

Differences Between the IBC and NFPA101 and Guidelines for Proper Firestop Inspections

Aaron Miller, CFPS
Vice President



39th Annual FPC Seminar + Expo

Seminar Objectives

The objectives of this presentation is to review the similarities and differences between the latest International Building Code (IBC) and the NFPA 101 (Life Safety Code). Reviewing areas within the two major codes organizations, we will focus on key elements that will help guide the IBC and NFPA differences.

Then the focus will be on the proper guidelines for firestop inspection based on the IFC inspector guidelines for through penetrations, fire resistive joints, and perimeter fire barrier systems. The goal will be a better understanding of the proper techniques for firestop inspections and reviews.

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The logo for the International Building Code (IBC), featuring the letters 'IBC' in a large, bold, white sans-serif font. Below the letters, in a smaller font, is the text 'A Member of the International Code Family™'. The background is dark with a subtle geometric pattern.

INTERNATIONAL
BUILDING CODE®

ICC and NFPA

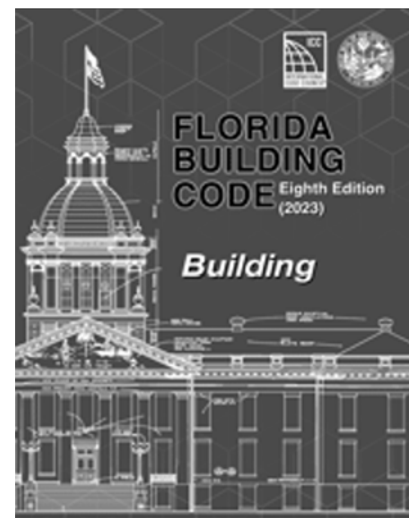
- The American Society for Health Care Engineering has been working to unify the codes, standards and other regulations that apply to health care facilities.

The logo for NFPA 01 Safety Code, featuring the number '01' in a large, bold, white sans-serif font. Below the number, in a smaller font, is the text 'Safety Code'. The background is a grayscale image of a modern glass skyscraper.

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ICC and NFPA

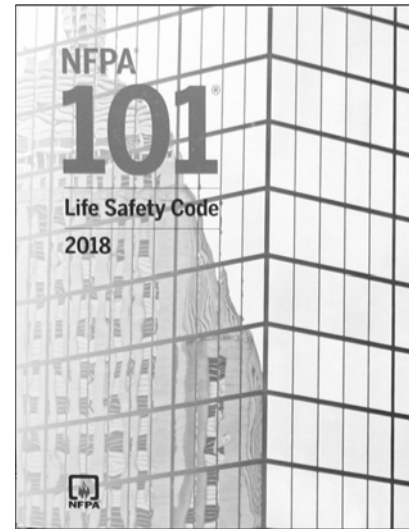
- The International Building Code (IBC) is developed and produced by the International Code Council (ICC) along with International Fire Code (IFC) and other codes such as plumbing, electrical, etc. The ICC updates codes every three years.
- Currently Florida is using 7th Edition 2020 Florida Building Code: Building with an effective date of December 31st, 2023, for the Eighth Edition (2023) update to the Florida Building Code: Building.



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ICC and NFPA

- The National Fire Protection Association (NFPA) codes and standards produces the NFPA 101, NFPA 99, Health Care Facilities Code, etc. Most of the NFPA codes and standards are on a 3-year cycle, though some extend to a four- or five-year cycle.
- Florida currently uses the 2020 FFPC, 7th edition based on the NFPA 101, 2018.



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NFPA 101

- The NFPA addresses fire, means of egress and features of fire protection to hazardous materials emergencies, injuries from falls, and emergency communications. NFPA 101 addresses minimum building design, construction, operation, and maintenance requirements necessary to protect building occupants from danger caused by fire, smoke, and toxic fumes.
- The NFPA 101 does not specifically include requirements for property protection.
- NFPA 101 applies to both new and existing conditions. The existing chapters of the NFPA 101 apply to established buildings and establish a minimum level of safety for a given occupancy.
- NFPA 101 establishes operating conditions for buildings after being occupied.
- The NFPA 101 requires minimum construction type, rated separations, interior finishes, means of egress, fire alarm and suppression systems.
- NFPA 101 does not create a separate classification for areas that have high hazardous materials. Regardless of the occupancy there are provisions for high – hazard areas and subclassifications such as storage/industrial and further requirements can be found within the occupancy chapter.
- NFPA 101 has requirements for special construction and high-rise buildings that have specific code regulations that modify the base occupancy.

