

CHAPTER 34

REPAIR, ALTERATION, ADDITION, AND CHANGE OF USE OF EXISTING BUILDINGS

(780 CMR 34 is entirely unique to Massachusetts)

780 CMR 3400.0 SCOPE

3400.1 General: The provisions of 780 CMR 34 are intended to maintain or increase public safety, health, and general welfare in existing buildings by permitting repair, alteration, addition, and/or change of use without requiring full compliance with the code for new construction except where otherwise specified in 780 CMR 34.

3400.2 Compliance: Repairs, alterations, additions, and changes of use shall conform to the requirements of 780 CMR 34. Where compliance with the provisions of this code for new construction is required by 780 CMR 34, and where such compliance is impractical because of construction difficulties or regulatory conflicts, *compliance alternatives* as described in 780 CMR 3406.0 may be accepted by the *building official*.

Note: Specialized codes, rules, regulations, and laws pertaining to repair, alteration, addition, or change of use of existing buildings promulgated by various authorized agencies may impact upon the provisions of 780 CMR 34. Specialized state codes, rules, regulations, and laws include, but are not limited to those listed in *Appendix A*.

3400.3 Applicability: The provisions of 780 CMR 34 apply to repair, alteration addition or change in use to existing buildings which qualify to use 780 CMR 34 (see 780 CMR 3400.3.1), based on the proposed continuation of, or change in use group, as follows:

1. Continuation of the same *use group*, or a change in *use group* which results in a change in *hazard index* of one or less as determined by 780 CMR 3403 shall comply with 780 CMR 3404.0.
2. Change in use group to a use group with *hazard index* of two or more greater than the *hazard index* of the existing use shall comply with the requirements of 780 CMR 3405.0 and the code for new construction.
3. **Part change in use (Mixed Use):** Portions of the building is changed to a new *use group*, shall be separated from the remainder of the building with *fire separation assemblies* complying with 780 CMR 313, or with approved *compliance alternatives*. The portion of the building changed shall be made to conform with the applicable provisions of 780 CMR 34.

4. **Additions:** Additions to *existing buildings* shall comply with all code requirements for new construction, except as otherwise provided in 780 CMR 34. The combined height and area of the *existing building* and the addition shall not exceed that allowed by 780 CMR 503.0 and Table 503 as modified by 780 CMR 504 and 506. Where a *fire wall* complying with 780 CMR 707.0 and 708.0 is provided, the addition shall be considered as a separate building.

5. **Ordinary repairs:** *Ordinary repairs* conforming to 780 CMR 110.3 (4), 780 CMR 2 and 780 CMR 902 may be performed without a building permit.

6. **Assembly use groups:** A change from any other use group to an assembly use group (A) or any alteration or change in occupancy within an assembly use group shall comply with the requirements of the code for new construction, except that earthquake requirements need only conform to 780 CMR 3408.

6.1 Existing A-2 use means of egress: For existing buildings or portions thereof that are classified as A-2 use and which have an occupant load of 50 or greater; which have a single main exit door, such egress system shall conform to the requirements of 780 CMR 1006.2.2.1 and the exit access to such single main exit door shall be sized in accordance with 780 CMR 1011.3. Non-compliance with these requirements shall be cause for the issuance of an Exit Order in accordance with 780 CMR 3400.5.1.

As an alternative, or where construction, regulatory or other conditions exist which would preclude the installation of said main entrance/exit door and associated exit access, the owner shall cause the existing means of egress system to be evaluated by a Massachusetts registered architect or Massachusetts registered professional engineer. Such evaluation shall determine whether the existing means of egress is sufficient to accommodate the occupant load or whether the existing means of egress requires improvement to accommodate safely the occupant load. If the existing means of egress is insufficient to accommodate the occupant load, such inadequate means of egress will, as a minimum, be deemed in violation of 780 CMR 3400.4.1.2. Calculation methodologies based on alternative approaches to life safety may be utilized in order to effect said egress evaluation.

THE MASSACHUSETTS STATE BUILDING CODE

7. **Institutional use groups:** A change from any other use group to an institutional use group (I) or any alteration or change in occupancy within an institutional use group shall comply with the requirements of the code for new construction, except that earthquake requirements need only conform to 780 CMR 3408.

8. **Residential use groups:** A change from any other use group to a residential use group (R) or any alteration or change in occupancy within an residential use group shall comply with the requirements of the code for new construction, except that earthquake requirements need only conform to 780 CMR 3408.

9. **Historic buildings:** Buildings which qualify as *totally or partially preserved historic buildings* in accordance with 780 CMR 3409 shall meet the provisions of 780 CMR 3409.

10. **Structural requirements:** Structural requirements for additions, and for existing buildings subject to repair, alteration, and/or change of use, shall be in accordance with 780 CMR 3408, except:

- a. *Totally Preserved Historic Buildings* need not comply with the wind load and seismic load requirements of 780 CMR 3408; and
- b. *Partially Preserved Historic Buildings* need not comply with the seismic load requirements of 780 CMR 3408.

3400.3.1 Buildings which qualify: The provisions of 780 CMR 34 shall apply to *existing buildings* which have been legally occupied and/or used for a period of at least five years. Any building for which there exists an outstanding notice of violation or other order of the building official shall not qualify to use 780 CMR 34 unless such proposed work includes the abatement of all outstanding violations and compliance with all outstanding orders of the building official. Buildings which do not qualify as *existing buildings* for the purposes of 780 CMR 34 shall comply fully with the applicable provisions of this code for new construction.

Exceptions:

- (1) *Existing buildings* or portions thereof which are changed in use from any other use group to day care centers (I-2 or E) shall not qualify as *existing buildings* for the purposes of 780 CMR 34, but shall comply with the requirements of 780 CMR 4, as applicable.
- (2) *Existing buildings* or portions thereof, which are changed in use from any use to a Group Residence, Limited Group Residence or Group Dwelling Unit shall not qualify as *existing buildings* for the purposes of 780 CMR 34, but shall comply with the provisions of 780 CMR 4, as applicable.

3400.4.1 Existing Non Conforming Means of Egress: The following conditions, when observed by the *building official*, shall be cited, in writing as a violation. Said citation shall order the abatement of the non conformance and shall include such a time element as the building official deems necessary for the protection of the occupants thereof, or as otherwise provided for by statute.

1. Less than the number of *means of egress* serving every space and/or story, required by 780 CMR 1010.0 and Table 1010.2, or 780 CMR 36 for one and two family dwellings.
2. Any required *means of egress* component which is not of sufficient width to comply with 780 CMR 1009, or is not so arranged as to provide safe and adequate *means of egress*, including exit signage and emergency lighting.

3400.5 Hazardous Means of Egress:

3400.5.1 Exit Order/Hazardous Means of Egress: In any *existing building* or structure not provided with exit facilities as herein prescribed for new buildings and in which the exits are deemed hazardous or dangerous to life and limb, the *building official* shall declare such building dangerous and unsafe in accordance with the provisions of 780 CMR 121.0.

3400.5.2 Appeal from exit order: Any person served with any order pursuant to 780 CMR 3400.5 shall have the remedy prescribed in 780 CMR 121.

3400.6 Unsafe Lighting and/or Unsafe Ventilation: In any *existing building*, or portion thereof, in which (a) the light or ventilation do not meet the applicable provisions of 780 CMR 12.0 and (b) which, in the opinion of the *building official*, are dangerous, or hazardous, to the health and safety of the occupants, the *building official* shall order the abatement of such conditions to render the building or structure occupiable or habitable as applicable for the posted use and occupant load.

In enforcing the provisions of 780 CMR 3400.6 the *building official* may require or accept engineering or other evaluations of the lighting and/or ventilation systems in order to evaluate possible dangerous or hazardous conditions and acceptable solutions.

Where full compliance with 780 CMR for new construction is not practical for structural and/or other technical reasons, the *building official* may accept compliance alternatives, or engineering or other evaluations which adequately address the building or structure livability for the posted use and occupant load.

3400.4 Special Provisions for Means of Egress:

780 CMR: STATE BOARD OF BUILDING REGULATIONS AND STANDARDS
REPAIR, ALTERATION, ADDITION AND CHANGE OF USE OF EXISTING BUILDINGS

780 CMR 3401.0 DEFINITIONS

3401.1 General: Definitions shall, for the purposes of 780 CMR 3401.0, have the meaning shown herein:

Building System: Any mechanical, structural, egress, electrical, plumbing, building enclosure and/or fire protection system, or fire resistive construction system, or portion thereof.

Building System Component: A part or portion of a *building system*.

