

Fire, Smoke, and Combination Fire/Smoke Dampers



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Member: NFPA

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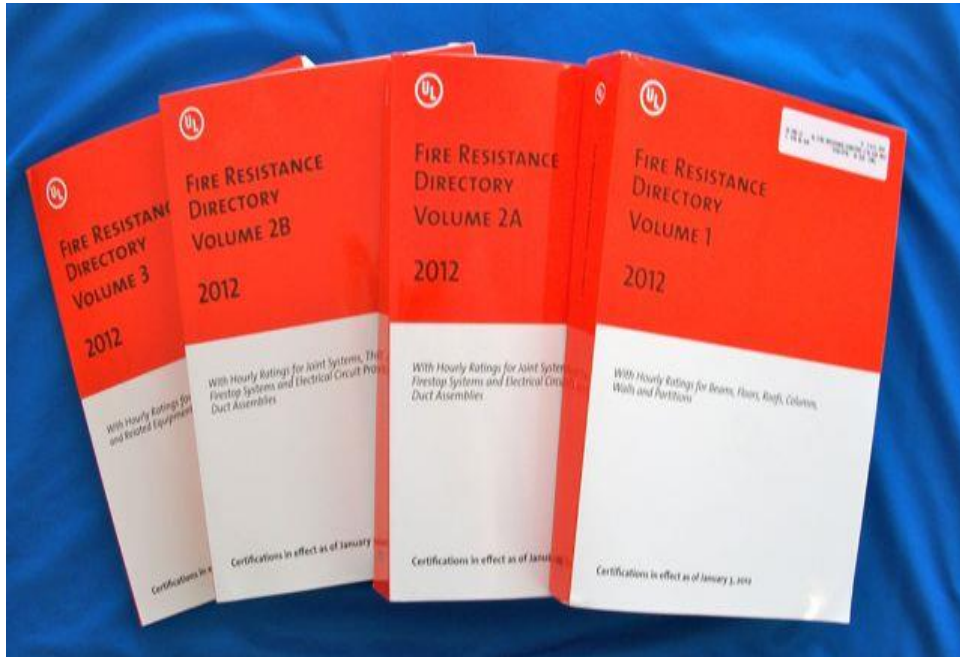
Member: USGBC (LEED Green Associate)



Agenda

- Life Safety Damper Overview
- Damper Basics
 - Penetration Requirements
 - Installations & FAQs
- Code Required Testing
- Common Field Issues
- Improper Installations

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Keyword: greenheck

UL Category Control Number

Company Name

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Location

91 Results :: Keyword: greenheck

Action Display: General

Document Name	Company Name	Notes	UL CCN Description
AKUS.R18933	GREENHECK FAN CORP		Filters, Grease
AUUZ.E200616	GREENHECK FAN CORP		Commercial Applia
AUUZ7.E200616	GREENHECK FAN CORP		Commercial Applia
BHZF.R39668	GREENHECK FAN CORP		Discrete Products I
BXUV.L501	Aerix Industries AIR BALANCE INC AIR KING VENTILATION PRODUCTS		Fire-resistance Rati Fire-resistance Rati

All UL life safety products are listed in the UL Directories

www.UL.com



Life Safety Damper Types

- Fire Dampers
- Smoke Dampers
- Combination Fire/Smoke Dampers
 - Corridor Dampers
- Ceiling Radiation Dampers



Fire Dampers

“A device, installed in an air distribution system, designed to close automatically upon detection of heat, to interrupt migratory airflow, and to **restrict the passage of flame.**” (NFPA 80)



Curtain Fire Damper



True Round Fire Damper



Multi-blade Fire Damper

Smoke Dampers

“A device within the air distribution system to **control the movement of smoke.**” (NFPA 80)



**True Round
Smoke Damper**



**Steel/SS
Smoke Damper**



**Aluminum
Smoke Damper**

Combination Fire/Smoke Dampers

“A device that meets **both the fire damper and smoke damper requirements.**” (NFPA80)



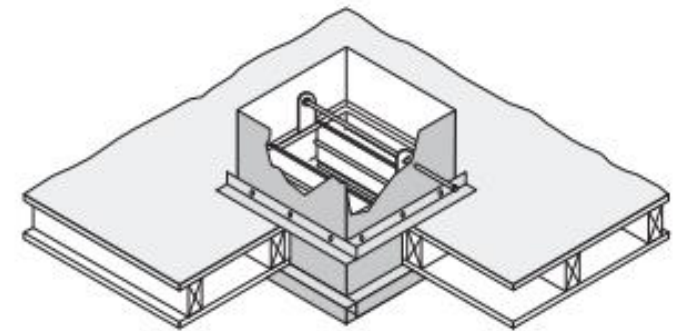
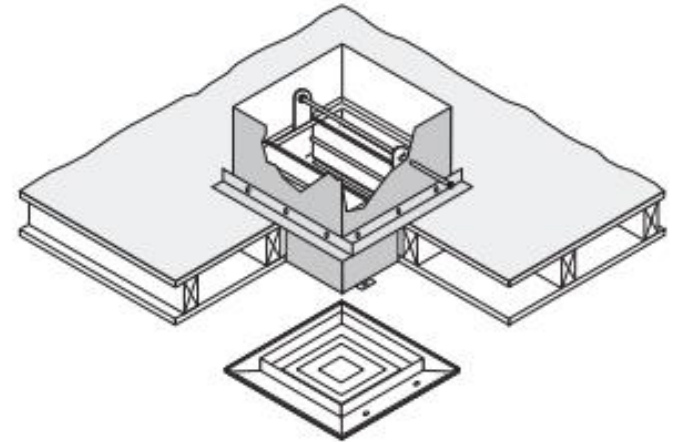
Purpose of Combination Fire/Smoke Damper

- Provide the same level of protection as individual fire and smoke dampers
- Fire rating – UL555 certified
- Leakage rating – UL555S certified
 - Always supplied with factory mounted actuator
- Always dynamically rated



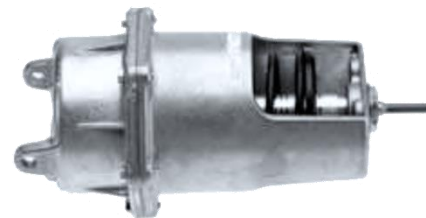
Corridor Dampers

- Fire/smoke dampers that have been designed for use in corridors.
 - “Corridor” = means of egress travel to an exit, typically found in hospitals.
- There are additional test requirements for Corridor Dampers in UL555 and they carry an additional 1 hr. rating when certified.
- Most commonly used in California.



