

Plan Review Checklist for 1&2 Family Residential  
 Basement Conversion to Habitable Space  
 9th edition, Massachusetts State Building Code

The following symbols indicate in this plan review items have been satisfied for the purpose of plan review. **X** ✓

If section states "complete" that indicates that section is satisfied move to next section.

If unchecked that item needs to be addressed.

Property Address: \_\_\_\_\_

Review by: \_\_\_\_\_

Review Date Started: \_\_\_\_\_ Completed Review Date \_\_\_\_\_

E-Mail Address \_\_\_\_\_ Phone Number \_\_\_\_\_

Permit Application Denied

Approved as submitted

Approved as noted

Resubmit with requested information for approval

**Project Information:**

- Type of Proposed Work
- Market or Affordable
- Is Owner doing the Work
- Property Type
- Total Number of Dwellings
- Brief Description of Proposed Work

**Site Information:**

- Lot Area
- Frontage
- Zoning Overlay District
- Flood Zone Designations
- Water Supply
- Sewage Disposal system
- Zoning District
- Flood Zone Information
- Construction Type

**Construction Details:**

- # Bedrooms
- # Garage
- Finished Basement s.f.**
- ~~Occupancy Load 3rd Floor~~
- ~~Unfinished Bsmt s.f.~~
- ~~2nd floor s.f.~~
- ~~Occupancy Load 2nd Floor~~
- ~~Other Space s.f.~~
- ~~Occupancy Load Other Space~~
- # Floor
- ~~Total Decks & Porches s.f.~~
- ~~3rd Floor s.f.~~
- ~~1st Floor s.f.~~
- ~~Occupancy Load 1st Floor~~
- Building Code Edition
- Garage s.f.
- Subdivision Name
- Sprinkler System**

**Estimated Construction Cost:**

- Building
- Plumbing
- Fire Protection
- Electric
- Mechanical (HVAC)
- Total Estimated Cost

**Registered Home Improvement Contractor:**

- o Contractor's Name
- o Business Name
- o Registration #
- o Registration Expiration Date
- o Mailing Address
- o Preferred Telephone #
- o Email

**License Construction Supervisor:**

- o Name
- o Mailing Address
- o Phone #
- o Email
- o License #
- o Expiration Date

**Homeowner License Exemption:**

- o Name Homeowner
- o Phone #
- o Homeowner Signature

## 5. Completed Energy Conservation Code Collection Checklist

# 2018 International Energy Conservation Code

**R402.2.9 Basement walls.** Walls associated with conditioned basements shall be insulated from the top of the *basement wall* down to 10 feet (3048 mm) below grade or to the basement floor, whichever is less. Walls associated with unconditioned basements shall meet this requirement unless the floor overhead is insulated in accordance with Sections R402.1.2 and R402.2.8.

TABLE R402.1.2 INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT <sup>a</sup>

CLIMATE ZONE	FENESTRATION U-FACTOR <sup>b</sup>	SKYLIGHT <sup>b</sup> U-FACTOR	GLAZED FENESTRATION SHGC <sup>b, c</sup>	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE <sup>e</sup>	FLOOR R-VALUE	BASEMENT <sup>d</sup> WALL R-VALUE	SLAB <sup>d</sup> R-VALUE & DEPTH	CRAWL SPACE <sup>e</sup> WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.32	0.55	0.25	38	20 or 13+5 <sup>b</sup>	8/13	19	5/13 <sup>f</sup>	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13+5 <sup>b</sup>	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13+5 <sup>b</sup>	13/17	30 <sup>g</sup>	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49	20+5 <sup>b</sup> or 13+10 <sup>b</sup>	15/20	30 <sup>g</sup>	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20+5 <sup>b</sup> or 13+10 <sup>b</sup>	19/21	38 <sup>g</sup>	15/19	10, 4 ft	15/19

c. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall.

"15/19" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.



**example of 15/19 utilizing R-5 continuous insulation**

## 6. Three sets of plans or electronically uploaded on-line

### 7. Construction Drawings

#### Cover Sheet

- o Address with Assessor Map and Parcel
- o Date of latest revision
- o Tabulated Square Foot Area of all proposed renovation (and spaces if applicable)

### 8. Construction documents (1/4" scale minimum)

- o Floor Plan area of work is being performed
- o Building dimensions Space designation – (ie: living room, kitchen, bedroom, storage, etc.)
- o Demonstrate light and ventilation compliance §R303.1
- o Door and window location per schedule on cover sheet, identifying egress windows and safety glazing including manufacturers specifications cut sheets on each type. Doors between condition & un-condition space be labeled solid and weather stripped.
- o Location and type of smoke detectors and carbon monoxide detectors & completed install permit
- o Emergency escape and rescue required. Basements, habitable attics and every sleeping room shall have at least one operable emergency escape and rescue opening

#### \*\*\*\*\*; 0\*\*\*\*\* Framing plan

- o Conventional framing plan all levels including roof, showing size, spacing and direction of structural members
- o Conventional header and beam sizes, spans and bearing clearly showing load path to foundation (ie: doorways, windows, archways, overhead doors, covered porches and decks and structural ridges)
- o Engineered floor framing and roof truss plans stamped by a professional registered engineer in the Commonwealth of Massachusetts.
- o Engineered manufactured beams and columns stamped by a registered professional engineer in the Commonwealth of Massachusetts. Calculations shall be site specific verifying they generated the loads indicated and that the input and output data provided is site specific to include verification of load path and column adequacy to foundation...disclaimers of any kind shall be rejected.
- o Provide stamped engineered analysis for bearing stud wall height greater than 10 feet, and for non-load bearing stud walls in excess of heights listed in Table §R602.3(5).

### 10. Mechanical Review

- o Identify the location and supply spec's of required mechanical ventilation of bathrooms at the ventilation rates noted in 780 CMR §R303.3
- o 2015 IECC R403.5 Mechanical ventilation (Mandatory). Location of unit must be marked on plans Specification along with installation manual must be submitted.
- o If utilizing existing equipment, you MUST submit a heat loss calculation showing existing loads and also proposed new loads (manual J)
- o Heating system location, size (BTU), location of fuel source and method of combustion air make-up (manual S)
- o Solid fuel burning appliance location, size, installation manual and method of combustion air make-up
- o Location of ductwork...if installed in exterior wall, the Energy Conservation Application Form noted above must reflect decreased R-value or indicate method of maintaining exterior wall integrity (manual D)
- o Completed mechanical application

