Code Requirements for Existing Buildings

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R.W. Sullivan Engineering (RWS) was established in 1945 and currently has 90 employees.

RWS is a full service engineering firm offering integrated services in the following disciplines:

- HVAC
- Electrical
- Plumbing
- Fire Protection
- Code
Comprehensive Code Services
– Building, Fire, Life Safety, Accessibility
– Plan Review
– Existing Building Surveys (Statement of Conditions)
– Variances and Appeals
– National and International Experience
R.W. Sullivan Engineering
Code Group

Beyond the Code

– Revit
– Sustainability and LEED
– Atrium Fire/Smoke and Egress Modeling
– Hazardous Materials
Agenda

Existing Buildings

• Building Code:
  – Introduction to IEBC
  – Compliance Options
    – Prescriptive
    – Work Area
    – Performance

• Energy Code

• Accessibility Codes:
  – Massachusetts Architectural Access Board Regulations
  – American’s with Disabilities Act
# Applicable Codes in New England

<table>
<thead>
<tr>
<th>State</th>
<th>Building</th>
<th>Fire</th>
<th>Energy</th>
<th>Existing</th>
</tr>
</thead>
</table>

◊ Based on population and previous code adoptions
• Applicability to Existing Buildings (IBC Section 102.6)
  – The legal occupancy of any structure existing on the date of adoption of this code shall be permitted to continue without change, except as is specifically covered in this code or, as deemed necessary by the building official for the general safety and welfare of the occupants and the public.
  
  – MA Amendment: Any existing building or structure shall meet and shall be presumed to meet the provisions of the applicable laws, codes, rules or regulations, bylaws or ordinances in effect at the time such building or structure was constructed or altered…
Int. Existing Building Code

• Three ways to comply with the code:
  • **Prescriptive Compliance Method (IBC Chapter 34):**
    • Additions, alterations or repairs, unless otherwise noted, follow that of new construction.
  
  • **Work Area Compliance Method:**
    • Requirements are based on level of work and generally applies to work area only.
  
  • **Performance Compliance Method (IBC Chapter 34):**
    • Utilizes a point system to ensure the level of public safety, health & welfare is maintained or exceeded after a renovation.
Prescriptive Compliance Method
Chapter 3
• Building Must comply with IFC (IEBC 101.5.1)

• **303.1 General.** Except as provided by Section 301.2 or this section, alterations to any building or structure shall comply with the requirements of the *International Building Code* for new construction. Alterations shall be such that the existing building or structure is no less conforming to the provisions of the *International Building Code* than the existing building or structure was prior to the alteration.
Additions (302):

- Additions to the building or structure must comply with 780 CMR (2009 IBC) for new construction.
- Combined height and area must conform to IBC.
Fire Escapes (305)

- Existing fire escapes are allowed to be counted as means of egress on existing buildings if tested and certified.

- New fire escapes on existing buildings are only permitted if exterior stairs are infeasible.
  - Restrictions on location
  - Cannot access through a window or use ladders.
Prescriptive Compliance Method
Chapter 3

• Change of Occupancy (307)
  – Cannot change use/occupancy unless the building meets the requirements of IBC for the proposed occupancy.
  • Building official may permit change in use without full IBC compliance if the new use is less hazardous than the existing use based on life and fire risk.
Work Area Method
Chapters 4 – 12
• Provisions are based on the type of work as defined in Chapter 4
  – **Repairs (402):**
    • Patching, restoration, or replacement of damaged elements to good or sound condition for maintenance purposes.
  – **Level 1 Alteration (403):**
    • Alterations to elements to serve the same purpose. No reconfiguration of spaces.
  – **Level 2 Alteration (404):**
    • Reconfiguration of spaces
    • Addition or elimination of windows or doors
    • Installation of any additional equipment
    • Renovation area $\leq 50\%$ of the aggregate building area.
  – **Level 3 Alteration (405):**
    • Renovation area $> 50\%$ of the aggregate building area.
  – **Change of Occupancy (406)**
  – **Additions (407)**
  – **Historic Buildings (408)**
  – **Relocated Structures (409)**
Nonstructural repair work other than routine maintenance / ordinary repairs requires a permit and can be made with same or like materials.

Work shall not make the building less conforming that it was before the repair was undertaken.
Level 1 Alteration
Chapter 6

• New finishes must comply with the IBC for new construction (602.1 – 602.3).

