The Commonwealth of Massachusetts

Office of Public Safety & Inspections Board

of Building Regulations and Standards

1 Federal St. - Suite 0600-Boston,

MA 02110-2012

780 CMR - MASSACHUSETTS BUILDING CODE - AMENDMENT PROPOSAL FORM

Code (Indicate with an 'x')	X_ Ninth Edition Base _ Ninth Edition One- and Two-Family Dwellings	*State Use Only*	
Date:	May 5, 2021	**Date Received:**	05/07/2021
Code Section:	AA104 and IECC Chapter 5	**Code Change Number:**	05-05-2021
Name and company affiliation if any: Mike Turns, PSD (on behalf of the Massachusetts Program Administrators)			
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Indicate with an 'x' the type of amendment proposed:

X Change Section X Add new section X Delete section and substitute _Delete section; no substitute

___Other, Explain:

Please type below the proposed amendment. If you propose to change a section, please copy the original text from the appropriate 2015 I-code and\or Massachusetts amendment. Indicate with strike out the text you propose to delete and add new text in either *italic* or red font. Also you please provide justification of your proposal as a second page and include information on the **Introduction and Background** of your proposal, **Pro *and* Con Reasons for Adoption** of it, a summary of estimated **Costs for Building Owners**, and **Life Safety Benefits** for building occupants. Also, please indicate whether or not the proposal has been presented to the International Code Council (ICC) for consideration. If not, please explain why the proposal is unique to Massachusetts. When complete email this file to Cesar.Lastra@state.ma.us. Please use additional pages if necessary.

Please see attachment

Introduction and Background:

Pro *and* Con Reasons for Adoption: Pros: Cons:

Costs to Building Owners:

Life Safety Benefits:

Massachusetts Building Code Change Proposal: "Additions and Alterations (Triple A) Stretch Code"

Part 2: Commercial construction

This code change proposal is offered on behalf of Mass Save, a collaboration of Massachusetts' natural gas and electric utilities and energy efficiency service providers including Berkshire Gas, Cape Light Compact, Eversource, Liberty Utilities, National Grid and Unitil.

Introduction and Background:

Currently, the stretch code does not apply to additions or alterations as Section AA refers to the Existing Buildings chapter just like non-stretch communities. Thus, the efficiency requirements for additions and alterations in stretch code communities are not a stretch at all. Given the high volume of these projects, there is a significant energy savings opportunity for the Commonwealth to add requirements for these project types in the stretch code.

This proposal would improve the energy efficiency of commercial buildings undergoing additions or alterations in stretch code communities. The proposed modifications below integrate directly with the structure of Chapter 5 of the IECC Commercial Provisions. The three main code sections are:

- C502 Additions
- C503 Alterations, and
- (new) C506 Extensive Alterations.

The elements of this proposal have been vetted and demonstrated to be cost effective. For instance, the building thermal envelope R-values and U-factors and provisions for lighting and mechanical systems in this proposal have all been taken from either the 2021 IECC or NYStretch (the stretch code of New York State) NYStretch (the stretch code of New York State) or proposals that have been adopted into 2021 IECC; therefore, these values have been vetted and demonstrated to be cost effective by other.

For Climate Zone 5A, a NYSERDA study[1] determined that NYStretch would on average save new commercial building owners $0.19 per square foot per year (10.5%) compared to ASHRAE 90.1-2016, with a simple payback of 9.8 years.

Pro and Con Reasons for Adoption:

Pros: Energy bill savings for commercial building owners and tenants, increased comfort for building occupants, and reduced carbon footprint statewide.

Cons: Small increased cost of construction, but these are likely to be offset by building owner savings.

Costs to Building Owners:

[1] 2020 NYStretch Energy Code Commercial Cost Effectiveness

Small increased cost of construction (likely to be offset by building owner savings)

Life Safety Benefits:

None

Note: The amendments mentioned in AA104.1 are addressed in a separate code change proposal.

Amendment to R202

R202 Definitions

Add definition:

EXTENSIVE ALTERATION. Any alteration where the total work area exceeds 75 percent of the building or dwelling unit. Work areas in which the alteration work is exclusively plumbing, mechanical or electrical shall not be included in the computation of the total area of all work areas.