Compliance Alternative: An alternative life-safety construction feature which meets or exceeds the requirements or intent of a specific provision of 780 CMR. The *Building Official* is authorized to approve or disapprove *compliance alternatives*. *Compliance alternatives* are only permitted for *existing buildings*.

Existing building or structure: Any building or structure qualifying under 780 CMR 3400.3.1.

Hazard Index: A numerical value, between 1 and 8, which is assigned to a specific *Use Group* in order to determine which of the provisions of 780 CMR 34 apply to the proposed work on the *existing building*. The *Hazard Index* is a relative scale used only to determine applicable provisions of 780 CMR 34. *Hazard indices* are listed in Table 3403 and *Appendix F*.

Historic buildings: (a) Any building or structure individually listed on the National Register of Historic Places or (b) any building or structure evaluated by MHC to be a contributing building within a National Register or State Register District. (c) any building or structure which has been certified by the Massachusetts Historical Commission to meet eligibility requirements for individual listing on the National Register of

NON-TEXT PAGE

Historic Places. Historic building shall be further defined as totally or partially preserved buildings. All entries into the totally preserved building list shall be certified by the Massachusetts Historical Commission. The Board of Building Regulations and Standards shall ratify all buildings or structures certified by the Massachusetts Historical Commission to qualify for *totally preserved* listing (see Appendix H).

Partially preserved buildings: (a) Any building or structure individually listed on the National Register of Historic Places or (b) any building or structure certified as a historic building by the Massachusetts Historical Commission and not designated a *totally preserved building* in Appendix H.

Restoration: Restoration is the process of accurately reconstructing or repairing the forms and details of a building or structure or portion thereof as it appeared at a particular period or periods of time by means of removal of later work or the replacement of missing original work

Totally preserved buildings: A *totally preserved building* is an *historic building* or structure. The principal use of such a building or structure must be as an exhibit of the building or the structure itself which is open to the public not less than 12 days per year, although additional uses, original and/or ancillary to the principal use shall be permitted within the same building up to maximum of 40% of the gross floor area. *Totally preserved buildings* shall be those listed in Appendix H. All entries into the *totally preserved building* list shall be certified by the Massachusetts Historical Commission. The Board of Building Regulations and Standards shall ratify all buildings or structures certified by the Massachusetts Historical Commission to qualify for *totally preserved* listing (See Appendix H).

Seismic Hazard Category: A numerical value, between 1 and 3, which is based on a proposed change in use, change in occupancy and cost of alterations in order to determine which of the provisions of 780 CMR 3408 apply to the proposed work on the *existing building*. The *Seismic Hazard Category* is a relative scale used only to determine applicable provisions of 780 CMR 34. *Seismic Hazard Categories* are listed in Table 3408.1

Substantial Renovation, or Substantial Alteration: The terms *substantial renovation* and *substantial alteration* are defined herein for the specific purpose of determining whether fire protective

systems are required in existing buildings, when such buildings undergo renovations or alterations, change in use or occupancy or additions. As used in 780 CMR 34, *substantial renovation* or *substantial alteration* shall have the following meanings; *Substantial renovation* and *substantial alteration* is work which is major in scope and expenditure when compared to the work and expenditure required for the installation of a fire protection system, when such system is required by 780 CMR 9 for a particular *use group*. The *building official* shall make such determination and may request the owner or applicant to provide such supporting information as is necessary to make such determination

780 CMR 3402.0 IMPLEMENTATION

3402.1 Building Permit Application Requirements for Existing Buildings: A building permit shall be required for any work regulated by 780 CMR 34.

Exception: *Ordinary repairs* may be performed without a building permit.

3402.1.1 Investigation and evaluation: For any proposed work regulated by 780 CMR 34, which is subject to 780 CMR 116, as a condition of the issuance of a building permit the building owner shall cause the *existing building* (or portion thereof) to be investigated and evaluated in accordance with the provisions of 780 CMR 34 (see Appendix F).

The investigation and evaluation shall be in sufficient detail to ascertain the effects of the proposed work (if any) on the structural, egress, fire protection, energy conservation systems and light and ventilation systems of the space under consideration and, where necessary, the entire building or structure.

3402.1.2 Submittal: The results of the investigation and evaluation, along with any proposed *compliance alternatives*, shall be submitted to the *building official* in written report form.

3402.1.3 Non Conformities and Compliance Alternatives: The application for a building permit shall identify all items of non or partial compliance with the requirements of 780 CMR 34, and *compliance alternatives*, if any are proposed, for approval by the building official. The *building official* shall respond to the acceptability of any proposed *compliance alternatives* within 30 days of the filing of the building permit application. Where proposed *compliance alternatives* are, in the opinion of the *building official*, unacceptable, or where issues of non-compliance remain, the permit

THE MASSACHUSETTS STATE BUILDING CODE

applicant shall have the remedies prescribed by 780 CMR 122.0.

3402.1.5 Documentation of compliance alternatives: Whenever action is taken on any building permit application to repair, make alterations or additions, or change the use or occupancy of an existing building, and when said application proposes the use of *compliance alternatives*, the building official shall ensure that one copy of the proposed *compliance alternatives*, including applicable plans, test data, or other data for evaluation, be submitted to the BBRs, together with a copy of the building permit application and the *building official's* decision regarding the proposed *compliance alternatives*.

780 CMR 3403.0 HAZARD INDEX

3403.1 Hazard Index: In the implementation of the provisions of 780 CMR 34, the *hazard index* associated with a particular use group shall be as identified in table 3403 and Appendix F. In order to determine the applicable provisions of 780 CMR 34 the *hazard index* of the existing *use group* shall be subtracted from the *hazard index* of the proposed use. The algebraic difference shall be used to determine the applicable provisions of 780 CMR 34.

Table 3403
HAZARD INDEX

USE GROUP ⁽¹⁾	DESCRIPTION	HAZARD INDEX NO. ⁽²⁾
A-1	Theater with stage	6
A-2	Night Club	7
A-3	Theater without stage	5
A-3	Restaurant	5
A-3	Lecture halls, recreations centers, museums, libraries. similar assembly buildings	4
A-4	Churches	4
B	Business	2
E	Educational (K through 12)	4
F	Factory and industrial	3
H	High hazard	8
I-1, I-3	Institutional restrained	5
I-2	Institutional incapacitated	4
M	Mercantile	3
R-1	Hotels, motels	2
R-2	Multi-family	2
R-3	One and two family	2
S-1	Storage, moderate hazard	3
S-2	Storage, low hazard	1

Notes to Table 3403:

(1) See 780 CMR 3 and 4 and Appendix F.

(2) Hazard Index Modifier for selected construction types as follows:

- (a) When a building is classified in construction Type 1A, 1B, 2A, or 2B, subtract one from the *Hazard index* shown in Table 3403 for the applicable proposed new use group only.
- (b) When a building is classified in construction Type 2C or 5B, add one to the *Hazard index* shown in Table 3403 for the applicable proposed new use group only. Exception: *Partially Preserved Historic Buildings* (780 CMR 3409).

780 CMR 3404.0 REQUIREMENTS FOR CONTINUATION OF THE SAME USE GROUP OR CHANGE TO A USE GROUP RESULTING IN A CHANGE IN HAZARD INDEX. OF ONE OR LESS

3404.1 General: The requirements of 780 CMR 3404.0 and applicable provisions of 780 CMR 3408 shall apply to all repairs and alterations to *existing buildings* having a continuation of the same use group or to *existing buildings* changed in use group of one or less *hazard index* (Table 3403).

3404.2 Requirements exceeding those required for new construction: *Existing buildings* which, in part or as a whole, exceed the requirements of 780 CMR may be altered, in the course of compliance with 780 CMR 34, so as to reduce or remove, in part or completely, features not required by this code for new construction.

Exception: Pursuant to M.G.L. c. 148, § 27A, fire protection devices, shall not be disconnected (temporarily or permanently), obstructed, removed or shut off or destroyed without first procuring a written permit from the head of the local fire department.

3404.3 New building systems: Any new *building system* or portion thereof shall conform to 780 CMR for new construction to the fullest extent practical. However, individual *components* of an existing *building system* may be repaired or replaced without requiring that system to comply fully with the code for new construction unless specifically required by 780 CMR 3408

3404.4 Alterations and repairs: Alterations or repairs to *existing buildings* which maintain or improve the performance of the building may be made with the same or like materials, unless required otherwise by 780 CMR 3408. Alterations or repairs which have the effect of replacing a *building system* as a whole shall comply with 780 CMR 3404.3

3404.5 Number of *Means of Egress*: Every floor or story of any existing building shall provide at least the number of *means of egress* as required by 780 CMR 3400.4 and which are acceptable to the *building official*.