• All new work must comply with the materials and methods of the applicable code (602.4).
Level 2 Alteration
Chapter 7

- Compliance with Level 1 work required (701.2).

- All new construction and elements must comply with the code for new construction except as noted in Chapter 7 (701.3).
  - For example dead end corridors and ceiling heights have slightly less stringent requirements.
Level 2 Alteration
Floor Openings (703.2)

• All floor openings must be enclosed with 1-hour fire resistance rated construction except:
  – Where permitted by the code for new construction
  – “Mini-Atrium” – 3 story atrium at grade
  – Use Group specific allowances for rating reductions or allowed floor openings
    – Existing open stairs up to 3 stories are permitted in fully sprinklered buildings of Use Group B, E, F, M, R-1, R-2, S
Level 2 Alteration
Floor Openings (703.2)

• Additional Requirements (703.2.2):
  • If work area exceeds 50% of the floor area, then all vertical openings other than stairways must be enclosed (applies outside work area)
    • Does not include vertical openings in tenant spaces completely outside the scope of work.
• Stairway Enclosure Requirements (703.2.3):
  • If work area exceeds 50% of the floor area, then all egress stairways must be enclosed with smoke-tight construction (at a minimum) from the highest work area floor and all floors below.
    • Unless enclosure is not required by the IBC
• Existing interior finishes in exits and corridors within work area must comply with IBC requirements (703.4)
  – If the work area is > 50% of the floor area, entire floor must use IBC approved finishes

• Automatic sprinkler systems must be installed in the work area if: (704.2)
  – The work area has exits or corridors shared by more than one tenant or they serve more than 30 occupants
  – The work area exceeds 50% of the floor area
  – The water supply is sufficient
  – The IBC requires it

• Fire alarm systems are required in the work area for Use Group E, I, and R occupancies (704.4)
  – Required throughout the floor if the work area exceeds 50% of that floor
Level 2 Alteration

Chapter 7

- Means of egress provisions only apply to work areas that include exits or corridors shared by more than one tenant.
- In general, egress requirements for doorways or corridors in work areas follow that of new construction (705.4-6)
  - Existing dead end corridors up to 35 ft are allowed (705.6)
  - In other than A and H occupancies, dead end corridors up to 70 ft are allowed if fully sprinklered
Level 3 Alteration
Chapter 8

• Compliance with Level 1 and 2 work required (801.2)

• Existing shafts and vertical openings must be protected by a 1 hour wall from the floor of the work area to the level of exit discharge (803.1)

• Fire alarm and detection systems must be provided throughout the building where required by Section 704.4 (Level 2).

• All Level 2 means of egress provisions apply regardless of number of tenants.
Change of Occupancy

Chapter 9
Change of Occupancy
Chapter 9

• Definition - A change in the purpose or level of activity within a building that involves a change in application of the requirements of this code

• Can apply even when the occupancy classification is not changed.
Hazard Categories determine what needs to be updated to new construction standards when changing occupancies.
Hazard Categories
Chapter 9

- Means of Egress (912.4)
- Height and Area (912.5)
- Exterior Wall Fire-Resistance (912.6)
- Enclosure of Vertical Shafts (912.7)
# Hazard Categories

Chapter 9

## TABLE 912.4 MEANS OF EGRESS HAZARD CATEGORIES

<table>
<thead>
<tr>
<th>RELATIVE HAZARD</th>
<th>OCCUPANCY CLASSIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Highest Hazard)</td>
<td>H</td>
</tr>
<tr>
<td>2</td>
<td>I-2, I-3, I-4</td>
</tr>
<tr>
<td>3</td>
<td>A, E, I-1, M, R-1, R-2, R-4</td>
</tr>
<tr>
<td>4</td>
<td>B, F-1, R-3, S-1</td>
</tr>
<tr>
<td>5 (Lowest Hazard)</td>
<td>F-2, S-2, U</td>
</tr>
</tbody>
</table>
Additions

Chapter 10
Additions
Chapter 10

- All additions to existing structures, including areas impacted by an addition, must meet the new construction requirements unless otherwise noted (1001.1)

- Additions must meet height and area limitations of the code for new construction (1002.1)

- Existing fire areas increased by the addition must be provided with fire protection systems per the code for new construction (1002.3)
Performance Compliance Methods
Chapter 13
Performance Compliance Methods
Chapter 13

• Applies to alterations, repairs, additions and change of occupancies in existing buildings including historic and moved.

