 Electric Vehicle Readiness.** All buildings shall comply with Section R404.4 Wiring  
641                   for Electric Vehicle Charging Spaces

642

643                   *RC105 Add Section RC105 as follows:*

644                   **SECTION RC105 SOLAR-ROOF ZONE**

645

646                   **RC105.1 General.** New detached one- and two-family dwellings, and townhouses with not less  
647                   than 600 square feet (55.74 m<sup>2</sup>) of roof area oriented between 110 degrees and 270 degrees of  
648                   true north shall comply with Sections RC105.2 through RC105.10.

649                   **Exceptions:**

650                   1. A building where all areas of the roof that would otherwise meet the  
651                   requirements of Section RC105 are in full or partial shade for more than 70  
652                   percent of daylight hours annually.

653

654                   **RC105.2 Construction document requirements for solar- zone.** Construction documents shall  
655                   indicate the solar zone.

656                   **RC105.3 Solar zone area.** The total solar zone area shall be not less than 300 square feet (27.87  
657                   m<sup>2</sup>) exclusive of mandatory access or setback areas as required by the *MA Fire Code*. New  
658                   townhouses three stories or less in height above grade plane and with a total floor area less than  
659                   or equal to 2,000 square feet (185.8 m<sup>2</sup>) per *dwelling unit* shall have a solar zone area of not less  
660                   than 150 square feet (13.94 m<sup>2</sup>). The solar zone shall be composed of areas not less than 5 feet  
661                   (1524 mm) in width and not less than 80 square feet (7.44 m<sup>2</sup>) exclusive of access or setback  
662                   areas as required by the *MA Fire Code*.

663                   **RC105.4 Obstructions.** Solar zones shall be free from obstructions, including but not limited to  
664                   vents, chimneys, and roof-mounted equipment.

665                   **RC105.5 Shading.** The solar zone shall be set back from any existing or new  
666                   permanently affixed object on the building or site that is located south, east or west of  
667                   the solar zone a distance not less than two times the object's height above the nearest  
668                   point on the roof surface. Such objects include, but are not limited to, taller portions of  
669                   the building itself, parapets, chimneys, antennas, signage, rooftop equipment, trees and  
670                   roof plantings.

671 **RC105.6 Capped roof penetration sleeve.** A capped roof penetration sleeve shall be  
672 provided adjacent to a solar zone located on a roof slope of not greater than 1 unit  
673 vertical in 12 units horizontal (8-percent slope). The capped roof penetration sleeve  
674 shall be sized to accommodate photovoltaic system conduit and shall have an inside  
675 diameter of not less than 1 1/4 inches (32 mm).

676 **RC105.7 Roof load documentation.** The structural design loads for roof dead load  
677 and roof live load shall be clearly indicated on the construction documents.

678 **RC105.8 Interconnection pathway.** Construction documents shall indicate pathways  
679 for routing of conduit or plumbing from the solar-ready zone to the electrical service  
680 panel or service hot water system.

681 **RC105.9 Electrical service reserved space.** The main electrical service panel shall  
682 have space to allow installation of a dual pole circuit breaker for solar electric  
683 installation.

684 **RC105.10 Construction documentation certificate.** A permanent certificate, indicating the  
685 solar PV system size in AC and DC KW and or solar thermal size in KW equivalent and other  
686 requirements of this section, shall be posted near the electrical distribution panel, water heater or  
687 other conspicuous location by the builder or registered design professional.

688  
689 **Referenced Standards:** *Add the following Reference Standards:*

690 a. CSA Group  
691 8501 East Pleasant Valley Road, Cleveland, OH 44131-5516  
692 CAN/CSA-C439-18. Laboratory methods of test for rating the performance of heat/energy-  
693 recovery ventilators.

694  
695 b. AHRI Air-Conditioning, Heating & Refrigeration Institute  
696 2311 Wilson Blvd., Suite 400, Arlington, VA 22201  
697 1060-2018. Performance Rating of Air-To-Air Exchangers for Energy Recovery Ventilation  
698 Equipment.

699  
700 **225 CMR 23: MASSACHUSETTS COMMERCIAL STRETCH ENERGY CODE**  
701 **AND MUNICIPAL OPT-IN SPECIALIZED CODE 2023**

702 **Massachusetts Stretch Code and Specialized Code for Commercial buildings**  
703

704 **(Note: please see 225 CMR 22.00 for low-rise Residential construction)**

705 The Massachusetts Stretch energy code (Stretch Code) first became available for municipal adoption in  
706 2009 as Appendix 110.aa and then 115.aa as part of the building code in 780 CMR. In 2021 the  
707 Massachusetts legislature passed new legislation moving authority for updates to the Stretch Code to the  
708 Department of Energy Resources and 225 CMR.

709 This code takes effect on July 1, 2023 and is designed to align with the forthcoming MA 10<sup>th</sup> edition  
710 building code promulgated under 780 CMR. Building permit applications for projects received on or after  
711 July 1, 2023 in Stretch Code communities shall comply with this code.

712 As with the 10<sup>th</sup> edition building code, this energy code is based on modified versions of the 2021 code  
713 books as published by the International Code Council (ICC). Specifically, the 2021 International Energy  
714 Conservation Code (IECC 2021) as amended.

715 This section (225 CMR 23) covers all buildings except for low-rise residential buildings which are  
716 covered by 225 CMR 22. 225 CMR 22 and 23 in combination form the Stretch Code – and must be  
717 adopted together and not in part.

718 Municipalities may also elect to adopt the combination of Appendix RC of 225 CMR 22 (Low rise  
719 residential) and Appendix CC of 225 CMR 23 (all other buildings) which together form the Municipal  
720 Opt-in Specialized code (Specialized Code).

721 For communities that have adopted the Stretch Code, the following 225 CMR 23 amendments to the  
722 IECC 2021 apply together with 225 CMR 22 for low-rise residential buildings.

723 For communities that adopt the Specialized Code, the following 225 CMR 23 amendments apply in  
724 combination with Appendix CC, along with 225 CMR 22 and Appendix RC for low-rise residential  
725 buildings.

726 In both the Stretch Code and the Specialized Code these amendments to the IECC 2021 replace Chapter  
727 13 – Energy Efficiency of 780 CMR in the Base energy code.

728 Please remember that the Massachusetts amendments posted online are *unofficial versions* that are made  
729 available for convenience. Official versions of the Massachusetts amendments may be purchased from the  
730 State House Bookstore at [www.sec.state.ma.us/spr/](http://www.sec.state.ma.us/spr/) and the IECC 2021 can be purchased from the ICC at  
731 [www.iccsafe.org](http://www.iccsafe.org)

732 **225 CMR 23: MASSACHUSETTS FRONT-END AMENDMENTS TO THE INTERNATIONAL**  
733 **ENERGY CONSERVATION CODE 2021**

734 **MASSACHUSETTS STRETCH ENERGY CODE – 2023 Commercial amendments to IECC2021**

735

736 **CHAPTER 1 [CE] SCOPE AND ADMINISTRATION**

737

738 **SECTION C103 CONSTRUCTION DOCUMENTS**

739

740 *C103.2 Insert after Subsection C103.2(13) the following:*

741 14. Solar Ready roof zone in accordance with Appendix CB, or *Potential Solar Zone Area* in  
742 accordance with Appendix CC.

743 15. EV Ready Spaces locations in accordance with Section C405.13

744 16. For buildings using the Relative Performance Pathway (C407.2) because average ventilation at  
745 full occupancy is greater than 0.5 cfm/sf, submit mechanical equipment schedules for all new and/or  
746 existing air handling equipment designed to supply any quantity of outdoor air to the space, and an  
747 airflow riser diagram encompassing the complete project boundary. Mechanical equipment  
748 schedules shall clearly indicate the total design outdoor airflow for each unit. The air riser diagram  
749 shall include all supply, exhaust, and return air systems serving the space. The air riser diagram shall  
750 also include a summary of the total outdoor air supplied, the total gross square footage served by the  
751 ventilation system, and the overall flow rate per area in cfm/sf.

752 17. For mixed fuel building following Appendix CC, construction documents showing electric  
753 HVAC retrofit design prepared by the HVAC engineer. The contract documents shall show future  
754 replacement of *combustion equipment* based HVAC system with an equivalent all electric system.  
755 Contract documents shall show *combustion equipment* to be replaced, future electric equipment,  
756 supporting electric, structural, and architectural infrastructure to be installed during building  
757 construction, and space allotments for future equipment.

758

759 *C103.2.2 Add the following Subsection:*

760 **C103.2.2 COMcheck submittal.** The construction documents submitted with the application for  
761 permit shall be accompanied by completed COMcheck Envelope, Lighting and Mechanical  
762 Compliance Certificates, and a Plan Review Inspection Checklist for the purposes of demonstrating  
763 compliance with the energy provisions of 225 CMR 23.00: *Stretch Energy Code*.

764 **Exception:** Projects documenting compliance following Section C407.2 (ASHRAE 90.1 Appendix  
765 G) shall follow applicable reporting requirements.

766

767

768 **CHAPTER 2 [CE] DEFINITIONS**

769

770 **SECTION C202 GENERAL DEFINITIONS**

771  
772 **C202** Add the following definitions:

773 **ALL-ELECTRIC BUILDING.** A building with no on-site *combustion equipment* for fossil fuel use or  
774 capacity for including fossil fuel use in space heating, water heating, cooking, or drying appliances.

775 **AUTOMATIC LOAD MANAGEMENT SYSTEMS (ALMS).** A control system that allows multiple  
776 connected *electric vehicle supply equipment (EVSE)* to share a circuit or panel and automatically manage  
777 power at each charger, reducing the total connected electrical capacity of all *EVSE*.

778 **CLASS 3 EXHAUST.** Exhaust meeting the definition of Class 3 air in ASHRAE/ASHE Standard 62.1-  
779 2019, including air with significant contaminant concentration, significant sensory-irritation intensity, or  
780 offensive odor. The Class 3 Exhaust system must be capable of reducing exhaust and makeup airflow  
781 rates to 50% of the zone design values or the minimum required to maintain pressurization relationship  
782 requirements.

783  
784 **CLASS 4 EXHAUST.** Exhaust meeting the definition of Class 4 air in ASHRAE/ASHE Standard 62.1-  
785 2019, including laboratory fume hood exhaust, exhaust where energy recovery is not allowed by  
786 ASHRAE/ASHE Standard 170 for use in energy recovery systems with leakage potential, and systems  
787 exhausting toxic, flammable, paint or corrosive fumes or dust. The Class 4 Exhaust system must be  
788 capable of reducing exhaust and makeup airflow rates to 50% of the zone design values or the minimum  
789 required to maintain pressurization relationship requirements. Excludes *exempt exhaust*.

790  
791 **CLEAN BIOMASS HEATING SYSTEM.** Wood-pellet fired central boilers and furnaces with less than  
792 3 million Btu/hour rated heat input, where the equipment has a thermal efficiency rating of 85% (higher  
793 heating value) or greater; and a particulate matter emissions rating of no more than 0.08 lb. PM<sub>2.5</sub>/MMBtu  
794 heat output. Or wood chip fired central boilers and furnaces with less than 3 million Btu/hour rated heat  
795 input, where the equipment has a thermal efficiency rating of 80% or greater and a particulate matter  
796 emissions rating of no more than 0.10 lb. PM<sub>2.5</sub>/MMBtu heat output.

797  
798 **COMBUSTION EQUIPMENT.** Any *equipment* or *appliance* used for space heating, *service water*  
799 *heating*, cooking, clothes drying and/or lighting that can use *fuel gas*, *fuel oil* or solid fuel and that is not a  
800 *clean biomass heating system*.

801 **DEDICATED OUTSIDE AIR SYSTEM (DOAS):** A ventilation system that supplies 100 percent  
802 outdoor air primarily for the purpose of ventilation and that is a separate system from the zone space-  
803 conditioning system.

