



THE MAGAZINE OF EFFECTIVE COMPARTMENTATION

# Life Safety

## DIGEST

WINTER 2018

Fire Resistance Terminology

Fire-Resistance-Rated Assemblies-  
Loading of Horizontal Assemblies & Columns

Project FAIL-SAFE

Fire Code Requirements and "Inventory"

# FIRE CODE REQUIREMENTS AND "INVENTORY"

Once a building has been properly D-Designed, the structure has been built and products have been I-Installed, and become systems, and then the project has been I-Inspected and accepted, then what happens?

That's when the building takes on a life of its own. New mechanical, electrical, plumbing, communications, doors, windows, and other types of services are demanded by occupants. And, the piping, cables and ductwork that carry the services need to be installed from the source point to the occupant locations, meaning through walls, floors, and ceilings.

As new services are installed in buildings, the fire-resistance rated assemblies - both horizontal floors and vertical walls - are breached, so the piping, ductwork and communications, etc. can find their way to the service location. When fire-resistance rated assemblies are breached, they need to be repaired.



**Open breaches happen.**  
Pro-Firestop Photo

This brings us to the premise of this article - M-Maintenance - that completes the proper D-Design, I-Installation, I-Inspection and M-Maintenance of fire resistance. This keeps building occupant safety through reliable fire resistance.

What responsibility does the Building Owner and Manager have to keep the sprinkler system working for the building life-cycle? What about the alarm system that notifies the occupants of fire or emergency? A Building Owner and Manager keeps on top of these two key fire- and life-safety building systems because it's what Facility Managers do.

What about the responsibility for maintaining the third and fourth elements of fire- and life-safety - The Fire-Resistance Rated and smoke resistant assemblies, such as effective compartmentation and structural fire resistance? What about the egress system and education of the egress system users? Does the Building Owner and Manager have responsibility for any of these?



**Breaches made for penetrating items. Some are not pretty.**  
Pro-Firestop Photo

YES, is the answer. The effective compartmentation and structural fire resistance are key elements of the fire- and life-safety plans for a building. They are the 'silent policemen' that rest or stay dormant until fire or smoke starts in an area. The effective compartmentation and structural fire resistance resist the spread of fire or smoke 'to and from adjacent spaces', fire-compartment



**Even when warning stickers exist, (on pipe), services breach firestops.**  
Pro-Firestop Photo

to fire compartment and to and from buildings.

The egress system needs to be obvious and intuitive for the building occupants - and it needs to be known. That's why there should be education and drills for building occupants to support the egress designs.



**NFPA 1 states that improper installation is the building owner's responsibility.  
Specialty Firestop Services Photo.**

For years, the Fire Codes - The International Fire Code (IFC), NFPA 1, The Fire Code, and NFPA 101, The Life Safety Code - have had very specific language about maintaining effective compartmentation and structural fire resistance to the level of protection that the building was originally constructed.

The Building and Fire Codes speak clearly to the specifier and designer. The Building Code wants the construction documents to communicate a process to build the effective compartmentation and structural fire resistance correctly. The Fire Codes are usually thought to be for only new construction.

Since Fire Codes are retroactive codes, meaning buildings need to comply at new construction and during the building life-cycle, they require that the Specifier and Designer communicate Fire Code needs at new construction. And, the Fire Code dictates that there be documentation.

The documentation required for the Building Owner and Manager to keep on top of the fire resistance in the structure is called an "Inventory". The "Inventory" of fire-resistance rated assemblies is a new term that's in the Fire Code. The Building Owner and Manager really needs the inventory of "as built systems" as it's used to base their recordkeeping of existing fire resistance - which means build it right, document it right - so it can be maintained right.

To get maintenance Fire Code compliance, the fire-resistance rated assemblies must be built properly. To build correctly, we need to define 'fire resistance', state the fire-resistance ratings, and communicate how they are determined properly to the contractors through the Construction Documents including project manual and drawings. Check out the article in this issue about language from the International Building Code (IBC), Chapter 7 on Fire Resistance.