3404.6 Capacity of exits: All required *means of egress* shall comply with 780 CMR 1009.0. Existing *means of egress* may be used to contribute to the total egress capacity requirement based on the unit egress widths of 780 CMR 1009.0.

3404.7 Exit signs and lights: Exit signs and lighting shall be provided in accordance with 780 CMR 1023.0.

THE MASSACHUSETTS STATE BUILDING CODE

3404.8 Means of egress lighting: *Means of egress* lighting shall be provided in accordance with 780 CMR 1024.0.

3404.9 Height and Area limitations: The height and area requirements of 780 CMR 5 shall apply to *existing buildings* when such *existing buildings* are modified by addition and/or change in use. Modifications to the height and area requirements as provided in 780 CMR 504.0 and 506.0 are permitted.

3404.10 Existing Fire and party walls: No further compliance is required with 780 CMR 707.0. The height above the roof of existing fire, party and exterior walls need not comply with 780 CMR 3404.0

3404.11 Fire Protection Systems: Fire Protection Systems: Design, installation and maintenance of fire protection systems shall be provided in accordance with 780 CMR 3404.3 and 780 CMR 3404.12 as applicable.

3404.12 Fire protection systems are required for the following cases:

1. Additions where required by 780 CMR 9.0 for the specific *use group*.
2. For *existing buildings* and additions to *existing buildings*, where required by 780 CMR 9 or where required by 780 CMR 506 to satisfy height and area requirements.
3. *Existing buildings*, or portions thereof which are *substantially altered* or *substantially renovated*, and where otherwise required by 780 CMR 9.0 for the specific *use group*.
4. Existing buildings or portions thereof when changed in use to an A-2 occupancy shall be protected with an automatic fire suppression system. Where the A-2 occupancy is created in a mixed-use building, the A-2 occupancy, including all ingress and egress portions shall require automatic fire suppression when the A-2 occupant load is 50 or greater; additionally in such mixed use, the A-2 occupancy shall be separated from adjacent uses by one hour horizontal and vertical fire separation assemblies in accordance with 780 CMR 709.

Note: Notwithstanding the provisions of 780 CMR 3404.12, automatic Fire Suppression systems are required in municipalities which have adopted the provisions of M.G.L. c. 148, § 26G, H or I; also see M.G.L. c. 143, § 97A, M.G.L. c. 148, § 26G½ and M.G.L. c. 148A relative to statutory prospective and retroactive sprinkler requirements for nightclubs and similar USES.

3404.13 Enclosure of stairways: Open stairways are prohibited except in one- and two-family dwellings or unless otherwise permitted by

780 CMR 10. There shall be no minimum fire-resistance rating required for an existing enclosure of a stairway. Partitions or other new construction which is added in order to fully and solidly enclose a stairway shall provide a minimum fire-resistance rating of one hour. All doors in the enclosure shall be self-closing and tight-fitting with approved hardware. All doors in those portions of the stairway which are fire-resistance rated shall comply to the applicable provisions of 780 CMR 9.

3404.14 Assembly Use Groups: Notwithstanding the provisions of 780 CMR 3404, Assembly Use Groups shall comply with the provisions of 780 CMR 3400.3, item 6.

3404.15 Institutional Use Groups: Notwithstanding the provisions of 780 CMR 3404, Institutional Use Groups shall comply with the provisions of 780 CMR 3400.3, item 7.

3404.16 Residential Use Groups: Notwithstanding the provisions of 780 CMR 3404, Residential Use Groups shall comply with the provisions of 780 CMR 3400.3, item 8.

3404.17 Fire hazard to adjacent buildings: Any proposed change in the use or occupancy of an existing building which has the effect of increasing the fire hazard to adjacent buildings shall comply with the requirements of Table 705.2 for exterior wall fire resistance rating requirements, or with approved *compliance alternatives*.

3404.18 Accessibility for Persons with Disabilities: Accessibility requirements shall be in accordance with 521 CMR as listed in *Appendix A*.

3404.19 Energy Conservation: Energy conservation requirements shall be in accordance with 780 CMR 3407.0.

780 CMR 3405.0 REQUIREMENT FOR CHANGE IN USE GROUP TO TWO OR MORE HAZARD INDICES GREATER

3405.1 General: When the existing use group is changed to a new use group of two or more hazard indices higher (as provided in Table 3403), the existing building shall conform to the requirements of the code for new construction, except as provided in 780 CMR 3408 or as otherwise allowed in 780 CMR 3407.0.

3405.2 Accessibility for Persons with Disabilities: Accessibility requirements shall be in accordance with 521 CMR as listed in *Appendix A*.

780 CMR: STATE BOARD OF BUILDING REGULATIONS AND STANDARDS
REPAIR, ALTERATION, ADDITION AND CHANGE OF USE OF EXISTING BUILDINGS

**780 CMR 3406.0 COMPLIANCE
ALTERNATIVES**

3406.1 General: Where compliance with the provisions of the code for new construction, required by 780 CMR 34, is impractical because of construction difficulties or regulatory conflicts, *compliance alternatives* may be accepted by the building official.

Examples of *compliance alternatives* which have been used are provided in *Appendix F*. The building official may accept these *compliance alternatives* or others proposed.

3406.2 Documentation: In accordance with 780 CMR 3402.1.5, the building official shall ensure that the BBRs is provided with information regarding *compliance alternatives* accepted or rejected by the *building official*.

**780 CMR 3407.0 ENERGY PROVISIONS
FOR EXISTING BUILDINGS**

Implementation date: Note that commencing January 1, 1999, replacement windows for existing low-rise residential buildings are required to have a maximum thermal transmittance of 0.44 and such windows must be NFRC listed/labeled.

Exception 1: Criteria for NFRC listing/labeling and maximum U-0.44 are not required if the existing window (s) are true divided light (i.e. – single thickness multi-pane sashes with structural muntin bars) and being replaced with “like kind” units. This Exception additionally requires that a storm window be installed over the replacement window. The storm window may be installed internally, externally, or integrated with the primary window.

Exception 2: Criteria for NFRC listing/labeling and maximum U-0.44 are not required for basement windows with a unit height up to 24 inches, whether or not the basement is a conditioned space.

3407.1 General: 780 CMR 3407.0 establishes the energy provisions for *existing buildings* governed by 780 CMR 3404.0 or 780 CMR 3405.0.

3407.2 Compliance: Alterations to any building component affecting the energy conservation performance of an existing building shall comply with the applicable requirements of:

- (a) 780 CMR, Table 3407 (COMPONENT VALUES FOR ALTERED ELEMENTS) and all applicable subsections of 780 CMR 13.0, or:
- (b) 780 CMR 1304.2 for thermal envelope requirements and all other applicable requirements of 780 CMR 13.0, or:

(c) 780 CMR 1304.5 for thermal envelope requirements and all other applicable requirements of 780 CMR 13.0, or:

(d) 780 CMR 1309, or:

(e) 780 CMR Appendix J, as applicable.

3407.3 Exempt buildings: Refer to 780 CMR 1301.4 for thermally exempt buildings and 780 CMR 1308.1 for lighting exemptions.

3407.4 Compliance exceptions

3407.4.1 Fenestration: When alterations to a wall assembly include only altering the fenestration component, the areas of fenestration may be decreased or replaced with an opaque wall element made to comply with the thermal transmittance value of the existing wall.

3407.4.2 Ordinary repairs: *Ordinary repairs* need not comply with the energy provisions.

Note that in the repair of broken windows, broken doors or broken skylights, like-kind replacement shall be allowed, but the complete replacement of windows, doors or skylights in an *existing building* shall require compliance with the applicable requirements of 780 CMR 3407.2. Any window replacement that includes new jambs or new jamb liners does not qualify as an “ordinary repair,” and such replacement is subject to the energy performance criteria of 780 CMR, 3407.2.

3407.4.3 Roofs: Compliance of the roof/ceiling assembly is not required unless the existing roofing material is stripped off the roof deck. However, if a structural analysis by a registered professional engineer shows that the roof will not support the additional live loads imposed by compliance of the roof/ceiling assembly, or, if such analysis shows that addition of the required amount of insulation will cause ponding of water, then compliance of the roof/ceiling assembly is not required.