Smoke & Fire/Smoke Damper Actuators

- Actuators must be **factory installed**, per UL.
- Electric (120V, 24V, 230V) or Pneumatic.
- Two position (open/closed) and Modulating (Balancing) types.
- Different torque ratings, selection based on tested size of assembly.*
- May be externally or internally mounted. Φ



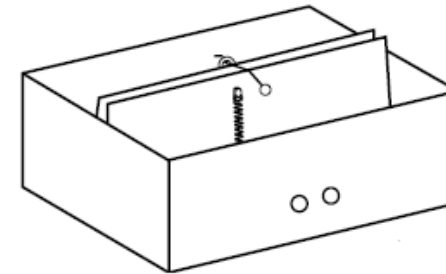
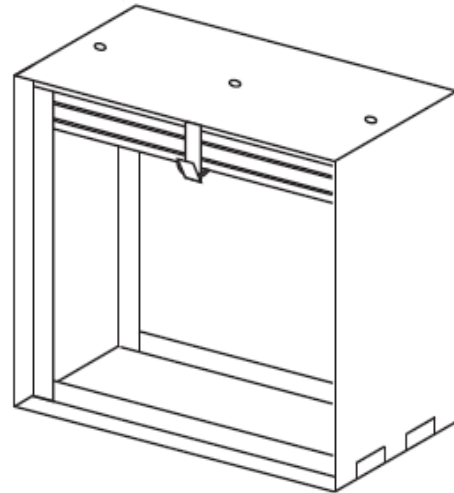
Ceiling Radiation Dampers

“A device installed to **limit radiant heat transfer through an air outlet or air inlet opening in the ceiling of a floor-or roof-ceiling assembly** having not less than a 1 hour fire resistance rating.” (NFPA 90A)



Fire Damper vs. Ceiling Damper?

- Limits spread of flame (UL555)
- Rated walls/floors/partitions
- Limits radiant heat (UL555C, UL263 or ASTM E119)
- Approved floor/ceiling or roof/ceiling assemblies only



Ceiling Damper Test Standards

Tested and listed to either UL 555C or UL555C & UL263.

UL 555C

CRDs listed to this standard can be used anywhere “hinged-door” type dampers are allowed.

Intended for use in sheet metal air duct outlets, typically in suspended ceilings.

UL 263

Part of a complete assembly which includes all of the elements of the floor or roof/ceiling design and only the specified damper can be used in that specific design.

Intended for use in specific floor/ceiling assemblies (i.e. wood truss or wood joist).

Typical UL 555C Application

- Air outlet, ceiling damper, and thermal blanket assembly installed in a suspended lay-in T-bar ceiling



Document 453343
Ceiling Radiation Dampers
CRD Series

Installation, Operation and Maintenance Manual

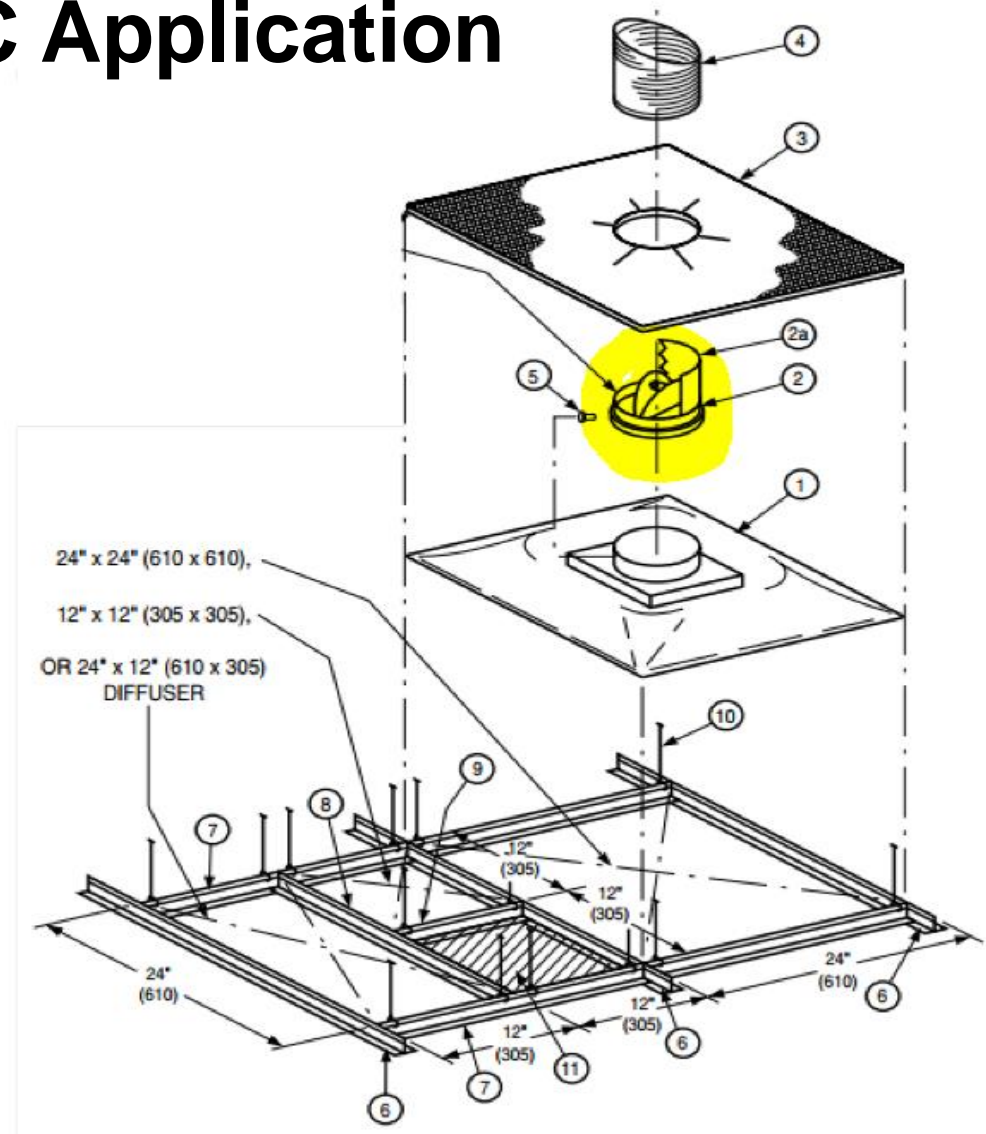
Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with these instructions will result in voiding of the product warranty and may result in personal injury and/or property damage.