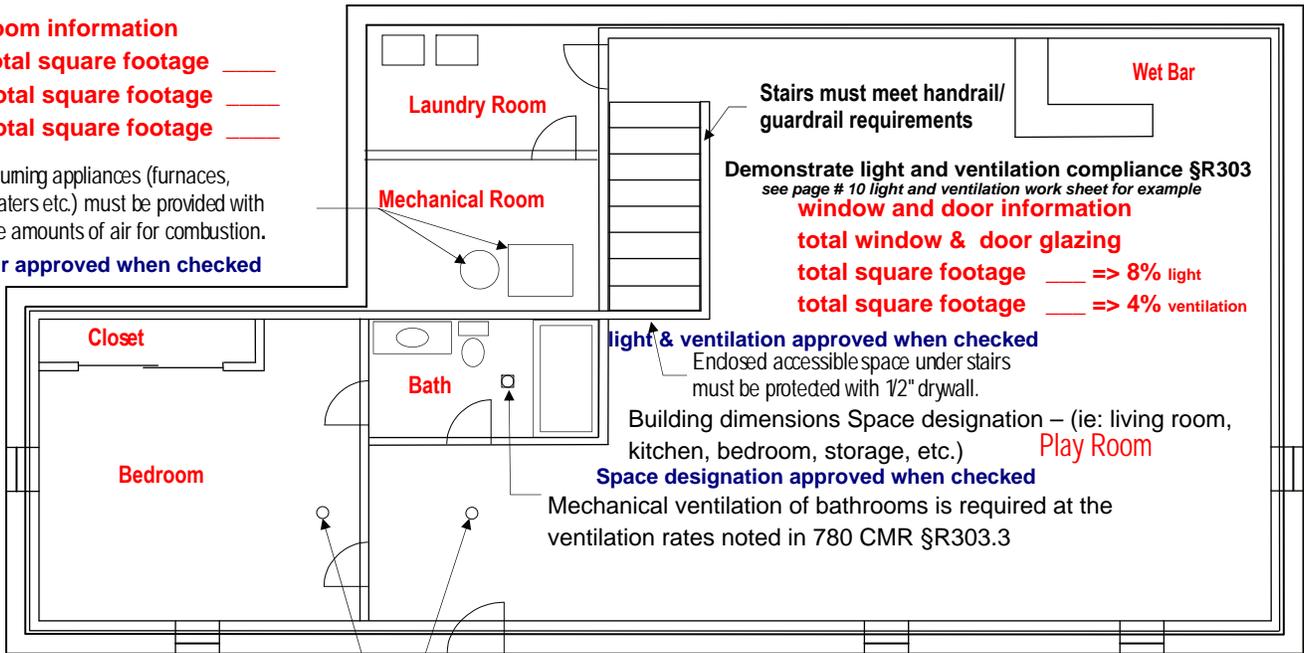
# Typical Basement Conversion to Habitable Space

**room information**  
**total square footage** \_\_\_\_  
**8% of total square footage** \_\_\_\_  
**4% of total square footage** \_\_\_\_

All fuel burning appliances (furnaces, water heaters etc.) must be provided with adequate amounts of air for combustion.

**combustion air approved when checked**

Building Department notes combustion air



Building Department Notes on Lights & Ventilation

All sleeping rooms must have an emergency escape window. §R310  
 See detail on next page

**sleeping room egress approved when checked**

Building Department notes sleeping room egress

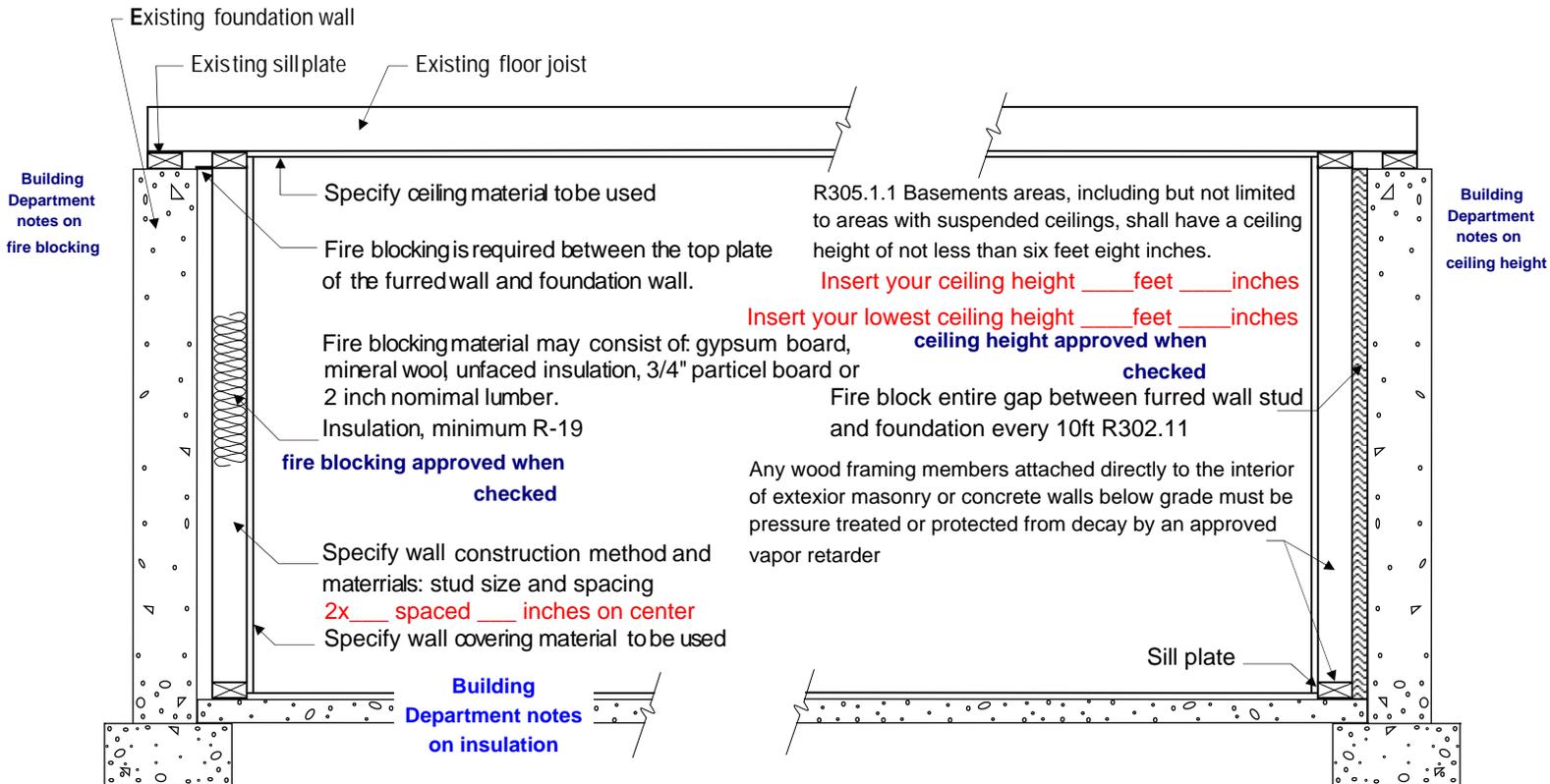
§ AJ102.3 Smoke Heat Detection and Carbon Monoxide Alarm Systems and CO Detection and Alarm. When one or more sleeping rooms are added or created in existing dwellings, the entire existing building shall be provided with smoke detectors, heat detector and carbon monoxide detectors designed, located and installed in accordance with the provisions for new construction, 780 CMR