780 CMR: STATE BOARD OF BUILDING REGULATIONS AND STANDARDS

THE MASSACHUSETTS STATE BUILDING CODE

TABLE 3407 Heating		Lighting	780 CMR 1308
COMPONENT VALUES FOR ALTERED ELEMENTS		Note 1. Wood plank and beam assemblies are constructions in which the finished interior surface is the underside of the roof deck.	
All wall construction containing heated or mechanically cooled space	U-0.08	68	
Containing heated or mechanically cooled space	U-0.08	For existing low-rise residential buildings, containing January 1, 1999, the maximum allowed thermal transmittance of replacement windows, with or without a storm window, shall be 0.44 and such windows and window with storm window combinations will be NFRC listed labeled. For all other existing building types (commercial/high-rise), window thermal transmittance requirements shall conform to the requirements of 780 CMR 13 generally and 780 CMR 1304.2 or 1304.5 or 1309, as applicable. Refer also to 780 CMR 13407.0 Exceptions 1 and 2.	
Containing unheated space	U-0.08	For windows, see 2, 5, 6, 7	
Wood plank and beam construction containing heated or mechanically cooled space	U-0.08	For skylights - no current restriction	
Construction other than wood plank and beam containing heated or mechanically cooled space	U-0.08	For skylights - no current restriction	
All construction enclosing heated or mechanically cooled space	U-0.08	For skylights - no current restriction	
Floor sections over area exposed to outside air or unheated areas	U-0.08	Insulation may be omitted from floors over unheated areas when foundation walls are provided with a U value of 0.17.	
Unheated slab on grade	U-0.08	The U value requirement of 0.17 for foundation walls may be omitted when floors over unheated spaces are provided with a U value of 0.08.	
Heated slab on grade	U-0.08	Refer to 780 CMR Appendix J Table J4.3.2 for allowable air infiltration rates for residential doors and windows. Allowable rate for commercial doors is 11 cfm/lin. ft of operable sash crack.	
Heating, cooling, sizing and efficiency	U-0.08		
Humidistats, thermostats & zoning	U-0.08		
Located in or on buildings	U-0.08		
-	U-0.08		

780 CMR: STATE BOARD OF BUILDING REGULATIONS AND STANDARDS
REPAIR, ALTERATION, ADDITION AND CHANGE OF USE OF EXISTING BUILDINGS

NON-TEXT PAGE

THE MASSACHUSETTS STATE BUILDING CODE

Note 6. The first floor exterior envelope of business and mercantile use groups shall have an overall thermal transmittance value not greater than .65 in lieu of individual component values for walls and fenestration.

Note 7. When the glass area is increased, the glass and wall components which are altered shall comply with the component values in Table 3407. The extent of wall made to comply shall be equivalent to the decreased opaque wall area.

780 CMR 3408.0 STRUCTURAL REQUIREMENTS FOR *EXISTING BUILDINGS*

3408.1 General Requirements:

3408.1.1 Buildings Constructed on or after January 1, 1975: The structural systems of *existing buildings* which were constructed under a building permit issued on or after January 1, 1975 shall conform to the requirements for new construction of either the current edition of 780 CMR (the Massachusetts State Building Code), or to the edition in effect on the date of the permit plus applicable provisions of 780 CMR 3408.0 of the current edition of the code. Provisions of 780 CMR 3408.0 which are less stringent than the code in effect on the date of the permit shall not apply.

3408.1.2 Buildings Constructed prior to January 1, 1975: The structural systems of existing buildings constructed under a building permit issued prior to January 1, 1975 shall conform to 780 CMR 3408.0 and the building code applicable at the time of the original building permit. In the event of conflict between the prior code and 780 CMR 3408.0, the provisions of 780 CMR 3408.0 shall govern.

3408.1.3 Structural Engineering Services: For buildings subject to construction control, as determined in 780 CMR 116, the Owner shall retain a *registered professional engineer* qualified in the structural design of buildings (hereinafter called the structural engineer) to perform all structural engineering required by 780 CMR. For purposes of determining applicability of construction control, the volume of enclosed space shall include the entire existing building and all proposed additions. (See 780 CMR 116.1 for buildings exempt from construction control.)

3408.2 Evaluation of Existing Buildings: The structural engineer shall make a structural evaluation of the *existing building* to determine the adequacy of all structural systems that are affected by alteration, addition, change of use, or damage to be repaired. The evaluation shall include review of relevant available documentation about the building design and construction, a field investigation of the existing

Note 8. When any alterations to the exterior wall component exposes the wall cavity or, when a finished system is added to a wall having no cavity, the wall must comply with the values in Table 3407.

Note 9. When mechanical system compliance is required on an existing system, only the portions of the system altered and any other portions which can reasonably be incorporated need comply.

conditions, and a structural analysis. When deemed necessary by the structural engineer, the evaluation shall also include detailed field surveys, testing, and laboratory analysis. Refer to 780 CMR F-104 in *Appendix F*. When new structural elements or strengthening of existing elements is necessary, the evaluation shall include the effects of such new elements and strengthening. A report on the structural evaluation shall be submitted to the building official with the application for the building permit.

3408.2.1 Field Investigation: The field investigation of an *existing building* shall be sufficient to determine the location, size, details, and conditions of existing structural elements, and to verify structural information on the drawings of the existing building, if said drawings exist.

3408.2.2 Structural Analysis: The structural analysis shall include analysis of all structural systems affected by the proposed alteration, addition, change in use or repair, or for which design loads are specified in 780 CMR 3408, and shall be adequate to demonstrate the ability of new and existing systems to support the required loads.

3408.2.3 Field Observations During Construction: The structural engineer shall make periodic field visits during the progress of the construction work on the existing building in order to observe and verify the assumed conditions on which the structural design was based, and shall modify the design should the observed conditions differ in any significant manner from those on which the structural design was based. The structural engineer shall provide a written notification to the building official of changes to the contract documents as shown on the permit application.

3408.2.4 Geotechnical Explorations: Explorations shall be performed as necessary to determine the subsoils and the type and condition of existing foundations for the lateral load analysis of foundations required in 780 CMR 3408.3.4 and for the liquefaction evaluation required in 780 CMR 3408.7.

3408.3 General Structural Design Requirements:

The provisions of 780 CMR 3408.3 shall apply to the structural analysis and design of additions, alterations, changes in use, and repairs to *existing*

buildings. Specific requirements for additions, and for alterations or changes of use, or repairs are prescribed in 780 CMR 3408.4 and 3408.5

THE MASSACHUSETTS STATE BUILDING CODE

respectively. Additional requirements for earthquake analysis and design are prescribed in 780 CMR 3408.6.

3408.3.1 New Structural Members and Systems: All new structural elements and systems, whether in new additions or in existing construction, shall be designed and constructed in accordance with the code requirements for new construction using the loads and criteria specified in 780 CMR 3408.0.

3408.3.2 Existing Structural Members and Systems: Strength of existing systems, elements, and connections shall be determined in accordance with current accepted engineering practice, using the actual strength and other physical properties of the existing materials. Alternatively, except for earthquake design, applicable design codes at the time of construction may be used to determine the strength of existing systems, elements and connections, provided that the allowable stresses specified in those codes are not exceeded, and provided the applicable provisions of those codes have not since been found to endanger public safety.

3408.3.2.1 Strength of Existing Materials: The strength of existing materials shall be determined by tests or from generally accepted historical records.

3408.3.2.2 Reuse of Existing Structural Members: Existing structural members in sound structural condition may be reused, providing analysis in accordance with 780 CMR 3408.3.2 demonstrates adequate capacity to support the loads required by 780 CMR 3408.0.

3408.3.3 Reinforcement and Repair of Existing Construction: Repair or reinforcement of existing structural elements or systems shall be designed and constructed in accordance with the code requirements for new construction, using the loads and criteria specified in 780 CMR 3408.0, and in the case of existing materials, using the actual physical properties of the existing materials. Alternatively, for other than earthquake design, design codes applicable at the time of construction of the existing building may be used, provided that the allowable stresses specified in those codes are not exceeded, and provided the applicable provisions of those codes have not since been found to endanger public safety.

3408.3.4 Lateral Load Analysis: Lateral load analysis of a building required by the provisions of 780 CMR 3408.0 shall:

1. Consider all walls, frames, diaphragms, and other structural elements that may contribute to lateral load resistance.
2. Consider eccentricity of center of applied wind load from center of rigidity of the structure.
3. Consider relative stiffnesses of resisting elements.
4. Consider flexibility of diaphragms where appropriate.
5. Include calculations of total lateral earthquake force as prescribed in 780 CMR 3408.6.1.
6. Include calculations of distribution of lateral earthquake force as in 780 CMR 1612.5.2, of horizontal torsional moments as in 780 CMR 1612.5.3, of overturning as in 780 CMR 1612.5.4, and of lateral forces on foundations and retaining walls as in 780 CMR 1612.4.9.