• Cannot be used for Use Group H or I occupancies (1301.2).
Performance Compliance Methods
Chapter 13

• Change in Occupancy
  – Provisions of this chapter must be that of the new occupancy

• Partial Change in Occupancy
  – If separated by a fire barrier then only the section changed needs to comply
  – If not, then the more stringent of the provisions between the two occupancies shall apply to the entire building

• Additions
  – Must meet IBC requirements for new construction.
  – Height and area limitations of IBC can not be exceeded
  – If a fire wall is provided between existing building and addition, then the addition can be considered a separate building.

• Alterations and Repairs
  – If the existing building does not comply with the code for new construction, any alterations or repairs cannot result in the buildings being less safe.
The design evaluation is comprised of three main categories:

- **Fire Safety**
  - Structural Fire Resistance
  - Automatic Fire Detection
  - Fire Alarm
  - Fire-Suppression System

- **Means of Egress**
  - Configuration
  - Characteristics
  - Support Features

- **General Safety**
  - Fire Safety Parameters
  - Means of Egress Parameters
Evaluation Example
Chapter 13

Example – Automatic Sprinklers

<table>
<thead>
<tr>
<th>Occupancy</th>
<th>Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a</td>
</tr>
<tr>
<td>A-1, A-3, F, M, R, S-1</td>
<td>-6</td>
</tr>
<tr>
<td>A-2</td>
<td>-4</td>
</tr>
<tr>
<td>A-4, B, E, S-2</td>
<td>-12</td>
</tr>
</tbody>
</table>

1. Category a — Sprinklers are required throughout; sprinkler protection is not provided or the sprinkler system design is not adequate for the hazard protected.

2. Category b — Sprinklers are required in a portion of the building; sprinkler protection is not provided or the sprinkler system design is not adequate for the hazard protected.

3. Category c — Sprinklers are not required; none are provided.

4. Category d — Sprinklers are required in a portion of the building; sprinklers are provided in such portion; the system is one that complied with the code at the time of installation.

5. Category e — Sprinklers are required throughout; sprinklers are provided throughout in accordance with Chapter 9 of the International Building Code.

6. Category f — Sprinklers are not required throughout; sprinklers are provided throughout in accordance with Chapter 9 of the International Building Code.
### Evaluation – Building Score

**Section 1301.7**

**TABLE 1301.7**  
**SUMMARY SHEET—BUILDING CODE**

<table>
<thead>
<tr>
<th>Existing occupancy</th>
<th>Proposed occupancy</th>
<th>Number of stories</th>
<th>Height in feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year building was constructed</td>
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<td></td>
</tr>
<tr>
<td>Type of construction</td>
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<tr>
<td>Percentage of open perimeter increase</td>
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</tr>
<tr>
<td>Completely suppressed: Yes</td>
<td>No</td>
<td></td>
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<tr>
<td>Compartmentation: Yes</td>
<td>No</td>
<td></td>
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<tr>
<td>Fire-resistance rating of vertical opening enclosures</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Type of HVAC system</td>
<td></td>
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<tr>
<td>Automatic fire detection: Yes</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire alarm system: Yes</td>
<td>No</td>
<td></td>
<td></td>
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<tr>
<td>Smoke control: Yes</td>
<td>No</td>
<td></td>
<td></td>
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<tr>
<td>Adequate exit routes: Yes</td>
<td>No</td>
<td></td>
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<tr>
<td>Maximum exit access travel distance</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Means of egress emergency lighting: Yes</td>
<td>No</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>SAFETY PARAMETERS</th>
<th>FIRE SAFETY (FS)</th>
<th>MEANS OF EGRESS (ME)</th>
<th>GENERAL SAFETY (GS)</th>
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<tbody>
<tr>
<td>1301.6.1 Building Height</td>
<td></td>
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<tr>
<td>1301.6.2 Building Area</td>
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<tr>
<td>1301.6.3 Compartmentation</td>
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<tr>
<td>1301.6.4 Tenant and Dwelling Unit Separations</td>
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<tr>
<td>1301.6.5 Corridor Walls</td>
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<tr>
<td>1301.6.6 Vertical Openings</td>
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<tr>
<td>1301.6.7 HVAC Systems</td>
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<tr>
<td>1301.6.8 Automatic Fire Detection</td>
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<tr>
<td>1301.6.9 Fire Alarm System</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1301.6.10 Smoke control</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1301.6.11 Means of Egress</td>
<td></td>
<td></td>
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<tr>
<td>1301.6.12 Dead ends</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1301.6.13 Maximum Exit Access Travel Distance</td>
<td></td>
<td></td>
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<tr>
<td>1301.6.14 Elevator Control</td>
<td></td>
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<tr>
<td>1301.6.15 Means of Egress Emergency Lighting</td>
<td></td>
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<tr>
<td>3412.6.16 Mixed Occupancies</td>
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<td>3412.6.17 Automatic Sprinklers</td>
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<tr>
<td>3412.6.18 Standpipes</td>
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<tr>
<td>3412.6.19 Incidental Accessory Occupancy</td>
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</tr>
</tbody>
</table>