**smoke & carbon alarms approved when checked**

see page # 10 fire detection location

Building Department notes smoke & carbon

## FLOOR PLAN FOR BASEMENT FINISH

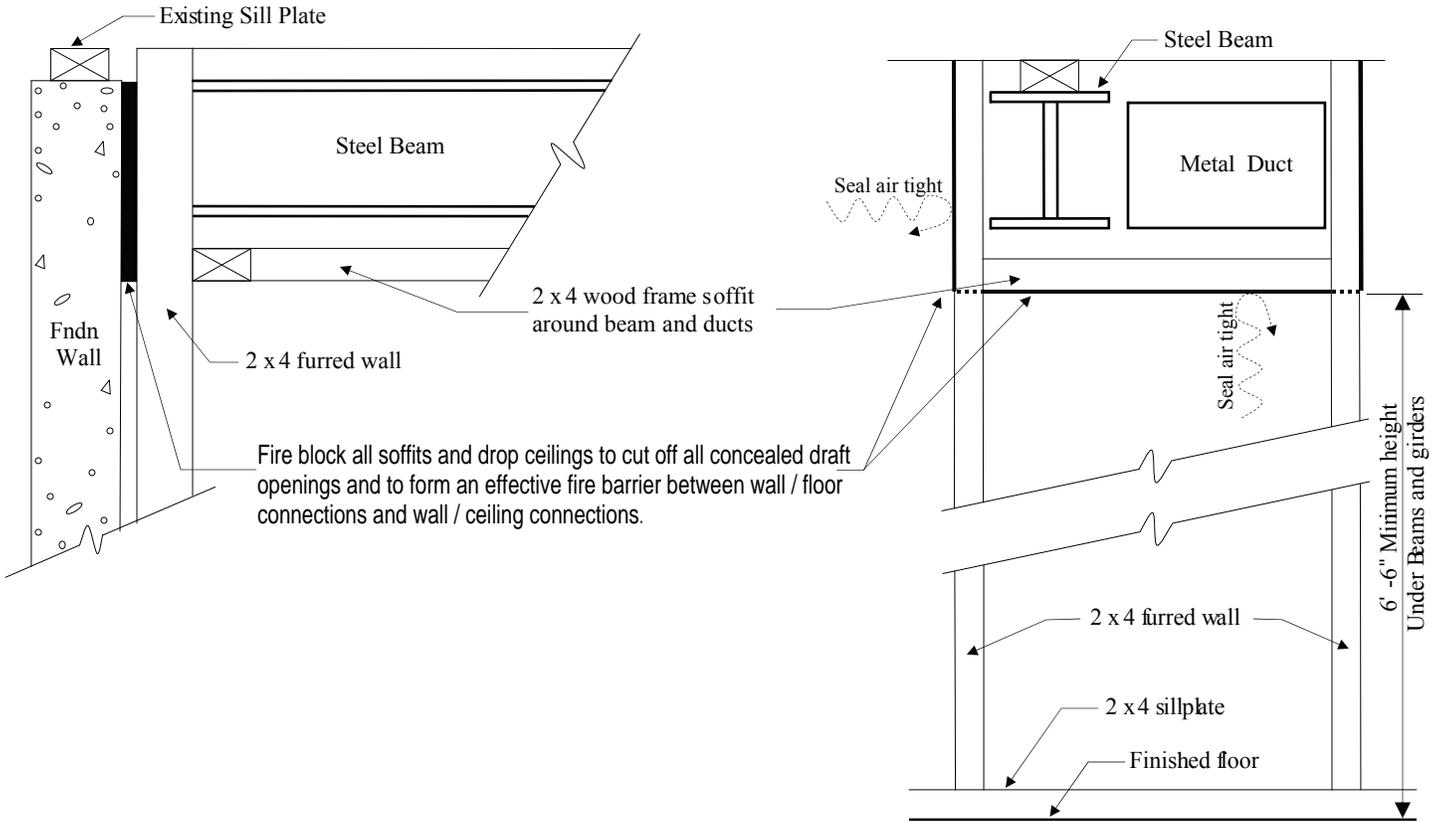


Building Department notes on fire blocking

Building Department notes on ceiling height

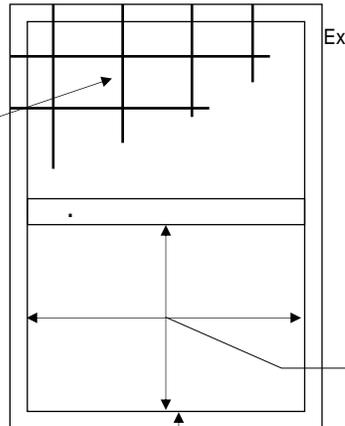
**insulation approved when checked**

## TYPICAL WALL SECTION



**SOFFIT FIRESTOPPING DETAIL**

Bars, grilles, covers, screens or similar devices are permitted to be placed over emergency escape opening or window wells provided they meet the minimum net clear opening requirements and such devices are releasable or removable from the inside without the use of a key, tool, special knowledge or force greater than that which is required for normal operation of the escape and rescue opening.



means of egress approved when checked

44" Max. sill height for egress (bedroom) \_\_\_\_ " (insert your sill height)

**EMERGENCY ESCAPE WINDOW DETAIL**

windows measured from floor to top of sill

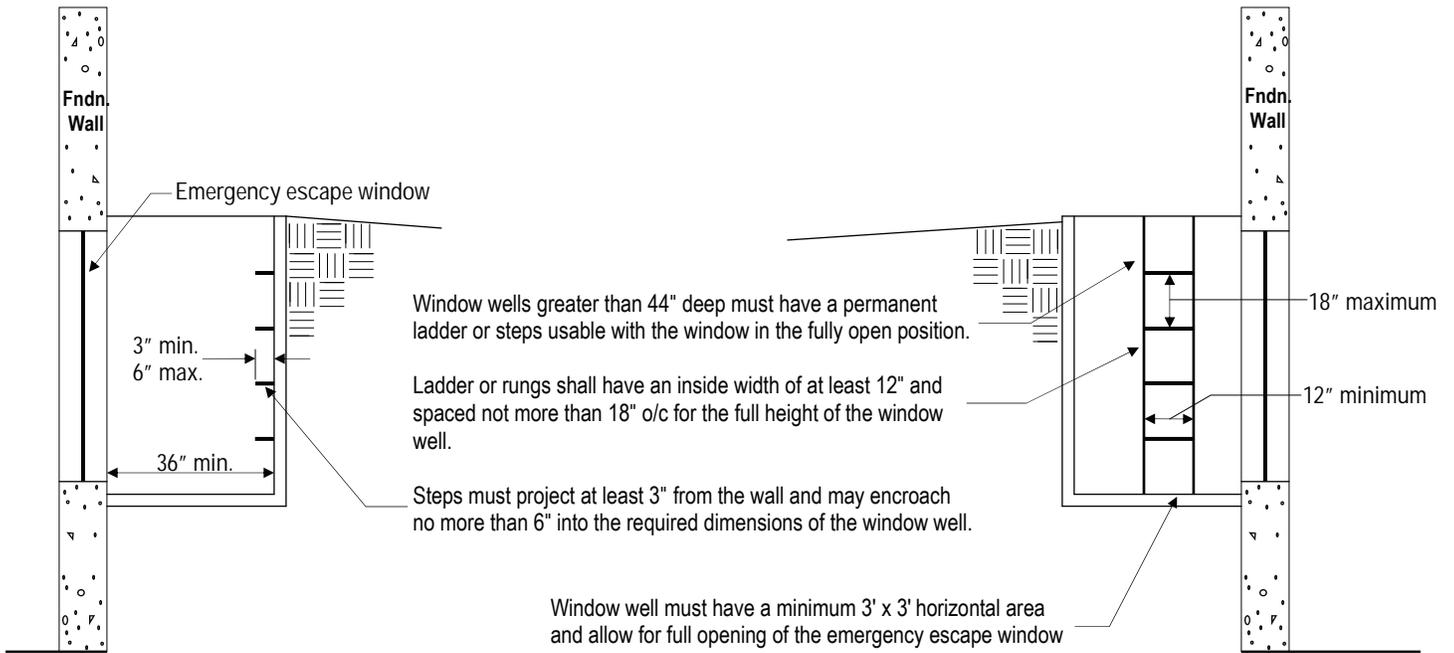
Building Department notes  
means of egress

Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys, tools or special knowledge.