3408.3.5 Existing Lateral Load Capacity: Alterations shall not be made to elements or systems contributing to the lateral load resistance of a building which would reduce their capacity to resist lateral loads, unless a structural analysis conforming to 780 CMR 3408.3.4 shows:

1. That the lateral load resisting system of the building as altered conforms to 780 CMR 1611.0 and 1612.0 of the code for new construction, or
2. That the lateral load resisting system as altered conforms to all applicable minimum load requirements of 780 CMR 3408, and that there is no reduction in the lateral load capacity of the building as a whole.

Existing elements or systems may be reinforced or replaced with new elements or systems of equivalent strength and stiffness, in order to meet these requirements.

A building which complies with 780 CMR 1611.0 and 1612.0 except that the lateral load resisting system does not conform to the detailing requirements of 780 CMR 19 through 23 for the structural materials and seismic load resisting system employed, may be considered to be in compliance with 780 CMR 3408.3.5 if the lateral load resisting system can safely resist a lateral force calculated in accordance with the formulae in 780 CMR 1612.4, but with lateral force factors (R) and force modification factors as stipulated in Tables 3408.2 and 3408.3, respectively.

3408.3.6 Load Combinations: The loads specified in 780 CMR 3408.0 shall be combined in accordance with 780 CMR 1616.0.

3408.3.7 Live Load Reduction: Live loads specified in 780 CMR 3408.0 may be reduced as permitted in 780 CMR 1608.0.

3408.3.8 Deficient or Damaged Structural

Members: Existing structural members that are found to be deficient or damaged, either prior to or during an alteration or addition, shall be repaired, replaced, or reinforced so that their load

THE MASSACHUSETTS STATE BUILDING CODE

capacities conform to the requirements of 780 CMR 3408.5. Existing structural members shall be considered deteriorated or damaged if their capacity is less than 85% of the strength required by 780 CMR 3408.1.1 or 3408.1.2, as applicable.

3408.4 Additions:**3408.4.1 Live, Dead, Snow and Special Loads:**

Additions shall be designed to support the live load, dead, snow and special loads specified in 780 CMR 1605.0 through 1610.0 and 1613.0 through 1615.0, inclusive. Where additions are supported on existing construction, the existing structural elements shall be reinforced or replaced, if necessary, to support these loads.

3408.4.1.1 Snow Drifts and Sliding Snow:

Where the geometry of an addition may cause snow drifting or sliding snow on existing adjacent construction, the affected existing construction shall be reinforced so that it will support the snow loads specified in 780 CMR 1610.0.

3408.4.2 Wind Loads:

3408.4.2.1 Structure-As-A-Whole: When the aggregate of all additions made to a building since January 1, 1975 produce effects due to the wind loads specified in 780 CMR 1611.0 that are more than 10% of the capacity of the existing lateral load resisting system of the building, a lateral load resisting system shall be provided so that the structure-as-a-whole will resist the wind loads specified in 780 CMR 1611.0. When such effects due to wind are less than 10% of the capacity of the existing lateral load resisting system, a lateral load resisting system shall be provided, where necessary, so that the structure-as-whole will resist the wind loads specified for Exposure A in 780 CMR 1611.0. Where portions of a building are structurally independent, the above requirement shall apply to each structurally independent portion.

3408.4.2.2 Walls and Roofs: New parts of enclosure walls and roofs that are subjected directly to the wind, and their local supporting structural elements, shall be designed to resist the wind loads specified in 780 CMR 1611.0. Existing local supporting structural elements of enclosure walls and roofs that are not altered need not comply with 780 CMR 1611.0.

3408.4.3 Earthquake Loads: All new materials and portions of the structure shall conform to all applicable provisions of 780 CMR 1612.0. Compliance of existing portions of the structure to

780 CMR 1612.0 is not required, except as stipulated in 780 CMR 3408.4.3.1 and 3408.4.3.2.

3408.4.3.1 Structurally Separated Additions:

Additions which are structurally separated from the existing portion of the building in accordance with 780 CMR 1612.4.8 shall be considered as separate structures for earthquake design purposes, and shall conform to all provisions of 780 CMR 1612.0. Existing portions of the structure need conform only to 780 CMR 3408.5.

3408.4.3.2 Additions Not Structurally Separated: Existing portions of buildings with new additions which are not structurally separated from the existing structure shall meet the following seismic design criteria:

1. If both the area and the weight of the building are increased by less than 10%, earthquake resistance of the existing portion of the building need only comply with requirements of 780 CMR 3408.3.5.
2. If either the area or weight of the building is increased by 10% or more, but neither is increased by more than 100%, the following seismic design criteria shall apply:
 - a. The structure shall be designed to resist a percentage of the base earthquake force, calculated in accordance with the requirements of 780 CMR 3408.6.1.1, not less than that given in Figure 3408.1.
 - b. Existing structural elements not conforming to the detailing requirements of 780 CMR 19 through 23 may be considered effective in resisting lateral seismic loads, providing that their design seismic force is calculated in accordance with 780 CMR 3408.6.1.
 - c. The *existing building* shall be investigated for the presence of special earthquake hazards as described in 780 CMR 3408.6.3, and all such hazards as are present shall be corrected in accordance with the provisions of 780 CMR 3408.6.3.
3. If either the area or weight of the building is increased by more than 100%, the structure as a whole shall comply with the code for new construction. Existing elements that do not conform to the requirements of 780 CMR 19 through 23 shall not be considered effective in resisting lateral seismic loads.
4. For the purposes of 780 CMR 3408.4.3.2, “area” shall mean the total of all gross floor and roof areas supported by the building structure, and “weight” shall have the same meaning as “W” as defined in 780 CMR 1612.5.1. Percentage changes in building area and weight shall be calculated by dividing the total area or weight of the structure after the proposed addition by the

780 CMR: STATE BOARD OF BUILDING REGULATIONS AND STANDARDS

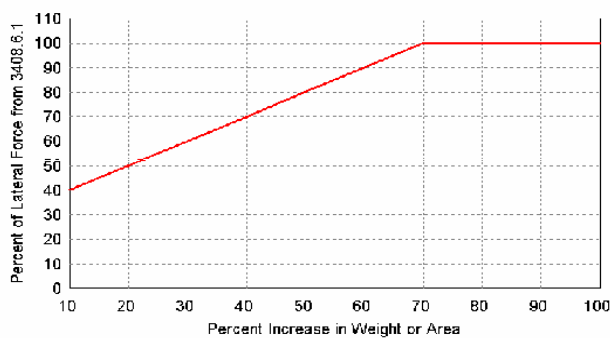
REPAIR, ALTERATION, ADDITION AND CHANGE OF USE OF EXISTING BUILDINGS

total area and weight existing five years prior
to the date of the current building permit
application.

THE MASSACHUSETTS STATE BUILDING CODE

Figure 3408.1
MINIMUM PERCENTAGE OF LATERAL
EARTHQUAKE LOAD

Percent Increase in Weight or Area	Percentage of Lateral Force from 3408.6.1
10	40
20	50
30	60
40	70
50	80
60	90
70	100



MINIMUM PERCENTAGE OF LATERAL
EARTHQUAKE LOAD

3408.5 Alterations, Repairs and Changes of Use: The following requirements apply to existing buildings which are altered or repaired, or for which there is a change of use.

3408.5.1 Floor Loads: Except as provided in 780 CMR 3408.5.2, the load capacity of all floors affected by alterations, repairs or changes in use

shall be adequate to support the loads required by 780 CMR 1605.0 through 1608.0, 1613.0 and 1614.0, inclusive, or the floors shall be reinforced or replaced with new structural members.

3408.5.2 Posted Live Load: Except for Use Groups, F, I, and S, any existing building in which a new use requires greater live loads may be posted for the originally approved live loads, provided that the use is controlled in a way acceptable to the building official, and so that the public safety is not endangered thereby.

3408.5.3 Wind Loads: The wind load capacity of the structure-as-whole shall not be less than that required for Exposure A in 780 CMR 1611.00. The existing lateral load resisting system shall be reinforced or new lateral load resisting elements or systems shall be added, as necessary, to meet this requirement.

Exception: The building official may waive this requirement if the alterations are minor and if there is not change in use, and if the structural engineer certifies that there are no alterations to structural elements.

3408.5.4 Earthquake Loads:

3408.5.4.1 Seismic Hazard Category for Existing Buildings: The Seismic Hazard Category for existing buildings shall be determined from Table 3408.1 on the basis of the proposed change in use, change in occupancy and cost of alterations.

