Basics and Fine Points of Fire, Smoke, and Combination Fire/Smoke Dampers

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  - IAPMO UMC TC

Outline

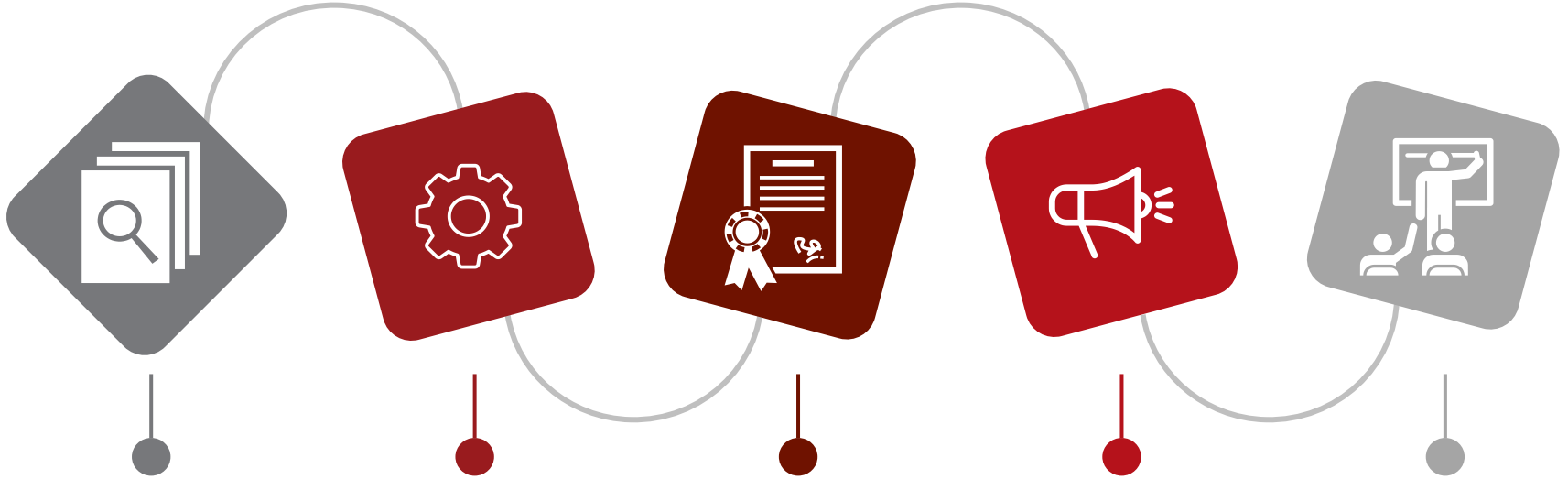
- Introductions
- Basics of Fire and Smoke Barriers
  - Definitions
  - System Descriptions
- Fine Points of Fire and Smoke Barriers
  - Design Considerations
  - Recent Code Developments
- Resources
- Q&A

Learning Objectives

At the end of this presentation, you will be able to:

1. Understand the different types of passive fire and smoke protection.
2. Explain the code requirements for access to fire and smoke dampers.
3. Identify the frequency at which fire and smoke dampers are required to be inspected and tested.
4. Identify recent code developments in NFPA 80 and NFPA 105.

AMCA's Value Chain



Fire and Smoke Barrier Basics

Definitions - Fire

Fire Barrier

- A fire-resistance-rated wall assembly of materials designed to restrict the spread of fire in which continuity is maintained.

Fire Damper

- A listed device installed in ducts and air transfer openings designed to close automatically upon detection of heat and resist the passage of flame

Fire Partition

- A vertical assembly of materials designed to restrict the spread of fire in which openings are protected.

Fire Wall

- A fire-resistance-rated wall having protected openings, which restricts the spread of fire and extends continuously from the foundation to or through the roof.

Definitions - Smoke

Smoke Barrier

- A continuous membrane, vertical or horizontal, such as a wall, floor or ceiling assembly, designed and constructed to restrict the movement of smoke

Smoke Damper

- A listed device installed in ducts and air transfer openings designed to resist the passage of smoke. The device is installed to operate automatically, controlled by a smoke detection system.