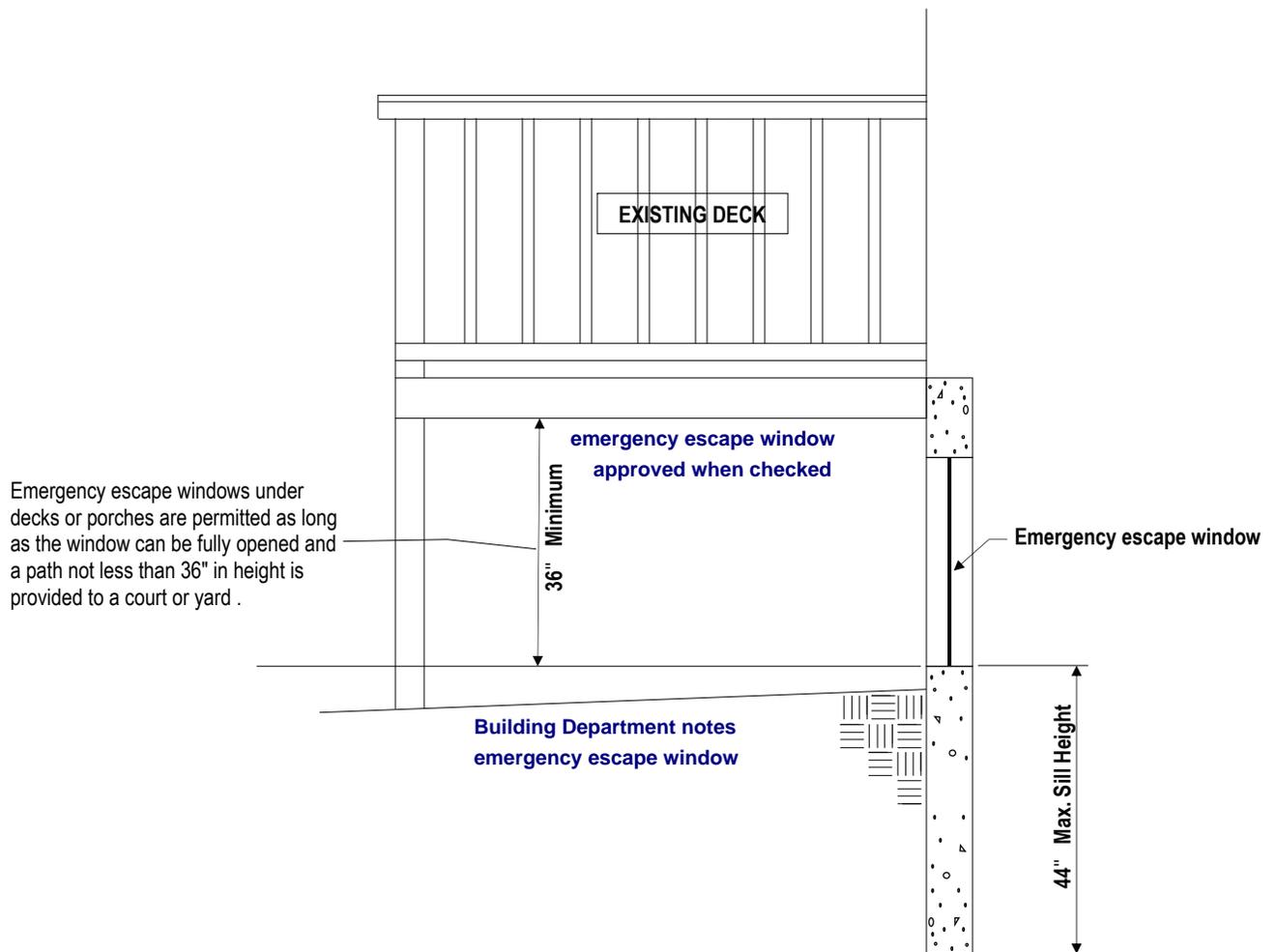
§ R310 Minimum Opening Area.

All emergency escape and rescue openings shall have a minimum net clear opening of 5.7 square feet.

- Exceptions:
1. Grade floor openings shall have a minimum net clear opening of five square feet (0.465 m<sup>2</sup>).
  2. Double hung windows used for emergency escape shall be permitted to have a net clear opening of 3.3 square feet (0.31 m<sup>2</sup>) provided that at least one operable sash meets the minimum height and width required by 780 CMR § R310.1.2 and § R310.1.3 and operational constraints defined by 780 CMR § R310.1.4.



**EMERGENCY ESCAPE WINDOW WELL DETAIL**



**EMERGENCY ESCAPE WINDOW UNDER EXISTING STRUCTURES**

R311.7.2 Headroom. The minimum headroom in all parts of the stairway shall not be less than 6 feet 8 inches (2032 mm) measured vertically from the sloped line adjoining the tread nosing or from the floor surface of the landing or platform on that portion of the stairway.

**building department notes on illumination**

**illumination approved when checked**

Stairway Illumination. All interior and exterior stairways shall be provided with an artificial light source to illuminate the stairs, including the landings and treads.

Interior stairways with 6 or more steps shall have a wall switch at each floor level to control the stair lighting.

Required stair lighting

Handrail height: 34" min. 38" max. measured from the nose of each step.

Maximum handrail width: 2 - 3/4" and must have a graspable surface.

Guardrails at platforms and landing cannot have opening greater than 4"

**R311.7.7.1 Height. Handrail height, measured vertically from the sloped plane adjoining the tread nosing, or finish surface of ramp slope, shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm).**

Required light switch

All openings in stair guardrail must be less than 4 - 3/8".

This space shall not allow the passage of a 6" sphere

Openings at back of stairs must be less than 4".

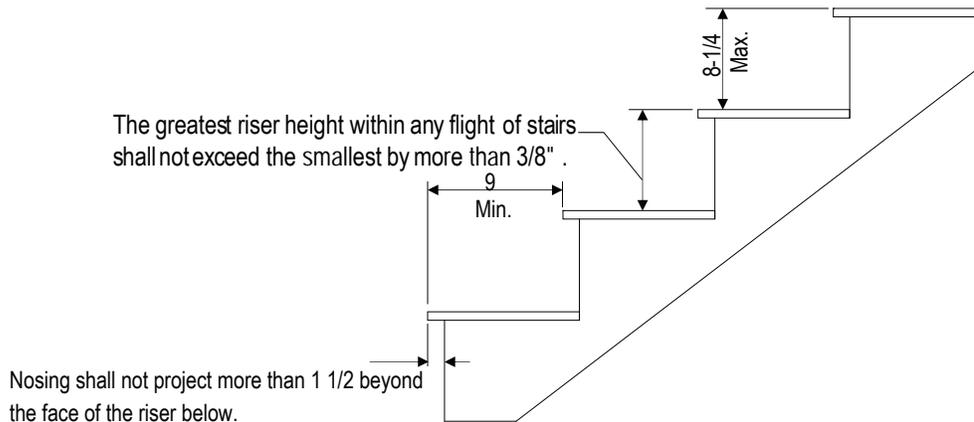
Enclosed accessible space approved when checked

Enclosed accessible space under stairs shall have walls, under stair surface and any soffits protected on the enclosed side with 1/2" gypsum board

**INTERIOR STAIR DETAIL**

**interior stair detail approved when checked**

**notes on interior stairs**



**TREAD AND RISER DETAIL**

## **CHECKLIST FOR APPLICATION CHECKLIST**

1. Owner's Authorization Form Completed
2. Signed contract between homeowner and the registered home improvement contractor subject to MGL c 142
3. In lieu of submitting a signed contract as the owner of record, the owner shall submit Signed Affidavit for Home Improvement Contractor Required Contract Terms
4. Electronic Set of plans for the building or structure
5. Mechanical Application (If applicable)
6. Smoke Detector Application, Sprinkler install approval from The Fire Department
7. Copies of Variances or Special Permits Granted by The Planning Board or Zoning Board of Appeals or any other Town Boards
8. Worker's Compensation Certificate
9. Insurance Binder from Insurance Company made out to the Town
10. Homeowner License Exemption (If applicable)
11. Copy of Construction Supervisor License
12. Copy of Home Improvement Registration (If applicable)
13. Statement for disposal of debris (If applicable)
14. Massachusetts Energy Compliance Report