These installation instructions apply to a 3 hour rated ceiling radiation dampers (aka ceiling dampers) mounted in a ceiling with supports from 1) a ceiling grid system, 2) ductwork above, or 3) structure above. Each type of damper support system is described with damper being mounted in conjunction with various air devices.



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Typical UL 263 Listing – Wood Truss

Design No. L550

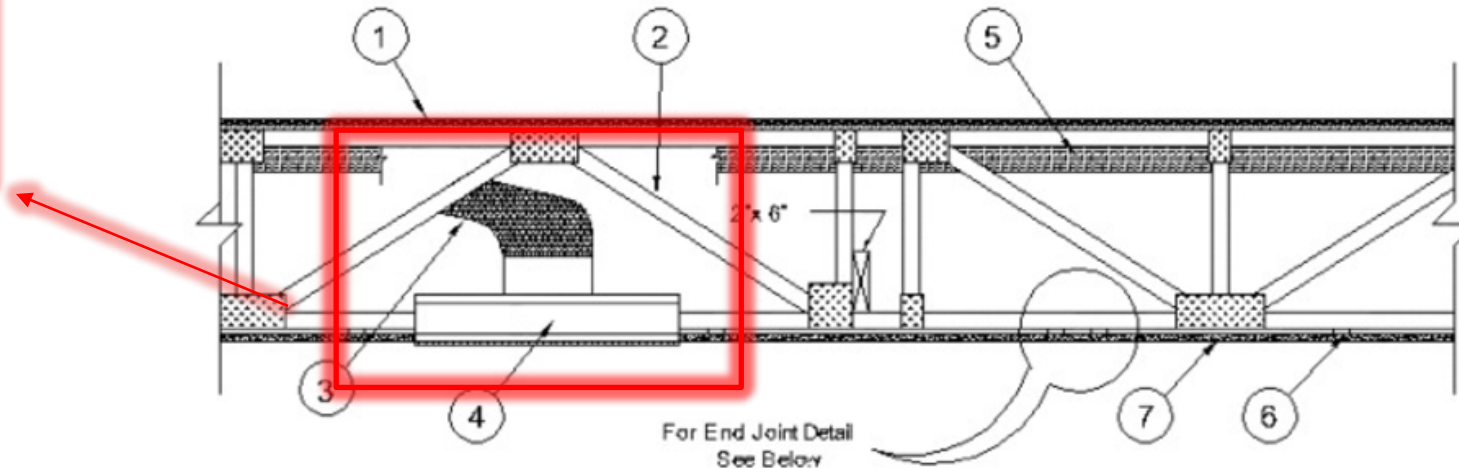
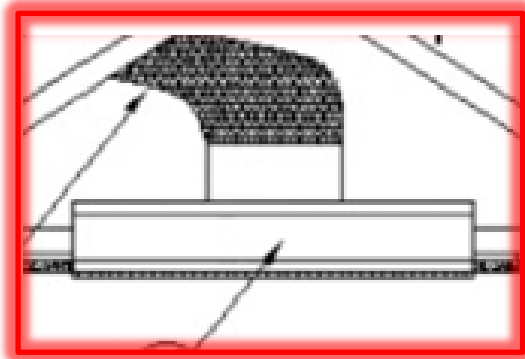
September 12, 2016

Unrestrained Assembly Rating – 1 Hr.

Finish Rating – 23 Min (See Items 5 or 5A)

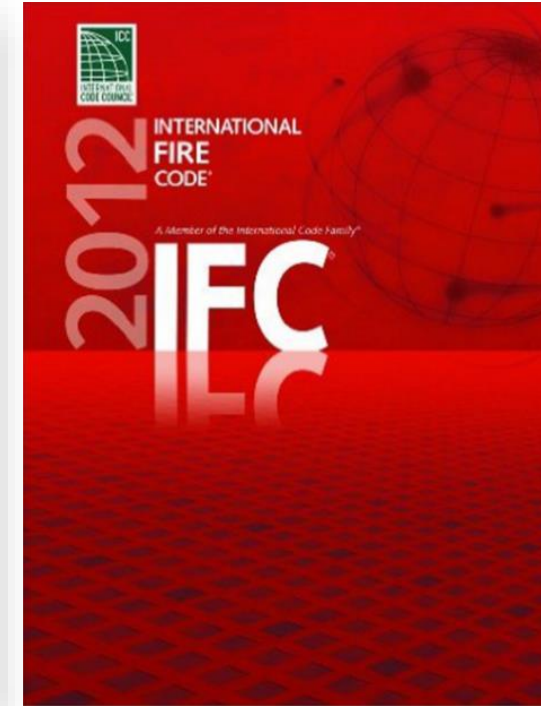
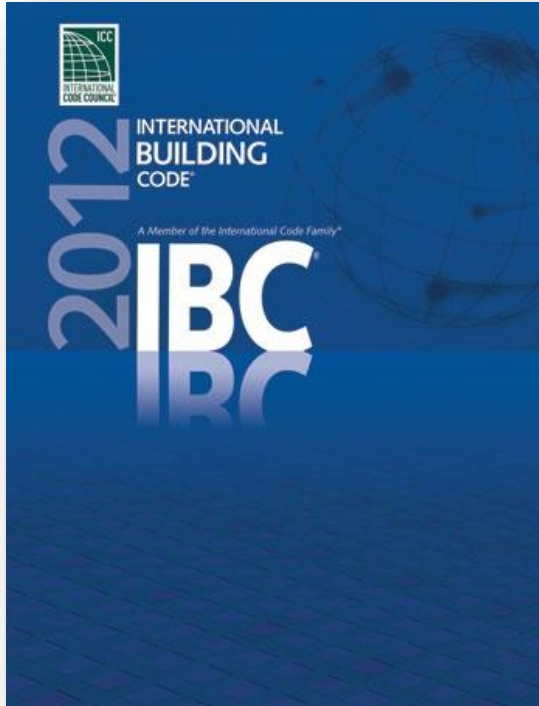
This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used – See Guide [BXUV](#) or [BXUV7](#)

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.



Penetration Types: Where are Dampers Required?