Combination Fire/Smoke Damper

- Close automatically upon the detection of heat and resist passage of flame and smoke.

Smoke Partition

- A wall assembly that extends from the top of the foundation or floor below to the underside of the floor or roof sheathing, deck or slab above or to the underside of the ceiling above to limit the transfer of smoke.

Essential Requirements

- Required fire-resistance rating
- Continuity
- Openings and penetrations
- Types of materials
- Structural robustness

Codes & Standards

Codes – Typically Adopted and Enforced state by state

IBC – International Building

IFC – International Fire Code

Standards - Provide guidance and are adopted in the codes

NFPA 80 – Standard for Fire Doors and Other Opening Protectives

- Regulates the installation and maintenance of assemblies and devices to protect opening in walls, floors, and ceilings against spread of fire and smoke within, into, or out of buildings.

NFPA 105 – Standard for Smoke Door Assemblies and Other Opening Protectives

- Prescribes minimum requirements for smoke door assemblies for use in providing safety to life and protection of property from smoke.

Fire and Smoke Barrier Fine Points

Damper Standards

ANSI/UL 555 – Standard for Fire Dampers

- Installed in the wall
- Fire Resistance Rating
  - 1.5 hour and 3 hour

ANSI/UL 555S – Standard for Smoke Dampers

- Installed to prevent smoke migration in HVAC system

UL 555C – Standard for Ceiling Dampers

- Tested as part of a rated assembly

ANSI/AMCA 500-D – Standard for Laboratory Methods of Testing Dampers for Rating

Smoke and Fire Dampers - Access

- Access required to permit inspection and testing.
- Access points shall be permanently identified.

Dynamic vs Static Systems

Fire dampers are classified for use in either dynamic or static systems

- Dynamic Systems
  - Continues to operate during a fire
- Static Systems
  - Automatically shuts down in the event of a fire

Smoke and Fire Dampers – Inspection and Testing

Fire Dampers

- Acceptance test
- One year after installation
- Every four years thereafter, except for hospitals which is every six years

Smoke Dampers

- Acceptance test
- One year after installation
- Every four years thereafter, except for hospitals which is every six years

Fire Barriers

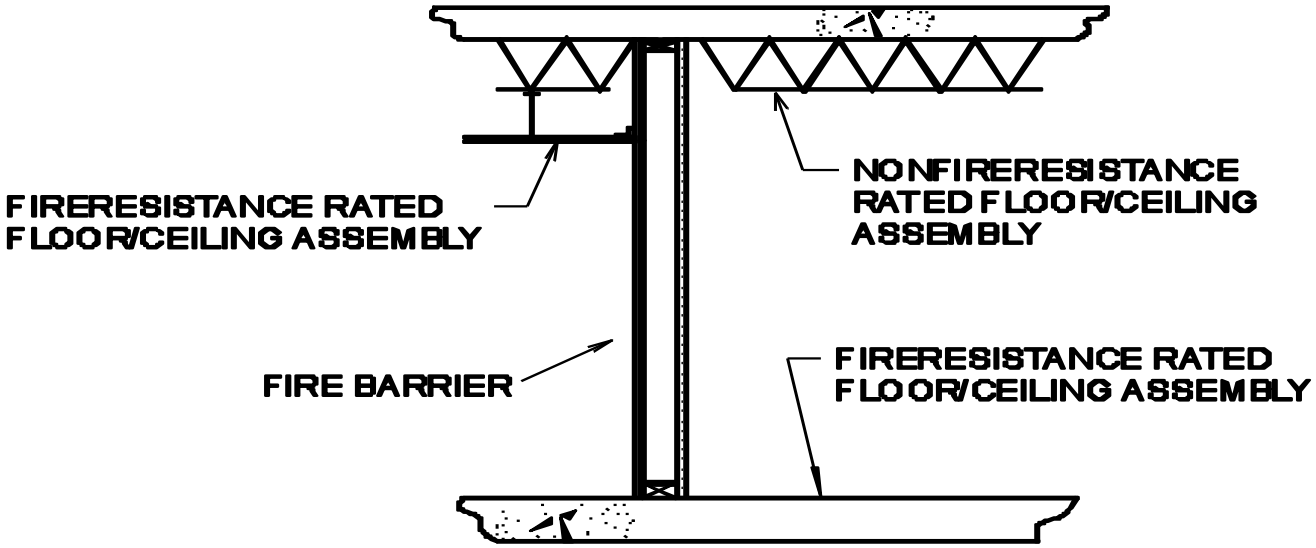
Fire barriers are used in the following applications:

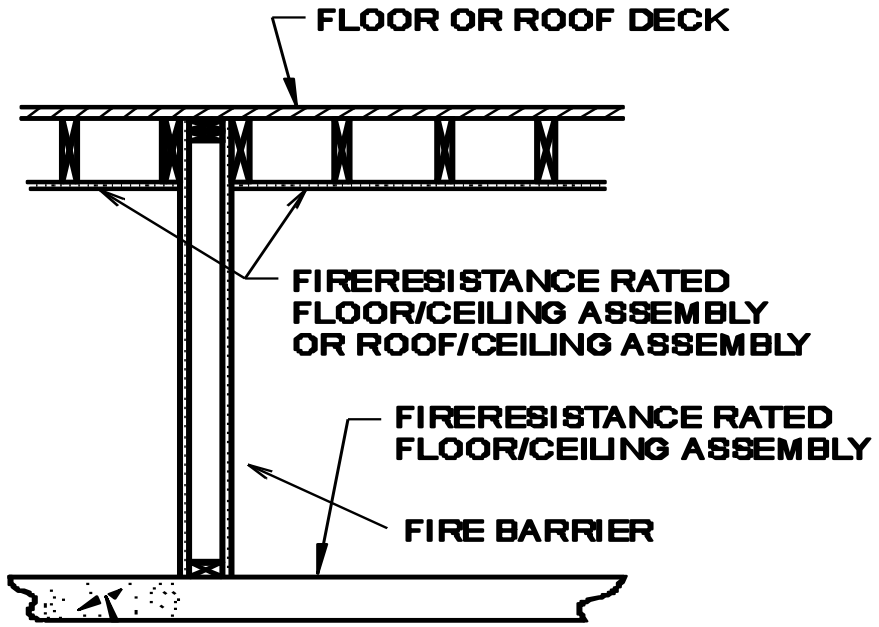
- Fire area separations
- Mixed occupancy separations
- Incidental use areas
- Hazardous area separations
- Exit enclosures – openings and penetrations restricted
- Shaft enclosures
- Horizontal exits
  - IBC – smoke damper required
  - NFPA – restricts duct penetrations
- Corridor walls – **NFPA only**

Summary of Fire Barriers

Issue	Requirement
Required Fire-Resistance Rating	Depends upon specific use
Required continuity	Floor/ceiling below to deck above
Openings	General: Aggregate glazing area (or width) <25% wall area/length; maximum size 120 sf. **Specific: Rules based on use of barrier**
Dampers	Depends on Code, application, and fire resistance rating

Continuity


FIRERESISTANCE RATED
FLOOR/CEILING ASSEMBLY
NONFIRERESISTANCE
RATED FLOOR/CEILING
ASSEMBLY
FIRE BARRIER
FIRERESISTANCE RATED
FLOOR/CEILING ASSEMBLY


FLOOR OR ROOF DECK
FIRERESISTANCE RATED
FLOOR/CEILING ASSEMBLY
OR ROOF/CEILING ASSEMBLY
FIRERESISTANCE RATED
FLOOR/CEILING ASSEMBLY
FIRE BARRIER

Fire Partitions

Fire partitions are used in the following applications:

- Dwelling unit separations
- Sleeping units in Group R-1, R-2 and I-1
- Tenant separation in covered malls
- Exit access corridor walls
- Elevator lobby separation

Remember, NFPA does not use this phrase

Summary of Fire Partitions

Issue	Requirement
Required Fire-Resistance Rating	1 hour, with exceptions, depending on use. For corridors see Table in Chapter 10 – IBC only
Required continuity	Floor/ceiling below to deck above or tight to underside of fire-resistance rated assembly. Supported by fire-resistance rated construction, except in corridors, tenant, and guestroom separations in Types IIIB and VB construction
Openings	20 minutes (w/o hose stream) for corridors 45 minutes for all others
Dampers	Required but exceptions generally apply