Table 3408.1
SEISMIC HAZARD CATEGORY

CHANGE IN USE ⁽¹⁾	CHANGE IN OCCUPANCY OR COST OF ALTERATIONS	
	Occupancy increased by more than 25% and to a total occupancy of 100 or more; or total cost of alterations exceeds 50% of the assessed valuation of the building. ⁽²⁾	All other changes in occupancy, and total cost of alterations less than or equal to 50% of assessed valuation of the building. ⁽²⁾
Change from Use Group with Hazard Index less than 4 to Use Group with Hazard Index of 4 or greater; or Seismic Hazard Exposure Group III per Table 1612.2.5.	3	2
All other changes in Use Group, or no change in Use Group.	2 ⁽³⁾	1 ⁽³⁾

Note 1. Refer to Table 3403 and Appendix F, Table F-1 for the *Hazard Index* of any use group. Adjustments to the *Hazard Index* indicated in the footnotes to Table 3403 shall not be applied for determination of *Seismic Hazard Category*.

Note 2. Total cost of alterations shall include the cost of alterations proposed under the current building permit application, plus the cost of any alterations covered by building permits in the two-year period preceding the date of the current permit application. The assessed valuation shall be as of the date of the current building permit application.

Note 3. When there is no change in use, the following costs may be excluded from the total cost of alterations:

- a. Costs incurred by requirements for compliance with the following:
 - i. Americans With Disabilities Act
 - ii. Massachusetts Architectural Access Board Regulations, 521 CMR
 - iii M.G.L. c. 148, § 26A½ requiring sprinklers in existing high-rise structures.
- b.Costs incurred for improvements in:
 - i. Sprinklering
 - ii. Smoke and heat detection
 - iii. Fire alarm systems
 - iv. *Exit* enclosures

3408.5.4.2 Partial Change of Use: For buildings in which more than 33% of the total floor area is classified as *Seismic Hazard Category* 2 or 3, the earthquake design of the entire building shall be governed by the requirements applying to that higher *Seismic Hazard Category*.

3408.5.4.3 For *Seismic Hazard Category* 1: Earthquake resistance need only comply with the requirements of 780 CMR 3408.3.5.

3408.5.4.4 For *Seismic Hazard Category* 2: Earthquake resistance shall comply with the requirements of 780 CMR 3408.3.5, and the existing building shall be investigated for the presence of special earthquake hazards as described in 780 CMR 3408.6.3, and all such hazards that are present shall be corrected in accordance with the provisions of 780 CMR 3408.6.3.

3408.5.4.5 For *Seismic Hazard Category* 3: Full compliance with 780 CMR 1612.0 is required, except as provided in 780 CMR 3408.5.4.6 and 3408.6.4, and except that existing structural systems not conforming to the requirements of 780 CMR 19 through 23 may be considered to participate in resisting lateral seismic loads, but only if the seismic design force is calculated in accordance with 780 CMR 3408.6.1.1.

3408.5.4.6 Maximum Lateral Earthquake Force: When the provisions of 780 CMR 3408.5.4 require compliance with the code for new construction, or otherwise require design for minimum lateral seismic force, and the building is not being extended in area or height, the design lateral seismic force need not exceed 75% of the base earthquake force calculated in accordance with 780 CMR 3408.6.1.1.

3408.6.1 R Factors and Force Modification Factors for Existing Construction:

3408.6.1.1 Base Earthquake Force: Where the provisions of 780 CMR require calculation of earthquake design forces on existing buildings, a base earthquake force shall be calculated in accordance with one of the following methods:

1. Where the lateral load resisting system conforms to the requirements of 780 CMR 1612., the base earthquake force shall be calculated using 780 CMR 1612.4 and the appropriate response modification factor R from Table 1612.4.4.
2. Where the lateral load resisting system does not conform to the requirements of 780 CMR 1612.0, the base earthquake force shall be calculated in accordance with 780 CMR 1612.4 except that the appropriate response modification factor R from Table 3408.2 shall be used.
3. Where the lateral load resisting system does not conform to the requirements of 780 CMR 1612.0, and is not adequately described by one of the systems identified in Table 3408.2, the base earthquake force shall be determined by a properly substantiated analysis which takes into account the dynamic and ductility characteristics of the existing structure, and ground motion characteristics consistent with the requirements of 780 CMR 1612.0. The ductility characteristics used in the analysis shall be confirmed by physical tests. If the ductility characteristics of the existing structure cannot be determined, the structure shall be analyzed on the basis of an R factor of 1.25.

3408.6.1.2 Earthquake Design Force: The earthquake design force for the existing lateral load resisting system shall be equal to the base earthquake force calculated in accordance with 780 CMR 3408.6.1.1, multiplied by the appropriate reduction factor from 780 CMR 3408.4.3.2 or 780 CMR 3408.5.4.6, where applicable.

3408.6:

**3408.6.1.3 Earthquake Force on
Components of Lateral Resisting System:**

The earthquake design forces for components of the lateral load resisting system shall be determined from the lateral load analysis, based on the earthquake design force

780 CMR: STATE BOARD OF BUILDING REGULATIONS AND STANDARDS
REPAIR, ALTERATION, ADDITION AND CHANGE OF USE OF EXISTING BUILDINGS

calculated in accordance with 780 CMR 3408.6.1.2.

Exception: When the design earthquake force is derived from a base earthquake force calculated in accordance with 780 CMR 3408.6.1.1, Method 2, design forces for components of structural systems which are listed in Table 3408.3 shall be multiplied by a force modification factor as set forth in that Table.

3408.6.2 Existing Rigid Elements in Earthquake Analysis: Existing rigid elements may be assumed not to participate in the lateral load resisting system, provided that their effect on the action of the system is considered and provided for in analysis and design. In addition, the effects of the lateral deflection on such rigid elements themselves and on their attachment to the building structure shall be considered. Where the existing rigid elements are load-bearing elements, such as walls or braced frames, which do not conform to the detailing requirements of 780 CMR 1903, 2104, 2203 or 2306, as applicable:

- 1. The value of R used in design shall not be greater than 4, and,
- 2. The lateral stiffness of the building in any story, based on the elements assumed in the design to resist lateral loads, shall not be less than ½ of the stiffness that would pertain if all new and existing elements were considered to be fully effective in resisting lateral loads.

780 CMR 3408.6.2 shall not apply to buildings where the required lateral load resistance is controlled by 780 CMR 3408.3.5.

3408.6.3 Reduction of Earthquake Hazards: Where the provisions of 780 CMR 3408.0. require correction of special earthquake hazards, the following measures shall be taken to reduce hazards from parapets, masonry walls, and/or precast concrete structural elements which do not conform to the requirements of 780 CMR 1612.0:

- 1. **Parapets:** All parapets not meeting the requirements of 780 CMR 1612.0 shall be removed, or braced so as to meet the requirements of 780 CMR 1612.7 and, for unreinforced masonry parapets, 780 CMR 3408.6.4.
- 2. **Masonry walls:** All masonry walls shall be connected to floor or roof diaphragms, or other elements providing their lateral support, so as to conform to the requirements of 780 CMR 1612.7. The design force for the connection shall not be less than 100 pounds per linear foot of wall. Connections shall not produce cross-grain bending in wood members.
- 3. **Precast concrete structural elements:** Interconnections of precast concrete structural

elements shall be investigated, and reinforced if necessary. Connections shall conform to the requirements of 780 CMR 19.

Table 3408.2
RESPONSE MODIFICATION FACTOR “R”
FOR EXISTING BUILDINGS (1,2)

BUILDING LATERAL FORCE RESISTING SYSTEM	R	C _d
Wood Systems		
Light Framed Plywood Shear Walls 3 Stories or Less	6.5	4
Other Wood Buildings	5	3
Steel Systems		
Steel Moment Frame	4.5	4
Steel Braced Frame without Gravity Loads in Braces	5	4.5
Steel Braced Frame with Gravity Loads in Braces	4	3.5
Steel Frame with Concrete Shear Walls	5.5	5
Cast-in-Place or Precast Concrete Systems		
Concrete Moment Frame	3	2.5
Concrete Frame with Concrete Shear Walls	4.5	4
Unreinforced Concrete Shear Walls	1.5	1.5
Unreinforced Masonry Systems		
Infill Shear Walls in Complete Steel or Concrete Frame ⁽³⁾	1.5	1.5
Shear Wall Systems with Partial Steel or Concrete Frame	1.38	1.38
Bearing Wall Systems	1.25	1.25

Note 1. See Table 3408.3 for Force Modification Factors applicable to Components of Lateral Force Resisting Systems.