“I” Codes



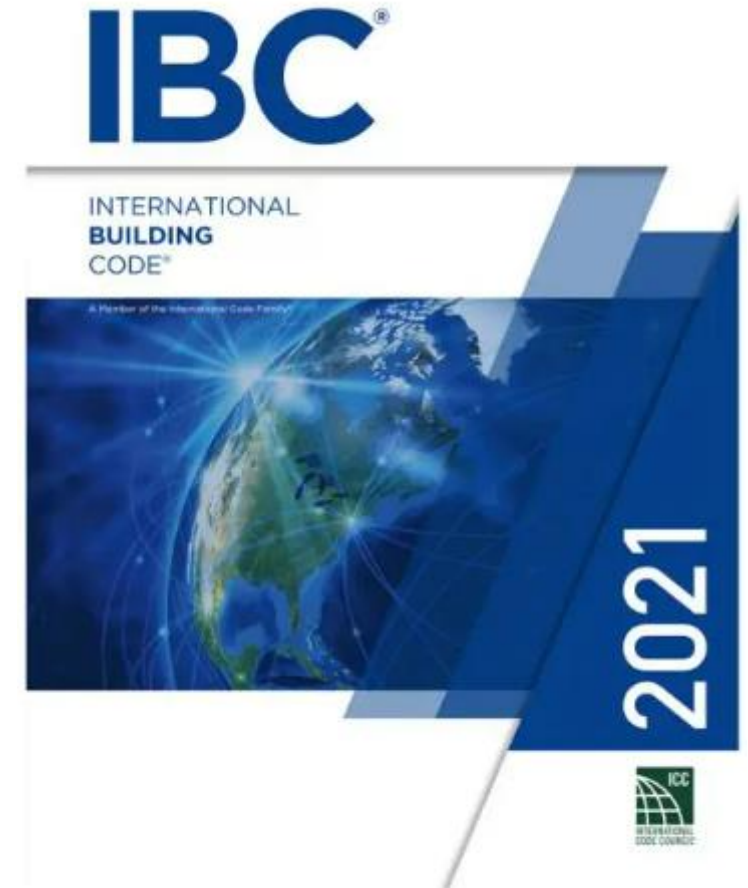
- First published in 2000, combo of 3 legacy codes: BOCA National Building Code (BOCA/NBC), Uniform Building Code (UBC) & Standard Building Code (SBC)
- **IBC** – design of building; **IMC** – design of mechanical systems; **IFC** – regulate fire hazards, testing, maintenance in existing buildings

International Building Code (IBC)

→ Ch. 7 – Fire & Smoke Protection Features

→ Sec. 717 – Ducts & Air Transfer Openings

- Baseline Requirements:
 - Dampers must be listed & labeled to applicable UL standard
 - Dampers must be installed in accordance with manufacturer's instructions
- Defines the type of damper required to protect penetrations through each type of rated building element



Hourly Fire Resistance Rating

IBC table 717.3.2.1

Type of Penetration	Minimum Damper Rating (hours)
Less than 3 hour fire resistance rated assemblies	1½
3 hour or greater fire resistance rated assemblies	3

2 hour assembly rating = **1.5** hour rated damper

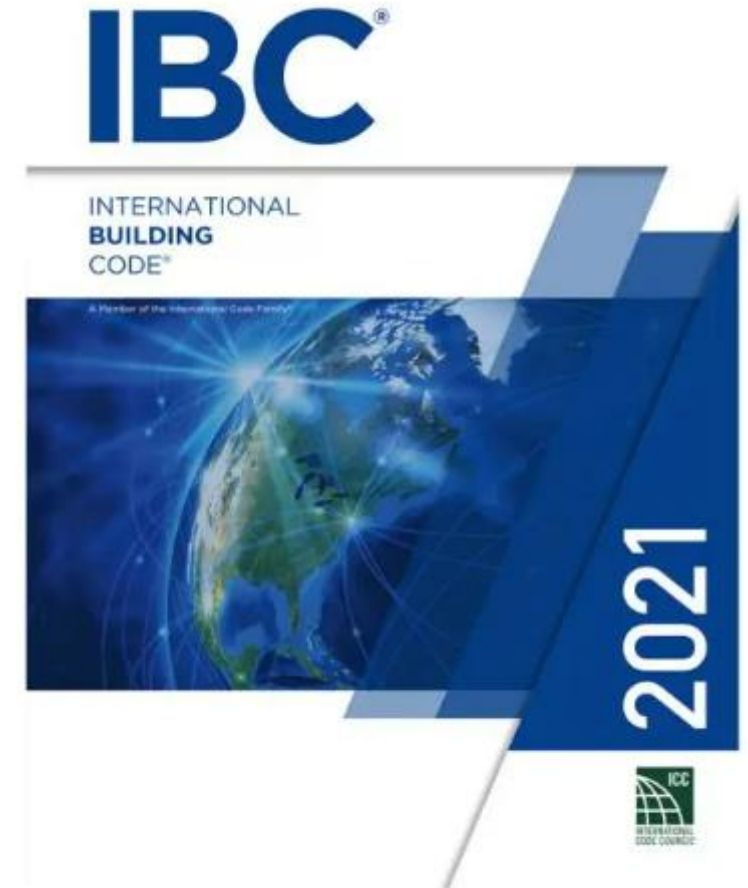
3 hour assembly rating = **3** hour rated damper

4 hour assembly rating = **3** hour rated damper

Code Mandated Applications of Life-Safety Dampers

Section 717.5: Where Life-Safety Dampers are Required

- **717.5.1 Fire Walls**
- **717.5.2 Fire Barriers**
- **717.5.3 Shaft Enclosures**
- **717.5.4 Fire Partitions (includes corridors)**
- **717.5.5 Smoke Barriers**
- **717.5.6 Exterior Walls**
- **717.5.7 Smoke Partitions**



IBC

Chapter 7

Section 717.5

Ducts & Air Transfer Openings

The provisions of this section shall govern the protection of duct penetrations and air transfer openings in assemblies required to be protected and duct penetrations in nonfire-resistance-rated floor assemblies.

The following table indicates what walls are regulated by Section 717.5 and where these requirements are referenced from.