Source NFPA.org

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IBC

- The International Building Code (IBC) is an essential tool to preserve public health and safety that provides safeguards from hazards associated with the built environment.
- The IBC applies to new construction, alterations, additions and renovations.
- The IBC requires minimum construction type, rated separations, interior finishes, means of egress, fire alarm and suppression systems, safety glazing, ventilation, wind, flood and earthquake requirements.
- The IBC establishes conditions on when a building is ready for completion and occupancy.
- The IBC contains separate occupancy classifications for areas or spaces that manufacture, process, store, or create high-hazardous materials that are present or in significant quantities.
- The IBC includes occupancy classifications for utility and miscellaneous.
- The IBC has requirements for special construction and high-rise buildings that have specific code regulations that modify the base occupancy.
- The IBC references the NFPA 99 for medical gas.

Source ICCsafe.org

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NFPA 101/IBC Classification

NFPA 101 and 5000 Occupancy Classification	IBC Occupancy Classification
Assembly	Assembly (Divided into subcategories A-1, A-2, A-3, A-4, A-5)
Ambulatory Health Care (4 or more patients being treated –incapable of self preservation due to treatment-anesthesia-injury/illness)	Business
Educational (Prior to 2021-24 months or older – 30 months or older)	Educational
Day Care (two main categories children and adult services)	Educational or Institutional (Children under 24 months and adults – institutional) (1-exception is childcare facility with more than 5 but less than 100 clients 2 ½ years or younger located on a level of exit discharge) (I-4)
Health Care	Institutional (Divided into subcategories I-1, I-2, I-3, I-4)
Detention and Correctional	Institutional (Divided into subcategories I-1, I-2, I-3, I-4)
Residential Board and Care	Institutional or Residential (I-1), R-3, R-4 Depends on the number of occupants –if they are receiving personal care
One- and Two-Family Dwelling	Residential (Divided into subcategories R-1, R-2, R-3, R-4)
Lodging or Rooming House	Residential (Divided into subcategories R-1, R-2, R-3, R-4) Depends on Number of Occupants
Hotels and Dormitory	Residential (Divided into subcategories R-1, R-2, R-3, R-4) Depends on nature of the occupants.
Apartment	Residential (Divided into subcategories R-1, R-2, R-3, R-4)
Mercantile	Mercantile
Business	Business
Industrial	Factory and Industrial (Divided into subcategories F-1, F-2)
Storage	Storage (Divided into subcategories S-1, S-2)
No Equivalent Classification	High Hazard (Divided into subcategories H-1, H-2, H-3, H-4, H-5)
No Equivalent Classification	Utility and Miscellaneous

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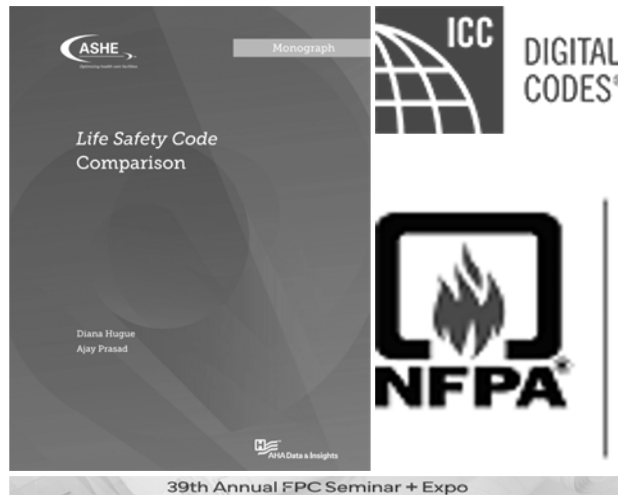
Differences Between the IBC and NFPA 101