804 **ELECTRIC VEHICLE.** An automotive-type vehicle for on-road use, such as passenger automobiles,  
805 buses, trucks, vans, neighborhood electric vehicles, electric motorcycles, and the like, primarily powered  
806 by an electric motor that draws current from a rechargeable storage battery, fuel cell, photovoltaic array,  
807 or other source of electric current.

808 *Informational note: defined as in 527 CMR 12 section 625.2.*

809 **ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE):** The conductors, including the ungrounded,  
810 grounded, and equipment grounding conductors, and the *electric vehicle* connectors, attachment plugs,  
811 and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of  
812 transferring energy between the premises wiring and the *electric vehicle*.

813 *Informational note: defined as in 527 CMR 12 section 625.2.*

814 **ELECTRIC VEHICLE READY PARKING SPACE (“EV READY SPACE”):** A designated parking  
815 space which is provided with wiring and electrical service sufficient to provide AC Level II or equivalent  
816 EV charging, as defined by Standard SAE J1772 for *EVSE* servicing light duty *electric vehicles*.

817 **ENTHALPY RECOVERY RATIO.** The ratio of change in enthalpy of the entering supply airflow and  
818 the leaving supply airflow to the difference in enthalpy between the entering supply airflow and the  
819 entering exhaust airflow, with no adjustment to account for that portion of the psychrometric change in  
820 the leaving supply airflow that is the result of leakage of entering exhaust airflow rather than exchange of  
821 heat or moisture between the airstreams.

822 **EXEMPT EXHAUST.** Exhaust for which energy recovery systems are prohibited by the applicable  
823 International Mechanical Code.

824  
825 **EXHAUST SOURCE HEAT PUMP.** A type of electric heat pump that utilizes ventilation exhaust air  
826 as the thermal energy source.

827 **FUEL GAS.** A natural gas, manufactured gas, liquified petroleum gas or a mixture of these.

828 *Informational note: Definition of fuel gas is mirrored from 2021 IMC to be useful in defining combustion*  
829 *equipment. It typically refers to natural gas and propane.*

830 **FUEL OIL.** Kerosene or any hydrocarbon oil having a flash point not less than 100°F (38°C).

831 *Informational note: Definition of fuel oil is mirrored from 2021 IMC to be useful in defining combustion*  
832 *equipment. It typically refers to heating oil products*

833 **GLAZED WALL SYSTEM.** System consisting of any combination of both vision glass and/or *spandrel*  
834 *sections* to create an above-grade wall that is designed to separate the exterior and interior environments.  
835 These systems include, but are not limited to, curtain walls, window walls, and storefront windows.

836 **MIXED-FUEL BUILDING.** A *building* that contains *combustion equipment* or includes piping for such  
837 *equipment*.

838 **OTHER EXHAUST.** Any exhaust that does not fall under the categories of *Exempt Exhaust, Class 4*  
839 *Exhaust, or Class 3 Exhaust*.

840  
841 **SENSIBLE ENERGY RECOVERY RATIO.** The change in the dry-bulb temperature of the outdoor air  
842 supply divided by the difference between the outdoor air and entering exhaust air dry-bulb temperatures,  
843 expressed as a percentage.

844 **SPANDREL SECTION.** The opaque portion of a *glazed wall system* typically used to conceal or  
845 obscure features of the building structure or used for visual effect. A spandrel section may consist of, but  
846 is not limited to, an exterior exposed cladding layer (glazing or opaque material) with an interior insulated  
847 panel.

848 **TENANT SPACE FIT OUT ZONE.** Portion of a building in which only the envelope is completed, and  
849 the mechanical, lighting, and other interior systems are either incomplete or partially complete at the time  
850 of building permitting. Mechanical, lighting, and other interior systems may be completed under either  
851 the same building permit or a different building permit from the host building.

852 **THERMAL BRIDGE:** Part of the *building envelope* where otherwise uniform thermal resistance is  
853 changed by full or partial penetration of the thermal insulation by materials with higher thermal

854 conductivities and/or where the interior and exterior areas of the envelope are different, such as, but not  
855 limited to, parapets and corners.

856 **CLEAR FIELD:** A *thermal bridge* that is uniformly distributed throughout an assembly such  
857 that accounting for the *thermal bridge* individually is impractical for whole-building calculations.

858 **LINEAR:** A *thermal bridge* that is continuous in one direction of the exterior envelope.

859 **POINT** A *thermal bridge* that is discrete and countable on an individual basis for whole-building  
860 calculations.

861  
862 **CHAPTER 3 [CE] GENERAL REQUIREMENTS**

863  
864 **SECTION C301 CLIMATE ZONES**

865  
866 *C301 Replace Section C301 as follows:*

867 **C301.1 General.** Massachusetts is in *climate zone 5A*

868  
869 **CHAPTER 4 [CE] COMMERCIAL ENERGY EFFICIENCY**

870  
871 **SECTION C401 – GENERAL**

872  
873 *C401.2 Replace Section C401.2 as follows:*

874 **C401.2 Application.** Commercial buildings shall comply with either Section C401.2.1 or C401.2.2.  
875 When constructed for the first time, all requirements imposed on the building housing a *tenant space fit*  
876 *out zone* shall also apply to the *tenant space fit out zone*. Commercial buildings containing multiple use  
877 type classifications (mixed-use buildings) shall comply with C401.2.4

878  
879 **C401.2.1 Prescriptive and Performance Compliance.** Commercial buildings shall comply with  
880 one of the following:

- 881  
882 1. **Prescriptive Compliance:** This pathway may only be used for any nonresidential  
883 building, or portions thereof when following C401.2.4, up to 20,000-sf. The Prescriptive  
884 Compliance pathway requires compliance with Sections C401.3, C402 through C406,  
885 and Section C408.
- 886 2. **Targeted Performance Compliance:** This pathway shall be used for dormitory, fire  
887 station, library, office, school, police station, post office, and town hall buildings, or  
888 portions thereof when following C401.2.4, over 20,000-sf which have average ventilation  
889 at full occupancy of 0.5 cfm/sf or less. This pathway can also be used for any building of  
890 any size. After 1 July 2024, this pathway shall be used for residential buildings, or  
891 portions thereof when following C401.2.4, over 12,000-sf, or the building may comply  
892 with Section C401.2.2. The Targeted Performance Compliance pathway requires  
893 compliance with Section C401.3, Sections C402 through C406, Section C407.1, Section  
894 408, and select sections of ANSI/ASHRAE/IESNA 90.1-2019 Appendix G as described  
895 in Section 407.1.
- 896 3. **Relative Performance Compliance:** This pathway may be used by buildings not  
897 required to use Option 2. The Relative Performance Compliance pathway requires that  
898 the Proposed building complies with Sections C401.3, C402.1.5, C402.2.8, C402.3,  
899 C402.4, C402.5, C402.6, C402.7, C403.5, C403.7, C405.2.4, C405.13, C406, C407.2,



900 C408, and ANSI/ASHRAE/IESNA 90.1-2019 using the Appendix G compliance  
901 pathway as modified in Section C407.2.

902  
903 **Exception:** Additions, alterations, repairs and changes of occupancy to existing buildings  
904 complying with Chapter 5. This exception does not include *tenant space fit out zones* when  
905 constructed for the first time.

906  
907 **C401.2.2 Certified Performance Standard Compliance.** Commercial buildings or portions  
908 thereof when following C401.2.4 shall comply with one of the following certified performance  
909 standards:

- 910
- 911 1. **Passive House Compliance:** This pathway can be used for any building of any size.  
912 The Passive House Compliance pathway requires compliance with Sections C401.3,  
913 C402.3, C405, C407.3 and C408.
  - 914 2. **HERS Compliance:** This pathway can be used for any Group R building with multiple  
915 individual *dwelling units*. The HERS pathway requires compliance with Section  
916 C401.3, C402.3, C405, C407.4 and C408.

917  
918 **C401.2.4 Add Section C401.2.4 Mixed Use Buildings**

919 **C401.2.4 Mixed Use Buildings.** Where different building use types within a new building require  
920 different Section C401.2 Compliance Pathways, each use type shall separately and individually show  
921 compliance with C401.2.1 or C401.2.2 for that respective use type.

922  
923 **C401.4 Add Section C401.4 as follows:**

924 **C401.4 Building electrification.** Building projects which utilize Section C407.2.1 shall conform with  
925 C401.4.1. Building projects which utilize Section C402.1.5.2 shall conform with C401.4.2 except for  
926 buildings using the Relative Performance pathway because average ventilation at full occupancy is  
927 greater than 0.5 cfm/sf which shall comply with C401.4.1 rather than C401.4.2. Building projects which  
928 utilize Section CC104.1, Part 1 shall conform with C401.4.3.

929 **C401.4.1 Partial Space Heating Electrification.** Electric air source, *exhaust source*, or ground  
930 source heat pumps systems shall supply 25% of the building's peak space heating and ventilation  
931 air heating load at the ASHRAE 99.6% winter climatic design condition. Heat pumps used for  
932 space and ventilation air heating shall comply with C401.4.4.

933 C401.4.1.1 The heat pumps shall be controlled to prioritize their primary operation, prior  
934 to operation of supplemental fossil-fuel equipment, during non-emergency conditions.

935 **C401.4.2 Full Space Heating Electrification.** Electric air source, *exhaust source*, or ground  
936 source heat pump systems shall supply 100% of the building's peak space heating and ventilation  
937 air heating load at the ASHRAE 99.6% winter climatic design condition. No fossil fuel heating  
938 equipment shall be used for space heating or ventilation air heating. Heat pumps used for space  
939 and ventilation air heating shall comply with C401.4.4.

940 **C401.4.3 Full Space and Water Heating Electrification.** Electric air source, *exhaust source*, or  
941 ground source heat pumps systems shall supply 100% of the building's peak space heating and  
942 ventilation air heating load at the ASHRAE 99.6% winter climatic design condition. Electric air  
943 source, ground source, electric resistance, or solar thermal systems shall supply 100% of the  
944 building's service water. No fossil fuel equipment shall be used for space heating, ventilation air

945 heating, or service water heating. Heat pumps used for space and ventilation air heating shall  
946 comply with C401.4.4. Heat pump service water heating shall conform to the applicable  
947 efficiencies in Section C404.2. Solar thermal service water shall have solar fraction of 0.4 or  
948 larger.

949  
950 **C401.4.4 Heat Pump Requirements.** Heat pumps used for space heating and ventilation air  
951 heating shall comply with C401.4.4.1 through C401.4.4.3.

952 C401.4.4.1 Heat pump equipment shall conform to the applicable efficiencies in Section  
953 C403.3.2.

954 C401.4.4.2 For buildings with multiple heat pump systems, compliance shall be based on  
955 the combined capacity of all heat pump systems serving the building. For purposes of  
956 this calculation, the heating capacity of a heat pump system shall not exceed the heating  
957 load of that system and the portion of the building served by that system.

958 C401.4.4.3 For purposes of this calculation, the capacity of *exhaust source heat pumps*  
959 shall only include the heating capacity that exceeds the energy recovered by the  
960 minimum ventilation heat recovery required by C403.7.4. In addition, for purposes of  
961 this calculation, the capacity of the *exhaust source heat pumps* shall not exceed the heat  
962 pump capacity when the exhaust airflow is at 50% of design airflow.

963

964 **C402.1.3** Delete Subsection C402.1.3 and Table C402.1.3 and mark as Reserved.

965 **C402.1.3** Reserved.

966 **C402.1.5** Replace Section C402.1.5 with the following:

967 **C402.1.5 Component performance alternative.** Building envelope values and fenestration  
968 areas determined in accordance with C402.1.5.1 or C402.1.5.2 shall be an alternative to  
969 compliance with the *U*- factors in Tables C402.1.4 and C402.4 and the maximum allowable  
970 fenestration areas in Section C402.4.1. *Fenestration* shall meet the applicable SHGC  
971 requirements of Section C402.4.3. Buildings following ANSI/ASHRAE/IESNA 90.1-2019  
972 Appendix G shall comply with this section.

