2018 International Building Code Overview

- Life Safety Damper Section 717

AMCA *insite* ™ Webinar Series | AMCA International | www.amca.org

Scott Arnold

Content Manager, AMCA International

Webinar Moderator

- Joined AMCA in 2017
- Leads development and publication of technical articles, white papers and educational materials.
- Editor-in-chief of the award-winning *AMCA inmotion* magazine.

amca INTERNATIONAL

WWW.AMCA.ORG/CARES

MAY 14, 2020

Wear red. Post a selfie. Make a pledge.

#AMCACares, #HVACChallenge, #MSF

TODAY'S WEBINAR SPONSOR

POTTORFF®

www.pottorff.com

Mark Saunders – Pottorff VP of Sales and Marketing

- Member of the AMCA Code Action and Review Committee since 2012, including three terms as Chairman.
- Member of the AMCA Statistical Program Committee.
- Associate member of ASHRAE.

Introductions & Guidelines

- Participation Guidelines:
  - Audience will be muted during the webinar.
  - Questions can be submitted anytime via the GoToWebinar platform and will be addressed at the end of the presentation.
  - Reminder: This webinar is being recorded!
  - To earn PDH credit for today, please stay clicked onto the webinar **for the entire hour**.
  - A post-webinar evaluation will be emailed to everyone within one day, and it must be completed to qualify for today's PDH credit.
  - Every person that wants to receive PDH credit must be individually registered. If people are watching in a group and want credit, please contact Lisa Cherney (*lcherney@amca.org*) for a group sign-in sheet.

Q & A

To submit questions:

- From the attendee panel on the side of the screen, select the "Questions" drop down option.
- Type your question in the box, starting with the name of the presenter for whom your question is for.
- Click "Send".

AMCA International has met the standards and requirements of the Registered Continuing Education Program. Credit earned on completion of this program will be reported to RCEP at RCEP.net. A certificate of completion will be issued to each participant. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the RCEP.

Attendance for the entire presentation AND a completed evaluation are required for PDH credit to be issued.

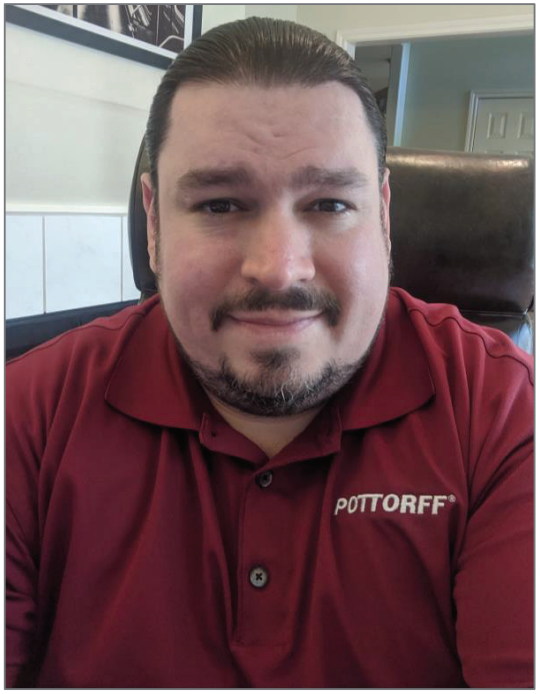
ENGINEERING RCEP
REGISTERED CONTINUING EDUCATION PROGRAM

COPYRIGHT MATERIALS

James Carlin

Product Manager- Dampers, AMCA Member company

- BA in Mechanical Engineering, Stevens Institute of Technology
- Experience with air control dampers since 2007
- Background in aerospace industry and with UL



2018 International Building Code Overview

Purpose and Learning Objectives

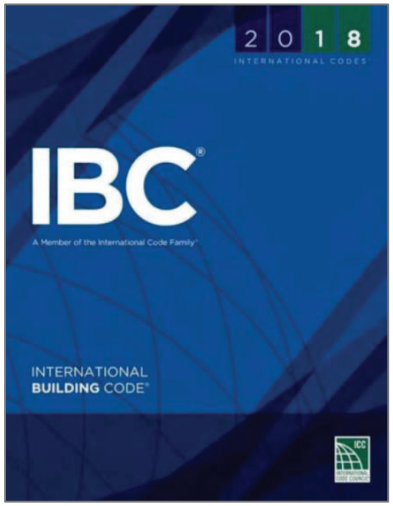
The purpose of this presentation is to inform industry professionals about the requirements for protecting duct penetrations in fire and smoke rated barriers outlined in Section 717 of the 2018 International Building Code.