	IBC	NFPA
Suites	<ul style="list-style-type: none"> • Intervening rooms limited to three doors. • Maximum 100' travel distance within suite (can be increased to 125' with smoke detection). 	<ul style="list-style-type: none"> • Hazardous suites (1-hour rated and smoke detection) • No limit to intervening rooms. • Maximum 100-foot travel distance within suite.
Corridors	<ul style="list-style-type: none"> • Must be continuous to the exits and be separated from other areas in accordance with Section 407.3 except as provided in Sections 407.2.1-407.2.4. 	<ul style="list-style-type: none"> • Corridors shall be separated from all other areas by partitions complying with 18.3.6.2 through 18.3.6.5 unless otherwise permitted.
Corridor Walls	Corridor walls in hospitals are constructed as smoke partitions.	<ul style="list-style-type: none"> • Must limit the transfer of smoke.
Dead End Corridors	<ul style="list-style-type: none"> • 20' 	<ul style="list-style-type: none"> • 30'
Storage Rooms (50 and 100 ft ² of combustible material)	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Smoke partitions and doors provided with door closing devices, (18.3.2.1.3)
Storage rooms (more than 100 sq ft of combustible material)	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • 1-hr fire barrier, ¾-hr doors with closers, (18.3.2.1.2)
Elevator Lobbies	<ul style="list-style-type: none"> • Required in hospitals 4 stories or more, IBC 3006.2 	<ul style="list-style-type: none"> • Required if used for occupant evacuation. Ever floor served by the elevator shall have an elevator lobby and form a 1-hr barrier in accordance with 8.5.
Generator Rooms	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Emergency Power: 1-hr separation and 2-hr fuel supply, (7.2.3.12)
Central/bulk laundries (more than 100 sq. ft)	<ul style="list-style-type: none"> • 1-hr or provide automatic fire sprinkler system. 	<ul style="list-style-type: none"> • 1-hour fire barrier, ¾-hr doors with closers.
Shaft Ratings	<ul style="list-style-type: none"> • 2-hour fire barrier (4 or more stories) • 1-hour fire barrier (if floor penetrated is NR or 1-hr rated, otherwise 2-hr). 	<ul style="list-style-type: none"> • 2-hour fire barrier (4 or more stories) • 1-hour fire barrier.
1-500 Occupants	<ul style="list-style-type: none"> • 2 Exits (Table 3006.3.2) 	<ul style="list-style-type: none"> • 3 Exits (7.4.1.1)
Exits in each Smoke Compartment	<ul style="list-style-type: none"> • Based on occupant load and travel distance. Travel distance not to exceed 200' from smoke barrier to barrier door. Independent egress required without recovery into smoke compartment per 407.2.2. 	<ul style="list-style-type: none"> • Access to 2 exits
Panic Hardware	<ul style="list-style-type: none"> • Assembly/Education occupancy – 50 plus 	<ul style="list-style-type: none"> • Assembly/Education occupancy – 50 plus
High Rise Provisions	<ul style="list-style-type: none"> • Minimum Construction type. • Seismic Considerations. • Structural integrity of interior exit stairways and elevator hoist way enclosures. • Bond strength of sprayed fire-resistant material. • Automatic sprinkler system. • Emergency systems. • Emergency voice/alarm communication system. • Emergency responder radio coverage. • Fire Command Center. • Smoke removal (post-fire salvage and overhaul ops) • Standby and emergency power. • Fuel line piping protection. • Stairway communication system. • Smokeproof enclosures. • Luminous egress path markings. 	<ul style="list-style-type: none"> • Automatic sprinkler protections. • Voice command system. • Smokeproof enclosures.
Building Construction Type (Area/Height)	<ul style="list-style-type: none"> • Based on height and area – Type IA construction required for building more than five stories. 	<ul style="list-style-type: none"> • Based on number of stories – maximum required is Type II (equal to IBC type 1B)