973

974 **C402.1.5.1 Low glazed wall system buildings.** Buildings in which less than or equal to  
975 50% of the total, above-grade wall area of the *building thermal envelope* is a *glazed wall*  
976 *system* shall comply with Equation 4-2a and vision glass used in the *glazed wall system*  
977 shall have a maximum whole assembly U factor of U-0.25.

978 Area-weighted U proposed  $\leq 0.1285$  **(Equation 4-2a)**  
979 where:

980 Area-weighted U proposed = U value for each distinct assembly type of the above grade  
981 wall portion of the *building thermal envelope* weighted by vertical area  
982 for each distinct assembly type.

983

984 **C402.1.5.2 High glazed wall system buildings.** Buildings in which more than 50% of  
985 the total, above-grade wall area of the *building thermal envelope* is a *glazed wall system*  
986 shall comply with Equation 4-2b, vision glass used in the *glazed wall system* shall have a

987 maximum whole assembly U factor of U-0.25, and the building complies with Section  
988 C401.4.2.

989 Area-weighted U proposed  $\leq 0.1600$  (Equation 4-2b)

990 where:

991 Area-weighted U proposed = U value for each distinct assembly type of the above grade  
992 wall portion of the *building thermal envelope*, weighted by the vertical  
993 area for each distinct assembly type.

994 **Exception:**

995 1. Buildings using the Relative Performance pathway because average ventilation at full  
996 occupancy is greater than 0.5 cfm/sf shall comply with C401.4.1 rather than  
997 C401.4.2.

998

999 **C402.2.4.1** Delete the exception in Subsection C402.2.4.1:

1000

1001 **C402.2.8** Add Subsection C402.2.8 as follows:

1002 **C402.2.8 Fireplaces.** New combustion fireplaces shall have tight-fitting flue dampers or doors,  
1003 and outdoor combustion air as required by the fireplace construction provisions of MA  
1004 Construction Codes, as applicable. Where using tight-fitting doors on factory-built fireplaces  
1005 listed and labeled in accordance with UL 127, the doors shall be tested and listed for the fireplace.

1006

1007 **C402.3** Replace Section C402.3 with the following:

1008 **C402.3 Rooftop solar readiness (Mandatory).**  
1009 Follow Appendix CB: Solar-ready zone – Commercial.

1010

1011 **C402.4** Modify Vertical fenestration U-factors in TABLE C402.4 as follows:

1012 **CLIMATE ZONE 5 AND MARINE 4**

1013 **Vertical fenestration U-factor**

Fixed fenestration	0.30
Operable fenestration	0.32

1014

1015 Add Subsection C402.4.6:

1016 **C402.4.6 Fenestration Documentation.** In accordance with Section 303.1.3 fenestration performance  
1017 shall be documented according to C402.4.6.1 or C402.4.6.2.

1018 **C402.4.6.1 Labeled Performance.** The thermal transmittance of glazed fenestration products within the  
1019 scope of NFRC shall be indicated by labels applied to the products at the manufacturing location or by a  
1020 label certificate produced by an NFRC Approved Calculation Entity.

1021 **C402.4.6.2 Calculated Performance.** Fenestration products outside the scope of NFRC may  
1022 demonstrate compliance by submitting a thermal simulation report prepared by a registered design  
1023 professional for each product as defined by NFRC 100. Thermal simulations shall be performed in  
1024 accordance with the NFRC 100-2020 simulation procedures at the size and configuration defined in  
1025 NFRC 100 Table 4-3.

1026 **C402.5** Replace Section C402.5 with the following:

1027 **C402.5 Air leakage—thermal envelope.** The *building thermal envelope* shall comply with Sections  
1028 C402.5.1 through Section C402.5.10.1.

1029

1030 **C402.5.1** Replace Section C402.5.1 with the following and delete the exception:

1031 **C402.5.1 Air barriers.** A continuous *air barrier* shall be provided throughout the *building thermal*  
1032 *envelope*. The continuous *air barrier* is permitted to be any combination of inside, outside, or within  
1033 the *building thermal envelope*. The *air barrier* shall comply with Sections C402.5.1.1, and  
1034 C402.5.1.2. The *air leakage* performance of the *air barrier* shall be verified in accordance with  
1035 Section C402.5.2.

1036

1037 **C402.5.1.1** Replace Section C402.5.1.1 with the following:

1038 **C402.5.1.1 Air barrier design and documentation requirements.** Design of the continuous *air*  
1039 *barrier* shall be documented in the following manner:

1040 1. Materials, assemblies, and systems comprising the continuous *air barrier* and  
1041 their position within each *building thermal envelope* assembly shall be identified.

1042 2. Joints, interconnections, and penetrations of the continuous *air barrier* materials,  
1043 assemblies and systems shall be detailed.

1044 3. The continuity of the *air barrier* at building element assemblies that enclose  
1045 conditioned space or provide a boundary between conditioned space and unconditioned  
1046 space shall be identified.

1047 4. Documentation of the continuous air barrier shall detail methods of sealing the  
1048 air barrier such as wrapping, caulking, gasketing, taping or other *approved* methods at the  
1049 following locations:

1050 i. Joints around fenestration and door frames.

1051 ii. Joints between walls and floors, between walls at building corners,  
1052 between walls and roofs including parapets and copings, where above-  
1053 grade walls meet foundations and similar intersections.

1054 iii. Penetrations or attachments through the continuous *air barrier* in  
1055 building envelope roofs, walls, and floors.

1056 iv. Building assemblies used as ducts or plenums.

1057 v. Changes in continuous *air barrier* materials and assemblies.

1058 vi. Transition from one wall or roof assembly type to another such as, but  
1059 not limited to, transition between opaque wall system and *glazed wall*  
1060 *system*, and transition between a curtain wall *glazed wall system* and a  
1061 storefront *glazed wall system*.

1062

1063 5. Identify where testing will or will not be performed in accordance with Section  
1064 C402.5.2. Where testing will not be performed, a plan for field inspections required by  
1065 C402.5.2.3 shall be provided that includes the following:

1066 i. Schedule for periodic inspection(s),

1067 ii. Continuous air barrier scope of work,

1068 iii. List of critical inspection items,

1069 iv. Inspection documentation requirements, and

1070 v. Provisions for corrective actions where needed.

1071

1072 **C402.5.1.2** Renumber Section C402.5.1.1 as Section C402.5.1.2 and make the following changes:

1073

1074 *In Part 3, delete* “Joints and seams associated with penetrations shall be sealed in the same  
1075 manner or taped”

1076 *In Part 3, replace* “from wind stack effect and mechanical ventilation” with “pressure”.

1077 *In Part 4, replace* “C402.5.10” with “C402.5.1.2.1”.

1078 **C402.5.1.2.1** *Add Section C402.5.1.2.1 as follows:*

1079 **C402.5.1.2.1 Electrical and communication boxes.** Electrical and communication boxes that  
1080 penetrate the air barrier of the *building thermal envelope*, and that do not comply with  
1081 C402.5.1.2.1.1, shall be caulked, taped, gasketed, or otherwise sealed to the air barrier element  
1082 being penetrated. All openings on the concealed portion of the box shall be sealed. Where  
1083 present, insulation shall rest against all concealed portions of the box.

1084  
1085 **C402.5.1.2.1.1** *Add Section C402.5.1.2.1.1 as follows:*

1086 **C402.5.1.2.1.1 Air-sealed boxes.** Where air-sealed boxes are installed, they shall be marked in  
1087 accordance with NEMA OS 4. Air-sealed boxes shall be installed in accordance with the  
1088 manufacturer's instructions.

1089  
1090 **C402.5.1.3** *Delete Section C402.5.1.3*

1091  
1092 **C402.5.1.4** *Delete Section C402.5.1.4*

1093  
1094 **C402.5.1.5** *Delete Section C402.5.1.5*

1095  
1096 **C402.5.2** *Replace Section C402.5.2 with the following:*

1097  
1098 **C402.5.2 Air leakage compliance.** *Air leakage* of the *building thermal envelope* shall be tested by  
1099 an *approved* third party in accordance with C402.5.2.1. The measured *air leakage* shall not be  
1100 greater than 0.35 cfm/ft<sup>2</sup> (1.8 L/s × m<sup>2</sup>) of the *building thermal envelope* area at a pressure differential  
1101 of 0.3 inch water gauge (75 Pa) with the calculated *building thermal envelope* surface area being the  
1102 sum of the above- and below-grade *building thermal envelope*.

1103  
1104 **Exceptions:**

1105 1. Where the measured *air leakage* rate is greater than 0.35 cfm/ft<sup>2</sup> (1.8 L/s × m<sup>2</sup>)  
1106 but is not greater than 0.45 cfm/ft<sup>2</sup> (2.3 L/s × m<sup>2</sup>), the *approved* third party shall perform  
1107 a diagnostic evaluation in accordance with ASTM E1186. All identified leaks shall be  
1108 sealed where such sealing can be made without damaging existing building components.  
1109 A report specifying the corrective actions taken to seal leaks shall be deemed to establish  
1110 compliance with the requirements of this section where submitted to the code official and  
1111 the building owner. Where the measured *air leakage rate* is greater than 0.45 cfm/ft<sup>2</sup>  
1112 (2.3 L/s × m<sup>2</sup>), corrective actions must be made to the building and an additional test  
1113 completed for which the results are 0.45 cfm/ft<sup>2</sup> (2.3 L/s × m<sup>2</sup>), or less.

1114 2. As an alternative, buildings or portions of buildings, containing Group R and I  
1115 occupancies, shall be permitted to be tested by an *approved* third party in accordance  
1116 with C402.5.2.2. The reported *air leakage* of the *building thermal envelope* shall not be  
1117 greater than 0.27 cfm/ft<sup>2</sup> (1.4 L/s × m<sup>2</sup>) of the *testing unit enclosure area* at a pressure  
1118 differential of 0.2 inch water gauge (50 Pa).

1119  
1120 **C402.5.2.1** *Add Section C402.5.2.1 as follows:*

1121  
1122  
1123  
1124  
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**C402.5.2.1 Whole building test method and reporting.** 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.

**Exceptions:**

1. For buildings less than 10,000 ft<sup>2</sup> (1000 m<sup>2</sup>) the entire *building thermal envelope* shall be permitted to be tested in accordance with ASTM E779, ASTM E3158 or ASTM E1827 or an equivalent *approved* method.
2. For buildings greater than 50,000 ft<sup>2</sup> (4645 m<sup>2</sup>), portions of the building shall be permitted to be tested and the measured *air leakage* shall be area-weighted by the surface areas of the *building thermal envelope* in each portion. The weighted average tested *air leakage* shall not be greater than the whole building leakage limit. The following portions of the building shall be tested:
  - i. The entire *building thermal envelope* area of stories that have any conditioned spaces directly under a roof.
  - ii. The entire *building thermal envelope* area of stories that have a building entrance, a floor over unconditioned space, a loading dock, or that are below grade.
  - iii. Representative above-grade portions of the building totaling not less than 25 percent of the wall area enclosing the remaining conditioned space.