## MAINTENANCE OF FIRE RESISTANCE

Maintenance of Fire Resistance is required by the Fire Codes - The International Fire Code, NFPA 1, The Fire Code, and NFPA 101, The Life Safety Code. **NFPA 101, The Life Safety Code** has a requirement in Chapter 4 for maintaining fire resistance. The underline and italics are for emphasis only.

**4.6.12 Maintenance, Inspection, and Testing.**  
**4.6.12.1** Whenever or wherever any device, equipment, system, condition, arrangement, level of protection, fire resistive construction, or any other feature is required for compliance with the provisions of this Code, such device, equipment, system, condition, arrangement, level of protection, fire-resistive construction, or other feature *shall thereafter be continuously maintained...* in accordance with applicable NFPA requirements ....  
[NFPA 101:4.6.12.1, emphasis added]

Continuous maintenance means something. It means that the Building Owner and Manager has a responsibility to assure that the fire resistance is continuously maintained to protect people in buildings. This ensures safe 'defend in place' and/or egress.

Then, NFPA 101 clearly directs the Building Owner and Manager to have the fire resistance inspected, maintained and tested under the supervision of a responsible person at specified intervals. The specified intervals are in NFPA 80 and NFPA 105 for fire and smoke dampers, NFPA 80 for fire doors and fire rated glazing.

NFPA 221 has requirements for the assemblies. Maintenance direction is also found in other documents such as Manufacturers' maintenance instructions. This is for all fire-resistance rated assemblies and the features of fire resistance including firestopping, fire dampers, fire rated glazing, rolling and swinging fire doors.



**Fire doors keep areas safe. Door Security & Safety Foundation of the DHI Photo**

4.6.12.5 Maintenance, inspection, and testing shall be performed under the supervision of a responsible person who shall ensure that testing, inspection, and maintenance are made at specified intervals in accordance with applicable NFPA standards or as directed by the AHJ. [NFPA 101:4.6.12.5, emphasis added]

NFPA 1 - The Fire Code - has very specific language speaking to the Building Owner in many ways. NFPA 1 directs the Building Owner and Manager to care for the fire resistance in a very specific way. Maintain the fire resistance integrity all the time.

12.3.3.1 Required fire-resistive construction, including fire barriers, fire walls, exterior walls due to location on property, fire-resistive requirements based on type of construction, draftstop partitions, and roof coverings, shall be maintained and shall be properly repaired, restored, or replaced where damaged, altered, breached, penetrated, removed, or improperly installed. [NFPA 1, 12.3.1, emphasis added]

Take note that roof coverings, and improper installation - original and ongoing - are included in NFPA 1.

Why roof coverings? Roof coverings are part of a fire-resistance rated assembly. If a roof covering is replaced with materials that are not part of the listing for the roof assembly, it negates the fire resistance rating.



**Roof Coverings matter when part of the fire-resistance rated assembly. Waukegan Roofing Photo**

The Improper Installation puts responsibility on the Building Owner and Manager to know the building has been built correctly. This is speaking loudly that fire-resistance rated assemblies and their features of fire resistance all need to be installed to the listing and manufacturers installation instructions.

Continuing, the NFPA 1 adds that the Building Owner and Manager maintain the fire resistance using a listed repair system or materials and methods equaling the original permitted construction. The NFPA 1 even adds that when patching fire rated gypsum wallboard, it needs to be in a specific method:

12.3.3.2 Where required, fire-rated gypsum wallboard walls or ceilings that are damaged to the extent that through openings exist, the damaged gypsum wallboard shall be replaced or returned to the required level of fire resistance using a listed repair system or using materials and methods equivalent to the original construction.

The NFPA 1 does give guidance on intervals for inspecting fire-resistance rated assemblies. While it says three years, the language above states that the fire-resistance ratings need to be maintained continuously.

12.3.3.3 Where readily accessible, required fire-resistance rated assemblies in high-rise buildings shall be visually inspected for integrity at least once every 3 years. [NFPA 1, 12.3.2, 12.3.3, emphasis added]

This section below assigns more responsibility for training for those who inspect the fire-resistance rated assemblies to the Building Owner. It means that they can't send just anyone to inspect their fire resistance. The document requires people with technical knowledge and experience in fire resistance-rated design AND construction.