SECTION	WALL TYPE	REFERENCED FROM	TYPE OF DAMPER
717.5.1 (IMC 607.5.1)	Fire walls	706.11	Fire damper
717.5.1.1 (IMC 607.5.1.1)	Fire wall – Horizontal exits	706.11	Fire damper, Smoke damper
717.5.2 (IMC 607.5.2)	Fire barriers	707.10	Fire damper
717.5.2.1 (IMC 607.5.2.1)	Fire barriers – Horizontal exits	707.10	Fire damper, Smoke damper
717.5.3 (IMC 607.5.5)	Shaft enclosures	713.10	Fire damper, Smoke damper
717.5.4 (IMC 607.5.3)	Fire partitions	708.9	Fire damper
717.5.4.1 (IMC 607.5.3 and 607.5.4)	Fire partitions – Corridors	708.9	Fire damper, Smoke damper
717.5.5 (IMC 607.5.4)	Smoke barriers	709.8	Smoke damper
717.5.6 (IMC 607.5.6)	Exterior walls	705.10	Fire damper
717.5.7 (IMC 607.5.7)	Smoke partitions	710.8	Smoke damper

IBC: Types of Penetrations

- **Fire Wall**: Extends from foundation through roof, allows collapse of structure either side w/o collapse of wall. Can be walls between buildings on lot lines, or to divide one building into separate buildings.
- **Fire Barrier**: Fire resistance-rated vertical assembly (generally), continuity maintained.
 - Exit passageway & enclosures, atrium boundaries, stairwell enclosures, separations btw. occupancies in a mixed-use building.
- **Fire Partition**: Fire resistance-rated vertical assembly, in which openings are protected.
 - Corridor walls or elevator lobbies (w/ exceptions); Separate dwelling units, sleeping rooms, and tenant spaces in malls.

IBC: Types of Penetrations

- **Smoke Barrier**: Continuous membrane to restrict movement of smoke, vertical or horizontal. IBC 709.3 requires smoke barriers be 1 hour rated.
- **Smoke Partition**: Unrated membrane to restrict smoke movement. Limited use in Code. SD only required in air transfer openings.
- **Smoke Wall**: No such thing!

IBC: Types of Penetrations

- **Shaft**: Enclosed space extending through one or more stories of a building, connecting vertical openings in successive floors.
 - *2 hr rated \geq 4 stories, 1 hr fire-rated $<$ 4 stories.*
- **Horizontal (Fire Resistant) Assembly**: Continuity maintained. Floors & Roofs.
- **Membrane Penetration**: an opening in a floor or roof/ceiling assembly that only passes through one side.

Where are dampers NOT required?*

- Clothes dryer exhaust
- Kitchen (grease) duct penetrations
- Hazardous exhaust ducts
- Dust collection penetrations

* check IBC or local code, or consult AHJ

Typical Damper Installations

Required Elements of an “Approved” Life-Safety Damper Installation

1. Rated Barrier

2. Listed Product

3. Installation Requirements



Fire Damper - Curtain Type Typical Installation

① **UL CLASSIFIED FIRE DAMPER - DYNAMIC OR STATIC**

1 1/2 Hr. Label - For fire separations up to 2 Hrs.