**C402.5.2.2** *Renumber Section C402.5.2 as new Section C402.5.2.2 and make the following changes:*

*Add “ASTM E3158,” after “ASTM E1827”*

*Replace “Units shall be tested separately with an unguarded blower door test as follows:” with “Units shall be tested without simultaneously pressurizing adjacent units and shall be separately tested as follows”.*

*In part 2 add “a middle floor unit” between “including a top floor unit” and “a ground floor unit”*

*In part 2, replace “two units shall be tested” with “three units shall be tested”*

*Add new Part 3 as follows: “Enclosed spaces with not less than one exterior wall in the building thermal envelope shall be tested in accordance with C402.5.3.”*

*Add the following exception “Exception: Corridors, stairwells, and enclosed spaces having a conditioned floor area not greater than 1,500 ft<sup>2</sup> shall be permitted to comply with Section C402.5.1.5 and either Section C402.5.1.3 or C402.5.1.4.”*

**C402.5.2.3** *Renumber Section C402.5.1.5 as Section C402.5.2.3 and make the following changes:*

*Add “In addition to the requirements of Sections C402.5.2.1 and C402.5.2.2” after “verification criteria” and before “the installation of the continuous air barrier”.*

*In part 2, replace “components and assemblies” with “materials, assemblies, and systems”*

*In part 2, delete “while the air barrier is still accessible for inspection”*

1167 *In part 2, replace “Sections C402.5.1.3 and C402.5.1.4” with “Sections C402.5.2.3.1 or*  
1168 *C402.5.2.3.2” and add “The air barrier shall remain accessible for inspection and repair”*  
1169  
1170 ***C402.5.2.3.1*** *Renumber Section C402.5.1.3 as new Section C402.5.2.3.1.*  
1171  
1172 ***C402.5.2.3.2*** *Renumber Section C402.5.1.4 as new Section C402.5.2.3.2.*  
1173  
1174 ***C402.5.3*** *Renumber Section C402.5.4 as Section C402.5.3 and make the following changes:*  
1175  
1176 *Replace “shall meet the provisions of Table C402.5.4” with “shall comply with Table C402.5.3”.*  
1177 *Add “conducted by an accredited, independent testing laboratory” between “Testing shall be”*  
1178 *and “in accordance with”*  
1179 *Replace “reference test standard in C402.5.4 by an accredited, independent testing laboratory”*  
1180 *with “reference test standard in Table C402.5.3”.*  
1181 *In Exception 1, replace “C402.5.1” with “C402.5.1.2”*  
1182 *In Exception 2, replace “comply with the testing alternative of Section C402.5,” with “are tested*  
1183 *for air leakage in accordance with Section C402.5.2”*  
1184 *In Exception 2, replace “Table C402.5.4” with “Table C402.5.3”*  
1185 *Relabel “Table C402.5.4” to “Table C402.5.3”*  
1186 ***C402.5.4*** *Renumber Section C402.5.5 as Section C402.5.4 and make the following changes:*  
1187  
1188 *In Part 2.1, delete “Table C402.1.3 or”.*  
1189 *In Part 2.2 replace “Section C402.5.1.1” with “Section C402.5.1.2”.*  
1190 *In Part 2.4 replace “Water lines” with “Piping serving as part of a heating or cooling system”.*  
1191 ***C402.5.5*** *Renumber Section C402.5.6 as Section C402.5.5 and make the following changes:*  
1192  
1193 *Replace “Section C402.5.4” with “Section C402.5.3”.*  
1194 ***C402.5.6*** *Renumber Section C402.5.7 as Section C402.5.6.*  
1195  
1196 ***C402.5.7*** *Renumber Section C402.5.8 as C402.5.7 and make the following changes:*  
1197  
1198 *Replace “infiltration” with “air leakage”.*  
1199 ***C402.5.8*** *Renumber Section C402.5.9 as Section C402.5.8 and make the following changes:*  
1200  
1201 ***C402.5.9*** *Renumber Section C402.5.10 as Section C402.5.9.*  
1202  
1203 *In part 2 replace “more” with “greater”*  
1204  
1205 *In part 2 replace “when” with “where”*  
1206  
1207 ***C402.5.10*** *Renumber Section C402.5.11 as Section C402.5.10 and make the following changes:*

1208  
1209 *Replace “and lower the heating setpoint to 55°F (13°C)” with “and lower the heating setpoint to*  
1210 *50°F (10°C)”*

1211  
1212 *In Exception 1, add “operable openings into” before “separately-zoned areas”*

1213  
1214 *In Exception 2, replace “warehouses” with “storage occupancies”*

1215  
1216 *In Exception 3, revise to read: “Doors located in the exterior wall that are part of a vestibule*  
1217 *system”.*

1218  
1219 *Add new Exception 4, “Operable openings used as part of a designed system for natural*  
1220 *ventilation.”*

1221  
1222 **C402.5.10.1** *Renumber Section C402.5.11.1 as Section C402.5.10.1*

1223  
1224 **C402.6** *Add Section C402.6 as follows:*

1225 **C402.6 Approved calculation software tools.** The following software tools are sufficient to  
1226 demonstrate compliance with Sections C401.2.1 Prescriptive Compliance and C402.7.

1227 1. COMcheck-Web available at: <https://www.energycodes.gov/comcheck>  
1228

1229 **C402.7** *Add Section C402.7 and subsections as follows:*

### 1230 **C402.7 Derating and Thermal Bridges**

1231 **C402.7.1 General.** In addition to pre-calculated assembly U-factors, C-factors, or F-factors outlined in  
1232 Appendix A of ASHRAE 90.1 2019, vertical envelope performance shall also take into account effect of  
1233 *thermal bridges* according to both C402.7.2 and C402.7.3. In addition, the thermal resistance of *spandrel*  
1234 *sections* within *glazed wall systems* shall be according to C402.7.4. Together with Appendix A of  
1235 ASHRAE 90.1 2019, these derated values and *spandrel section* values shall be used when showing  
1236 compliance with Section C402.1.4 or Section C402.1.5, as applicable.

1237  
1238 **C402.7.2 Continuous Insulation for Vertical Walls.** Installed vertical wall continuous insulation shall  
1239 be derated using either C402.7.2.1, C402.7.2.2, or C402.7.2.3 to account for the effect of fasteners  
1240 through the continuous insulation.

1241 **C402.7.2.1. Prescriptive Derating.** Derate vertical wall continuous insulation using Equation  
1242 C402.7.2.1 and Derating Factor from C402.7.2.1.1 for portions of wall having brick veneer systems and  
1243 C402.7.2.1.2 or C402.7.2.1.3 for portions of wall having cladding systems.

1244 (Equation C402.7.2.1)

1245  $R_{\text{derated}} = R_o \times \text{Derating Factor}$

1246 Where

1247  $R_{\text{derated}}$ : R value after derating, to be used when showing compliance  
1248 R402.7.2



1249 R<sub>o</sub>: R value of the continuous insulation prior to derating

1250 Derating Factor: From C402.7.2.1.1, C402.7.2.1.2, or C402.7.2.1.3

1251 **C402.7.2.1.1 Brick Veneer Systems.** Wall systems comprised of brick anchors fasteners supporting  
1252 brick veneer shall use a Derating Factor of 0.7 to account for the *clear field thermal bridge* derating effect  
1253 of the fasteners. In addition, brick shelf angles shall be derated according to Section C402.7.3 to account  
1254 for the *linear thermal bridge* derating effect of any brick shelf angles.

1255 **C402.7.2.1.2 Cladding Systems.** Wall systems comprised of cladding systems shall use Derating Factor  
1256 per Table 402.7.2.1.2

1257 **Table 402.7.2.1.2**

Thickness of R <sub>o</sub>	Derating Factor
R <sub>o</sub> is less than or equal to R-15	Derating Factor = 0.74 – 0.021 x R <sub>o</sub>
R <sub>o</sub> is greater than R-15	Derating Factor = 0.55 – 0.007 x R <sub>o</sub>

1258

1259 **C402.7.2.1.3 Cladding Systems with Qualifying Thermal Breaks.** If plastic or fiberglass fasteners  
1260 entirely comprised of material having thermal conductivity of 3 Btu-in/hr-ft<sup>2</sup>-F or less are used to support  
1261 external cladding; or, if fasteners having thermal breaks which have a conductivity of 3 Btu-in/hr-ft<sup>2</sup>-F or  
1262 less on both ends of the fastener are used to support external cladding, use Derating Factor of 0.8.

1263 **C402.7.2.2 Reference Derating.** Use pre-solved, derated continuous insulation values contained in  
1264 Building Envelope Thermal Bridging Guide, version 1.6 or higher, published by BC Hydro Power Smart.

1265 **C402.7.2.3. Modelled Derating.** Use two or three-dimensional finite element analysis heat transfer  
1266 model to calculate derated value. A three-dimensional model shall be used when there are *point thermal*  
1267 *bridges* or thermal bridging in multiple planes.

1268 **C402.7.3. Linear Thermal Bridges.** In addition to derating per Section C402.7.2, installed vertical wall  
1269 insulation U values shall be further derated for *linear thermal bridges* where the vertical wall intersects  
1270 the following: brick shelf angles, balconies, vertical interior walls, horizontal interior walls, windows,  
1271 roof, other vertical walls on different plane, and grade\_ using Equation C402.7.3.

1272 (Equation C402.7.3)

1273 
$$U_{derated} = \frac{PSI * Length}{A_{total}} + U_o$$

1274 Where

1275 U<sub>derated</sub> Derated wall U value (Btu/hr-ft<sup>2</sup>-F)

1276 PSI Value from Section C402.7.3.1, C402.7.3.2, or C402.7.3.3 (Btu/hr-ft-F)

1277 Length Length of linear *thermal bridge* (ft)

1278 A<sub>total</sub> Area of derated wall (ft<sup>2</sup>)

1279 U<sub>o</sub> Wall or roof U value prior to *linear thermal bridge* derating

1280 **C402.7.3.1 Prescriptive PSI values.** Use PSI values from Table C402.7.3.1

1281 **Table C402.7.3.1**

Type of Linear Thermal Bridge	PSI-value (Btu/hr - ft - F)
Balcony to exterior vertical wall intersection	1.00
Intermediate floor to exterior vertical wall intersection	0.60
Interior vertical wall to exterior vertical wall intersection	0.50
Fenestration to exterior vertical wall intersection	0.32
Parapet (vertical wall to roof intersection)	0.60
Brick shelf angle	0.35
Vertical wall to grade intersection	0.52
Vertical wall plane transition (building corners and other changes in vertical wall plane)	0.25

1282

1283 **C402.7.3.2. Reference PSI Values.** Use pre-solved PSI values contained in Building Envelope Thermal  
1284 Bridging Guide, version 1.6 or higher, published by BC Hydro Power Smart.

1285 **C402.7.3.3. Modelled PSI Values.** Use a two or three-dimensional finite element analysis to calculate  
1286 PSI values. A three-dimensional model shall be used when there are *point thermal bridges* or thermal  
1287 bridging in multiple planes.

1288 **C402.7.4 Thermal Resistance of Spandrel Sections.** R-factor of opaque *spandrel sections* within *curtain*  
1289 *wall* systems shall be accordance with C402.7.4.1, C402.7.4.2, or C402.7.4.3.

1290 **C402.7.4.1 Prescriptive R value.** Opaque *spandrel sections* within *glazed wall systems* shall at least R-  
1291 12 insulation. For the purpose of calculating weighted U in accordance with Section C402.1.5, *spandrel*  
1292 *sections* shall use default values in Table C402.7.4.1.

1293 **Table C402.7.4.1: Default R values for Spandrel Sections**

Type	Default R-Value
Thermally broken	3.5
Non-thermally broken	2

1294

1295 **C402.7.4.2. Reference R values.** Use pre-solved opaque *spandrel sections* R values contained in  
1296 Building Envelope Thermal Bridging Guide, version 1.6 or higher, published by BC Hydro Power Smart.

1297 **C402.7.4.3. Modelled R values.** Use a two or three-dimensional finite element analysis to calculate R  
1298 value of opaque *spandrel section*. A three-dimensional model shall be used when there are *point thermal*  
1299 *bridges* or thermal bridging in multiple planes.