Amendment to Stretch Code AA104

AA104 Replace the section with the following:

AA104 Existing Buildings

For alterations, renovations, and additions of existing buildings in these municipalities, the energy efficiency requirements of ~~780 CMR 13.00: Energy Efficiency or Chapter 11 of 780 CMR 51.00 shall be used as applicable~~ AA104.1 through AA104.3 shall be met as applicable based on the use and occupancy of the building.

AA104.1 Existing Low-Rise Residential Buildings

Additions, alterations, repairs, and changes of occupancy or use in all one- and two-family dwellings and multiple single-family dwellings (townhouses), as well as Groups R-2, R-3, and R-4 of four stories or less above grade plane, shall comply with 780 CMR 51.00 Chapter 11 Sections R501 through R505 as amended below, and Sections 506 and 507.

AA104.2 Existing Commercial Buildings

Additions, alterations, repairs, and changes of occupancy or use in all non-residential and R-use buildings of more than four stories shall comply with 780 CMR 51.00 Chapter 11 Sections C501 through C505 as amended below.

AA104.3 Existing Large Area and High Energy Use Buildings: Reserved

[Note: The track changes notations below, highlighted in red, denote differences between the 2021 IECC and the proposed changes. This was done with the assumption that the 2021 IECC will become effective as the base code prior to or at the same time as this proposal.]

SECTION C501

GENERAL

C501.2 Delete exception:

C501.2 Compliance.

~~**Exception:** *Additions, alterations, repairs* or *changes of occupancy* complying with ANSI/ASHRAE/IESNA 90.1.~~

SECTION C502

ADDITIONS

C502.2 Revise section as follows:

C502.2 Change in space conditioning. Any unconditioned or low-energy space that is altered to become conditioned space shall be required comply with Section C502, where all thermal envelope assemblies are considered new building envelope assemblies.

~~Exceptions:~~

1. ~~Where the component performance alternative in Section C402.1.5 is used to comply with this section, the proposed UA shall not be greater than 110 percent of the target UA.~~
2. ~~Where the total building performance option in Section C407 is used to comply with this section, the annual energy cost of the proposed design shall be not greater than 110 percent of the annual energy cost otherwise permitted by Section C407.2.~~

C502.3 Revise section as follows:

C502.3 Compliance

Additions shall comply with sections C502.3.1 through C502.3.6.2.

C502.3.1 ~~Vertical fenestration area~~ Building thermal envelope.

Additions shall comply with items 1 or 2 below, as applicable:

1. Where an addition has a new vertical fenestration area that results in a total building fenestration area less than or equal to that permitted by Section C402.4.1, the addition shall comply with Section C402, where Table C402.1.3 is replaced by Table C502.3.1, Table C402.1.4 is replaced by Table C502.3.2, and Table C402.4 is replaced with Table C502.1.3.
2. Where an addition with vertical fenestration that results in a total building fenestration area greater than Section C402.4.1 or an addition that exceeds the fenestration area ~~greater than that~~ permitted by Section C402.4.1, the ~~fenestration~~ addition shall comply with Section ~~C402.3.1.1 for the addition only~~ C402, including complying with either Section C402.4.1.1, or C402.1.5.

Additions complying with Section C402.1.5 shall achieve 10 percent better than code as reported in COM*check*™ or equivalent compliance software. [Alternatively, PNNL could integrate these amendments into a stretch code version.]

Table C502.3.1(1)

Opaque Thermal Envelope Insulation Component Minimum Requirements, R-Value Method[a,h]