3 Hr. label - For fire separations up to 4 hrs.

② **FIRE SEPARATION**

③ **RETAINING ANGLES**

④ **BREAKAWAY JOINT**

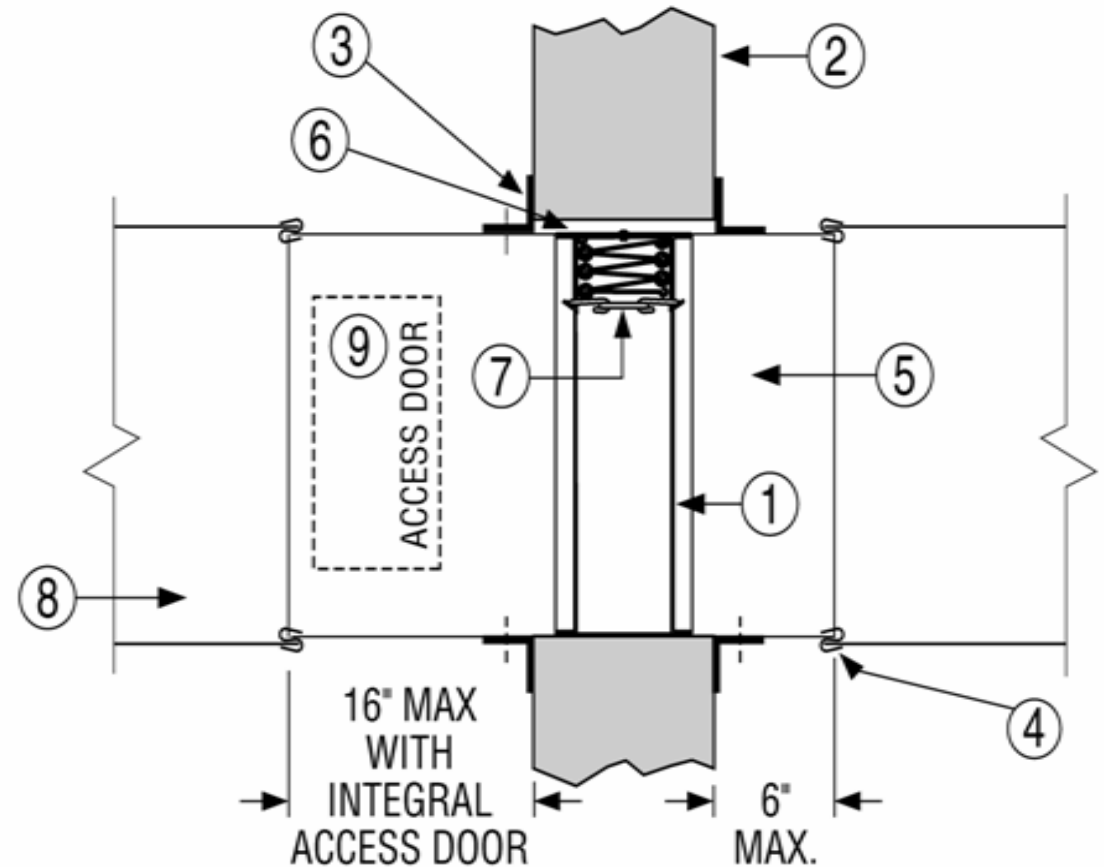
⑤ **SLEEVE (DUCT GAUGE MIN. SMACNA/NFPA 90A SPEC.)**

⑥ **EXPANSION CLEARANCE**

⑦ **UL LISTED HEAT RESPONSE DEVICE (FUSIBLE LINK)**

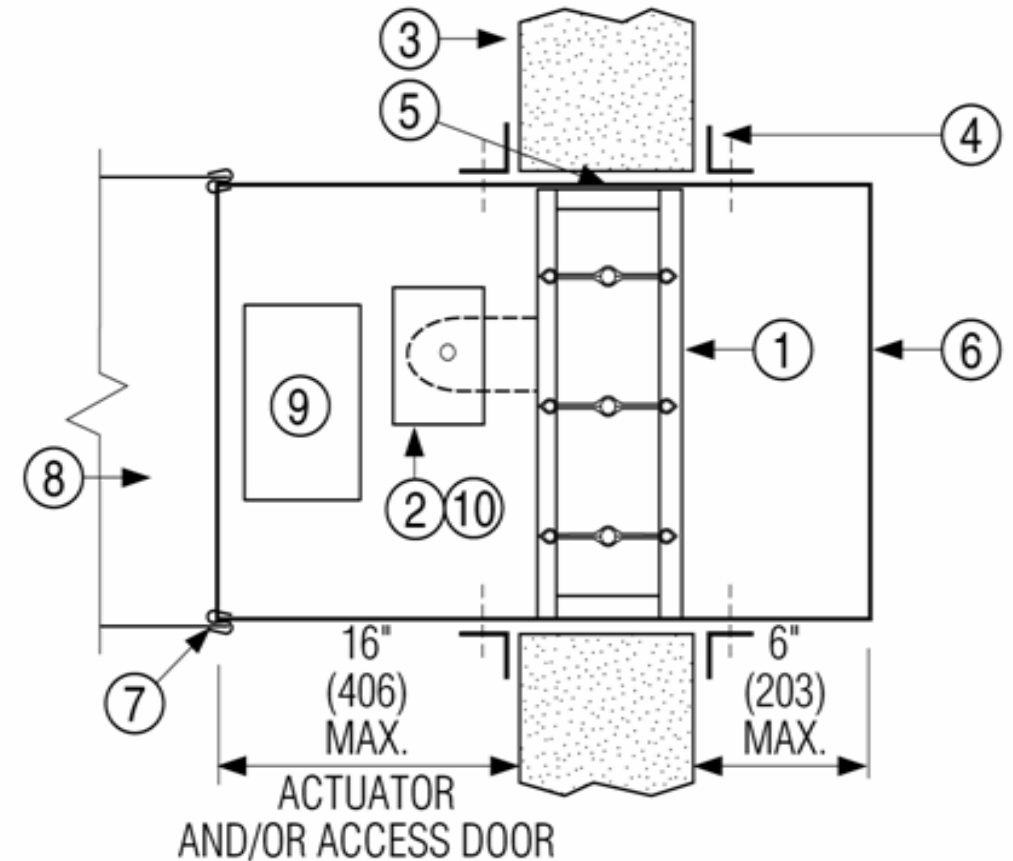
⑧ **DUCT**

⑨ **ACCESS DOOR**



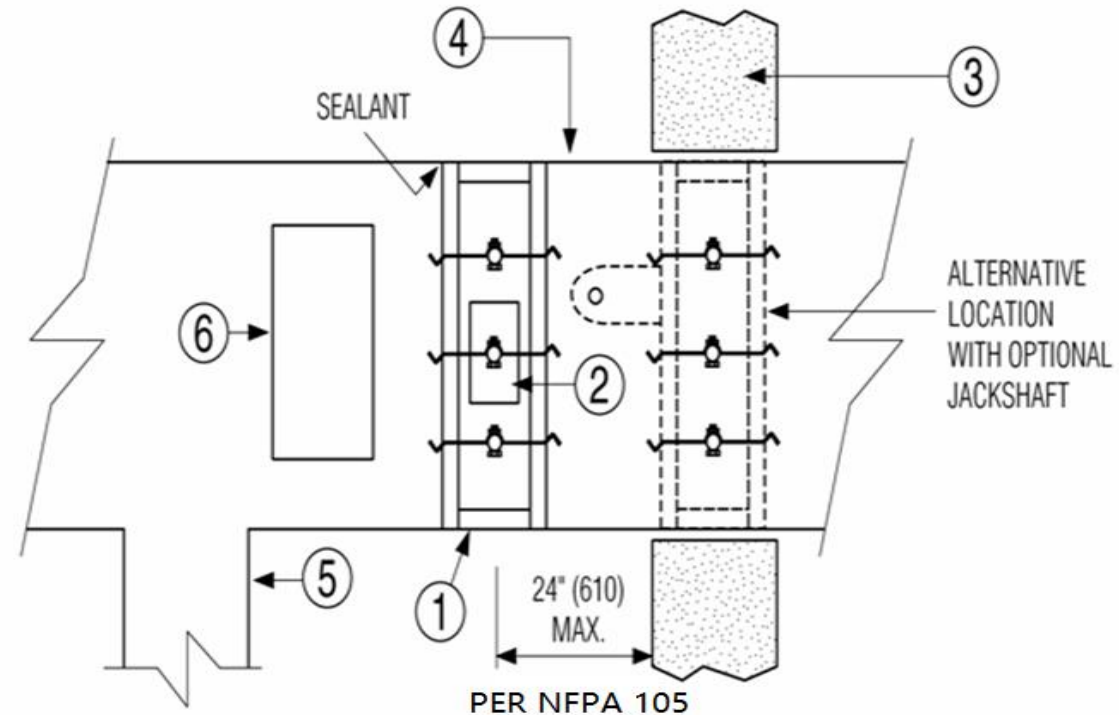
Combination Fire/Smoke Damper Typical Installation

1. UL CLASSIFIED AS BOTH A DYNAMIC FIRE DAMPER AND A LEAKAGE RATED SMOKE DAMPER
2. UL QUALIFIED DAMPER/ACTUATOR ASSEMBLY
Pneumatic or Electric Actuators
3. FIRE SEPARATION & SMOKE BARRIER
4. RETAINING ANGLES
5. EXPANSION CLEARANCE
6. SLEEVE
7. BREAKAWAY JOINT
8. STEEL DUCT
9. ACCESS DOOR
10. UL LISTED HEAT RESPONSIVE DEVICE