1300 **C403.5 Modify Section C403.5 as follows**

1301 *Add "Dedicated outside air systems" as Item 4 of the list of where air or water economizers shall*  
1302 *be provided.*

1303  
1304 *Delete exception 5 and renumber subsequent exceptions to reflect deletion*

1305  
1306 **Table C403.5(1).** *Show only Climate Zone 5A.*

1307  
1308 **Table C403.5(2).** *Delete this table*

1309  
1310 **C403.7.4** *Replace C403.7.4 as follows*

1311 **C403.7.4 Energy Recovery Systems.** Energy recovery ventilation systems shall be provided as specified  
1312 in Section C403.7.4.1, as applicable and C403.7.4.2.

1313 **C403.7.4.1** *Modify Section C403.7.4.1 as follows:*

1314 *Replace “not less than 60 percent at heating design condition.” with “not less than 75 percent at*  
1315 *heating design condition. Outdoor air must be delivered directly to the dwelling unit. The*  
1316 *building weighted average sensible energy recovery effectiveness must meet the requirements of*  
1317 *C403.7.4.2.”*

1318 *Delete all the exceptions (exceptions 1 through 4).*

1319 **C403.7.4.2** *Modify Section C403.7.4.2 as follows:*

1320 *Replace “The energy recovery system shall provide an enthalpy recovery ratio of not less than*  
1321 *50% at design conditions” with “The energy recovery system shall result in either 1 or 2, as*  
1322 *applicable”*

1323 *Add 1 and 2 as follows*

1324 1. *A sensible recovery ratio of at least 50% at heating design conditions for systems that*  
1325 *provide makeup for Class 3 or 4 exhaust. The requirement can be satisfied either for*  
1326 *each fan system individually or based on a weighted average of the ventilation air flow*  
1327 *for all applicable fan systems in the entire building per Equation C403.7.4.2(1).*

1328 **Equation C403.7.4.2(1)**

1329 *Weighted average sensible energy recovery ratio = [sensible energy recovery ratio*  
1330 *for fan system 1 x outside air flow for system 1 + sensible energy recovery ratio for*  
1331 *fan system 2 x outside air flow for system 2 + ... ]/[outside air flow for system 1 +*  
1332 *outside air flow for system 2 + ...]*

1333  
1334 2. *An enthalpy recovery ratio of not less than 70% at heating and cooling design conditions*  
1335 *for all other systems. The requirement can be satisfied either for each fan system*  
1336 *individually or based on a weighted average of the ventilation air flow for all applicable*  
1337 *fan systems in the entire building per Equation C403.7.4.2(2).*

1338  
1339 **Equation C403.7.4.2(2)**

1340 *Weighted average enthalpy energy recovery ratio = [enthalpy recovery ratio for fan*  
1341 *system 1 x outside air flow for system 1 + enthalpy recovery ratio for fan system 2 x*

1342 outside air flow for system 2 + ... ]/[outside air flow for system 1 + outside air flow  
 1343 for system 2 + ...]

1344 *Delete exceptions 2 (including 2.1 and 2.2), 4, 5, 6, 7, and 8*

1345 *Renumber exception 3 as exception 2*

1346 *Renumber exception 9 as exception 3 and change from “20 hours per week” to “10 hours per*  
 1347 *week*

1348 *Renumber exception 10 as exception 4*

1349 *Renumber exception 11 as exception 5*

1350 *Revise Tables C403.7.4.2(1) and C403.7.4.2(2) and show only Climate Zone 5A row, as follows:*

1351 **Table C403.7.4.2(1)**  
 1352

1353 **ENERGY RECOVERY REQUIREMENT (Ventilation systems operating less than 8,000 hours per**  
 1354 **year)**

Climate Zone	PERCENT (%) OUTDOOR AIR AT FULL DESIGN AIRFLOW RATE							
	>=10% and <20%	>=20% and < 30%	>=30% and < 40%	>=40% and <50%	>=50% and <60%	>=60% and <70%	>=70% and <80%	>=80%
	Design Supply Fan Airflow Rate (cfm)							
5A	10,000	8,000	2,750	0	0	0	0	0

1355  
 1356  
 1357  
 1358

**Table C403.7.4.2(2)**

1359 **ENERGY RECOVERY REQUIREMENT (Ventilation systems operating note less than 8,000**  
 1360 **hours per year)**

Climate Zone	PERCENT (%) OUTDOOR AIR AT FULL DESIGN AIRFLOW RATE							
	>=10% and <20%	>=20% and < 30%	>=30% and < 40%	>=40% and <50%	>=50% and <60%	>=60% and <70%	>=70% and <80%	>=80%
	Design Supply Fan Airflow Rate (cfm)							
5A	0	0	0	0	0	0	0	0

1361

1362 **C405.2.4** Modify Section C405.2.4 as follows

1363 *In item 1, replace “150 watts” with “100 watts”*

1364 *In item 3, replace “150 watts” with “100 watts”*

1365

1366 **C405.13** Add Section C405.13 as follows:

1367 **C405.13 Electric Vehicle Ready Parking Spaces (“EV Ready Spaces”) (Mandatory).** New parking  
1368 spaces shall provide *EV Ready Spaces* in accordance with Table C405.13. Installed wiring suitable for  
1369 6.6kW or higher SAE J1772-2017 AC Level II EVSE shall be connected to the service panel and run to  
1370 within 6 feet (1828mm) of any qualifying parking space. Conductors and outlets for *EVSE* shall be sized  
1371 and installed in accordance with the MA electrical code.

1372 **TABLE C405.13 EV-READY SPACE REQUIREMENTS**

Occupancy Classification	Minimum percentage of EV-Ready Spaces	EV Charging Performance Requirements
Group R and Group B	20%	40-amp dedicated branch circuit or larger branch circuit with ALMS in accordance with Table C405.13.1
All Other Occupancies	10%	40-amp dedicated branch circuit or larger branch circuit with ALMS in accordance with Table C405.13.1

1373 **Exceptions:**

- 1374 1. Parking spaces and garage spaces intended exclusively for storage of vehicles for  
1375 retail sale or vehicle service are excluded from the EV-ready space percentage  
1376 calculation.
- 1377 2. Any parking facility with 4 or more spaces providing installed Direct Current fast  
1378 charging EVSE with a minimum charging speed of 150 kW to each space.
- 1379 3. One or more AC Level II spaces may be substituted with multiple AC Level I spaces  
1380 provided with wiring for a minimum 20amp, 120-volt EVSE, with a ratio of at least 3  
1381 AC Level I spaces for each AC Level II space required.
- 1382 4. Parking spaces specifically designated for medium or heavy-duty vehicles are  
1383 excluded from the EV-ready space percentage calculation.
- 1384

1385 **C405.13.1** Add Section C405.13.1 as follows:

1386 **C405.13.1 Minimum Charging Performance Requirements.** *Automatic Load Management System*  
1387 (*ALMS*) may be used to control *electric vehicle* loads for EV-Ready or EVSE-Installed Spaces with AC  
1388 Level II or Level I charging, subject to the performance requirements in Table C405.13.1. The maximum  
1389 number of parking spaces that may share a single branch circuit varies based on the percentage of all  
1390 parking spaces to be provided with *EVSE*.

1391 **TABLE C405.13.1 EV-READY PERFORMANCE REQUIREMENTS**

Circuit Breaker Amperage	Maximum Parking Spaces that May Share a Branch Circuit with 10%-60% EV Ready spaces	Maximum Parking Spaces that May Share a Branch Circuit with 61-100% EV Ready spaces
40A	1	2
50A	1	2

60A	2	4
70A	3	6
80A	4	8
90A	5	9
100A	6	10

1392

1393 **C405.13.2** Add Section C405.13.2 as follows:

1394 **C405.13.2 Identification.** Construction documents shall indicate the branch circuit termination point and  
 1395 proposed location of future EVSE. Construction documents shall also provide information on amperage  
 1396 of future EVSE, wiring schematics, Automatic Load Management Systems, and electrical load  
 1397 calculations to verify that the electrical panel service capacity and electrical system, including any on-site  
 1398 distribution transformers, have sufficient capacity to simultaneously charge all EVs at all required EV  
 1399 ready spaces.

1400

1401

1402 **C406.1** Modify Section C406.1 as follows:

1403 Replace “shall achieve a total of 10 credits” with “shall achieve a total of 15 credits”

1404 **Table C406.1(1)** Modify Table C406.1(1) as follows:

1405

1406 Delete rows for C406.2.1 and C406.7.3

1407 Replace row for option C406.2.3 with the following

1408

<u>Section</u>	<u>Climate Zone 5A</u>
C406.2.3 Renewable space heating	<u>15</u>

1409

1410 Add the following row for option C406.12:

1411

<u>Section</u>	<u>Climate Zone 5A</u>
C406.12 Heavy Timber Construction	<u>8</u>

1412

1413 **Table C406.1(2)** Modify Table C406.1(2) as follows:

1414

1415 Delete rows for C406.2.1 and C406.7.3

1416 Replace row for option C406.2.3 with the following

1417

<u>Section</u>	<u>Climate Zone 5A</u>
C406.2.3 Renewable space heating	<u>15</u>

1418

1419 Add the following row for option C406.12:

1420

<u>Section</u>	<u>Climate Zone 5A</u>
C406.12 Heavy Timber Construction	<u>8</u>

1421

1422 **Table C406.1(3)** Modify Table C406.1(3) as follows:

1423

1424 Delete rows for C406.2.1 and C406.7.3

1425 *Replace row for option C406.2.3 with the following*  
1426

<u>Section</u>	<u>Climate Zone 5A</u>
C406.2.3 Renewable space heating	<u>15</u>

1427  
1428 *Add the following row for option C406.12:*  
1429

<u>Section</u>	<u>Climate Zone 5A</u>
C406.12 Heavy Timber Construction	<u>8</u>

1430  
1431 *Table C406.1(4) Modify Table C406.1(4) as follows:*  
1432

1433 *Delete rows for C406.2.1 and C406.7.3*  
1434 *Replace row for option C406.2.3 with the following*  
1435

<u>Section</u>	<u>Climate Zone 5A</u>
C406.2.3 Renewable space heating	<u>15</u>

1436  
1437 *Add the following row for option C406.12:*  
1438

<u>Section</u>	<u>Climate Zone 5A</u>
C406.12 Heavy Timber Construction	<u>8</u>

1439  
1440 *Table C406.1(5) Modify Table C406.1(5) as follows:*  
1441

1442 *Delete rows for C406.2.1 and C406.7.3*  
1443 *Replace row for option C406.2.3 with the following*  
1444

<u>Section</u>	<u>Climate Zone 5A</u>
C406.2.3 Renewable space heating	<u>15</u>

1445  
1446 *Add the following row for option C406.12:*  
1447

<u>Section</u>	<u>Climate Zone 5A</u>
C406.12 Heavy Timber Construction	<u>8</u>

1448  
1449 *C406.1.1 Modify Section C406.1.1 as follows:*

1450 *Replace “minimum number of 5 credits” with “minimum number of 10 credits”*

1451 *C406.2.1 Delete this section*

1452 *C406.2.3 Replace Section C406.2.3 with the following:*

1453 **C406.2.3. Renewable space heating.** All space heating shall be provided with cold-climate air source  
1454 heat pumps having rated coefficient of performance (COP) of at least 1.75 at 5 degrees Fahrenheit source  
1455 air, or ground source heat pumps.

1456 *C406.7.3 Delete this section*

1457 *C406.9 Replace Section C406.9 with the following:*

1458 **C406.9 Reduced air leakage.** *Air leakage* of the *building thermal envelope* shall be tested by an  
1459 *approved* third party in accordance with Section C402.5.2.1. The measured *air leakage* shall not  
1460 exceed 0.20 cfm/ft<sup>2</sup> (1.1 L/s × m<sup>2</sup>) of the *building thermal envelope* at a pressure differential of 0.3 inches  
1461 water gauge (75 Pa), with the calculated surface area being the sum of the above- and below-grade  
1462 *building thermal envelope*.  
1463

1464 **C406.12** *Add Section C406.12 as follows:*

1465 **C406.12 Heavy Timber construction.** In buildings with 4 stories or more of Type IV heavy timber  
1466 construction either above grade, or above a podium.