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

1. Identify the different types of fire and smoke rated barriers.
2. Outline the code requirements for fire damper and smoke damper actuation.
3. Explain the minimum code requirements for protecting duct penetrations of these barriers.
4. Describe the ramifications of not using fire or smoke dampers to protect rated barriers.

AGENDA

- **Code Development Process**
- **Damper Ratings and Actuation**
- **Damper Requirements by Assembly Type**
  - Overview
  - Fire Walls
  - Fire Barriers, Horizontal Exits, Shaft Enclosures
  - Fire Partitions, Corridors
  - Smoke Barriers, Smoke Partitions
  - Exterior Walls
  - Through Penetrations, Ceiling Membrane Penetrations



International Building Code Overview

Legacy Codes

- ICBO, BOCA, & SBCCI
- 1994 - Join together to form the *International Code Council* (ICC)

3-Year Adoption Cycle

- Proposals, Hearings, Amendments, Adoption
- First Edition = 1997 IBC
- Current Code = 2018 IBC

Philosophy = Layered Protection Working in Unison

- Passive (rated walls/dampers) **AND** Active (sprinklers/smoke control)
- Fire and Smoke containment

Life Safety Dampers - Damper Ratings

717.3.1 - Ceiling Radiation Dampers

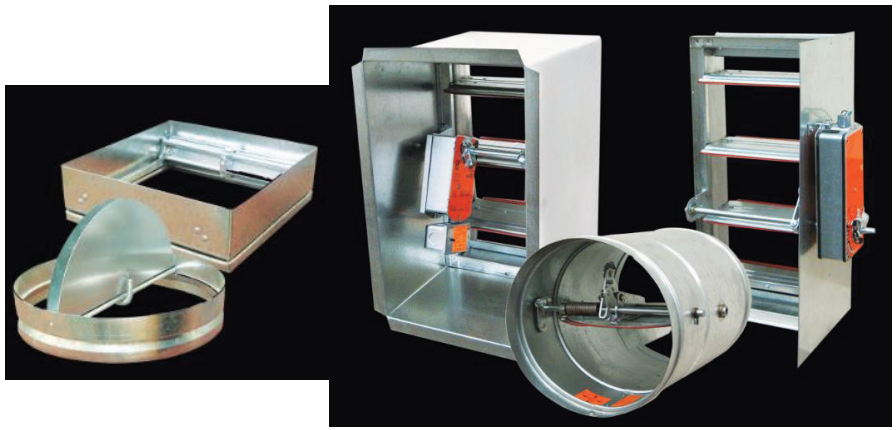
- UL-555C
- Fire rating to match assembly fire rating
- Dynamic rating required for fans-on during fire

717.3.2.1 - Fire Dampers

- UL-555
- 1-1/2 Hour (assemblies < 3hr)
- 3 Hour (assemblies ≥ 3hr)
- Dynamic rating required for fans-on during fire

717.3.2.2 - Smoke Dampers

- UL-555S
- Class-1 or Class-2, 250°F (min)



717.3.2.3 - Fire/Smoke Dampers

- Meet fire & smoke damper requirements

717.3.2.4 - Corridor Dampers

- UL-555 & UL-555-S
- 1 Hour rated
- Class-1 or Class-2, 250°F (min)

Life Safety Dampers:
717.3.3.1 - Fire Damper Actuation

System	Minimum Temperature	Maximum Temperature	Recommendations
Smoke Control	160°F	350°F	**Specify: 250°F single temperature link for all fire/smoke dampers** *STOP specifying Dual Temperature Resettable Links* 1. Simplicity – Smoke control without override cycle … then fire containment 2. Lower cost – Eliminates override wiring and added controls sequencing 3. Improved safety – Steady smoke containment pressure (no override cycle) Note: Specify 350°F when active smoke control systems requires it
All Others	160°F	Normal duct temp + 50°F (Typically 165°F)	**Specify: 212°F links on fire dampers when duct temperature ≥ 130°F** 1. Eliminates nuisance closure

Life Safety Dampers:
717.3.3.2 - Smoke Damper Actuation

The smoke damper shall close upon actuation of a listed smoke detector installed in accordance with 907.3 and one of the following:

1. Duct mounted smoke detector installed within 5 feet of the damper.
2. **Spot-type detector** where a damper is installed **above smoke barrier doors**.
3. **Spot-type detector** installed **within 5 feet of an unducted damper**.
4. Where a damper is installed in **a corridor** wall or ceiling, the damper shall be permitted to be controlled by a **smoke detection system installed in the corridor**.
5. **Smoke detector system** installed in all areas served by duct in which the damper is installed.