## Natural Light and Ventilation Worksheet

Space Designation	Floor Area Square Feet	Light (8% Required)	Light (Actual)	Ventilation (4% Required)	Ventilation (Actual)

**Natural and Mechanical Ventilation:**

Each habitable room must be provided with natural ventilation through open screened window or door areas that total at least 4% of the floor area of the room. As an alternative, the code permits mechanical ventilation. Most major manufacturers of ventilation equipment offer balanced supply and exhaust fan units for this purpose. Simple exhaust fans are not permitted since the resulting negative house air pressure is a safety hazard and infiltration is insufficient. Another code permitted alternative is to provide outside air directly into the return air plenum of a forced air HVAC unit in the required amount of 15 CFM per bedroom plus 15 CFM. Mechanical ventilation equipment manufacturer's specifications must be provided. (AJ501.6)(2009 IRC, R303)

Equation below is how to convert square inches to square footage

1st Equation is for natural light (8%)

$$37 \text{ inches} \times 57 \text{ inches} = 2,109 \text{ square inches} / 144 = 14.65 \text{ square footage}$$

2nd Equation is for natural ventilation (4%)

$$33.87 \text{ inches} \times 24.50 \text{ inches} = 828.8 \text{ square inches} / 144 = 5.76 \text{ square footage}$$

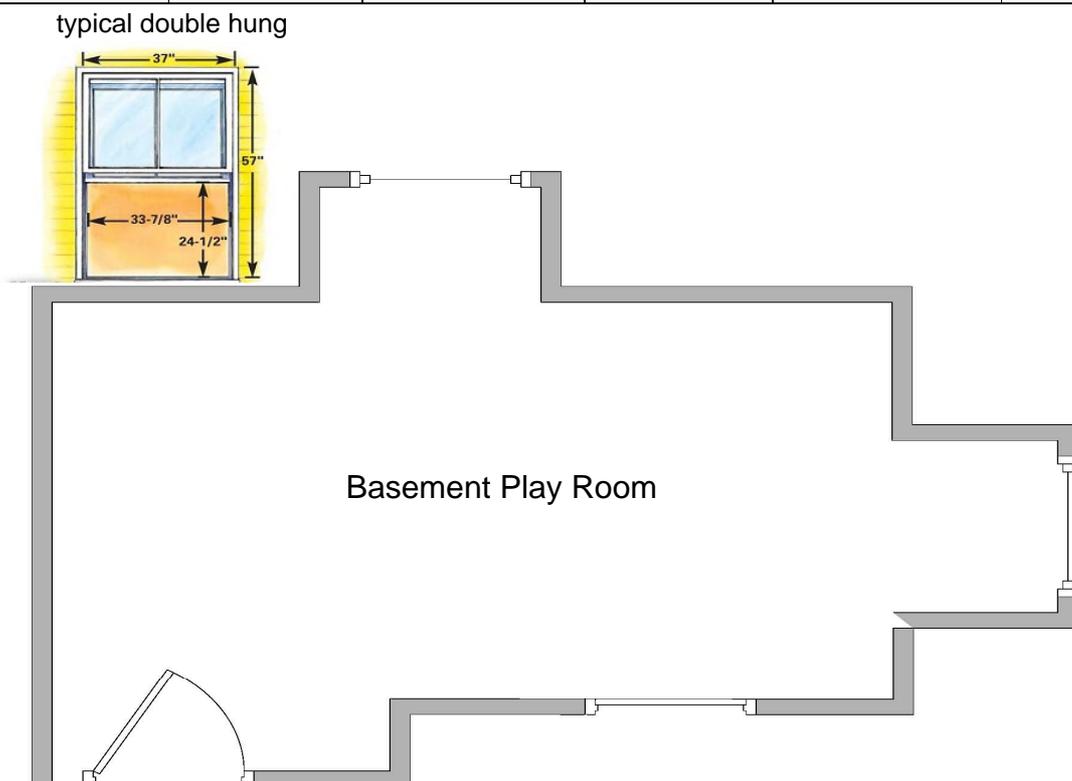
This space has three windows one door with no screen.

Natural light would be each window 14.65 time three window equals 43.95 square feet

Natural ventilation would be each window 5.76 times three windows equals 17.28 square feet

**example of natural light and ventilation work sheet**

Space Designation	Floor Area Square Feet	Light (8% Required)	Light (Actual)	Ventilation (4% Required)	Ventilation (Actual)
Basement Play Room	336	26.88	43.95	13.44	17.28



## SECTION R314 SMOKE ALARMS

**R314.1 Smoke detection and notification.** All smoke alarms shall be listed in accordance with UL 217 and installed in accordance with the provisions of this code and the household fire warning *equipment* provisions of NFPA 72.

**R314.2 Smoke detection systems.** Household fire alarm systems installed in accordance with NFPA 72 that include smoke alarms, or a combination of smoke detector and audible notification device installed as required by this section for smoke alarms, shall be permitted. The household fire alarm system shall provide the same level of smoke detection and alarm as required by this section for smoke alarms. Where a household fire warning system is installed using a combination of smoke detector and audible notification device(s), it shall become a permanent fixture of the occupancy and owned by the homeowner. The system shall be monitored by an *approved* supervising station and be maintained in accordance with NFPA 72.

**Exception:** Where smoke alarms are provided meeting the requirements of [Section R314.4](#).

**R314.3 Location.** Smoke alarms shall be installed in the following locations:

1. In each sleeping room.
2. Outside each separate sleeping area in the immediate vicinity of the bedrooms.
3. On each additional *story* of the *dwelling*, including *basements* and habitable attics but not including crawl spaces and uninhabitable *attics*. In *dwellings* or *dwelling units* with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full *story* below the upper level.

When more than one smoke alarm is required to be installed within an individual *dwelling* unit the alarm devices shall be interconnected in such a manner that the actuation of one alarm will activate all of the alarms in the individual unit.

**R314.3.1 Alterations, repairs and additions.** When *alterations*, repairs or *additions* requiring a *permit* occur, or when one or more sleeping rooms are added or created in existing *dwelling*s, the individual *dwelling unit* shall be equipped with smoke alarms located as required for new *dwelling*s.

**R314.5 Heat Detector.** A single heat detector listed for the ambient environment shall be installed in:

1. Any integral garage (“garage under”) or attached garage to the main house (detached garages do not require a heat detector).
2. A new addition attached garage to an existing dwelling. If the existing house contains a fire detection system that is compatible with the garage heat detector, then the detector shall be interconnected to the existing system. Where the existing fire detection system is not compatible with the garage heat detector, the garage heat detector shall be connected to a sounder (occupant notification appliance) or compatible heat detector containing a sounding device, located in the dwelling and within 20 feet (6096 mm) of the nearest door to the garage from the dwelling. The required garage heat detector is neither required to incorporate audible alarm notification nor is any audible notification device required in the garage.

**R314.5.1 Heat Detector Placement.** For flat-finished ceilings, the single heat detector shall be placed on or near the center of the garage ceiling. For sloped ceilings having a rise to run of greater than one foot in eight feet (305 mm in 2438 mm), the single heat detector shall be placed in the approximate center of the vaulted ceiling but no closer than four inches (102 mm) to any wall.

**R315.1 Governing Regulations.** Carbon monoxide alarms (alarms) for new construction and existing dwellings shall be furnished, installed and maintained by the owner in accordance with this section, M.G.L. c. 148, § 26F½, 527 CMR 31.00: *Carbon Monoxide Alarms*, 248 CMR, NFPA 720 and the manufacturer’s instructions.