**Building score — total value**

---

Insert points from evaluation of building elements.
Mandatory Safety Scores

- Option for building official to require a peer review by a registered design professional prior to issuing a building permit

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>FIRE SAFETY (MFS)</th>
<th>MEANS OF EGRESS (MME)</th>
<th>GENERAL SAFETY (MGS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-1</td>
<td>20</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>A-2</td>
<td>21</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>A-3</td>
<td>22</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>A-4, E</td>
<td>29</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>B</td>
<td>30</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>F</td>
<td>24</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>M</td>
<td>23</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>R</td>
<td>21</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>S-1</td>
<td>19</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>S-2</td>
<td>29</td>
<td>39</td>
<td>39</td>
</tr>
</tbody>
</table>

a. MFS = Mandatory Fire Safety
MME = Mandatory Means of Egress
MGS = Mandatory General Safety
Structural Work
Int. Existing Building Code

• Any work impacting existing structural systems must be evaluated by a structural engineer.

• Seismic Upgrades
  – For both the Prescriptive Method and Work Area Method generally required when lateral load increased more than 10% due to alteration. However required compliance varies (Prescriptive Method generally preferred).
Energy Code
International Energy Conservation Code
Energy Code

- Additions, renovations, and repairs to an existing building system or portion thereof must conform to the code for new construction, without requiring the unaltered portion of the building to comply.

- If the energy use of the building is not increased the following need not comply:
  
  • Storm windows
  
  • Glass only replacements in existing sash and frame (unless required elsewhere in IEBC)
  
  • Existing ceiling, wall, and floor cavities exposed during construction – if filled with insulation
  
  • Construction where existing roof, wall or floor cavity is not exposed
Accessibility

521 CMR
• **Existing Buildings: Alterations**
  
  – Altered portions of a facility are required to comply with the accessibility regulations to the maximum extent feasible.

  – The accessibility of the path of travel and facilities (toilet rooms, drinking fountains, etc.) serving an altered area must also be improved, unless the cost and scope of the overall alteration is disproportionate to the cost of the overall alteration.

  • **Disproportionate = cost exceeds 20% of the cost of primary alteration**

  • If the cost of alterations to the path of travel or facilities is disproportionate, these areas must still be improved up to 20% of the cost of the primary alteration.
• Existing Buildings: Removal of Barriers
  – Existing Public Accommodation: architectural barriers must be removed where such removal is able to be carried out without much difficulty or expense.
  – Priorities:
    • Accessible route and entrance to facility.
    • Access to areas within the facility where goods and services are made available to the public.
    • Accessible restroom facilities.
    • Take any other measures necessary to provide access to accommodations, privileges, advantages, goods, or services of a place of public accommodation
Existing Buildings: Renovations (3.3)

- The level of compliance for existing buildings is based on the following thresholds:
  - Work costs less than $100,000: only the work being performed is required to comply.
  - Work costs $100,000 or more but less than 30% of assessed value of existing building: in addition to work being performed, an accessible public entrance and an accessible toilet room, telephone and drinking fountain must comply with 521 CMR (if public toilets, telephones and drinking fountains are provided).
  - Exempt Work: Curb cuts, MEP without architectural alterations, roof repair or replacement, window repair or replacement, repointing and masonry repair, septic systems, site utilities, and landscaping.
521 CMR: Massachusetts Architectural Access Board

• Existing Buildings: Renovations (3.3), con’t
  • Cost of work is equal to 30% or more of the assessed value of the existing building: entire building is required to comply with 521 CMR.
    – Exempt Work: None

• In determining applicability of 521 CMR, the cost of all work performed within a 3 year period must be added together.
Questions?

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