CLIMATE ZONE	All other	Group R
Roofs		
Insulation Entirely above roof deck	~~R-30ci~~ R-33ci	~~R-30ci~~ R-33ci
Metal buildings[b]	R-19 + R-11 LS	R-19 + R-11 LS
Attic and other	~~R-49~~ R-53	~~R-49~~ R-53
Walls, above grade		
Mass[f]	~~R-11.4ci~~ R-13.3ci	~~R-13.3ci~~ R-15.2ci
Metal building	R-13 + ~~R-14ci~~ R-19.5ci	R-13 + ~~R14ci~~ R-19.5ci
Metal framed	R-13 + ~~R-10ci~~ R-11ci	R-13 + ~~R-10ci~~ R-11ci
Wood framed and other	R-13 + ~~R-7.5ci~~ R-9ci or ~~R-19~~ R-20 + R-5ci	R-13 + ~~R-7.5ci~~ R-9ci or ~~R-19~~ R-20 + R-5ci
Walls, below grade		
Below-grade wall[c]	R-7.5ci	R-10ci
Floors		
Mass[d]	~~R-14.6ci~~ R-15ci	R-16.7ci
Joist/framing	R-30[e]	R-30[e]
Slab-on-grade floors		
Unheated slabs	R-15 for 24" below	R-15 for 24" below
Heated slabs[g]	~~R-15~~ R-20 for ~~36"~~ 48" below + R-5 full slab	~~R-15~~ R-20 for ~~36"~~ 48" below + R-5 full slab
Opaque doors		
Non-Swinging	R-4.75	R-4.75

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 4.88 kg/ m^2, 1 pound per cubic foot = 16 kg/m^3. ci = Continuous insulation, NR = No Requirement, LS = Liner System.

a. Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.

b. Where using R-value compliance method, a thermal spacer block shall be provided, otherwise use the U-factor compliance method in Table C402.1.4.

c. Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.

d. “Mass floors” shall be in accordance with Section C402.2.3.

e. Steel floor joist systems shall be insulated to R-38.

f. “Mass walls” shall be in accordance with Section C402.2.2.

g. The first value is for perimeter insulation and the second value is for slab insulation. Perimeter insulation is not required to extend below the bottom of the slab.

h. Not applicable to garage doors. See Table C402.1.4.

Table C502.3.1(2)

Opaque Thermal Envelope Assembly Maximum Requirements, U-Factor Method

	All other	Group R
Roofs		
Insulation Entirely above roof deck	~~U-0.032~~ U-0.030	~~U-0.032~~ U-0.030
Metal buildings	U-0.035	U-0.035
Attic and other	~~U-0.021~~ U-0.020	~~U-0.021~~ U-0.020
Walls		
Mass[e]	~~U-0.090~~ U-0.086	~~U-0.080~~ U-0.076
Metal building	~~U-0.050~~ U-0.048	~~U-0.050~~ U-0.048
Metal framed	~~U-0.055~~ U-0.052	~~U-0.055~~ U-0.052
Wood framed and other[c]	~~U-0.051~~ U-0.048	~~U-0.051~~ U-0.048
Below-grade wall[c]	C-0.119	C-0.092
Floors		
Mass[d]	U-0.057	U-0.051
Joist/framing	U-0.033	U-0.033
Slab-on-grade floors		
Unheated slabs	F-0.52	F-0.51
Heated slabs	F-0.62	F-0.62
Opaque doors		
Nonswinging door	U-0.31	U-0.31
Swinging door	U-0.37	U-0.37
Garage door <14% glazing	U-0.31	U-0.31

a. For SI: 1 inch = 25.4 mm, 1 pound per square foot = 4.88 kg/m2, 1 pound per cubic foot = 16 kg/m3. ci = Continuous insulation, NR = No Requirement, LS = Liner System.

b. Where assembly U-factors, C-factors, and F-factors are established in ANSI/ASHRAE/IESNA 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/ISNEA 90.1 Appendix A.

c. Where U-factors have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The R-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.

d. Where heated slabs are below grade, below-grade walls shall comply with the U-factor requirements for above-grade mass walls.

e. “Mass floors” shall be in accordance with Section C402.2.3. “Mass walls” shall be in accordance with Section C402.2.2.

Table C502.3.1(3)

Fenestration Maximum U-factor and SHGC Requirements

Vertical fenestration		
U-factor		
Fixed fenestration	0.36	
Operable fenestration	~~0.45~~ 0.43	
All other vertical fenestration		
All fenestration	0.27	
Entrance doors	0.63	
SHGC		
	Fixed	Operable
PF < 0.2	0.38	0.33
0.2 ≤ PF < 0.5	0.46	0.40
PF ≥ 0.5	0.61	0.53
Skylights		
U-factor	~~0.50~~ 0.48	
SHGC	~~0.40~~ 0.38	

PF = Projection Factor

a. U-factor and SHGC are rated in accordance with NFRC 100

C502.3.1.1 Add section as follows:

C502.3.1.1 Thermal resistance of mechanical equipment penetrations (Mandatory)

When the total area of penetrations from mechanical equipment listed in Table C403.2.3(3) exceeds 1 percent of the opaque above-grade wall area, the mechanical equipment penetration area shall be calculated as a separate wall assembly with a default U-factor of 0.5.