Life Safety Dampers - Requirements by Assembly Type

IBC Section	Assembly Type	Typical Rating	Function	Required Protection
717.5.1	Fire Wall (706)	3 hr	Continuous wall from foundation to/thru roof and won't collapse if the structure on either side collapses in fire.	Fire Damper
717.5.2	Fire Barrier (707)	2 hr	Occupancy separations, incidental use areas, shaft enclosures, exit enclosures, exit passageways, horizontal exits, exterior walls.	Fire/Smoke Damper
717.5.1.1 717.5.2.1	Horizontal Exits (1026)	2 hr	Means of egress.	Fire/Smoke Damper
717.5.3	Shaft Enclosure (713)	2 hr	Extending through one or more stories in a building, connecting vertical openings in successive floors / roof.	Fire/Smoke Damper
717.5.4	Fire Partition (708)	1 hr	Walls separating dwelling units or tenant spaces in covered malls, corridor walls, elevator lobby separations.	Fire Damper
717.5.4.1	Corridor (1020)	1 hr	An enclosed exit access component that defines and provides a path of egress travel.	Fire/Smoke Damper Radiation/Smoke Damper
717.5.5	Smoke Barrier (709)	1 hr	Bisects floors of underground buildings and patient floors of a hospital, hospital egress & areas of refuge.	Smoke Damper
717.5.6	Exterior Walls (705)	2 hr	Bearing or nonbearing walls used to enclose a building.	Fire Damper
717.5.7	Smoke Partition (710)	0	Corridor and care-suite walls in Group I-2, Certain elevator lobbies	Smoke Damper
717.6.1	Horizontal Through Penetration	2 hr	Through penetrations of horizontal assemblies (floors or roof assemblies).	Shaft Enclosure Fire Damper
717.6.2	Ceiling Membrane Penetration (711)	1 hr	Penetrations of ceiling membrane of floor/ceiling or roof/ceiling assembly.	Ceiling Radiation Damper

Life Safety Dampers: 717.5.1 - Fire Walls

Continuous wall from foundation to/thru roof and won't collapse if the structure on either side collapses in fire. Commonly 3-hour rated.

Minimum Requirements	Recommendations
Fire Damper No Exceptions	**Fire Damper** No Exceptions

Life Safety Dampers: 717.5.2 - Fire Barriers

Occupancy separations, incidental use areas, shaft enclosures, exit enclosures, exit passageways, horizontal exits, exterior walls. Commonly 2-hour rated.

Minimum Requirements	Recommendations
Fire Damper Exceptions: 1. ASTM E119 without Fire Damper - *None exist* 2. Use of Fire Damper will interfere with 909 smoke control system. *Valid, but only with a **mechanical** (fans on during a fire) 909 smoke control systems.* 3. Fully sprinklered building per 903.1, non-H occupancy, ≤ 1 Hr rated, 26ga ducted supply and return (grille to HVAC unit) *Risky. Ignores heat radiation on unexposed side and duct breech from falling debris during fire.*	**Fire/Smoke Damper** Exceptions: 1. Use a Smoke Damper instead of Fire/Smoke Damper when a closed Fire Damper would disable 909 active smoke control systems. *Valid, but only with a **mechanical** (fans on during a fire) 909 smoke control systems.* *Fire Barriers are critical life-safety assemblies that isolate occupants, protect egress, and segment the building and as such protecting against fire and smoke spread thru the duct is essential.*

Life Safety Dampers:
717.5.1.1 & 717.5.1.2 - Horizontal Exits

A passage through, or around, a fire barrier to an area of refuge that affords safety from fire and smoke, thus affording those not capable of self-preservation a means to “exit” to a designated “safe area” within the building. Commonly 2-hour rated.