Source ASHE LIFE SAFETY COMPARISON MONOGRAPH 2018

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Comparisons
Resources



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Firestop Maintenance

- Currently in both the ICC and NFPA Codes and Standards:
- 2018 IFC –
- Section 701.5/701.6/701.7 – Address maintain protection and the owner's responsibility. These include an inventory of all required fire-resistance rated construction. This construction shall be visually inspected by the owner annually and properly repaired/replaced. Records of repairs and maintenance shall be maintained. Unsafe conditions are required to be repaired.
- 703.1/704.1 – Covers maintaining of through penetrations and joints.
- NFPA 101-
- 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. Maintenance shall be provided in accordance with applicable NFPA requirements or requirements developed as part of a performance-based design, or as directed by the authority having jurisdiction.
- 2021 Code 703.2/704.2 – Will include changes to the IFC Class Outline for repair of penetrations, joints, and voids.
- 2021 CODE 708.1 – Will include changes to the IFC Class Outline for Maintenance of fireproofing.

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Firestop Inspections

The IBC requires that fire resistance ratings of floors, walls, ceilings and roofs, or fire rated ducts enclosures must be restored when an opening is made to accommodate MEP penetrations. Joints between walls, floors and floors and walls, must have the same resistance ratings as the adjacent construction.

NFPA 101 (Life Safety Code), NFPA 70, the International Mechanical Code, and the International Plumbing Code include provisions for the protection of penetrations. The codes require inspection of the systems before they are concealed.

The IFC has requirements for periodic inspection of firestop systems throughout the life of the building.

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Major Elements of Quality Firestop Inspections



- Walk through visual inspections should be made at the rough and final inspections.
- Firestop Systems shall not be concealed from view before the inspection and approved (IBC 110.3.6).
- Destructive evaluation will be made on various types of firestop systems if necessary or required.
- Construction documents with locations and systems (firestop systems from third party agencies or engineering judgments) must be kept onsite to assist in the inspection.
- Proper material depths, annular space, attachment, spacing and product type are critical to the effectiveness of the system.
- Measure the depth and width of materials as indicated in the details (sometimes density measurements are also required for products as thermal insulation).
- Compare the installed firestop system with the approved submitted details.

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Penetration Firestop Systems



Step One: Confirm that the submitted drawings reference an applicable tested system/EJ for the through penetration or membrane penetration.

Step Two: Confirm that the penetration system being used had been tested for the construction assembly penetrated and meets the hourly rating.

Step Three: Verify that the parameters indicated in the system meet the field install.

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Penetration Overview

1. Does the rating of the penetration system equal or greater than the assembly penetrated?
2. Does the field install match the tested listed system/EJ ?
3. Opening Size?
4. Does the penetrant match the system size, material, diameter, thickness, insulation, cable sizes, spacing, percent fill, bundle size?
5. Annular Space?
6. Does it require forming, bracing, backing material?
7. Required sealant or coating depth, proper material.
8. Any anchors, fasteners, securing items , plates, etc. required.



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Fire Resistive Joint Systems



Step One: Confirm that the submitted drawings reference an applicable tested system/EJ for the listed fire resistive joint.

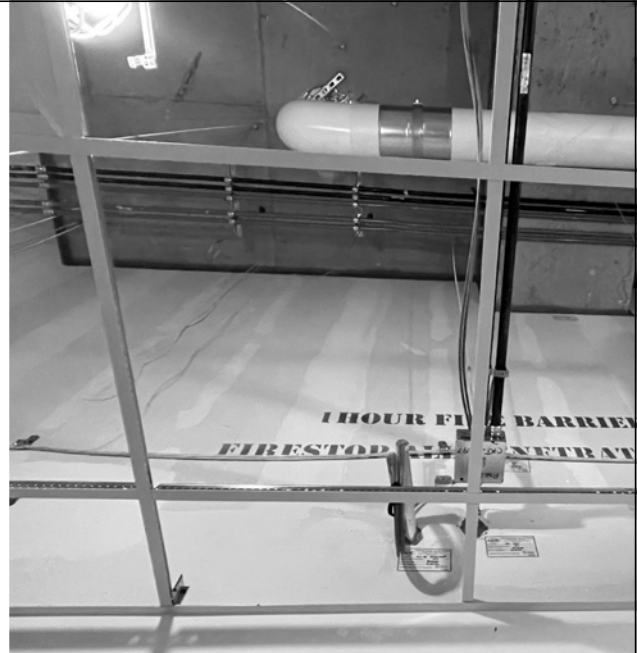
Step Two: Confirm that the tested and listed systems meet the movement requirements.