Exception: Where mechanical equipment has been tested in accordance with testing standards approved by the authority having jurisdiction, the mechanical equipment penetration area may be calculated as a separate wall assembly with the U-factor as determined by such test.

C502.3.1.2 Add section as follows:

C502.3.1.2 Continuous Insulation (Mandatory)

Structural elements of balconies and parapets that penetrate the building thermal envelope, shall comply with one of the following:

1. Structural elements penetrating the building thermal envelope shall be insulated with continuous insulation having a minimum thermal resistance of R-3.
2. Structural elements of penetrations of the building thermal envelope shall incorporate a minimum R-3 thermal break where the structural element penetrates the building thermal envelope.

C502.3.1.3 Add section as follows:

C502.2.10 Air leakage-thermal envelope (Mandatory).

Additions shall comply with the requirements of C402.5.

C502.3.3.1 Add section as follows:

C502.3.3.1 Energy Recovery Ventilation Systems (Mandatory)

Ventilation systems shall comply with C403.7.4, except that exception 8 is replaced with the following:

Where the largest source of air exhausted at a single location at the building exterior is less than 75 percent of the design ventilation outdoor air flow rate. Multiple exhaust fans or outlets located within a 30-foot radius from the outdoor air supply unit shall be considered a single exhaust location.

C502.3.3.2 Add section as follows:

C502.3.3.2 Allowable fan horsepower (Mandatory).

Mechanical systems shall comply with Section C403.8.1, where Table C403.8.1(1) is replaced with Table C502.2.3.2. Fan supplying air to active chilled beams shall not be required to comply with Section C403.8.1.

Table C502.2.3.2 Fan Power Limitation

	Limit	Constant volume	Variable volume
Option 1: Fan system motor nameplate hp	Allowable nameplate motor hp	hp ≤ CFM_s*~~0.0011~~ 0.0090	hp ≤ CFM_s*~~0.0015~~ 0.0011
Option 2: Fan system bhp	Allowable fan system bhp	bhp ≤ CFM_s X ~~0.00094~~ 0.00088 + A	bhp ≤ CFM_s X ~~0.0013~~ 0.0010 + A

For SI: 1 bhp = 735.5 W, 1 hp = 745.5 W, 1 cfm = 0.4719 L/S

Where:

CFM_s = The maximum design supply airflow rate to conditioned spaces served by the system in cubic feet per minute.

hp = The maximum combined motor nameplate horsepower.

bhp = The maximum combined fan brake horsepower.

A = Sum of [PD X CFM_D/4131]

Where:

PD = Each applicable pressure drop adjustment from Table C403.8.1 (2) in. w.c.

CFM_D = The design airflow through each applicable device from Table C403.8.1(2) in cubic feet per minute.

C502.3.6 Revise section as follows:

C502.3.6 Light power and systems

New lighting systems that are installed as part of the addition shall comply with Section C405 and Section 502.3.6.1.1.

C502.3.6.1.1 Add section as follows:

C502.3.6.1.1 Occupant sensor controls. In addition to meeting the requirements of C405.2.1, occupant *sensor controls* shall also be installed in dining areas.

C502.3.7 Add section as follows:

C502.2.7 Power Conversion System

New traction elevators with a rise of 75 feet or more in new buildings shall have a power conversion system that complies with Sections C502.2.8.1 through C502.2.8.3.

C502.2.8.1 Motor. Induction motors with a Class IE2 efficiency ratings, as defined by IEC EN 60034-30, or alternative technologies, such as permanent magnet synchronous motors that have equal or better efficiency, shall be used.

C502.2.8.2 Transmission. Transmissions shall not reduce the efficiency of the combined motor/transmission below that shown for the Class IE2 motor for elevators with capacities below 4,000 lbs. Gearless machines shall be assumed to have a 100 percent transmission efficiency.