Minimum Requirements	Recommendations
Fire/Smoke Damper	**Fire/Smoke Damper**
Smoke Damper Exceptions 1. None Fire Damper Exceptions 1. Refer to assembly type (Fire Wall or Fire Barrier)	No Exceptions *Critical life-safety egress protection for defend-in-place occupants. Protect all penetrations against fire and smoke.* *Note: Given that a smoke damper is mandatory, the nominal cost add for a fire/smoke damper vs a smoke damper is well worth the addition of fire protection.*

Life Safety Dampers: 717.5.3 - Shaft Enclosure

Minimum Requirements	Recommendations
Fire/Smoke Damper Fire Damper Exceptions: 1. 22" subduct with continuous upward airflow to the outside *No testing or analysis to justify this as a valid tradeoff.* 2. ASTM E119 without Fire Damper *None exist and Smoke Damper required.* 3. Use of Fire Damper will interfere with 909 smoke control system. *Valid tradeoff for mechanical 909 system, but not valid for passive 909 system.* 4. Parking garage shaft separated from building shafts by ≥ 2hr rated construction. *Valid tradeoff.* Smoke Damper Exceptions: 1. Group B or R, 903.1.1 sprinklered throughout, toilet/bath exhaust, 22" subduct with continuous upward exhaust to the outside and standby power for fan per 909.11. *Valid tradeoff when using a high-temperature smoke exhaust fan.* 2. Parking garage shaft separated from building shafts by ≥ 2hr rated construction. *Risky. Smoke from high load fuel fire spreading to other subterranean garage levels* 3. Use of Smoke Damper will interfere with 909 mechanical smoke control system. *Risky. Hard to justify since Smoke Damper is integrated into smoke control system.* Fire/Smoke Damper Exceptions: 1. Kitchen and clothes dryer exhaust systems *Valid tradeoff due to risk of grease/lint fire in the duct.*	**Fire/Smoke Damper** Fire Damper Exceptions: 1. Use of Fire Damper will interfere with 909 smoke control system. *Valid tradeoff for mechanical 909 system (not for passive 909 system). Smoke damper still required.* 2. Parking garage shaft separated from building shafts by ≥ 2hr rated construction. *Valid tradeoff. Smoke damper still required.* Smoke Damper Exceptions: 1. Group B or R, 903.1.1 sprinklered throughout, toilet/bath, 22" subduct with continuous upward exhaust to the outside and standby power for fan per 909.11. *Valid tradeoff when using a high-temperature smoke exhaust fan.* Fire/Smoke Damper Exceptions: 1. Kitchen and clothes dryer exhaust systems *Valid tradeoff due to risk of grease/lint fire in the duct.* *Unprotected shaft openings allow stack effect, wind effect, and natural fire pressures to drive fire and smoke vertically (up and down) throughout the building.*

Life Safety Dampers: 717.5.4 - Fire Partitions

Walls separating dwelling units or tenant spaces in covered malls, corridor walls, elevator lobby separations. Commonly 1-hour rated.

Minimum Requirements	Recommendations
Fire Damper Exceptions: 1. Mall tenant partitions where walls aren't required to extend to the floor/roof above. *Valid, provided the rated wall stops at a non-rated ceiling.* 2. 26 ga duct, ≤ 100sq-in, installed above a ceiling, doesn't connect corridor to adjacent rooms or terminate at a rated wall, and has a 12" x 16 ga sleeve with 16 ga angles and mineral wool packing the annular space *Not financially viable.* 3. Fully sprinklered building per 903.1, ≤ 1 Hr rated, 26ga ducted supply and return (grille to HVAC unit) *Risky. Relies solely on one system. Ignores radiant heat on unexposed side and duct breech due to falling debris in a fire.*	**Fire Damper** Exceptions: 1. Mall tenant partitions where walls aren't required to extend to the floor/roof above. *Valid, provided the rated wall stops at a non-rated ceiling.*