Step Three: Verify that the rating of the joint system is equal to the required rating of the assembly and matches the construction joint assemblies and that the parameters in the listed system meet the install.

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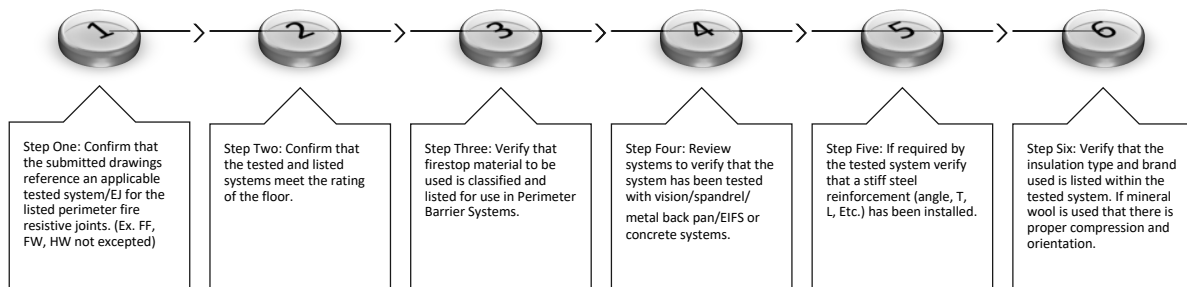
Joint Systems Overview

1. Is the joint system tested and listed?
2. Is the installed system correct for the assembly joints?
3. Does the installed system meet the movement required?
4. Is the joint installed within the tested system min/max size?
5. What is the required forming, packing or backing material?
6. Specified sealant, coating or device?
7. Specified cover plates, bond breaker tape, deflection track if required?



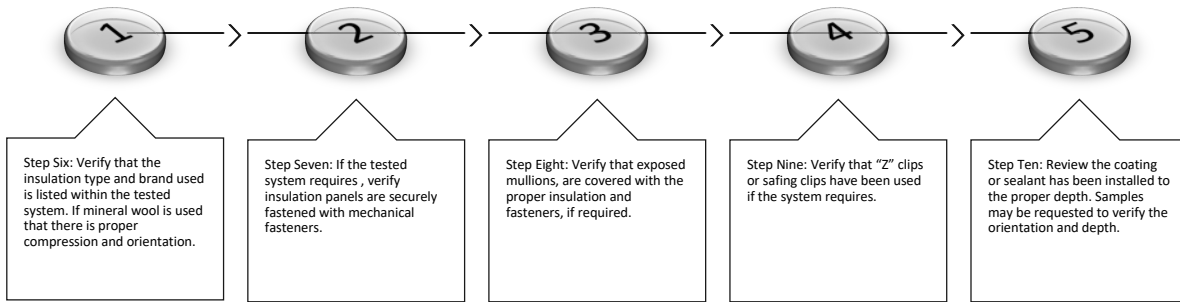
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Perimeter Fire Barrier Systems

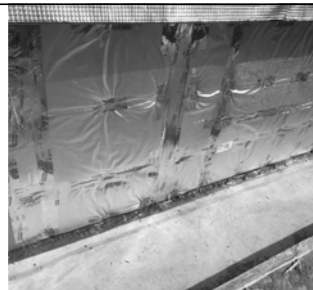


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Perimeter Fire Barrier Systems



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Perimeter Systems Overview

1. Is the perimeter fire barrier system tested and listed and match the assembly?
2. Is the tested system equal to the floor rating?
3. Does the installed system follow the listing.
4. Is the joint gap installed within the tested system min/max size?
5. Does the design allow for vision glass or mullions at floor level – if applicable.
6. Does the insulation meet the type, thickness, density, etc..?
7. Are their required spandrel perimeter angles.
8. Required framing/mullion covers.
9. Support clips if required.
10. Safing type, compression, depth, etc.
11. Listed system material sealant, coating or device.