Note 2. For buildings deriving lateral *load* resistance from a combination of structural systems:

- a. For vertical combinations with a regular flexible upper portion above a rigid lower portion, perform a two-stage analysis. Evaluate the flexible upper portion as a separate structure supported laterally by the rigid base. Evaluate the base structure as a separate structure, adding the base shear and overturning moment from the upper structures as lateral forces applied at the top of the base structure.
- b. For combinations along different horizontal axes, use values of R and C_d for the principal system in the respective directions, except in buildings deriving a significant portion of lateral resistance from bearing walls. For these buildings, use the values of R and C_d associated with the bearing wall system for all directions.
- c. For other combinations, use the lowest value of R (and corresponding value of C_d) of all systems participating in lateral *load* resistance.

Note 3. To qualify for a R factor of 1.50, infill walls must bear tightly on surrounding frame members on all four sides. In all other cases, use a R factor of 1.38.

Table 3408.3
FORCE MODIFICATION FACTORS FOR
COMPONENTS OF LATERAL LOAD
RESISTING SYSTEMS

STRUCTURAL COMPONENT	FORCE MODIFICATION FACTOR ⁽¹⁾
Structural Steel Systems	
All forces in bracing connections not conforming to 780 CMR 2204.3.1.	0.4R
All forces in column connections using partial penetration welds not conforming to relevant portions of 780 CMR 2203.0.	0.8R
All forces in members and connections of open web steel joists resisting earthquake loads.	0.8R
Cast-in-Place and Precast Concrete Systems	
Moment at any cross-section of a flexural member where the reinforcing ratio is less than 200/fy, or where the reinforcing consists of less than two bars, or is less than ¼ of the amount of reinforcing in the opposite face of the member.	0.8R
Moment and shear in any beam without closed stirrups at a maximum spacing of d/4 over a distance of 1½d from each end of the clear span.	0.4R
Moment and shear in any column without ties as a spacing not exceeding the smaller of times the diameter of the smallest enclosed bar, 24 tie bar diameters, or ½ the smallest dimension of the member, over a distance from each end of the member not less than 1/6 the clear height of the column, the largest dimension of the member, or 18 inches.	0.8R
Force in concrete shear wall reinforcing with splices that do not develop the full yield stress of the reinforcing in tension.	0.8R
Shear in shear walls not conforming with minimum wall reinforcing requirements.	0.4R
Axial force in any column supporting a discontinuous stiff element, such as a shear wall, resisting axial loads, unless the column has special transverse reinforcement over its full height.	0.8R
All forces in precast concrete connections not conforming to the requirements of 780 CMR 19.	0.8R
All Systems	
Shear in any story where the strength of all shear resisting elements is less than 65% of the strength of all shear resisting elements in the story above.	0.8R

Note 1. Force Modification Factor shall not be less than 1.0.

3408.6.4 Existing Unreinforced Masonry

Walls: Where compliance with the code for new construction is required by 780 CMR 3408.0, existing unreinforced masonry walls in sound condition may continue in service, providing:

1. They are adequately tied to the structural elements providing their lateral support; and,
2. The ratio of unbraced height or length to nominal thickness in at least one direction does not exceed 20 for walls spanning laterally between two supports, nor 4 for cantilever walls and parapets; and,
3. The wall is of sufficient strength to resist the required earthquake forces from 780 CMR 1612.7.

Masonry walls allowed to be unreinforced by the provisions of the code for new construction and which satisfy all provisions of the code for new construction need not satisfy 780 CMR 3408.6.4 item 2. Additional bracing or structural ties may be provided to meet these requirements. Unreinforced walls continuing in service under 780 CMR 3408.6.4 shall not be considered effective as shear walls resisting lateral earthquake force specified in 780 CMR 16, except where the provisions of 780 CMR 3408.0 specifically permit use of structural systems not conforming to 780 CMR 2104.

3408.6.5 Changes in Building Mass: A reduction in the weight of a building shall not be considered to offset a reduction in lateral load capacity of the building, in evaluating compliance with 780 CMR 3408.3.5, except that the weight of the building as altered shall be used in evaluating compliance with 780 CMR 1612.0. An increase in the weight of the building shall be considered as an addition, for purposes of determining earthquake resistance requirements (see 780 CMR 3408.4).

3408.7 Liquefaction Evaluation for Existing

Buildings: The subsoils supporting the existing building shall be evaluated to determine the potential for liquefaction, and if necessary the subsoils and/or foundations shall be improved to prevent failure in the event liquefaction occurs, as required below:

1. Existing buildings with *Seismic Hazard Category 1* (see 780 CMR 3408.5.4 and Table 3408.1) shall not require evaluation of liquefaction potential or compliance with 780 CMR 1805.3.
2. Existing buildings with *Seismic Hazard Category 2* or *3* (see 780 CMR 3408.5.4 and Table 3408.1) shall comply with the requirements of 780 CMR 1805.3.
3. Existing buildings with structurally separate additions shall comply with 3408.7 item 1 or 2, based on the *Seismic Hazard Category* of the existing building.

780 CMR: STATE BOARD OF BUILDING REGULATIONS AND STANDARDS
REPAIR, ALTERATION, ADDITION AND CHANGE OF USE OF EXISTING BUILDINGS

4. Existing buildings with structurally attached additions which meet the requirements of 780 CMR 3408.4.3.2, item 1, and which are

THE MASSACHUSETTS STATE BUILDING CODE

classified as *Seismic Hazard Category 1* (see 780 CMR 3408.5.4 and Table 3408.1), shall not require evaluation of liquefaction potential or compliance with 780 CMR 1805.3.

5. Existing buildings with structurally attached additions which meet the requirements of 780 CMR 3408.4.3.2, item 2, and which are classified as *Seismic Hazard Category 1* or 2, shall comply with the requirements of 780 CMR 1805.3, except that the blow count scale in Figure 1805.3 may be multiplied by the appropriate reduction factor from Figure 3408.1.

6. Existing buildings with structurally attached additions which meet the requirements of 780 CMR 3408.4.3.2, item 3, shall comply with the requirements of 780 CMR 1805.3.

780 CMR 3409.0 HISTORIC BUILDINGS

3409.1 Scope: The provisions of 780 CMR 3409.0 shall govern all buildings and structures in the Commonwealth which are legally designated as *historic buildings*. 780 CMR 3409.0 shall preempt all other regulations of 780 CMR governing the reconstruction alterations change of use and occupancy, repairs maintenance and additions for the conformity of historic buildings and structures to 780 CMR, with the exception of 780 CMR 122.0 for appeals, or unless otherwise specified (see *Appendix H*). There is no obligation for owners of historic properties to apply for 780 CMR 3409.0.

3409.1.1 Key Definitions: The following five definitions are found in 780 CMR 3401.1, but are also presented here as such definitions form a significant portion of 780 CMR 3409.

Historic buildings: (a) Any building or structure individually listed on the National Register of Historic Places or (b) any building or structure evaluated by MHC to be a contributing building within a National Register or State Register District. (c) any building or structure which has been certified by the Massachusetts Historical Commission to meet eligibility requirements for individual listing on the National Register of Historic Places. *Historic building* shall be further defined as *totally* or *partially preserved buildings*. All entries into the *totally preserved building* list shall be certified by the Massachusetts Historical Commission. The Board of Building Regulations and Standards shall ratify all buildings or structures certified by the Massachusetts Historical Commission to qualify for *totally preserved* listing (see *Appendix H*).

Partially preserved buildings: (a) Any building or structure individually listed on the National Register of Historic Places or (b)

any building or structure certified as a *historic building* by the Massachusetts Historical Commission and not designated a *totally preserved building* in *Appendix H*.

Restoration: *Restoration* is the process of accurately reconstructing or repairing the forms and details of a building or structure or portion thereof as it appeared at a particular period or periods of time by means of removal of later work/or the replacement of missing original work

Totally preserved buildings: A *totally preserved building* is an *historic building* or structure. The principal use of such a building or structure must be as an exhibit of the building or the structure itself which is open to the public not less than 12 days per year, although additional uses, original and/or ancillary to the principal use shall be permitted within the same building up to maximum of 40% of the gross floor area. *Totally preserved buildings* shall be those listed in *Appendix H*. All entries into the *totally preserved building* list shall be certified by the Massachusetts Historical Commission. The Board of Building Regulations and Standards shall ratify all buildings or structures certified by the Massachusetts Historical Commission to qualify for *totally preserved* listing (See *Appendix H*).