Life Safety Dampers: 717.5.4.1
Corridors – Sidewall Only / Non-Rated Ceiling

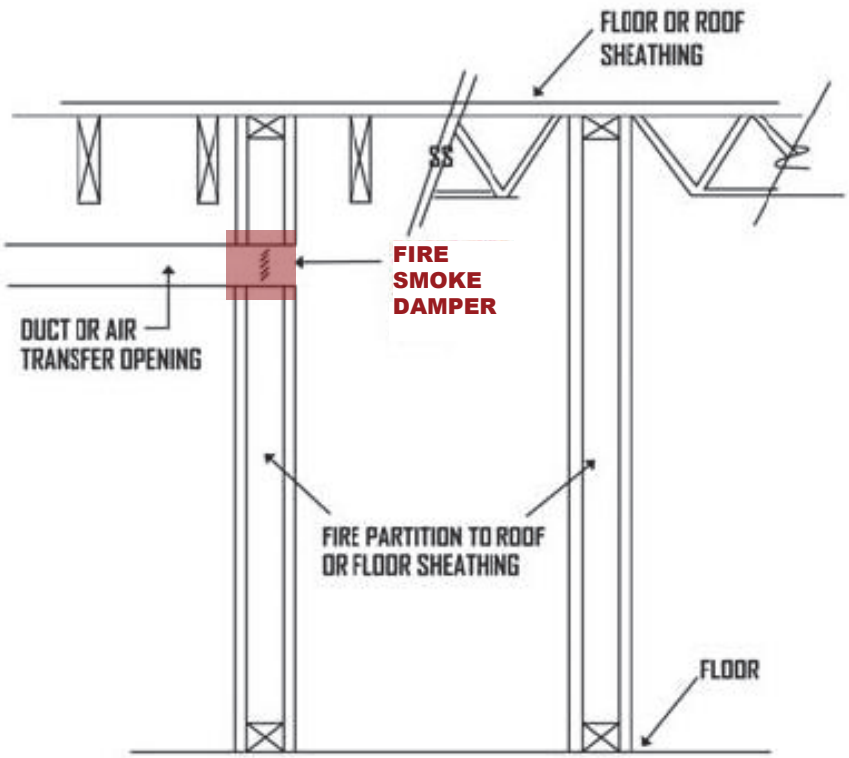


Figure 1 – Sidewall penetration

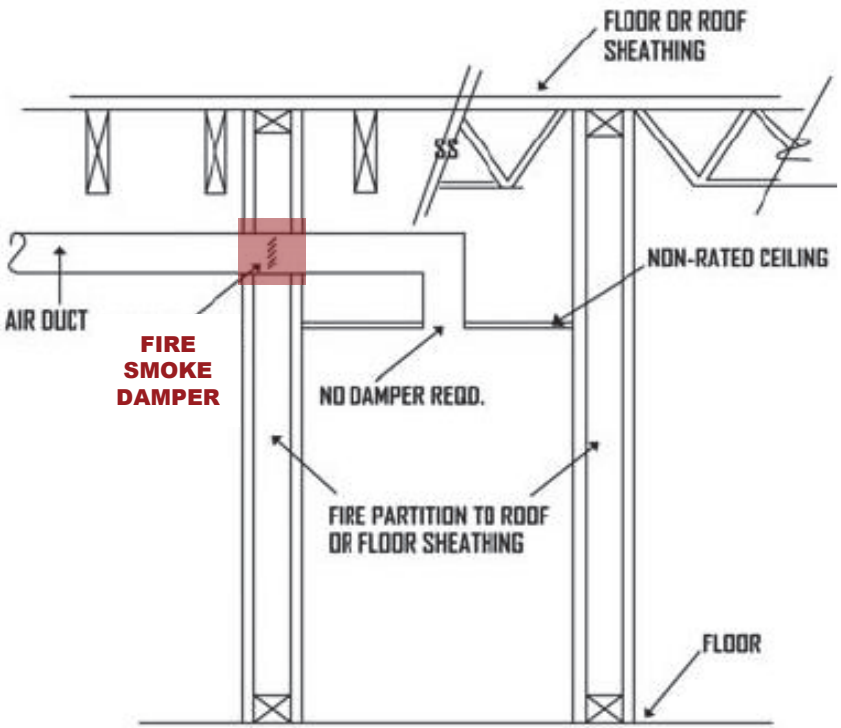


Figure 2 – Sidewall penetration with non-rated ceiling

Life Safety Dampers: 717.5.4.1
Corridors – Non-Rated Ceiling

An enclosed exit access component that defines and provides a path of egress travel with sidewall duct and a non-rated (no) ceiling. Commonly 1-hour rated.

Minimum Requirements	Recommendations
Fire/Smoke Damper Fire Damper Exceptions: 1. Fully sprinklered building per 903.1 and duct is protected with through penetration fire stop caulk per 714. *Risky. Relies solely on one system. Ignores radiant heat on unexposed side and duct breech due to falling debris in a fire.* Smoke Damper Exception: 1. Building is equipped throughout with approved 909 smoke control system and Smoke Damper is not necessary for operation of smoke control system. *Risky. Isolation of egress corridors is essential to life-safety.* 2. 26 ga duct system with no openings serving the corridor. *Risky. Ignores duct breech from falling debris during a fire.*	**Fire/Smoke Damper** Fire Damper Exceptions: 1. None Smoke Damper Exception: 1. Building is equipped throughout with approved 909 smoke control system and Smoke Damper is not necessary for operation of smoke control system. *Valid, but only when the smoke damper **will interfere** with a **mechanical** (fans on during a fire) 909 systems .* ***NOT** valid for passive (fans off during fire) 909 system.*