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Inspections Require Tested/Listed Systems or EJ's

IBC -1705.18.1 Penetration firestops. Inspections of penetration firestop systems that are tested and listed in accordance with Sections 714.4.1.2 and 714.5.1.2 shall be conducted by an approved inspection agency in accordance with ASTM E 2174.

1705.18.2 Fire-resistant joint systems. Inspection of fire-resistant joint systems that are tested and listed in accordance with Sections 715.3.1 and 715.4 shall be conducted by an approved inspection agency in accordance with ASTM E 2393.



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Inspection Process



- Statistical sampling
- Verify materials prior to installation
- Verify against listed systems and/or EJs
- Verify that ALL firestops installed

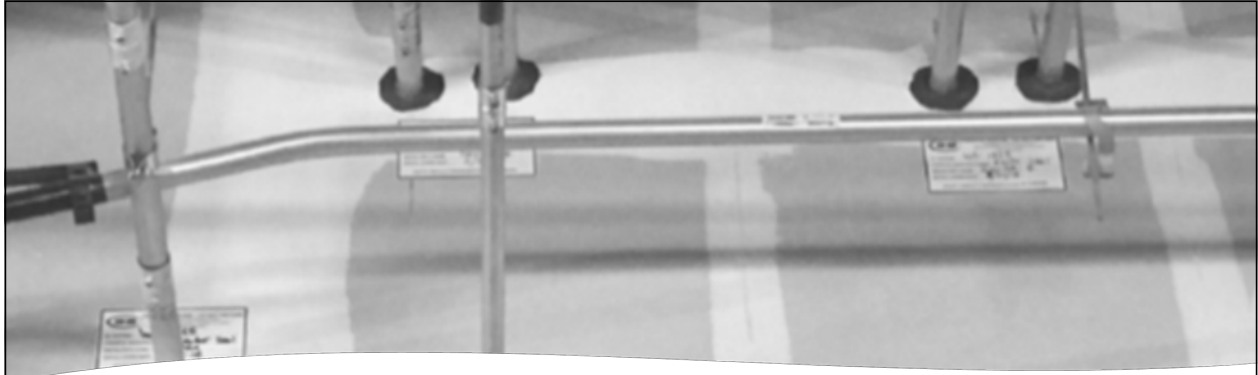
ASTM E2174: *Standard Practice for On-Site Inspection of Installed Fire Stops*

- For each "type" of firestop being installed:
 - Witness 10% of Installations, or
 - Destructive Testing on 2% of Installations

ASTM E2393, *Standard Practice for On-Site Inspection of Installed Fire Resistant Joint Systems and Perimeter Fire Barriers*

- For each "type" of fire resistant joint system being installed:
 - Witness 5% of linear feet being installed, or
 - Destructive (or disassembly) testing on 1 ft. per every 500 ft. *IFC 2018

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Properly Tooled Penetrations

- The Firestop sealant must be well bonded to penetrating item and surrounding wall or floor
- Should always inspect both sides
- If Collars are used seal at the wall and proper tabs

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Material Shrinkage



IFC NOTE:

1. Nothing mandates shrinkage testing for firestop sealants – many sealants do not publish value.
2. When inspecting installed firestop and a physical sample is taken, measure the depth of sealant at the bond line to verify original installed sealant depth due to shrinkage that will occur typically in the center of the sample

- Understand some sealants may shrink when installed
- Listing always reports wet sealant thickness
- % shrinkage, if available, is in firestop product listing card – Fill, Void, or Cavity Materials
- ASTM C1241 shrinkage test

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Resources



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Questions



Source IFC 2018

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