**R315.2 Installation Locations.** One alarm shall be installed on each story of a dwelling unit, including basements and cellars (but not including crawl

spaces and uninhabitable attics). When mounting a carbon monoxide alarm on a story with a bedroom, the alarm, shall be located outside of bedrooms but no further than 10 feet of any bedroom door. If a combination smoke/carbon monoxide alarm is used, its location must comply with this section.

**R315.3 New Construction.** Alarms shall either be an interconnected 120V or part of a low voltage combination system or wireless system. Alarms shall have secondary (standby) power from monitored batteries in accordance with NFPA 72. For fire alarm control units (panels) and wireless systems, the panel battery shall serve as the source of secondary power. Alarms shall be UL 2034 or UL 2075 listed, as applicable. Alarms may be interconnected with fire alarms providing they are compatible and the fire alarms take precedence.

**R315.4 Existing Dwellings.** For existing dwellings, carbon monoxide alarms shall be provided in accordance with Section 315 for new construction, as applicable, for the following circumstances:

1. When one or more bedrooms are added or created in a dwelling unit, the entire dwelling shall be provided with alarms.
2. When a dwelling unit undergoes complete reconstruction such that all walls and ceilings are open to framing the entire dwelling unit shall be provided with alarms.
3. In an existing two-family dwelling, when one or more bedrooms are added or created in both of the two dwelling units, the entire building shall be provided with alarms.
4. In a townhouse building when one or more bedrooms are added or created in a dwelling then that dwelling unit shall be provided with carbon monoxide alarms.
5. In a townhouse building when a dwelling unit undergoes complete reconstruction such that all walls and ceilings are open to framing, that dwelling unit shall be provided with carbon monoxide alarms.

**COMMONWEALTH OF MASSACHUSETTS  
STATE BUILDING CODE  
780 CMR, 9th Edition**

---

**FIRE PROTECTION SYSTEMS  
CHAPTER 9**

---

***GUIDELINES FOR THE PREPARATION  
OF FIRE PROTECTION SYSTEM  
NARRATIVE REPORTS***

**780 CMR – 901.2.1 Tier One Construction Documents  
Process by which Building Permit is obtained**

**780 CMR – 901.2.1 Tier Two  
Process by which Building Department & Fire Department  
approves the commencement of the installation of  
fire protection systems**

**page 15 of Construction Control Document and page 8 of Fire Protection  
Narrative must be sign by Building Department also Fire Department  
before any fire protection commencement begins**

**After Tier One is obtained, Tier Two is the process by which the Building Department  
and Fire Department  
approves the commencement of the installation of fire protection systems**

**To All Contractors: FIRE DEPARTMENT CONSTRUCTION AND TIER 2  
REQUIRED DOCUMENTS**

**For Plan Review, Approval to Install and Rough Inspections**

- **Two (2) Copies of all required Tier II documents shall be submitted in separate, marked packets to the Fire Department and the Building Department, respectively, for all required and non-required Fire Protection/Detection Systems.**
- **All documents shall be submitted prior to receiving an Authorization of Commencement to Install, as depicted in the Building Packet, page 8, Construction Control Document or page 15 of the Fire Protection Narrative.**
- **Fee Schedule: Fire Alarm Systems (Residential and Commercial) \$50.00 per Unit.  
One Unit=one apartment, one condo, one commercial tenant space.  
Sprinkler System-\$100.00**

**The fee shall accompany the Fire Department required document packet, in the form of a check, made out to the Town of Grafton. This check shall be separate from, and in addition to, any Building Department fees.**

- **All required documents are to be submitted as a package. Partial submittals will not be accepted.**
- **Required documents are also needed for modifications, alterations, additions or deletions of an existing system.**

**If a Fire Department pre-construction conference is needed, contact the Fire Department business office.**

## **FIRE PROTECTION SYSTEMS NARRATIVE REPORTS**

The interaction of fire protection systems can be extremely complex. The detection of a fire in a building by an automatic device may be designed to initiate other life saving fire protection systems or devices, or other mechanical systems

In some circumstances life different individuals or different companies may design safety systems, which are required to interact. The narrative report is intended to provide a single document, which describes the design rationale of all fire protection systems and the interface between systems. It is an invaluable tool for building officials, fire officials, building owners and maintenance personnel.

780 CMR 901.2.1 Tier One Construction Documents requires the submission of so called fire protection systems narrative reports as part of the construction documents, which must be filed in order to obtain a building permit or must be submitted along with the requirements for a Tier Two Review for approval prior to installation of any Fire Protection Equipment.

The following document has been developed to assist end users of the Massachusetts State Building Code in the preparation “*narrative reports*” for fire protection systems as required in 780 CMR 9 (Section 901.2.1)

**NARRATIVE REPORTS**  
**As regulated by 9<sup>th</sup> Edition, 780 CMR, Section 901.2.1**

**GENERAL**

**901.2.1.1 Fire Protection Construction Documents:**

1. a. Basis (methodology) of design for the protection of the occupancy and hazard for compliance with 780 CMR and applicable NFPA Standards, in the form of a narrative report.
- b. Sequence of operation of all fire protection systems and operation in the form of a narrative report.
- c. Testing criteria to be used for final system acceptance in the form of a Narrative report.

**DEFINITION**

A Narrative Report is a written summary description of the building or structures and all applicable fire protection systems and related operational features. Explains the analogy and methodology used by the designers in the design of the systems for the protection of the building occupants and emergency response personnel for all required and non-required fire protection systems.

**APPLICABILITY**

Required fire protection system installed in new buildings or structures, required fire protection system modification or addition to an existing system, non-required fire protection systems regulated by regulatory codes other than 780 CMR or voluntarily installed require approval, permits and inspections by building and fire department officials.

The enforcement provision of 780 CMR requires that a narrative report be submitted as part of the plan review and prior to the issuance of building permit. Administratively depending on the project size, scope and complexity, the code official should make a reasonable decision as to require a full comprehensive or partial report.

A Narrative Report for detached one and two family dwellings is not a requirement of Section 901.2.1 Tier One Construction Documents, however a limited version of the narrative Report identifying the type and style of household fire warning systems to be installed is recommended.

**PURPOSE**

Expedites the plan review and inspection process by building and fire officials. It is maintained on file for use at time of final inspection and periodic reviews during future field inspections. Is referenced to insure that all future modifications, alterations, addition

or deletion to the original systems are current and that the original system's protection and required system performance are not compromised or have been altered without building or fire official prior review.

Building owners benefit by knowing how their building's fire protection and life safety systems work and provides procedures and method for testing and maintenance. A copy of the Narrative Report should be kept on the premises and be available for review prior to testing or proposed modifications to be made to any portion of the building's life safety systems

### **DEVELOPMENT & SUBMISSION FORMAT**

Prepared by a qualified, identified individual who has "taken charge" in the development of an entire coordinated "report" which includes all information regarding the design basis, sequence of operation and testing criteria associated with all required or non-required fire protection systems set forth by applicable Laws, Regulations and Standards.

The "report" is to be submitted with plans and specifications for review and approval by code officials prior to the issuance of a building permit. The Narrative Report should be written in a clear conversational format. The installation specification is not considered a Narrative Report. The Narrative Report is a stand alone document, 8½" x 11" for filing and ease of use by code officials, including an administrative cover page identifying the project name, building address, name, address and phone number of the individual who has "taken charge" in the preparation of the Narrative Report.

### **COMMENTARY**

The promulgation of the State Building Code is written in a way to require uniformity for all buildings and structures regardless of local conditions. The intent of the codes can be subjective and interpretative by both designers and code officials; uniformity is not always necessarily achieved.