Life Safety Dampers: 717.5.4.1
Corridors – Rated Ceiling

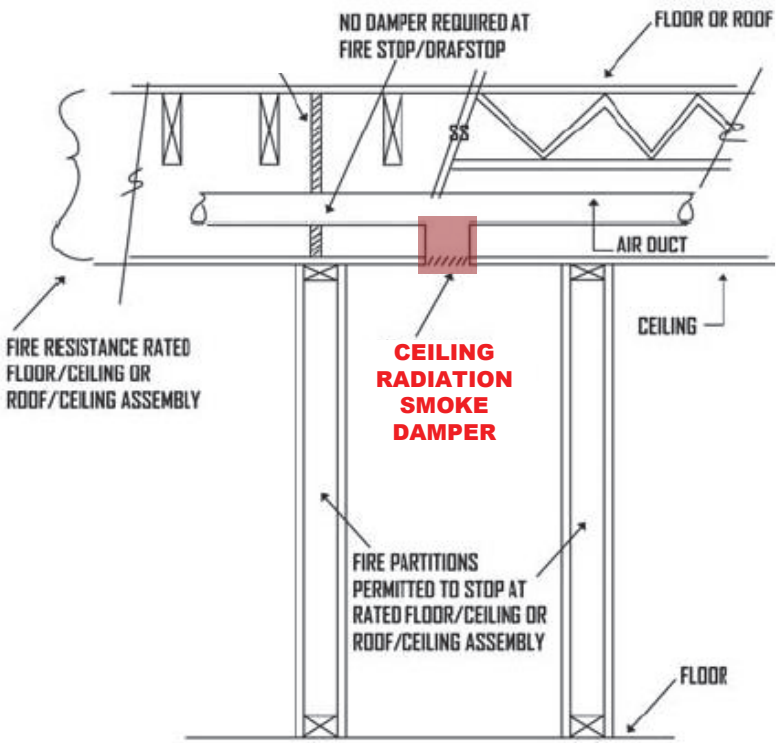


Figure 3 – Rated walls terminate at floor/ceiling or roof/ceiling assembly

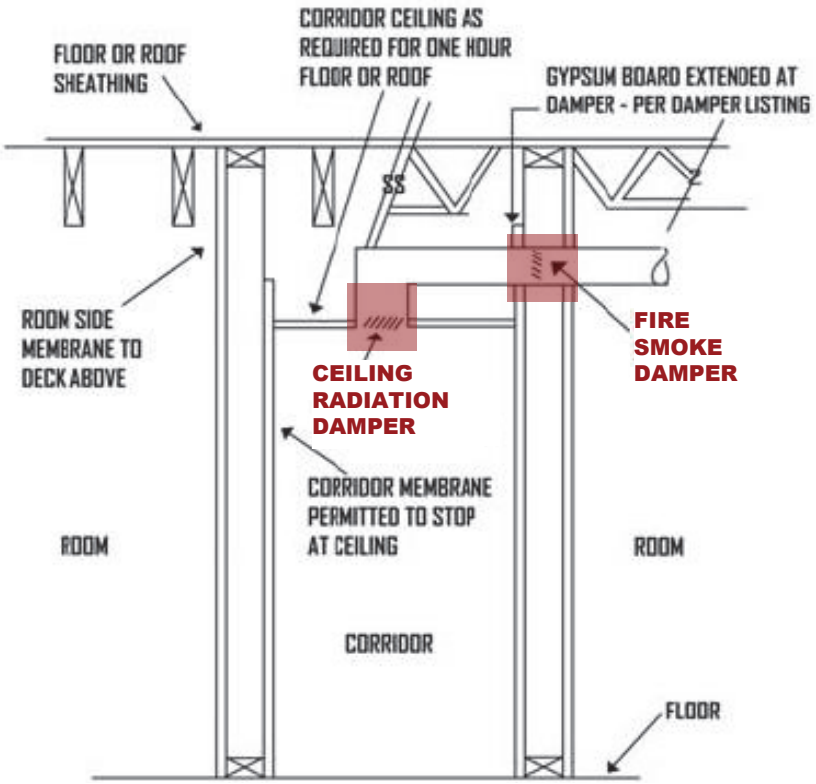


Figure 4 – Sidewall penetration with rated ceiling

Life Safety Dampers: 717.5.4.1
Corridors – Rated Ceiling

An enclosed exit access component that defines and provides a path of egress travel with a fire-rate ceiling. Commonly 1-hour rated.