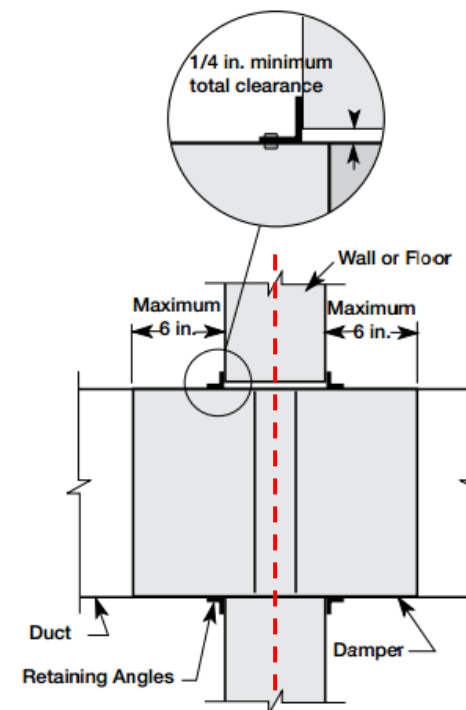
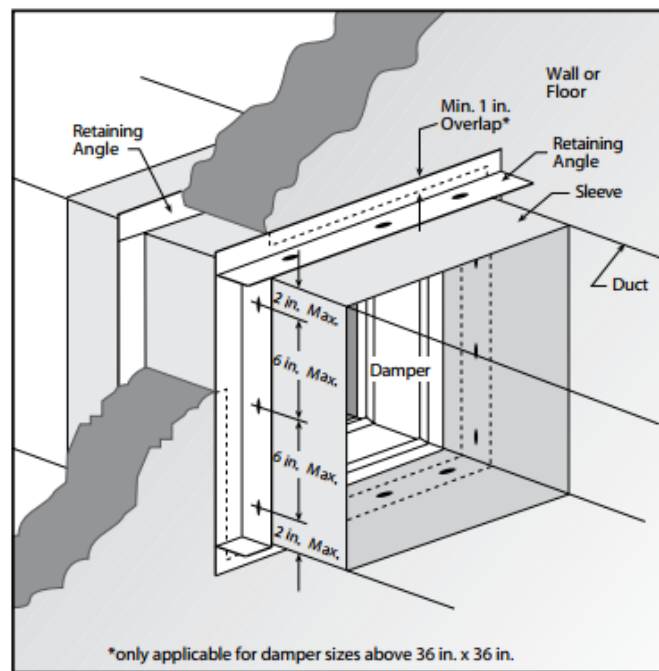
Smoke Damper Typical Installation

- ① UL CLASSIFIED LEAKAGE RATED SMOKE DAMPER
- ② UL QUALIFIED ACTUATOR/DAMPER ASSEMBLY
Pneumatic or Electric Actuators
- ③ SMOKE BARRIER
- ④ DUCT
- ⑤ 1st DUCT OUTLET
- ⑥ ACCESS DOOR



Traditional “In wall” Installation

- The centerline of the damper frame must be in the plane of the wall/floor
- Requires annular space between the damper sleeve and wall opening
- Retaining Angle Installation
 - 2-Sided Angles must be fastened to the sleeve (not to the barrier)



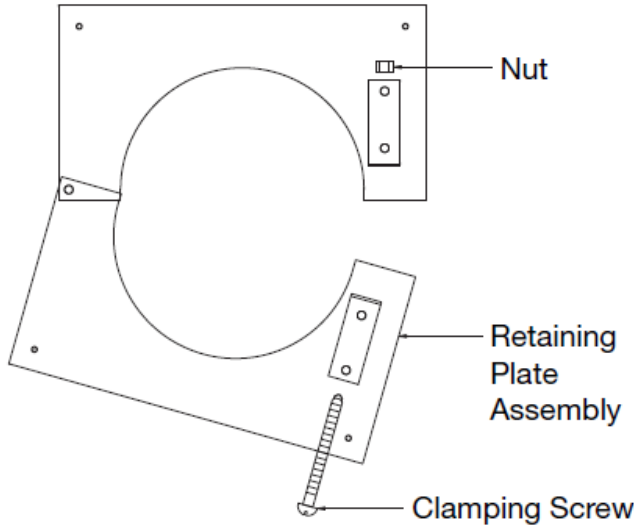
True Round Life-Safety Dampers



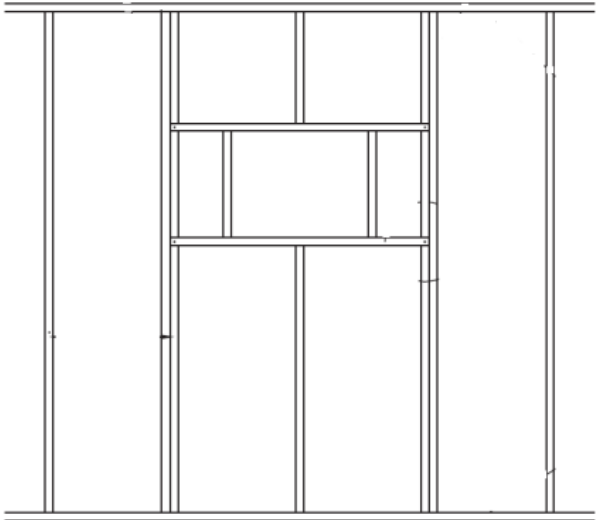
DFDR-510
True Round
Dynamic Fire Damper



FSDR-510
True Round
Fire Smoke Damper



Retaining Plate
Included with the Damper

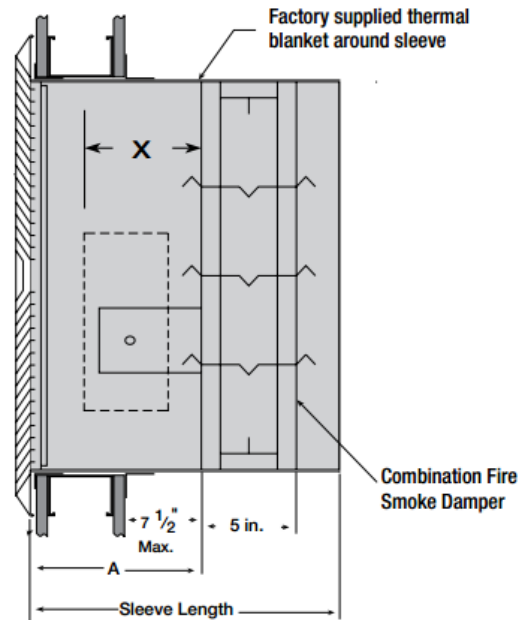


**The Opening in the Wall
Does Not Have to be
Round!**

“Out-Of-Wall” Installation Methods

Only valid for specific models that were tested outside the plane of the rated barrier

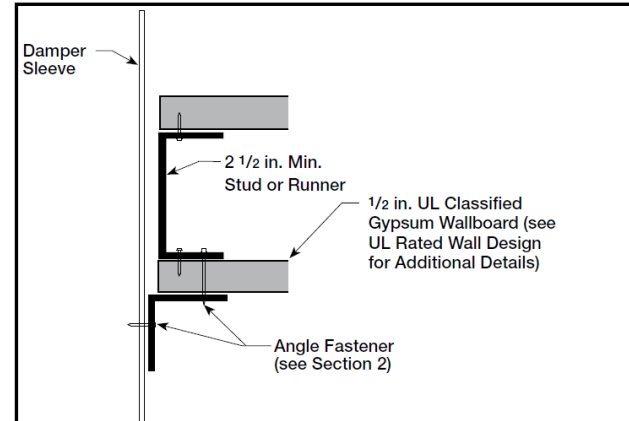
Commonly used in shaft walls installations where there is no external access to the actuator.