1467

1468 **C407** *Replace Section C407 in its entirety with the following:*

1469 **C407.1 Targeted Performance**

1470 This option requires compliance with Section C407.1.1 through C407.1.2.

1471

1472 **C407.1.1 Compliance**

1473

1474 Building shall comply with Sections C407.1.1.1 through C407.1.1.6

1475

1476 **C407.1.1.1 Building performance modeling**

1477 Building performance modeling shall be used to show compliance with C407.1.1.5. The  
1478 simulation program shall be a computer-based program for the analysis of energy consumption in  
1479 buildings. The simulation shall include calculation methodologies for the building components  
1480 being modeled and meet the requirements in ANSI/ASHRAE/IESNA 90.1-2019 Section  
1481 G2.2.1(a)-(d) and G2.2.4.  
1482

1483 **C407.1.1.2 Climatic Conditions**

1484 The simulation program shall perform the simulation using hourly values of climatic data using  
1485 representative weather files prescribed by the Massachusetts Department of Energy Resources.  
1486

1487 **C407.1.1.3 Modeling Building Envelope Infiltration**

1488 The air leakage rate of the building envelope shall be modeled following ANSI/ASHRAE/IESNA  
1489 90.1-2019 Section G3.1.1.4.  
1490

1491 **C407.1.1.4 Internal loads, scheduling, and other modeling assumptions**

1492 Performance modeling shall use the internal load, scheduling, and other assumptions as  
1493 prescribed by the Massachusetts Department of Energy Resources.  
1494

1495 **C407.1.1.5 Thermal energy demand intensity (TEDI) limits**

1496 Performance modeling shall show that the building's heating thermal energy demand intensity  
1497 and cooling thermal energy demand intensity are less than or equal to the values in Table  
1498 C407.1.5.  
1499

1500 **Table C407.1.1.5 Thermal Energy Demand Intensity (TEDI) Limits**

1501



Use Type	Heating TEDI (kBtu/sf-yr)	Cooling TEDI (kBtu/sf-yr)
Office, fire station, library, police station, post office, town hall $\geq$ 125,000-sf	1.5	23
Office, fire station, library, police station, post office, town hall between 75,000 and 125,000-sf	$4 - 0.00002 * \text{Area (sf)}$	$18 + 0.00004 * \text{Area (sf)}$
Office, fire station, library, police station, post office, town hall $\leq$ 75,000-sf	2.5	21
K-12 School $\geq$ 125,000-sf	2.2	12
K-12 School between 75,000 and 125,000-sf	$2.7 - 0.000004 * \text{Area (sf)}$	$32 - 0.00016 * \text{Area (sf)}$
K-12 School $\leq$ 75,000-sf	2.4	20
Residential multifamily and dormitory $\geq$ 125,000-sf	2.8	22
Residential multifamily and dormitory between 75,000 and 125,000-sf	$3.8 - 0.000008 * \text{Area (sf)}$	$4.5 + 0.00014 * \text{Area (sf)}$
Residential multifamily and dormitory $\leq$ 75,000-sf	3.2	15
All other $\geq$ 125,000-sf	1.5	23
All other between 75,000 and 125,000-sf	$4 - 0.00002 * \text{Area (sf)}$	$18 + 0.00004 * \text{Area (sf)}$
All other $\leq$ 75,000-sf	2.5	21

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**C407.1.1.6 Mixed use buildings**

For buildings having more than one use type where any use type is more than 10% of the total space conditioned area, each separate use type having more than 10% of the total space conditioned area shall separately and individually show compliance with C407.1.1.5 for that respective use type. Use types having less than or equal to 10% of the total space conditioned area do not have to show separate, individual compliance with C407.1.1.5 but can be incorporated into and treated as the majority use type.

**C407.1.2 Documentation**

1513  
 1514 Simulated performance shall be documented, and documentation shall be submitted to rating authority.  
 1515 Documentation shall include all the assumptions used in the performance modeling such that the  
 1516 documentation can be used as a specification checklist for implementation during design and  
 1517 construction. The information shall be submitted in a report and shall include the items described in  
 1518 ANSI/ASHRAE/IESNA 90.1-2019 Appendix G Section G1.3.2 Parts b, g, h, i, j, k, l, n, o, and q, and  
 1519 Section G1.3.3.

1520  
 1521 **C407.2 Relative Performance.** This option requires compliance with Section C407.2.1 and C407.2.2  
 1522

1523 **C407.2.1 Electrification and Documentation of Highly Ventilated Buildings.** Buildings using the  
 1524 Relative Performance Pathway (C407.2) because average ventilation at full occupancy is greater than 0.5  
 1525 cfm/sf shall have space heating electrified in accordance with Section C401.4.1 and shall submit design  
 1526 documents showing ventilation system design and air flow rates as required by Section C103.2 part 16.  
 1527

1528 **C407.2.2 Compliance.** Building shall comply with ANSI/ASHRAE/IESNA 90.1-2019 Section 4.2 using  
 1529 the Appendix G pathway as modified by C407.2.2.1 and C407.2.2.2.

1530  
 1531 **C407.2.2.1 Modification to ANSI/ASHRAE/IESNA 90.1-2019 Section 4.2.**

1532  
 1533 **90.1-2019 Section 4.2** Replace 4.2.1.1 with following:

1534  
 1535 New buildings shall comply with 4.2.2 through 4.2.5 and normative Appendix G. When using Normative  
 1536 Appendix G, the Performance Energy Index (PEI) of new buildings, additions to existing buildings, and  
 1537 alterations to existing buildings shall be less than or equal to the Performance Energy Index Target (PEI<sub>t</sub>)  
 1538 when calculated in accordance with the following:

1539  
 1540 
$$PEI_t = [BBUE + (BPF \times BBRE)]/BBSE$$

1541  
 1542 PEI = Performance Energy Index calculated in accordance with Section G1.2

1543 BBUE = Baseline building unregulated site energy

1544 BBRE = Baseline building regulated site energy

1545 BPF = Building performance factor from Table 4.2.1.1 For building area types not  
 1546 listed in Table 4.2.1.1 use “All others”. Where a building has multiple area types, the  
 1547 required BPF shall be equal to the area-weighted average of the building area types.

1548 BBSE = Baseline building site energy (sum of BBUE and BBRE)  
 1549

1550 **90.1-2019 Section 4.2** Revise Table 4.2.1.1 to show only Climate Zone 5A; remove multifamily, office,  
 1551 and school; and adjust the BPFs as follows:

1552  
 1553 **Table 4.2.1.1 Building Performance Factor (BPF)**  
 1554

Building Area Type	Climate Zone 5A
Health care/hospital	0.59
Hotel/motel	0.57
Restaurant	0.62
Retail	0.47

Warehouse	0.41
All others	0.51

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**C407.2.2.2 Modification to ANSI/ASHRAE/IESNA 90.1-2019 Appendix G**

**90.1-2019 Section G** In all Sections of Appendix G, replace references to “baseline building performance” with “baseline building site energy”, replace “proposed building performance” with “proposed building site energy”, replace “energy cost savings” with “site energy savings”

**90.1-2019 Section G** Replace G1.2.2 with following, keeping the exception unchanged:

The site energy of the proposed design is calculated in accordance with the provisions of this appendix using the following formula:

$$\text{Performance energy index (PEI)} = \frac{\text{Proposed building site energy}}{\text{baseline building site energy (BBSE)}}$$

Both the proposed building site energy and the baseline building site energy shall include all end use load components within and associated with the building when calculating the performance energy index.

**90.1-2019 Section G** Delete G1.3.2 Part m and Part p

**90.1-2019 Section G** Delete G2.1 Part c

**90.1-2019 Section G** Revise G2.4.1 as follows

Site recovered energy shall be subtracted from the proposed building site energy when calculating performance. Energy used to recharge vehicles that are used for on-road and off-site transportation purposes, or energy losses from use of behind-the-meter energy storage, should not be included when calculating performance. On-site renewable energy shall not be subtracted from the proposed building site energy when calculating performance.

**90.1-2019 Section G** Delete G2.4.2

**90.1-2019 Section G** Add the following row to Section G Table G3.1.1-1.

**TABLE G3.1.1-1 BASELINE BUILDING VERTICAL FENESTRATION PERCENTAGE OF GROSS ABOVE-GRADE-WALL AREA**

Building Area Types	Baseline Building Gross Above-Grade-Wall Area
Multifamily	24%

**Section C407.3** Add Section C407.3 as follows:

**C407.3 Passive House.** This option requires compliance with Section C407.3.1 and C407.3.2.

**C407.3.1 Compliance.** Buildings shall be pre-certified as meeting the Phius CORE 2021 or Phius ZERO 2021 Passive Building Standard – North America, or newer, demonstrated using Phius approved software, where Phius Design-Certification is demonstrated by Phius and a Certified Passive House

1597 Consultant (CPHC); or, Projects pre-certified as meeting the Certified Passive House standard using the  
1598 current software and program criteria by the Passive House Institute (PHI), where PHI certification is  
1599 demonstrated by a Certified Passive House Designer and a Certified Passive House Certifier.

1600 **C407.3.2 Documentation.** Compliance with Phius or PHI shall be in accordance with C407.3.3.1 or  
1601 C407.3.3.2

1602 **C407.3.2.1 Phius Documentation.** When using WUFI Passive or other Phius-approved software:

- 1603 2. Prior to the issuance of a building permit, the following item(s) must be provided to the  
1604 Building Official:
- 1605 a. A Phius 2021 (or newer) Verification Report which demonstrates project compliance
  - 1606 with Phius 2021 (or newer) performance requirements.
  - 1607 b. A statement from the CPHC that the verification report results accurately reflect the
  - 1608 plans submitted.
  - 1609 c. Evidence of project registration from Phius.

1610 OR

- 1611 b. A Design Certification Letter from Phius.

- 1612 2. Prior to the issuance of a certificate of occupancy, the following items must be provided to the  
1613 building official:

- 1614 a. Design Certification Letter from Phius.
- 1615 b. An updated Verification Report by the CPHC which reflects “as-built” conditions and
- 1616 test results that demonstrate project compliance with Phius (blower door and ventilation
- 1617 results).
- 1618 c. A statement from the CPHC that the envelope meets the Phius hygrothermal
- 1619 requirements found in Appendix B of the Phius 2021 Certification guidebook
- 1620 d. A statement from the Phius Certified Verifier or Rater that the project test results and
- 1621 other Phius verification requirements are met.
- 1622 e. A copy of the Phius workbook listing all testing results and as-built conditions.

1623 OR

- 1624 a. A Project Certificate demonstrating final certification awarded by Phius.

1625 AND

- 1626 f. A statement from the Phius Verifier or Rater of compliance with C405.13: EV ready,
- 1627 and Appendix CB: Solar Ready Provisions.

1628 **C407.3.2.2 Passive House International (PHI) Documentation.**

- 1629 2. If using PHI Passive House software, prior to the issuance of a building permit, the following  
1630 item(s) must be provided to the Building Official:

- 1631 a. A PHPP compliance report which demonstrates project compliance with current PHI
- 1632 performance requirements;
- 1633 b. A statement from the Certified Passive House Consultant/Designer (CPHC/D) that
- 1634 the PHPP results and compliance report accurately reflect the plans submitted;
- 1635 c. Evidence of project registration from a Certified Passive House Certifier.

1636 OR

- 1637 a. A Design Certification Letter from a Certified Passive House Certifier.

- 1638 2. Prior to the issuance of a certificate of occupancy, the following items must be provided to  
1639 the building official:

- 1640 a. A Design Certification Letter from a Certified Passive House Certifier.