Smoke Barriers

Smoke barriers are used in the following applications:

- Group I-2
- Group I-3
- Areas or refuge
- Other specific applications

Summary of Smoke Barriers

Issue	Requirement
Required Fire-Resistance Rating	1-hour with the exception that a construction of a minimum 0.1" thick steel in Group I-3 buildings is allowed
Required continuity	Horizontal: Outside wall to outside wall Vertical: Floor to slab or deck above, continuous through interstitial spaces Supporting construction may be required based upon the applicable codes
Openings	20 minutes – but not a true fire door Smoke- and draft-controlled doors tested in accordance with UL 1784 – one edition of the IBC
Dampers	Smoke dampers required although exception for health care

Smoke Partitions

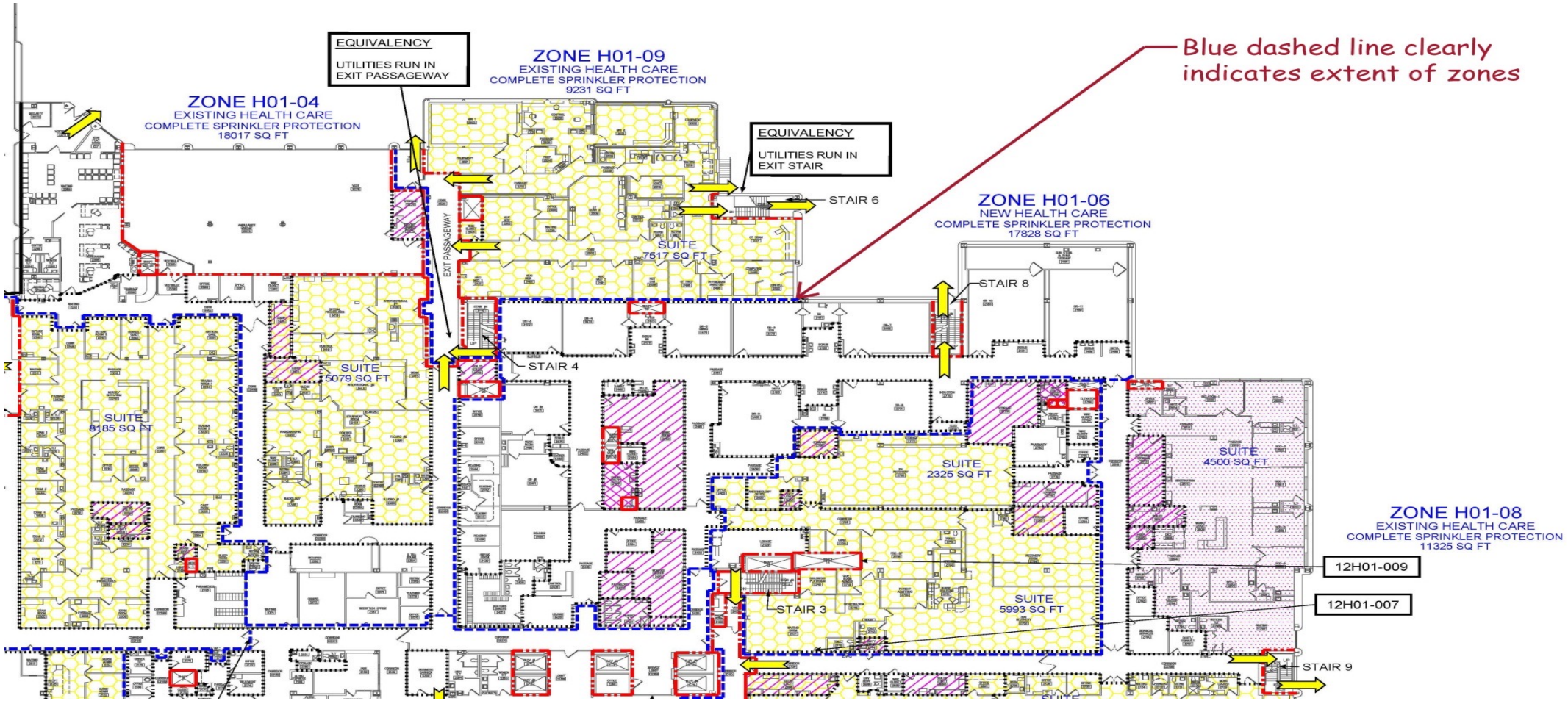
Smoke partitions are used in the following applications:

- Corridor walls in Group I-2 – IBC only
- Sprinkler protected hazardous areas – NFPA

Summary of Smoke Partitions

Issue	Requirements
Required Fire-Resistance Rating	Not required (unless otherwise required)
Required continuity	Floor/ceiling below to deck above or tight to underside of ceiling membrane in ceiling membrane designed to limit passage of smoke - Difference between NFPA/ICC for ceiling tiles
Openings	Windows: Sealed to resist free passage of smoke Doors: No louvers Self closing, or automatic closing by smoke detectors
Dampers	Smoke dampers required in air transfer openings

Drawing Information




WARNING
FIRE-RATED BAR
PENETRATION BY PERMIT ON
WARNING

Special Considerations

Smoke control systems – Alternative protection shall be used if damper will interfere with operation of the system.

Hazardous exhaust ducts

- Comply with the mechanical code
- Dampers typically prohibited

New Developments - Instructions

- **NFPA 80 and NFPA 105 – 2019 Editions**

19.2.2* – For new damper installations, the damper manufacturer's installation and maintenance instructions shall be maintained on site.

A.19.2.2 – In order to verify a damper has been properly installed in accordance with the manufacturers' listing, such as a damper with a retaining angle on one side only, it is necessary to have this information onsite.

New Developments

- NFPA 80 and NFPA 105 – 2019 Editions recognize remote inspection

19.5.2.3.3.1 General

(A) Dampers inspected remotely shall be designed with the ability to A damper with remote inspection capability shall positively indicate when the damper is fully open and fully closed.

(B) Prior to using, the initial remote inspection shall include a visual inspection of the installed damper shall be performed damper in accordance with 19.5.2.3.2 .

(C) The visual inspection shall confirm that the position indication method accurately reflects the full-open and full-closed position of the damper.

New Developments

19.5.2.3.3.2 Test Procedure

(A) A signal from the damper's position indication device to shall confirm that the damper is in the full-open or full-closed position as required by the system design.

(B) The damper shall be commanded and confirmed to the full-closed or full-open position.

(C) The damper shall be confirmed to the original operating position as required by the system design.

(D) If the remote inspection fails to comply with 19.5.2.3.3.2(A) through 19.5.2.3.3.2(C) , a visual inspection shall be performed in accordance with 19.5.2.3.2.

New Developments – IBC 2021 Edition

- 717.4 Access, identification and periodic inspection and testing of fire and smoke dampers shall comply with Sections 717.4.1 through 717.4.3.
- 717.4.1 Access. Fire and smoke dampers shall be provided with an approved means of access that is large enough to permit inspection and maintenance of the damper and its operating parts. Dampers equipped with fusible links, internal operators, or both shall be provided with an access door that is not less than 12 inches square or provided with a removable duct section
- 717.4.1.1 The access shall not affect the integrity of fire-resistance-rated assemblies. The access openings shall not reduce the fire-resistance rating of the assembly. Access doors in ducts shall be tight fitting and suitable for the required duct construction.
- **717.4.1.2 Restricted Access. Where space constraints or physical barriers restrict access to a damper for periodic inspection and testing, the damper shall be a single- or multi-blade type damper and shall comply with the remote inspection requirements of NFPA 80 or NFPA 105.**
- 717.4.2 Identification. (No Change)
- **717.4.3 Periodic inspection and testing. Periodic inspection and testing of fire dampers shall be in accordance with NFPA 80. Periodic inspection and testing of smoke dampers shall be in accordance with NFPA 105. Periodic inspection and testing of combination fire/smoke dampers shall be in accordance with NFPA 80 and NFPA 105.**

AMCA Resources

- AMCA International: *www.amca.org*
- AMCA Publications & Standards: *www.amca.org/store.*
- Other AMCA web pages for webinars, papers, etc. on many other topics: *www.amca.org/educate*

Questions?

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