12.3.3.3.1 The person responsible for conducting the visual inspection shall demonstrate appropriate technical knowledge and experience in fire-resistance-rated design and construction acceptable to the AHJ.

In the section below, reporting and documentation is mentioned. The report is what the Building Owner and Manager will show to the Fire Marshal who is inspecting for code compliance and to the Insurance Company for risk reduction.

12.3.3.3.2 A written report prepared by the person responsible for conducting the visual inspection shall be submitted to the AHJ documenting the results of the visual inspection. [NFPA 1, 12.3.3.1, 12.3.3.2, emphasis added]

The International Fire Code has very specific language that has existed for quite some time about maintaining fire resistance in buildings.

The 2015 version of the International Fire Code requires similar language to that which we saw in the NFPA 1, Chapter 12 in 703.1. Here's what the 2015 International Fire Code says:

**703.1 Maintenance.** The required fire-resistance rating of fire-resistance-rated construction, including, but not limited to, walls, firestops, shaft

enclosures, partitions, *smoke barriers*, floors, fire-resistive coatings and sprayed fire-resistant materials applied to structural members and fire-resistant joint systems, shall be maintained. Such elements **shall be visually inspected by the owner annually and properly repaired, restored or replaced where damaged, altered, breached or penetrated**. Records of inspections and repairs shall be maintained...

[2015 International Fire Code, 703.1, emphasis added]

Note that there needs to be a visual inspection performed annually on the fire-resistance rated assemblies and the features of fire resistance - firestopping, fire doors, fire dampers, fire rated glazing. That's more frequent than is required by NFPA 1, The Fire Code. Then, the bolded words in the 2015 International Fire Code are very similar to the NFPA 1 Chapter 12's direction to the Building Owner.

The fire resistance shall be "...restored or replaced where damaged, altered, breached or penetrated..."; and records are required. Further, 703.1 continues that the assemblies do not need to be visually inspected if there is no access, such as a hatch, access door, or ceiling tile. For those assemblies hidden by hard ceilings without access through a panel, it assumes that the installation was correct originally and that the assembly has not been altered, breached, or penetrated.

In the International Code Council's code development process for the 2018 version of the International Fire Code, there was a reorganization that was debated and APPROVED.

The International Code Council's Fire Code Action Committee (FCAC), led by Michael O'Brian, Brighton (MI) Fire Department with task group leader Howard Hopper from UL and a team of interested parties, had numerous meetings about the reorganization.

The task group effort separated the fire resistance section of the Fire Code into specific sections for each fire resistance discipline. This brings attention to them both individually and as a complete package to clarify the requirements for Building Owners and Managers.

## 2018 INTERNATIONAL FIRE CODE

The Scope of the new 2018 International Fire Code 701.1 and 701.2, says it well.

**701.1 Scope.** The provisions of this chapter shall govern the **inspection and maintenance of the materials, systems and assemblies used for structural fire resistance, fire-resistance rated construction separation of adjacent spaces** and construction installed to resist the passage of smoke to safeguard against the spread of fire and smoke within a building and the spread of fire to or from buildings. New buildings shall comply

with the *International Building Code*.

[IFC 701.1 2018, emphasis added]

Then, section 701.2 then describes the barriers and structural members to be protected.

### 701.2 Fire-Resistance Rated Construction

#### Structural Members

Exterior Walls

Fire Walls, Fire Barriers, Fire Partitions

Horizontal Assemblies

Shaft Enclosures

The rest of the section 701 - the charging language for the section - keeps the requirements stated in 703.1 of the 2015 edition and adds one important concept. It adds that there needs to be an 'inventory' kept of the fire resistance.

**701.6 Owner's responsibility.** The owner shall maintain an inventory of all required fire-resistance-rated and smoke resistant construction, and the construction included in Sections 703 through 707 and such construction shall be visually inspected by the **owner annually and properly repaired, restored or replaced where damaged, altered, breached or penetrated**. [IFC 701.1 2018, emphasis added]

NOTE: The underlined text is the new additional language about the inventory of fire-resistance required that became part of the 2018 IFC.