The Narrative Report attempts to clarify to the code official the designer's intent and his interpretation of the code. The code official may agree or disagree with the designer's interpretation.

Historically the requirements for fire protection systems have become site specific and building code requirements not uniformly enforced. The size of the community, fire department staffing, fire department equipment availability and suppression tactics established by the local fire department have effected the uniformity of enforcement. Site specific requirements less than or more than the building code requires may have reasonable intent; however, this type of enforcement in some cases has proven to be controversial in the applicability of code uniformity.

The Narrative Report can be a valuable instrument when accurately prepared; it will establish a line of communication between the designer and the code official resulting in what the building code mandates, uniformity and consensus in the interpretation of the codes.

### **901.2.1 Tier One Construction Documents**

#### **(a.i.) BASIS (METHODOLOGY) OF DESIGN**

This portion of the narrative report should be broken down into the following six sections

#### **SECTION 1 901.2.1 Tier One Construction Documents - Building Description**

This section identifies specific features of a building that contributes to the overall understanding of the fire protection systems and features required to be identified in the Narrative Report

- a) Building “Use” Group
- b) Total square footage of building
- c) Building height
- d) Number of floors above grade
- e) Number of floors below grade
- f) Square footage per floor
- g) Type(s) of occupancies (hazards) within the building
- h) Type(s) of construction
- I) Hazardous material usage and storage
- j) High storage of commodities within a building usually over 12 ft.
- k) Site access arrangement for emergency response vehicles

#### **SECTION 2 - Applicable Laws, Regulations and Standards**

This section identifies regulatory codes and standards that may have an impact in the design and plan approval of the required and the non-required fire protection systems as per the requirements of 780 CMR, requiring the preparer of the Narrative Report to have had conducted a comprehensive code research

- a) 780 CMR code sections “Fire Protection System Requirements” and Edition
- b) NFPA Standards and Edition used for design of each specific fire protection system
- c) Applicability of Sections of M.G.L., Chapter 148, “Fire Prevention”
- d) Applicability of Sections of 527 CMR “Fire Prevention Regulations”
- e) Applicability of “approved” local by-laws or ordinances (*state specific ordinance*)
- f) Applicability of specialized codes (plumbing, elevator, and electrical, architectural access)
- g) Applicability of Federal Laws (OSHA, ADA, etc.)

### **SECTION 3 - Design Responsibility for Fire Protection Systems**

This section identifies the accountability for a specific fire protection system design and the accountability for the integration of the fire protection systems constituting a building life safety system.

- a) The professional engineer (PE) fully designs (complete layout and calculations) and specifies the fire protection system or systems to be installed, reviews and approves the installing contractor's shop drawings. The PE is considered the engineer of record and certifies system installation for code compliance at completion.
- b) The professional engineer (PE) provides a partial design and specifies the design criteria to be used by the installing contractor who finalizes the system layout, provides calculations to confirm the design criteria. The PE reviews and approves the installing contractor's final layout and calculations. The PE is considered the engineer of record and certifies system installation for code compliance at completion.
- c) Design-build, the installing contractor completely designs and specifies (develops a full system layout, design criteria and calculations), installs the stem and certifies system installation for code compliance at completion. There may be a professional engineer involved but not necessarily.

Whichever above method is selected, the project requires an engineer of record to assume responsibility for the coordination of each specific fire protection system requiring integration, forming an entire building life safety system.

### **SECTION 4 - Fire Protection Systems to be Installed**

This section identifies key "performance design criteria" and features for each specific fire protection system

- a) Water supply, fire mains and hydrants
- b) Automatic sprinkler systems and components
- c) Standpipe systems and components
- d) Fire alarm systems and components
- e) Automatic fire extinguishing systems
- f) Manual suppression systems
- g) Smoke control/management systems
- h) Kitchen cooking equipment and exhaust systems
- I) Emergency power equipment
- j) Hazardous material monitoring equipment
- k) Seismic considerations

The description (specific features) for the above fire protection systems shall also indicate if the system is:

- Required by Regulations, Law or “approved” by-law or Ordinance
- Non-required, developer provides voluntarily
- A complete new system
- An addition or expansion to existing system
- A modification/repair to existing system
- Level of protection to be provided, 100% or partial protection or exempt by regulatory code

### **SECTION 5 - Features Used in the Design Methodology**

This section identifies the designer’s intent in the overall design and criteria development of either a required or a non-required system.

- a) Building occupant notification and evacuation procedures
- b) Emergency response personnel, site and systems features
- c) Safeguards, fire prevention and emergency procedures during new construction and impairment plans associated with existing system modifications.
- d) Method for future testing and maintenance of systems and documentation

### **SECTION 6 - Special Consideration and Description**

This section identifies the designer’s intent to deviate from prescriptive requirements of regulatory codes and standards with alternative methods.

- a) Application of “performance-base design” in lieu of prescriptive code requirement
- b) Interpretation/clarification between designer and code officials
- c) Waiver or variance sought through the regulatory appeal process

### **901.2.1 Tier One Construction Documents**

#### **(1. a. ii.) SEQUENCE OF OPERATION**

This portion of the narrative report is a difficult section to write as it entails the specific operation of system devices and equipment and their related integration.

### **SECTION 1**

- a) An operational description of either a system or specific devices within a system and the “resulting action” associated with the operation of the system or specific devices
- b) The operational description shall include all interconnected (integrated) fire protection systems and devices required or non-required forming an entire building life safety system

- c) All signage indicating equipment location, operational and design features and certified documents attesting to system installation integrity

This section of the narrative report can be brief as in a simple system such as a one story 15,000 sq.ft. mercantile building with only a sprinkler system and fire alarm notification devices. Or complex, such as in a 25 story high-rise hotel with fire pumps, emergency generator, fire alarm and sprinkler zones, automatic standpipes, automatic voice and manual evacuation signals, smoke management system, automatic elevator recall, special extinguishing systems, remote annunciation, automatic locking devices, alarm retransmission methods and emergency response procedures.

The sequence of operation of a building life safety system, particularly with complicated systems must be reviewed and understood by code officials. A team approach should be used by developers, designers, equipment suppliers, contractors including code officials to clearly describe and understand the proper operation of the integrated systems.

When a complex system is proposed, the initial narrative report of the “sequence of operation” should be viewed only as a draft. At various stages of installation modifications may be made. The designers should submit a final narrative for approval by the code officials prior to witnessing a system acceptance.

Communication between the developers and code officials is an important element particularly in this phase, as the building codes and the NFPA Standards tend to be flexible and interpretative.

### **901.2.1 Tier One Construction Documents**

#### **(1. a. iii.) TESTING CRITERIA**

This portion of the narrative report should be broken down into the following three sections

#### **SECTION 1 - Testing Criteria**

This section identifies the individual in charge who will coordinate the final acceptance testing and witnessed by appropriate code officials

#### Personnel

- a) Identification of professional in charge for setting up and coordinating all testing
- b) Method of verification and confirmation by professional in charge that all fire protection systems, equipment and devices have been individually tested and tested as an entire system when specific systems are integrated to form a building life safety system
- c) Method of coordination by professional in charge of all contractors, equipment distributors and code officials required to perform and witness all testing, testing

dates and times, notification to public utilities, personnel required to perform all required testing as a system or individual system component testing

## **SECTION 2 - Equipment and Tools**

This section will identify the necessary equipment available on site at time of witnessing the operational features of the fire protection systems, integrated building life safety and systems that require validation from code officials to expedite the acceptance testing.