- 1644 b. An updated PHPP compliance report which reflects “as-built” conditions and test results
- 1645 (blower door and ventilation results) that demonstrates project compliance with PHI
- 1646 performance requirements;
- 1647 c. A copy of the Passive House Verifier’s or Rater’s test results;
- 1648 d. A statement from the CPHD that the project test results meet the model performance
- 1649 requirements, all the mandatory limits and any other mandatory requirements.
- 1650 OR
- 1651 a. A Final Certification Letter from a Certified Passive House Certifier
- 1652
- 1653 AND
- 1654 A statement from the Passive House Verifier or Rater of compliance with C405.13: EV
- 1655 ready, and Appendix CB: Solar Ready Provisions.

1656

1657 **Section C407.4** Add Section C407.4 as follows:

1658 **C407.4 HERS Index (HERS) for multi-family buildings**

1659 This option requires compliance with Section C407.4.1, C407.4.2, C407.4.3

1660

1661 **C407.4.1 Compliance**

1662 Each dwelling unit shall have a certified HERS Index (HERS) rating less than or equal to the appropriate

1663 value indicated in Table C407.4 when compared to the *HERS index reference design* for each dwelling

1664 unit prior to credit for onsite renewable electric generation. Buildings shall meet or exceed ENERGY

1665 STAR Multifamily New Construction (MFNC) program requirements. The Home Energy Rating Index

1666 (HERS) shall be determined in accordance with RESNET/ICC Standard 301-2019. Software tools used

1667 for determining HERS Index shall be Approved Software Rating Tools in accordance with RESNET/ICC

1668 301. Where calculations require input values not specified by Sections R402, R403, R404 and R405,

1669 those input values shall be taken from RESNET/ ICC 301.

1670 **TABLE C407.4 MAXIMUM ENERGY RATING INDEX**

Building Energy Sources	Maximum HERS Index score <sup>a</sup>		
	New construction permits until June 30, 2024	New construction permits after July 1, 2024	Major alterations, additions, or Change of use <sup>b</sup>
Mixed-fuel building	52	42	52
Solar Electric Generation	55	42	55
All-Electric building	55	45	55
Solar Electric & All-Electric building	58	45	58

1671 <sup>a</sup> Maximum HERS rating prior to onsite renewable electric generation in accordance with Section C407.4

1672 <sup>b</sup> Alterations, Additions or Change of use covered by Section R503.1.5 are subject to this maximum

1673 HERS rating.

1674

1675 **C407.4.2 Documentation.** Documentation verifying that the methods and accuracy of compliance

1676 software tools conform to the provisions of this section shall be provided to the *building official* in

1677 accordance with C407.4.3.1 and C407.4.3.2:

1678 **C407.4.2.1 Prior to issuance of building permit.** Prior to the issuance of a building permit, the following  
1679 items must be provided to the Building Official:

- 1680 1. Building street address, or other building site identification.
- 1681 2. Declare the HERS Index on title page and building plans.
- 1682 3. The name of the individual performing the analysis and generating the compliance report.
- 1683 4. The name and version of the compliance software tool.
- 1684 5. Documentation of all inputs entered into the software used to produce the results for the reference  
1685 design and/or the rated home.
- 1686 6. A certificate indicating that the proposed design has a HERS Index less than or equal to the  
1687 appropriate score indicated in Table C407.4 when compared to the ERI reference design. The  
1688 certificate shall document the building component energy specifications that are included in the  
1689 calculation, including: component level insulation R-values or U-factors; assumed duct system  
1690 and building envelope air leakage testing results; and the type and rated efficiencies of proposed  
1691 heating, cooling, mechanical ventilation, and service water-heating equipment to be installed. If  
1692 on-site renewable energy systems will be installed, the certificate shall report the type and  
1693 production size of the proposed system.
- 1694 7. When a site-specific report is not generated, the proposed design shall be based on the worst-case  
1695 orientation and configuration of the rated home.

1696  
1697 **C407.4.2.2 Prior to issuance of certificate of occupancy.** Prior to the issuance of a certificate of  
1698 occupancy, the following items must be provided to the Building Official:

- 1699 1. Building street address or other *building site* identification.
- 1700 2. Declaration of the Final HERS Index on title page and on building plans.
- 1701 3. The name of the individual performing the analysis and generating the report.
- 1702 4. The name and version of the compliance software tool.
- 1703 5. Documentation of all inputs entered into the software used to produce the results for  
1704 the reference design and/or the rated home.
- 1705 6. A final confirmed certificate indicating that the confirmed rated design of the built  
1706 home complies with Sections C407.4. The certificate shall report the energy features  
1707 that were confirmed to be in the home, including: component-level insulation R-  
1708 values or U-factors; results from any required duct system and building envelope air  
1709 leakage testing; and the type and rated efficiencies of the heating, cooling,  
1710 mechanical ventilation, and service water-heating equipment installed.
- 1711 7. Documentation that each unit meets or exceeds ENERGY STAR Multifamily New  
1712 Construction (MFNC) program requirements.
- 1713 8. Where on-site renewable energy systems have been installed on or in the home, the  
1714 certificate shall report the type and production size of the installed system.
- 1715 9. Compliance with C405.13, and either Appendix CB or Appendix CC as applicable  
1716

1717 **C407.4.3 Verification by approved agency.** Verification of compliance shall be completed by a  
1718 certified HERS rater.

1719

## 1720 **CHAPTER 5 [CE] EXISTING BUILDINGS**

1721

1722 **C502.1** *Revise Section C502.1 as follows:*

1723 *Add the following first sentence* “Additions to an existing building where the addition is up to  
1724 100% of the size of the existing building and less than 20,000-sf shall comply with Sections  
1725 C401.3, C402 through C406, and Section C408. Additions which exceed either of these limits  
1726 shall comply with the applicable pathway for new construction in C401.2.”

1727 **C502.2** *Revise Section C502.2 as follows:*

1728 *Remove both exceptions*  
1729

1730 **C503.1** *Revise Section C503.1 as follows:*

1731 *Replace* “the requirements of Section C503” *with* “the requirements of Sections C503, C402,  
1732 C403, C404, and C405”

1733  
1734 *Replace Exception 3 with* “Where the component performance alternative in Section 402.1.5 is  
1735 used to comply with this section, the proposed UA shall not be greater than 110 percent of the  
1736 target UA.”

1737 **C505.1** *Revise Section C505.1 as follows:*

1738 *Replace* “this code” *with* “Sections C401.3, C402 through C406, and Section C408”  
1739

1740 **Appendix CB** *Adopt unamended*

1741 **APPENDIX CB: SOLAR-READY ZONE – COMMERCIAL.**

1742 **APPENDIX CC - MASSACHUSETTS MUNICIPAL OPT-IN SPECIALIZED ENERGY CODE**  
 1743 **2023**

1744 **COMMERCIAL BUILDING PROVISIONS**

1745 *The provisions contained in this appendix are not mandatory unless specifically referenced in the*  
 1746 *adopting ordinance. The provisions contained in this appendix together with referenced sections from*  
 1747 *the Stretch energy code constitute the Specialized opt-in code for commercial buildings, and may be*  
 1748 *adopted by a city or town together with the Residential Specialized code Appendix RC as their stretch*  
 1749 *energy code. When adopted by the local municipality, the provisions in this appendix are mandatory in*  
 1750 *combination with the IECC2021 with Massachusetts Stretch code amendments.*

1751 **SECTION CC101 GENERAL**

1754 **CC101.1** Replace Section CC101 as follows:

1755 **CC101.1 Purpose.** The purpose of this appendix is to form the commercial building provisions of the  
 1756 Massachusetts Municipal Opt-in Specialized Code to supplement the Massachusetts Stretch Energy Code  
 1757 and to provide a compliance pathway for buildings that require renewable energy systems of adequate  
 1758 capacity to achieve net zero carbon.

1760 **CC101.2** Replace Section CC101.2 as follows:

1762 **CC101.2 Scope.** This appendix applies to new buildings that are addressed by the Municipal Opt-in  
 1763 Specialized Code.  
 1764 Residential buildings and *dwelling units* within mixed use buildings shall comply as follows:

- 1765 1) New *dwelling units* over 4,000 square feet in conditioned floor area in *Mixed Fuel*  
 1766 *Buildings* shall comply with the Zero Energy pathway and Section CC103 or with  
 1767 residential code Section RC102.
- 1768 2) New R-use buildings over 12,000 square feet in conditioned floor area shall comply in  
 1769 accordance with Table CC101.2.

1771 **TABLE CC101.2 MULTI-FAMILY AND R-USE COMPLIANCE**

R-Use buildings over 12,000 sf, or R-Use portions over 12,000 sf in mixed-use buildings	Compliance Path options by permit submittal date		
	C407.3 Passive house	C407.1 Targeted Performance	C407.4 HERS Index
Up to 5 stories	Required from Jan 1, 2023		
6 stories and higher	Required from Jan 1, 2024	Optional until Jan 1, 2024	Optional until Jan 1, 2024

1772 **Exceptions:**

- 1773 1. Detached one- and two-family dwellings and townhouses as well as Group R-2 buildings  
 1774 three stories or less in height above grade plane, manufactured homes (mobile dwellings), and  
 1775 manufactured houses (modular dwellings). These buildings and dwelling units shall comply  
 1776 with Residential Appendix RC under the Specialized energy code.
- 1777 2. Buildings that use neither electricity nor fossil fuel.

1772  
1773  
1774  
1775  
1776  
1777  
1778



1779 **CC101.3** Add Section CC101.3 as follows:

1780 **CC101.3 Compliance.** New buildings shall demonstrate compliance with Sections CC101.4, CC101.5  
1781 and one of the following pathways:

- 1782 4. **Zero Energy pathway:** Buildings shall comply with Section CC103 and demonstrate that they  
1783 are *Zero Energy Buildings* in accordance with Equation CC-1. *Mixed Fuel Buildings* with any  
1784 capacity for on-site fossil fuel use shall be pre-wired for future electrification of all fuel uses in  
1785 accordance with Section CC105.
- 1786 5. **All-Electric pathway:** Buildings shall comply with Section CC104.
- 1787 6. **Mixed Fuel pathway:** *Mixed Fuel Buildings* other than *Zero Energy Buildings* with any capacity  
1788 for on-site fossil fuel use shall comply with CC105 and CC106. The following uses shall be  
1789 excluded when determining whether new buildings will have on-site fossil fuel use:
- 1790 1. On-site back-up generators using fossil fuels
  - 1791 2. On-site refuelling of vehicles or outdoor equipment using fossil fuels
- 1792

1793 **CC101.4** Add Section CC101.4 as follows:

1794 **CC101.4 Minimum building energy efficiency.** New buildings shall comply with Section C401.2.1 or  
1795 C401.2.2. as prescribed in Section C401. Existing buildings shall comply with Chapter 5 as amended.

1796 **CC101.5** Add Section CC101.5 as follows:

1797 **CC101.5 Minimum electric vehicle ready parking requirements.** New parking spaces shall provide  
1798 *electric vehicle ready spaces* in accordance with Section C405.13 and Table C405.13.

1799 **SECTION CC102 DEFINITIONS**

1800  
1801 **CC102** Add the following definitions:

1803 **NET ZERO EMISSIONS BUILDING.** A building which is consistent with achievement of MA 2050  
1804 net zero emissions, through a combination of highly energy efficient design together with being either a  
1805 *Zero Energy Building*, or an *All-Electric Building*, or where fossil fuels are utilized, the building is fully  
1806 pre-wired for future electrification and generates solar power on-site from the available *Potential Solar*  
1807 *Zone Area*.