3409.2 Totally preserved buildings:

3409.2.1 State Building Code exceptions: A *totally preserved building* shall be subject to the following exceptions:

1. Repairs, maintenance and restoration shall be allowed without conformity to 780 CMR generally, if the provisions of 780 CMR 3409.2.2 have been met.
2. In case of fire or other casualty to a *totally preserved building*, said building may be rebuilt, in total or in part, using such techniques and materials as are necessary to restore it to its original condition and use group.
3. If a *historic building* or structure, as a result of proposed work, would become eligible for certification as a *totally preserved building* and the Massachusetts Historical Commission so certifies by affidavit, such affidavit is submitted to the building official with the permit application, and the building official shall then allow the work to proceed under the provisions of 780 CMR 3409.2.

3409.2.2 Mandatory safety requirements: All *totally preserved buildings* shall comply to the following requirements:

3409.2.2.1 Fire protection equipment: Fire protection equipment shall be provided according to the following requirements.

THE MASSACHUSETTS STATE BUILDING CODE

1. Manual fire extinguishing equipment: All use groups, other than Residential R-3 and R-4, shall have approved manual fire extinguishing equipment, as determined by the head of the local fire department.

2. Fire Protective Signaling Systems (Fire Alarm Systems): All residential buildings in use groups R-1, R-2 and R-3 shall conform to the applicable requirements of 780 CMR 918 and 919 as applicable. All other use groups shall comply with 780 CMR 3409.2.2.1 items 2.(a) and (b):

(a) **Locations:** Provide smoke detectors in accordance with manufacturers listing and spacing requirements, but not less than one, for every 1200 square feet of floor area per level. In addition, all lobbies, common corridors, hallways and exitway access and discharge routes shall be provided with approved smoke detectors installed in accordance with the manufacturers listing and spacing requirements but not more than 30 feet spacing between detectors. All required smoke detectors shall have an alarm audible throughout the structure or building.

(b) **Single station and multiple station smoke detection devices:** Smoke detectors of single station and multiple station types shall meet the requirements of UL 217 and be listed or approved by a nationally-recognized fire-testing laboratory. All other smoke detectors shall be listed in accordance with UL 268 as listed in *Appendix A*.

3. **Manual pull stations:** A manual fire alarm pull station shall be provided in the natural path of egress in all use groups except R-3 and R-4. Manual pull stations shall be connected to the building fire warning system in conformance with NFPA 72 as listed in *Appendix A*.

3409.2.2.1.1 Supervision: Fire protective signaling systems required by 780 CMR 3409.2.2.1 shall be supervised in accordance with the requirements of 780 CMR 923.2.

Exception: Residential single and multiple station smoke detectors.

3409.2.2.2 Exit signs and emergency lights: Approved exit signs and emergency lighting, where designated by the local building official, shall be provided in compliance with 780 CMR 1023.0 and 780 CMR 1024.0.

Exception: All *totally preserved buildings* need not comply with 780 CMR 1023.0 and 780 CMR 1024.0 if not occupied after

daylight hours, except that paths of egress shall have exit signs.

3409.2.2.3 Maximum occupancy: Occupancy shall be limited by the actual structural floor load capacity as certified by a qualified Massachusetts *registered professional engineer* or *architect* or in accordance with 780 CMR 1008.0, whichever is less. Said floor load shall be posted in accordance with the procedures set forth in 780 CMR 120.0, 780 CMR 1003.3 and 780 CMR 1617.2. The owner shall submit evidence of this certification and related computations to the building official upon request.

3409.2.2.4 Limited egress: Where one or more floors of a *totally preserved building* are limited to one *means of egress*, the occupancy load shall be computed as follows:

1. **Floors below the first story:** Not more than one occupant per 100 square feet of gross floor area with a maximum occupancy of 49.
2. **First story:** Not more than one occupant per 50 square feet of gross floor area.
3. **Second story and above:** Not more than one occupant per 100 square feet of gross floor area, or 30 occupants per unit of egress width, whichever condition results in the lesser occupancy load.

3409.2.2.5 Inspections: The *building official* and the fire official shall inspect all *totally preserved buildings* not less frequently than once every year in order to determine that the building or structure continues to conform to 780 CMR 3409.2. A qualified Massachusetts *registered professional engineer* or *architect* shall certify every five years thereafter as to the exact floor load capacity of the building or structure. The building official shall certify all *totally preserved buildings* not less frequently than once every year. Fees shall be established at \$25.00 per building per inspection.

3409.2.2.6 Accessibility for Persons with Disabilities: Accessibility requirements shall be in accordance with 521 CMR as listed in *Appendix A*.

3409.2.2.7 Energy Conservation: *Totally preserved buildings* are exempt from the requirements of 780 CMR 13 and the energy conservation requirements of 780 CMR 36.

3409.3 *Partially preserved buildings:*

3409.3.1 State Building Code provisions: A *partially preserved building* shall be subject to the following provisions:

1. **Existing Systems** - individual components of an existing *building system* may be repaired or replaced in kind without requiring that system to comply fully with the code for new construction. (See 780 CMR 34, 780 CMR 3404.3: *New Systems*)

2. **Replacement in kind** - when the repair of historic materials including patching, splicing,

3409.3.2 State Building Code exceptions: A *partially preserved building* shall be subject to the following exceptions: Repairs or in kind replacement of the following features will be allowed on partially preserved buildings so as not to compromise the architectural integrity of the historical characteristics and qualities which contributed to the eligibility for listing in the National Register of Historic Places.

1. **Roofing** - repair or in kind replacement of an existing historic roof system (i.e., slate, wood, clay, tile, metal) shall be permitted without requiring structural compliance for equivalent new construction providing that dead and live loading requirements have not changed.

2. **Windows** - repair or in kind replacement of existing historic windows (i.e., frames, sash, muntins, glazing, sills, molding, shutters) shall be permitted without requiring energy code compliance.

3. **Entries/Porches** - repair or in kind replacement of existing individual decorative features of an existing system (i.e. columns, balustrades, stairs, pilasters, doors, sidelights) shall be permitted.

4. **Wood Siding/Decorative Elements** - Repair or in kind replacement of an existing system including such items as clapboards, shingles, cornices, brackets, and window and door surrounds shall be permitted.

5. **Masonry** - repair or in kind replacement of masonry units as part of an existing system (i.e., brick, stone, terra cotta, concrete and stucco) shall be permitted.

6. **Metals** - repair or in kind replacement of existing architectural metals (i.e. cast and wrought iron, steel, tin, copper and copper alloys, aluminum, zinc) shall be permitted.

7. **Interior features** - repair or in kind replacement of non-structural interior features that are important in defining the overall historic character of a building (i.e., columns, cornices, baseboards, fireplace mantels, paneling, window trim, doors, moldings, railings, flooring, plasterwork) shall be permitted.

3409.3.3 Applicability: 780 CMR 3409.3 and 780 CMR 34 shall apply to all *partially preserved Historic buildings*.

piecing-in, consolidating or reinforcing is not possible, compatible materials may be substituted which closely convey the form and design as well as the visual appearance of the existing feature.

3409.3.4 Continuation of use and occupancy:

The legal use and occupancy of any partially preserved building may be continued without change or further compliance to 780 CMR. The provisions of 780 CMR 3409.2 shall be required for *Historic buildings* accessible to the public on more than 50 days per year.

3409.3.5 Inspection certification and fees:

Partially preserved buildings shall not require annual inspection unless otherwise stipulated in 780 CMR 106.5 and Table 106.

3409.3.6 Fire damage: If a building or structure is damaged from fire or other casualty it may be restored to its original construction or it shall meet the requirements of 780 CMR provided these requirements do not compromise the features for which the building was considered Historic when listed in the National Register of Historic Places.

3409.3.7 Change in occupancy: See 780 CMR 34.

3409.3.8 New systems: See 780 CMR 34.

3409.3.9 Lesser and equal hazard: See 780 CMR 34. A *partially preserved building* classified under unprotected construction Type 3C or 5B shall have waived the requirement to add one to the Hazard Index number (See 780 CMR 34, Table 3403).

3409.3.10 Greater hazard: See 780 CMR 34. A *partially preserved building* classified under unprotected construction Type 3C or 5B shall have waived the requirement to add one to the Hazard Index number (See 780 CMR 34, Table 3403).

3409.3.11 Energy Conservation: Partially preserved buildings are exempt from the energy requirements of 780 CMR 13 and the energy requirements of 780 CMR 36.

Exception: Additions to partially preserved buildings shall comply with the energy provisions of 780 CMR 13 or of 780 CMR 36, as applicable.

3409.3.12 Accessibility for Persons with Disabilities: Accessibility requirements shall be

780 CMR: STATE BOARD OF BUILDING REGULATIONS AND STANDARDS
THE MASSACHUSETTS STATE BUILDING CODE

in accordance with 521 CMR as listed in
Appendix A.