- a) Identification of equipment and procedures to be used to verify system performance

**Example:**

Manufacturer's instructions

Specifier's special instructions

Approved Narrative Report, sequence of operation section

Smoke machines

Smoke candles

Sound meters

Fire hoses, nozzles

Flow measuring devices

Gauges

Voltage meters

Magnets

Communication radios

Fire department equipment

Special tools

Notification announcements

## **SECTION 3 - Approval Requirements**

This section identifies all the "close-out" documents for the code officials' departmental records

- a) Establish method of approval required (verbal or written) from code official if system satisfies all operational code compliance requirements
- b) Establish method of remedial action when a system or portion of a system fails to operate satisfactorily
- c) Documentation to be submitted to code officials at completion verifying that systems are in compliance with all laws, regulations and standards and pre-approved narrative reports
- d) Documentation as required by 780 CMR, Section 901.2.1
- e) Documentation to be submitted to code officials listing names, addresses and telephone number of personnel for emergency notification

## **DEFINITIONS**

**Fire Protection Systems** - Automatic sprinkler systems, fire detection system, fire alarm notification system, smoke control system, kitchen hood suppression system, etc.

**Building Life Safety System** - A combination of fire protection systems and other building fire protection features such as automatic door closers, emergency generators, emergency egress lighting, elevator systems, etc., interconnected or integrated with multiple fire protection systems functioning simultaneously when activated.

**Preparer of Narrative Report** - An individual who has taken charge of a project and has knowledge of required and non-required fire protection systems and buildings life safety systems. *The designer in charge of a specific design for a fire protection system may prepare their portion of the Narrative Report to be submitted to the individual who has "taken charge". The individual who has "taken charge" shall compile the data from the designer of each system and prepare a single, comprehensive and coordinated final Narrative Report describing each system and when applicable a description of how each system interfaces with the building life safety system's integration and sequence of operation. The take charge individual may be the architect, engineer of record, and the designer of any of the fire protection systems or an independent qualified consultant.*

***REQUIREMENTS TO OBTAIN INSTALLATION OF  
FIRE PROTECTION EQUIPMENT PERMITS  
FROM  
THE BUILDING DEPARTMENT***

**2. Tier Two, Shop Drawings** - Prior to installation of fire protection systems, shop drawings, where applicable, shall be submitted to the *building official* and fire official and shall contain, but not be limited to; detailed design layout, equipment specifications, system sequence of operation, and analysis to substantiate the design. Shop drawings shall note the name(s), license number(s) and license expiration date(s) of the contractor(s) installing the fire protection systems.

**Exception.** For shop drawings of Fire Alarm and Detection Systems see section 907.1.2 for applicable requirements.

**3. Tier Three, Record Drawings** - As built plans shall be provided to the building owner for all fire protection and life safety systems that are sealed as reviewed and approved by the *registered design professional* or legally recognized professional performing Construction Control. Where changes to original shop drawings are minor, a list of as-built changes shall be permitted to be submitted where sealed and reviewed and approved by the *registered design professional* or legally recognized professional performing Construction Control.

**Enclosed in this packet for your convenience is the required fire protection construction document check list.**

## ***REQUIRED FIRE PROTECTION CONSTRUCTION DOCUMENTS***

- All documents shall be submitted prior to the installation of all required and non-required fire protection/detection systems. A building permit **shall be obtained prior to installation.**
- This includes: modification, alterations, additions or deletions to an existing system.

*This check sheet is to accompany the submittal of all required documents for plan approval and review.*

**\*\*All required documents are to be submitted as a package. Partial submittals will not be accepted.**

All installations shall be done according to the provisions of M.G.L. Chapter 148, CMR's 780 and 527 and NFPA.

	<b>REQUIRED DOCUMENTS</b>	<b>Included</b>	<b>Missing</b>	<b>N/A</b>
1.	<b>PLANS-</b> 1 set of wet stamped plans shall be submitted with catalog sheets of all devices; In addition to the number of sets the contractor would want returned after markup/review.			
2.a.	<b>Narrative Report-</b> Basis of design for the protection of the occupancy and hazards.			
b.	Narrative is to include: scope of work to be performed, use group, building construction type and hazard use group.			
c.	Narrative is to include sequence of operation of all fire protection systems.			
d.	Narrative is to include testing criteria to be used for final system acceptance.			
3.	A copy of the <b>State License</b> of every person who will be working on systems.			
4.	Plans shall include <b>Building &amp; Site Access</b> for firefighting and rescue vehicles and personnel.			
5.	Plans shall include <b>Hydrant</b> location and water supply information.			

	<b>REQUIRED DOCUMENTS</b>	<b>Included</b>	<b>Missing</b>	<b>N/A</b>
6.	Plans shall include <b>Automatic Sprinkler System</b> - <i>type/description and design layout</i> of all equipment.			
7.	Plans shall include <b>Automatic Sprinkler System</b> - <i>control equipment location</i> .			
8.	Plans shall include <b>Kitchen Extinguishing System(s)</b> - <i>type/description and design layout</i> of equipment.			
9.	Plans shall include <b>Kitchen Extinguishing System(s)</b> - <i>control equipment location</i> .			
10.	Plan shall include <b>Automatic Standpipe System</b> - <i>type/description and design layout</i> of equipment.			
11.	Plan shall include <b>Standpipe System</b> - <i>type and location of hose valve(s)</i> .			
12.	Fire Department <b>Siamese Connection</b> - <i>type and location. When was flow test taken? Where was flow test taken from?</i>			
13.	<b>Fire Protective Signaling System</b> - <i>Type/Description and design layout of Fire Protective Signaling System(s)</i> .			
14.	<b>Fire Protective Signaling System</b> - <i>Control Equipment and remote annunciator location</i> .			
15.	<b>Fire Protection System(s)</b> - <i>equipment room location</i> .			
16.	<b>Fire Protection System(s)</b> - <i>equipment identification and operational signs</i> .			
17.	<b>Fire Protection System(s)</b> - <i>alarm/ supervisory signal transmission method and location</i> .			
18.	<b>Auxiliary Equipment</b> - <i>Life Safety Systems required to be integrated as part of the fire protective signaling system</i> .			
19.	<b>Smoke Control or Exhaust System</b> - <i>type/description and design layout</i> of equipment.			
20.	<b>Smoke Control or Exhaust System</b> - <i>control equipment location</i> .			

## 780CMR – 901.2.1 Tier Two Process

Approves the commencement of the installation of  
Fire protection systems

Page 15 of Construction Control Document and page 8 of Fire Protection  
Narrative must be sign by Building Department also Fire Department  
Before any fire protection commencement begins

Tier Two is the process by which the Building Department and  
Fire Department approves the commencement of the installation of fire  
protection systems

To All Contractors:

### **FIRE DEPARTMENT CONSTRUCTION AND TIER 2 REQUIRED DOCUMENTS**

For Plan Review, Approval to Install and Rough Inspections

- Two (2) Copies of all required Tier II documents shall be submitted in separate, marked packets to the Fire Department and the Building Department, respectively, for all required and non-required Fire Protection/Detection Systems.

- All documents shall be submitted prior to receiving an Authorization of Commencement to Install, as depicted in the Building Packet, page 8, Construction Control Document or page 15 of the Fire Protection Narrative
- **Fee Schedule: Fire Alarm Systems (Residential and Commercial) \$50.00 per Unit. One Unit=one apartment, one condo, one commercial tenant space. Sprinkler System-\$100.00**

The fee shall accompany the Fire Departmentrequired document packet, in the form of a check, made out to the Town of Grafton. This check shall be separate from, and in addition to, any Building Department fees.

- All required documents are to be submitted as a package. Partial submittals will not be accepted.
- Required documents are also needed for modifications, alterations, additions or deletions of an existing system.

**If a Fire Department pre-construction conference is needed, contact the Fire Department business office.**

