

LATERAL LOAD REQUIREMENTS FOR HISTORIC BUILDINGS IN THE 7TH EDITION OF THE MASSACHUSETTS STATE BUILDING CODE

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History

Section 3408, Structural Requirements for Existing Buildings, was first devised jointly by the Loads Advisory Committee (LAC) and the Seismic Advisory Committee (SAC) in 1992 for inclusion, by amendment, into the 5th Edition of the State Building Code. However, the Board of Building Regulations and Standards (BBRS) did not incorporate Section 3408 into the Code until the 6th Edition was promulgated on February 28, 1997. The deliberations of LAC and SAC in 1992 did not consider historic buildings.

The 6th Edition had a clause, 3400.3(10), directing the user to Section 3408 for structural requirements for alterations, repairs, additions, or changes of use to existing buildings, but the clause had an exception exempting all historic buildings from the requirements of the clause.

In 2000, the BBRS requested LAC to review complaints that the Code did not have structural requirements for historic buildings. LAC found, that the way the Code was written, that in-fact there were no structural requirements for historic buildings. LAC recommended to the BBRS that the exception to Clause 3400.3(10) be revised so that all historic buildings would be subject to Section 3408, except that totally preserved historic buildings² need not comply with the wind and seismic load requirements of Section 3408 and that partially preserved historic buildings need not comply with the seismic load requirements of Section 3408. LAC deferred its recommendation on whether partially preserved historic buildings should be subject to seismic load pending further study. BBRS amended the Code on January 19, 2001, as recommended by LAC.

LAC did not recommend that fully preserved historic buildings be subject to the wind and seismic load requirements, since these buildings are small and usually have adequate lateral resistance due to the nature of their construction.

For the proposed 7th Edition of the Code, the Joint LAC/SAC Committee on Chapter 34 reorganized, rewrote, and simplified Section 3408. In this version, partially preserved historic buildings are required to resist both wind and seismic load. Fully preserved buildings do not have

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²In the 7th Edition, totally preserved historic buildings are referred to as *house museums* and partially preserved historic buildings are referred to as *preserved historic buildings*.

to be designed to resist either load. The decision on partially preserved buildings is explained below.

Relationship of Historic Preservation to Structural Work

Partially preserved historic buildings are either designated as such by agreement between the owner and the Massachusetts Historical Commission (MHC), or are buildings in an historic district designated as such by MHC.

Section 3409.3.2 (of both the 6th Edition and the proposed 7th Edition) allows the preservation (i.e., repair or in kind replacement) of a list of historic features of partially preserved buildings regardless of requirements to the contrary in other sections of the Code. Examples of historic features that relate to structural support are historic roofs and historic masonry (walls, pilasters, and columns). Examples of non-structural features are historic windows, historic decorative features of entries and porches, and historic interior features that define the overall historic character of a building. There are no intrinsic conflicts between the preservation of these historic features, and structural requirements for lateral load resistance. Structural engineers can design the required structural features in cooperation with project architects so that they will not interfere with preservation.

It is important to note here that, except as may be required by agreement with MHC, an owner has the right to demolish or change any historic feature of a partially preserved building, and has a right to construct additions thereto. Currently (under the 6th Edition of the Code), an owner can demolish a large portion of a partially preserved building, or just save an historic facade, and reconstruct a new building attached thereto, without providing seismic load resistance. The owner can also build an attached addition of any size without providing seismic resistance. These results are not the intention of the preservation provisions of the Code.

So long as there is no significant interference with preservation of the historic features of a partially preserved building, there is no justification for relieving an owner of the responsibility of providing the wind and seismic load resistance specified in Section 3408.

Levels of Work in 7th Edition of Section 3408 and Their Effect on Partially Preserved Buildings

The 7th Edition of Section 3408 specifies various levels of work and the corresponding lateral loads that an existing building is required to resist. The following table lists the levels of work, a brief summary of each, and the corresponding required lateral loads.

Level 1 Work	Work not triggering Level 2 Work; minor alterations	No wind or seismic load requirements
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Level 2 Work	Substantial alterations, including increase in framed floor and roof area of up to 10%; change of use for more than 35% of the floor area	2/3 Code wind load and a lateral load of 1% (dead load + 1/2 snow load)
Level 3 Work	Same as Level 2 Work, but with substantial structural changes	Code wind load and 35% of Code seismic load
Level 4 Work	Structurally attached additions	Code wind load and sliding scale of 50% to 100% of Code seismic load for 10% to 60% increase in total framed floor and roof area.
Level 5 Work	Structurally attached additions greater than 100% of total framed floor and roof area; alterations with the removal or reconstruction of more than 40% of the total framed floor and roof area.	Code wind load and Code seismic load

If a partially preserved building has a change of use or is substantially altered, but the roof, floors exterior masonry walls, and interior masonry bearing and fire walls are left in-place with moderate changes, Level 2 Work would be triggered. Most good buildings will readily resist the required lateral loads for Level 2, without new braced frames or shear walls, but may require the connection of the masonry walls to the floors and roof. An exception to this situation may be long mill buildings with historic exterior masonry walls, which may require intermediate transverse shear walls or braced frames to resist the lateral loads.

For the first example, if there were substantial removal of interior masonry bearing or fire walls, and replacement with new braced frames or shear walls in other locations, or significant removal or reconstruction of floors or roofs, Level 3 Work would be triggered. The low level of seismic load required for Level 3 will generally be of the order of magnitude of the wind load.

Level 4 Work and Level 5 Work involve vertical additions³ or extensive structural changes to an existing building. This work will most probably entail new vertical steel frames or shear walls passing through the existing building to resist the imposed wind or seismic load, and will most probably require connection of the existing masonry walls to the floors and roof. Whether the new

³A horizontal addition is usually structurally separate; structurally separate additions are required to meet the Code requirements for new construction.

frames or shear walls have an adverse effect on preservation, or whether an addition has an adverse effect on preservation, is a matter of architectural design.

The structural work required for Level 2 is not elective; it is necessary for the reuse of an existing building. However, seismic resistance is not required for Level 2. On the other hand, the structural work required for Levels 3, 4, and 5 is elective; the owner and architect are not obliged to make the structural changes or additions in order to reuse the existing building; thus there is no justification for waiving seismic load requirements for Levels 3, 4, and 5 Work for partially preserved historic buildings.

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