Minimum Requirements	Recommendations
Radiation/Fire/Smoke Damper Ceiling Radiation Damper Exceptions: 1. None Smoke Damper Exception: 1. Building is equipped throughout with approved 909 smoke control system and Smoke Damper is not necessary for operation of smoke control system. *Risky. Isolation of egress corridors is essential to life-safety.* 2. 26 ga duct system with no openings serving the corridor. *Risky. Ignores duct breech from falling debris during a fire.*	**Radiation/Fire/Smoke Damper** Ceiling Radiation Damper Exceptions: 1. None Smoke Damper Exception: 1. Building is equipped throughout with approved 909 smoke control system and Smoke Damper is not necessary for operation of smoke control system. *Valid, but only when the smoke damper **will interfere** with a **mechanical** (fans on during a fire) 909 systems.* ***NOT** Valid for passive (fans off during fire) 909 system.*

Life Safety Dampers: 717.5.4.1
Corridors – Tunnel-Type

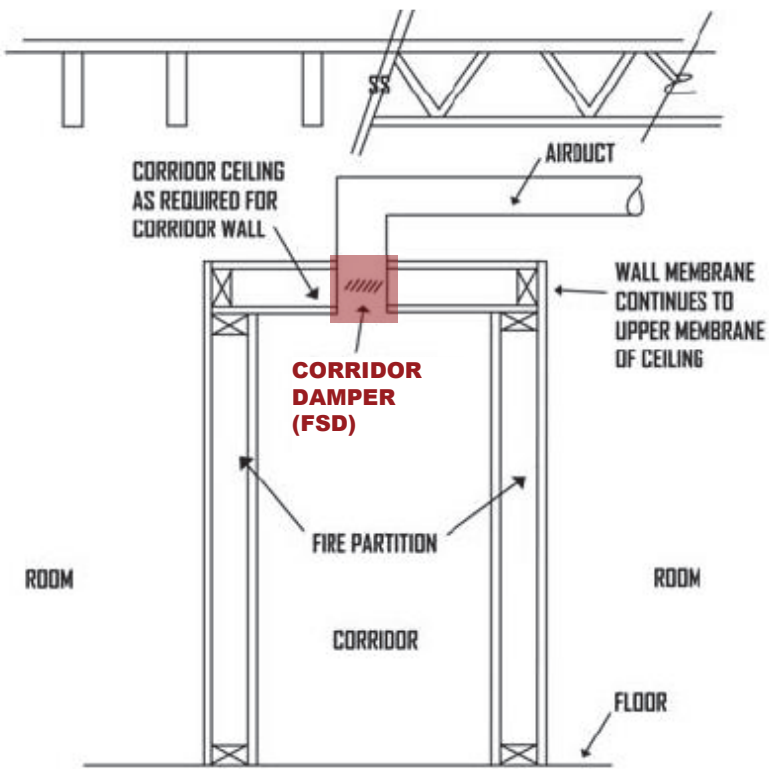


Figure 5 – Tunnel-type corridor

Minimum Requirements	Recommendations
Corridor Damper Corridor Damper Exceptions: 1. None	**Corridor Damper** Corridor Damper Exceptions: 1. None

Life Safety Dampers: 717.5.5 - Smoke Barriers

Bisects floors of underground buildings and patient floors of a hospital, hospital egress & areas of refuge. Commonly 1-hour rated.

Minimum Requirements	Recommendations
Smoke Damper	**Fire/Smoke Damper**
Exceptions: 1. Steel ducts with openings limited to a single smoke compartment. *Reasonable, provided supply and return air duct openings are limited to the same single smoke compartment.* 2. Group I-2, Condition 2, fully ducted, with 903.3.1.1 and 903.3.2 fast response sprinklers throughout. ***EXTREMELY RISKY**. Sprinkler systems are critical, but they don't stop smoke spread. Nothing in the duct to stop smoke spread throughout the building or prevent duct (metal or flex) breech during a fire. Relies on hospital staff to safely exit patients (including those not capable of self-preservation) out of the building during a fire.*	Exceptions: 1. Steel ducts with openings limited to a single smoke compartment. *Reasonable, provided supply and return air duct openings are limited to the same single smoke compartment.* *Fire damper requirements are not clearly spelled out, but it's a safe bet that they should be required given the 1-hour fire resistance rating of all smoke barriers. The cost difference between a fire/smoke and smoke damper is small.*

Life Safety Dampers: 717.5.7 - Smoke Partitions

Corridor and care-suite walls in Group I-2, Certain elevator lobbies. Commonly 0-hour rated.