C502.2.8.3 Drive. Potential energy released during motion shall be recovered with a regenerative drive that supplies electrical energy to the building electrical system.

C502.3.8 Add section as follows:

C502.3.8 Additional Energy Efficiency Credits

Additions shall comply with Section C406 as new buildings. Either the addition shall comply on its own or the entire building, including the addition, shall comply.

Section C503
Alterations

C503.1 Revise section as follows:

C503.1 General

Alterations to any building or structure shall comply with the requirements of Section C503. *Alterations* shall be such that the existing *building* or structure is not less conforming to the provisions of this code than the existing building or structure was prior to the *alteration*. *Alterations* to an existing *building*, *building* system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portions of the existing *building* or *building* system to comply with this code. *Alterations* shall not create an unsafe or hazardous condition or overload existing *building* systems.

Exception: The following *alterations* need not comply with the requirements for new construction, provided that the energy use of the building is not increased:

1. Storm windows installed over existing *fenestration*.
2. Surface-applied window film installed on existing single-pane *fenestration* assemblies reducing solar heat gain, provided that the code does not require the glazing or fenestration to be replaced.
3. ~~Existing ceiling, wall or floor cavities exposed during construction, provided that these cavities are filled with insulation.~~
4. Existing ceiling cavities without attic spaces above, provided reroofing is not in the scope the alteration, and the cavity is filled with R-30 minimum insulation.
5. Existing framed wall cavities, provided the cavity is filled with R-13 minimum insulation for nominal 2x4 walls and R-20 minimum insulation for nominal 2x6 walls.
6. Existing framed floor cavities provided the cavity is filled with R-30 minimum insulation.
7. Construction where the existing roof, wall or floor cavity is not exposed.
8. Roof recover.
9. *Air barriers* shall not be required for *roof recover* and roof replacement where the *alterations* or renovations to the building do not include *alterations*, renovations or *repairs* to the remainder of the building envelope.

C503.1.1 *Extensive alterations* shall comply with Section C506.

C503.5.1 Add subsection as follows:

C503.5.1 Lighting in existing luminaires

Regardless of whether lighting is part of the alteration, all existing luminaires shall contain only high efficacy lamps as defined by Section R202.

Exception: Where existing luminaires are not compatible with high efficacy lamps.

Section C505 Change of occupancy or use

C505.1 Revise section as follows:

C505.1 General

Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with ~~this code~~ Section 502. Where the use in a space changes from one use in Table C405.3.2(1) or C405.3.2(2) to another use in Table C405.3.2(1) or C405.3.2(2),the installed lighting wattage shall comply with Section C405.3. Where the space undergoing a change in occupancy or use is in a building with a fenestration area that exceeds the limitations of Section C402.4.1, the space is exempt from Section C402.4.1 provided that there is not an increase in fenestration area.

~~**Exceptions:**~~

~~1. Where the component performance alternative in Section C402.1.5 is used to comply with this section, the proposed UA shall not be greater than 110 percent of the target UA.~~

~~2. Where the total building performance option in Section C406 is used to comply with this section, the annual energy cost of the proposed design shall not be greater than 100 percent of the annual energy cost otherwise permitted by Section C407.3.~~

SECTION C506

EXTENSIVE ALTERATIONS

C506 Add section as follows:

SECTION C506

EXTENSIVE ALTERATIONS

C506.1 General *Extensive alterations* to existing buildings shall comply with Section C506.1.1 or C506.1.2 and C506.2.

C506.1.1 Prescriptive The extensive alteration shall meet the requirements for additions in Section C502 as applicable to the components being altered.

C506.1.2 Performance The extensive alteration shall demonstrate energy use per square foot at least 10% below the energy requirements of ANSI/ASHRAE/IESNA 90.1 2013 Appendix G. Extensive alterations following this compliance path shall earn 10 Energy Efficiency Credits according to section C406. The selected Energy Efficiency Credit options shall be included in calculating the baseline building performance value.

C506.2 Lighting in existing luminaires

Regardless of whether lighting is part of the alteration, all existing luminaires shall contain only high efficacy lamps as defined by Section R202.

Exception: Where existing luminaires are not compatible with high efficacy lamps.