## WHAT'S AN "INVENTORY" OF FIRE RESISTANCE?

The fire resistance Inventory can be defined as key elements needed to maintain the fire-resistance rated assemblies and its features. The 'inventory' of fire resistance term came about due the term used in facilities already. Inventories are kept by Building Owners and Managers for everything from power cords to power taps, and more. It seemed to be a concept that would communicate well to Building Owners of all types.

## WHAT DOES THE INVENTORY CONSIST OF?

The first inventory item is the **Life Safety Drawings**. These drawings are required to know where the fire-resistance rated horizontal assemblies and fire-resistance rated or smoke resistant walls are located. It can be assumed that the supporting construction for fire barriers, smoke barriers and fire-walls is also fire-resistance rated, meaning the structural protection needs to be maintained. That's the Sprayed Fire Resistant Materials (SFRM), Intumescent Fire Resistant Materials (IFRM), wrap systems, wallboard enclosures, and Horizontal Assemblies.



**SFRM's Maintenance Patching is required for continuous fire-resistance maintenance.  
GCP Applied Technologies, Inc. Photo**

These items need to be visually inspected, repaired or replaced when damaged, in addition to the barriers and their features of fire resistance - firestops, fire dampers, fire rated glazing, fire doors.

The second inventory item is the Manufacturers' installation instructions. The Manufacturers' installation instructions are required for the Building Owner and Manager to know what materials were used to build the fire-resistance rated assembly, as well as the protection of breaches. For fire dampers, the listings are incorporated into the Manufacturers' installation instructions. The manufacturers maintenance and repair instructions also need to be part of this inventory item.

The third key inventory element is the Listings. This is stated in many of the sections of the International Building Code. The listings are also stated as required to install the products to become systems - in the code. What are the listings?

There are listings for fire-resistance rated wall and floor assemblies, fire rated glazing, firestopping, fire dampers, and much more. Listings can be found at [www.UL.com](http://www.UL.com); [www.ApprovalGuide.com](http://www.ApprovalGuide.com); [www.Intertek.com](http://www.Intertek.com). For those in the Middle East, listings can be found at [www.bell-wright.com](http://www.bell-wright.com) in addition to the UL, FM and Intertek sites.

The components list the inventory of fire resistance assemblies and the features of fire resistance required for the Building Owner and Manager to maintain the passive fire protection package. The Building Owner and Manager needs the life safety drawings, Manufacturers' installation and maintenance instructions, and the listings to comply with the NFPA 1, NFPA 101, and International Fire Codes.

Therefore, the Specifier needs to communicate through the construction documents that the inventory be gathered by the General Contractor and passed on to the Building Owner and Manager. Watch for an article in the next issue of Life Safety Digest focusing on how the specifier can communicate to the building owner

and manager through the contractors using Division 1 - 01-78-39, Project Record Documents and the individual sections.

That's how these important inventory items are communicated to the building owner and manager. This inventory sets up the maintenance activities that need to comply with the Fire Codes.

## **WHY IS FIRE-RESISTANCE MAINTENANCE IMPORTANT?**

The safety record for buildings is related to the performance of the fire resistance, sprinkler, detection and alarm, egress systems, as well as the education of the occupants.

Fire resistance - and sprinklers, detection and alarms, egress systems - need to work when called upon by fire. Holes can be made in the assemblies and fire resistive material scraped off structural elements. Sprinkler or detection and alarm systems can be turned off too. While sprinklers might extinguish fires, they are designed to control them and limit size development in one area. Should two areas have fires, and put demand on the system, what happens? The alarm system needs to activate. If it doesn't, the building is now defending people in the place they are using fire-resistance features that make an egress system -- to protect them.

Thankfully, fires occur very infrequently in buildings. But when they do, we want everything to work. That's why the NFPA 1, The Fire Code, NFPA 101, the Life Safety Code, and the International Fire Code have a lot of direction to the Building Owner and Manager on the subject, and the message is clear: Maintain continuous fire-resistance.

We at FCIA - and with others - hope to help Building Owners and Managers through education about this critical component of the Total Fire Protection Package - fire resistance.

Staying on top of maintaining the fire resistance inventory, egress education, sprinklers, alarm/detection systems - means the Building Owner and Manager might just save a life - or many lives. 🔥

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