Minimum Requirements	Recommendations
Smoke Damper Exception: 1. Alternate protection is allowed when the Smoke Damper will interfere with 909 smoke control system. *Valid, but unlikely to be used.* *Smoke dampers are integrated into most mechanical (fans operate during a fire) 909 smoke systems and smoke dampers can't interfere with a passive (fans shutdown during a fire) 909 smoke control system.*	**Smoke Damper** Exception: 1. Alternate protection is allowed when the Smoke Damper will interfere with 909 smoke control system. *Valid, but unlikely to be used.*

Life Safety Dampers: 717.5.6 - Exterior Walls

Bearing or nonbearing walls used to enclose a building. Commonly 1-hour rated.

Minimum Requirements	Recommendations
Fire Damper No Exceptions	**Fire Damper** No Exceptions

Life Safety Dampers:
717.6.1 - Through Penetrations

Through penetrations of horizontal assemblies (floors or roof assemblies). Commonly 2-hour rated.

Minimum Requirements	Recommendations
Shaft Enclosure Exceptions: 1. Penetration of a single floor (two stories) in other than I-2 and I-3 occupancies when a Fire Damper is installed at the floor line. *Reasonable tradeoff.* 2. Penetration of three floors or less provided the duct is: (a) 26 ga and located in the wall cavity, (b) opens into only one dwelling and is continuous from the unit to the building exterior, (c) ≤ 4 inch diameter, (d) annual space is protected per ASTM E119, (e) ceiling grille openings are protected with a ceiling radiation damper. *Reasonable tradeoff.*	**Shaft Enclosure** Exceptions: 1. Penetration of a single floor (two stories) in other than I-2 and I-3 occupancies when a Fire Damper is installed at the floor line. *Reasonable tradeoff.* 2. Penetration of three floors or less provided the duct is: (a) 26 ga and located in the wall cavity, (b) opens into only one dwelling and is continuous from the unit to the building exterior, (c) ≤ 4 inch diameter, (d) annual space is protected per ASTM E119, (e) ceiling grille openings are protected with a ceiling radiation damper. *Reasonable tradeoff.*

Life Safety Dampers:
717.6.2 - Ceiling Membrane Penetrations

Penetrations of ceiling membrane of floor/ceiling or roof/ceiling assembly. Commonly 2-hour rated.

Minimum Requirements	Recommendations
Shaft Enclosure **or** **Ceiling Radiation Damper** Ceiling Radiation Damper Exceptions: 1. ASTM E119 show that a Ceiling Radiation Damper is not required in order to maintain fire-resistance rating of the assembly. *None exist.*	**Shaft Enclosure** **or** **Ceiling Radiation Damper** No Exceptions

Resources

- **AMCA International**: *www.amca.org*
- **2019 AMCA *inmotion* Magazine:** *http://bit.ly/AMCAinmotion2019*

  > Remote Periodic Testing of Life-Safety Dampers

- **AMCA Publication:** *www.amca.org/store*

  > **503-08:** Fire, Ceiling (Radiation), Smoke and Fire/Smoke Dampers Application Manual (Free PDF download)

- **AMCA White Papers:** *https://www.amca.org/educate/ #articles-and-technical-papers*

  > Fire and Smoke Dampers: Best Practice Design Tips

- **2018 International Building Code** (available for purchase):

  > *https://shop.iccsafe.org/codes/2018-international-codes-and-references/2018-international-building-code-and-references/2018-international-building-coder.html*

Thank you for your time!

To receive PDH credit for today's program, you must complete the online evaluation, which will be sent via email following this webinar.

If you viewed the webinar as a group and only one person registered for the webinar link, please email Lisa Cherney (lcherney@amca.org) for a group sign-in sheet today. Completed sheets must be returned to Lisa by tomorrow, May 15.

PDH credits and participation certificates will be issued electronically within 30 days, once all attendance records are checked and online evaluations are received.

Attendees will receive an email at the address provided on your registration, listing the credit hours awarded and a link to a printable certificate of completion.

Questions?

THANK YOU TO OUR SPONSOR!

POTTORFF®

NEXT PROGRAM

Join us for our next AMCA *insite* Pop-Up Webinar:

- Thursday, May 21
- 2:00-3:00pm CDT
- ***TOPIC: Basics of Large Diameter Fans***
- Presenter: Christian Taber, Principal Engineer - Codes and Standards, AMCA Member Company

>> For additional webinar dates go to: ***www.amca.org/webinar***

amca INTERNATIONAL

WWW.AMCA.ORG/CARES

MAY 14, 2020

Wear red. Post a selfie. Make a pledge.

#AMCACares, #HVACChallenge, #MSF