1809 **POTENTIAL SOLAR ZONE AREA.** The combined area of any low-sloped roofs and any steep-sloped  
1810 roofs oriented between 90 degrees and 300 degrees of true north where the annual solar access is 70  
1811 percent or greater. Annual solar access is the ratio of “annual solar insolation with shade” to the “annual  
1812 solar insolation without shade”. Shading from obstructions located on the roof or any other part of the  
1813 building shall not be included in the determination of annual solar access.

1815 **ZERO ENERGY BUILDING.** A building which through a combination of highly energy efficiency  
1816 design and onsite renewable energy generation is designed to result in net zero energy consumption over  
1817 the course of a year as measured in MMBtus or KWh<sub>eq</sub>, on a site energy basis, excluding energy use for  
1818 charging vehicles.

1820

1821 **CC102** Delete the definitions for: Adjusted off-site renewable energy, zero energy performance index  
1822 (ZEPI PB/EE)

1823  
1824 **SECTION CC103 ZERO ENERGY PATHWAY MINIMUM RENEWABLE ENERGY**  
1825

1826 **CC103.1** Modify Section CC103.1 as follows (keeping Table CC103.1 unchanged):

1827 Delete “or off-site renewable energy shall be procured”

1828 **Equation CC-1** Replace Equation CC-1 with the following:

1829  
1830  $RE_{onsite} \square E_{building}$  (Equation CC-1)

1831  
1832 where:  
1833  $RE_{onsite}$  = Annual site energy production from on-site renewable energy systems (see Section  
1834 CC103.2).  
1835  $E_{building}$  = Building energy use without consideration of renewable energy systems, on-site  
1836 energy storage, on-site back-up generators, or on-site refuelling of vehicles or outdoor equipment.

1837 When Section C401.2.1(1) is used for compliance with the Section CC101.4, building energy shall be  
1838 determined by multiplying the gross *conditioned floor area* plus the gross semi-heated floor area of the  
1839 proposed building by an EUI selected from Table CC103.1.

1840 Use a weighted average for mixed-use buildings.

1841  
1842 When any compliance pathway other than Section C401.2.1 Part 1 is used for compliance with CC101.4,  
1843 building site energy use shall be determined from energy simulations.

1844  
1845 **CC103.2** Modify Section CC103.2 as follows:

1846 After “approved by the code official” add “Commercial R-use buildings may comply using the  
1847 Zero Energy Buildings pathways in Appendix RC by certifying that all units meet HERS 0 or  
1848 lower with on-site renewable generation or by following the on-site renewable energy calculation  
1849 used in the Phius ZERO certification standard when following the Passive house compliance  
1850 pathway.”

1851 **CC103.3** Delete this section

1852  
1853 **CC104** Add Section CC104 as follows:

1854  
1855 **SECTION CC104 ALL ELECTRIC PATHWAY**

1856 **CC104.1 General.** New *all-electric buildings* shall comply with Sections CC101.4, CC101.5 and with  
1857 one of the following:

- 1858 1) Section C401.2.1 and Section C401.4.3  
1859 2) Section C407.3 Passive House  
1860 3) Exclusively R-use buildings permitted prior to January 2024 may comply with Section  
1861 C407.4 when all dwelling units have a HERS rating of 45 or less.

1862  
1863 **CC105** Add Section CC105 as follows:  
1864

1865 **SECTION CC105 MIXED-FUEL BUILDING PATHWAY**

1866 **CC105.1 General.** This section together with Section CC106 establishes additional minimum  
1867 requirements for new *mixed-fuel buildings*.

1868  
1869 **CC105.1.1 Biomass heating.** New buildings using *clean biomass heating systems* may comply  
1870 with this section without meeting CC105.3.1 and CC105.3.2. Buildings with any *combustion*  
1871 *equipment* using biomass that does not meet the performance standards of *clean biomass heating*  
1872 *systems* shall be deemed *mixed-fuel buildings* and shall comply with this section in full.  
1873

1874 **CC105.2 On-site renewable energy.** New mixed-fuel buildings shall have equipment installed for on-  
1875 site renewable energy with a rated capacity of not less than 1.5 W/ft<sup>2</sup> (16.1 W/m<sup>2</sup>) multiplied by the sum  
1876 of the gross conditioned floor area of the three largest floors.

1877 **Exception:** Where the building site cannot meet the requirement in full with an on-site renewable  
1878 energy system, the building site shall install a partial system designed to utilize not less than 75%  
1879 of the *Potential Solar Zone Area*.

1880  
1881  
1882 **CC105.3 Additional efficiency requirements.** Additional efficiency requirements for compliance with  
1883 this Section are set forth in Sections RC104.3.1 through RC104.3.3  
1884

1885 **CC105.3.1 More efficient HVAC equipment performance.** Primary heating and cooling  
1886 *equipment* shall meet the following efficiencies as applicable:  
1887 1. Space heating *combustion equipment* shall be rated at greater than or equal to 95 AFUE.  
1888 2. All refrigerant-based air conditioning equipment shall be a heat pump with greater than or  
1889 equal to 10 HSPF rated heating performance and greater than or equal to 16 SEER rated cooling  
1890 performance.  
1891 3. Ground source heat pump systems shall be rated at greater than or equal to 3.5 COP at design  
1892 temperature.  
1893

1894 For multiple cooling systems, all systems shall meet or exceed the minimum efficiency  
1895 requirements in this section and collectively shall be sized to serve 100 percent of the cooling  
1896 design load. For multiple heating systems, all systems shall meet or exceed the minimum  
1897 efficiency requirements in this section and collectively shall be sized to serve 100 percent of the  
1898 heating design load.

1899 **Exception:**  
1900 *Clean biomass heating systems* used as the primary heating system.  
1901

1902 **CC105.3.2 Reduced energy use in service water-heating option.** The hot water system shall  
1903 meet one of the following efficiencies:

- 1904 1. Greater than or equal to 82 EF *combustion equipment* service\water-heating system.  
1905 2. Greater than or equal to 2.0 UEF electric service water-heating system.  
1906 3. Greater than or equal to 0.4 solar fraction solar water-heating system.  
1907 4. *Clean biomass heating system* supplied water-heating system.  
1908

1909 **CC106 Add Section CC106 as follows:**  
1910

1911 **SECTION CC106 WIRING FOR FUTURE ELECTRIFICATION**  
1912

1913 **CC106.1 Additional electric infrastructure.** All *combustion equipment* and end-uses shall be installed  
1914 in accordance with this section. Capacity for the future electric circuits required in this section shall be  
1915 included in the load calculations of the original installation of electric service to the building, and each  
1916 *dwelling unit* for R-use buildings or portions thereof.

1917 **CC106.1.1 Electric infrastructure for dwelling and sleeping units.** *Combustion equipment* and  
1918 end-uses serving individual *dwelling units* or *sleeping units* shall comply with Section RC104.4.

1919 **CC106.1.2 Combustion water heating equipment.** Gas-fired or oil-fired water heaters with a  
1920 capacity less than 300,000 Btu/h (88 kW) shall be installed in accordance with the following:

- 1921 1. A dedicated 208/240-volt branch circuit with a minimum capacity of 30 amps  
1922 shall terminate within 3 feet (914 mm) from the water heater and be accessible to  
1923 the water heater with no obstructions. Both ends of the branch circuit shall be  
1924 labeled with the words "For Future Heat Pump Water Heater" and be electrically  
1925 isolated,  
1926 2. A condensate drain that is no more than 2 inches (51 mm) higher than the base of  
1927 the installed water heater and allows natural draining without pump assistance  
1928 shall be installed within 3 feet (914 mm) of the water heater,  
1929 3. The water heater shall be installed in a space with minimum dimensions of 3 feet  
1930 (914 mm) by 3 feet (914 mm) by 7 feet (2134 mm) high, and  
1931 4. The water heater shall be installed in a space with a minimum volume of 700  
1932 cubic feet (20,000 L) or the equivalent of one 16-inch (406 mm) by 24-inch (610  
1933 mm) grill to a heated space and one 8-inch (203 mm) duct of no more than 10  
1934 feet (3048 mm) in length for cool exhaust air.  
1935  
1936

1937 **CC106.1.3 Cooking ranges, ovens and cooktops.** An individual branch circuit outlet with a  
1938 minimum rating of 250-volts, 40-amperes shall be installed within three feet of each gas or  
1939 propane range or any permanently installed *combustion equipment* oven or cooktop.

1940 **Exception:** Commercial kitchens for cafeteria, restaurant or commercial catering  
1941 business use  
1942

1943 **CC106.1.4 Clothes Dryers.** An individual branch circuit outlet with a minimum rating of 250-  
1944 volts, 30-amperes shall be installed within three feet of each gas or propane clothes dryer.

1945 **Exception:** commercial drying equipment used for manufacturing and process loads  
1946

1947 **CC106.1.5 Other combustion equipment.** *Combustion equipment* not covered by Sections  
1948 CC106.1.1 and CC106.1.4 and within buildings having average ventilation at full occupancy of  
1949 0.5 cfm/sf or less shall be provided with conduit that is continuous between a junction box  
1950 located within 3 feet (914 mm) of the *appliance* or *equipment* and an electrical panel. The  
1951 junction box, conduit and bus bar in the electrical panel shall be rated and sized to accommodate  
1952 a branch circuit with sufficient capacity for an equivalent electric appliance, equipment or end use  
1953 with an equivalent equipment capacity. The electrical junction box and electrical panel shall have  
1954 labels stating, "For future electric equipment".

1955 **CC106.1.6 Other combustion equipment, highly ventilated buildings.** *Combustion equipment*  
1956 not covered by Sections CC106.1.1 and CC106.1.4 and within buildings having average  
1957 ventilation at full occupancy of greater than 0.5 cfm/sf shall comply with Section CC106.1.6.1  
1958 through CC106.1.6.5.

1959 **CC106.1.6.1 HVAC Design and Installed Associated Electric Service.** An all-electric  
1960 HVAC retrofit design shall be prepared by the HVAC engineer for approval by the  
1961 authority having jurisdiction. The electric service installed with the building shall be  
1962 sufficient to accommodate the all-electric HVAC retrofit design. The contract documents  
1963 shall show future replacement of *combustion equipment* based HVAC system with an  
1964 equivalent all-electric system. Contract documents shall show *combustion equipment* to  
1965 be replaced, future electric equipment, supporting electric, structural, and architectural  
1966 infrastructure to be installed during building construction, and space allotments for future  
1967 equipment.

1968 **CC106.1.6.2 Heating, Ventilation, and Air Conditioning (HVAC) Compatibility.**  
1969 HVAC design shall ensure that air, water, or other systems serviced by *combustion*  
1970 *equipment* can also be serviced by future electric retrofit equipment without having to  
1971 upgrade, alter, or update such systems.

1972 **CC106.1.6.3 Equipment Efficiencies.** Electric retrofit equipment used for space and  
1973 water heating shall conform to Section C401.4.3.

1974 **CC106.1.6.4 Installed Infrastructure.** Infrastructure shall be installed as part of  
1975 building construction to accommodate future electric retrofit in order to minimize cost  
1976 and disruption during retrofit. Infrastructure to be installed as part of building  
1977 construction shall include, but is not limited to, power infrastructure to building to  
1978 accommodate future electric retrofit system, electric service to future distributed  
1979 equipment within building, conduits to accommodate controls to future distributed  
1980 equipment within building, and structural and architectural elements to accommodate  
1981 future retrofit equipment.

1982 **CC106.1.6.5 Space for Future Retrofit Equipment.** Interior and exterior space shall be  
1983 allotted to accommodate all future electric retrofit equipment. Where interior or exterior  
1984 allotted space exceeds the space used for *combustion equipment* to be replaced, and/or  
1985 does not correspond to the *combustion equipment* locations to be replaced, such space  
1986 shall be set aside and may not be used for any other purpose. Signage, labels, and  
1987 borders shall be used to prominently display areas and limits set aside for future  
1988 equipment to prevent encroachment.