Alternative Installation Methods

Single Side Installation

- No annular space requirements
- Angles must be attached to both the sleeve and the barrier
- Allowable damper sizes:
 - Vertical Mount:
 - 80"x50"
 - 50"x80"
 - 40"x100"
 - Horizontal Mount
 - 144"x96"



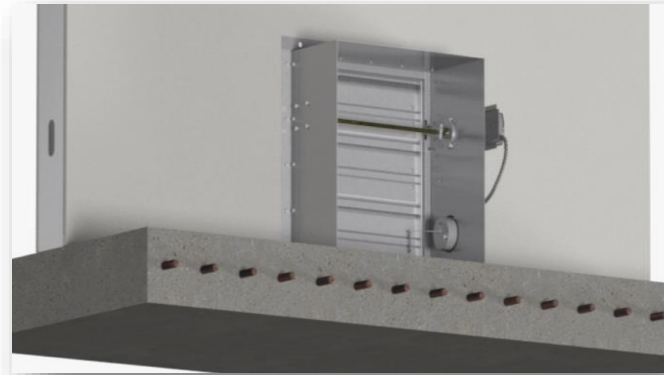
* Larger assemblies and 3 hour ratings require angles on *both* sides of barrier

Alternative Installation Methods

3 Sided Retaining Angle Installation Method



- The retaining angle may be omitted from any of the four sides
- UL approved



Installation FAQs

Common question: Do I HAVE TO seal around retaining angles?

- Sealing of retaining angles is **NOT REQUIRED**.
- Sealing of retaining angles **IS PERMITTED** when done in accordance with UL approved installation instructions.
- Specific requirements for location and type of sealant to be used.

Consult manufacturer's installation manual for specific requirements for each damper manufacturer and damper type.



Refer to:

'Installation Instructions for FD, DFD, DFD X, and FD X series Fire Damper models' (Part # 481324)

or

'Installation Instructions for FSD-xxx, DFD-xxx, & SSFSD-xxx series Fire & Combination Fire Smoke Dampers' (Part # 481318) for additional details.

The field or factory installation of a sleeve on a fire rated damper does not require any application of sealant to maintain the UL 555 classification of the fire damper assembly. However, the sealant can be used along any seams of a fire rated damper assembly (except along blade edges) to help prevent air leakage in high pressure applications.

The general installation of a fire rated damper is addressed in the UL 555 (Standard for Fire Dampers Seventh Edition July 12, 2006) in Section 18 "Installation and Operating Instructions". In reference to the use of a sealant in the area between the inside of a wall opening and the outside of the fire damper sleeve (referred to as the "annular space" see **Figure 1**), UL 555 provides the following information:

18 General

- 18.1 A copy of the installation and operating instructions shall be used as a reference in the examination and testing of the damper. For these purposes, a final printed copy is not required.
- 18.2 Each shipping container that contains a damper(s) shall be provided with legible instructions pertaining to the installation and operation of the damper. Illustrations are used with the required instructions to clarify the intent. Dampers shipped in a common container are required to be provided with one copy of the installation and operating instruction only.
- 18.3 The instruction shall specify:
 - a) the type of wall or partition (masonry or gypboard) or floor, as applicable;
 - b) the clearances required for expansion of the fire damper, as applicable;

Document 462703
Sealant Usage in Conjunction
with Fire Rated Dampers

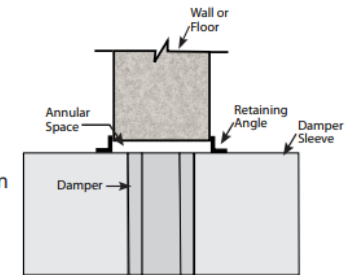


Figure 1



Common question: Do I HAVE TO seal around retaining angles?

When might this come up?

NFPA 1: Fire Code 12.7.7.1 (NFPA 101: 8.3.4.1)

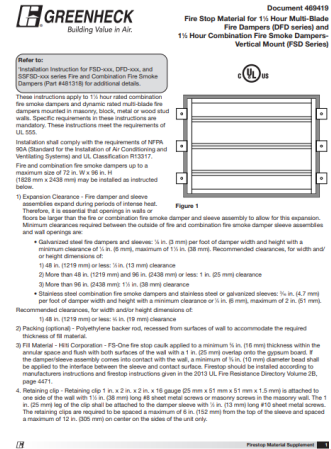
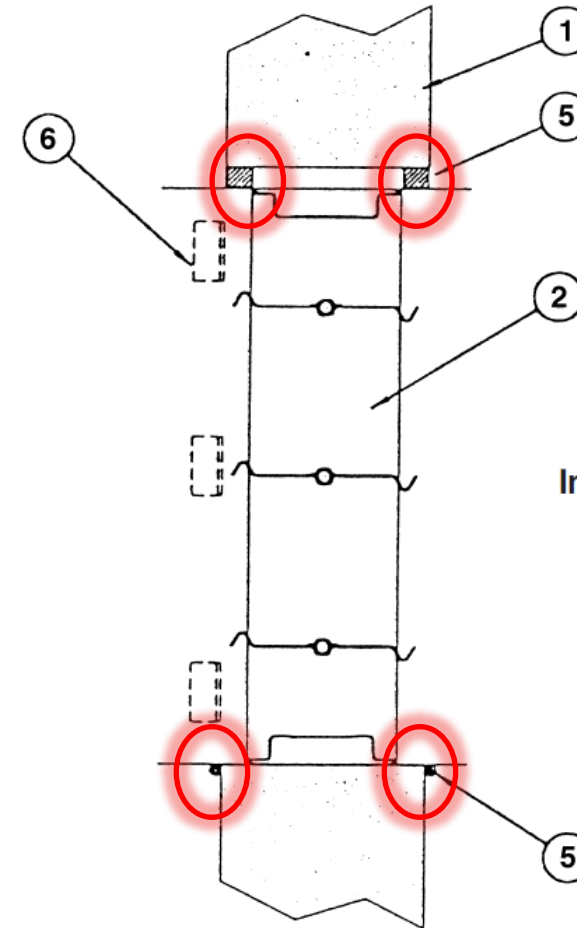
12.7.7 Opening Protectives.

12.7.7.1 Every opening in a fire barrier shall be protected to limit the spread of fire and restrict the movement of smoke from one side of the fire barrier to the other. [101: 8.3.4.1]

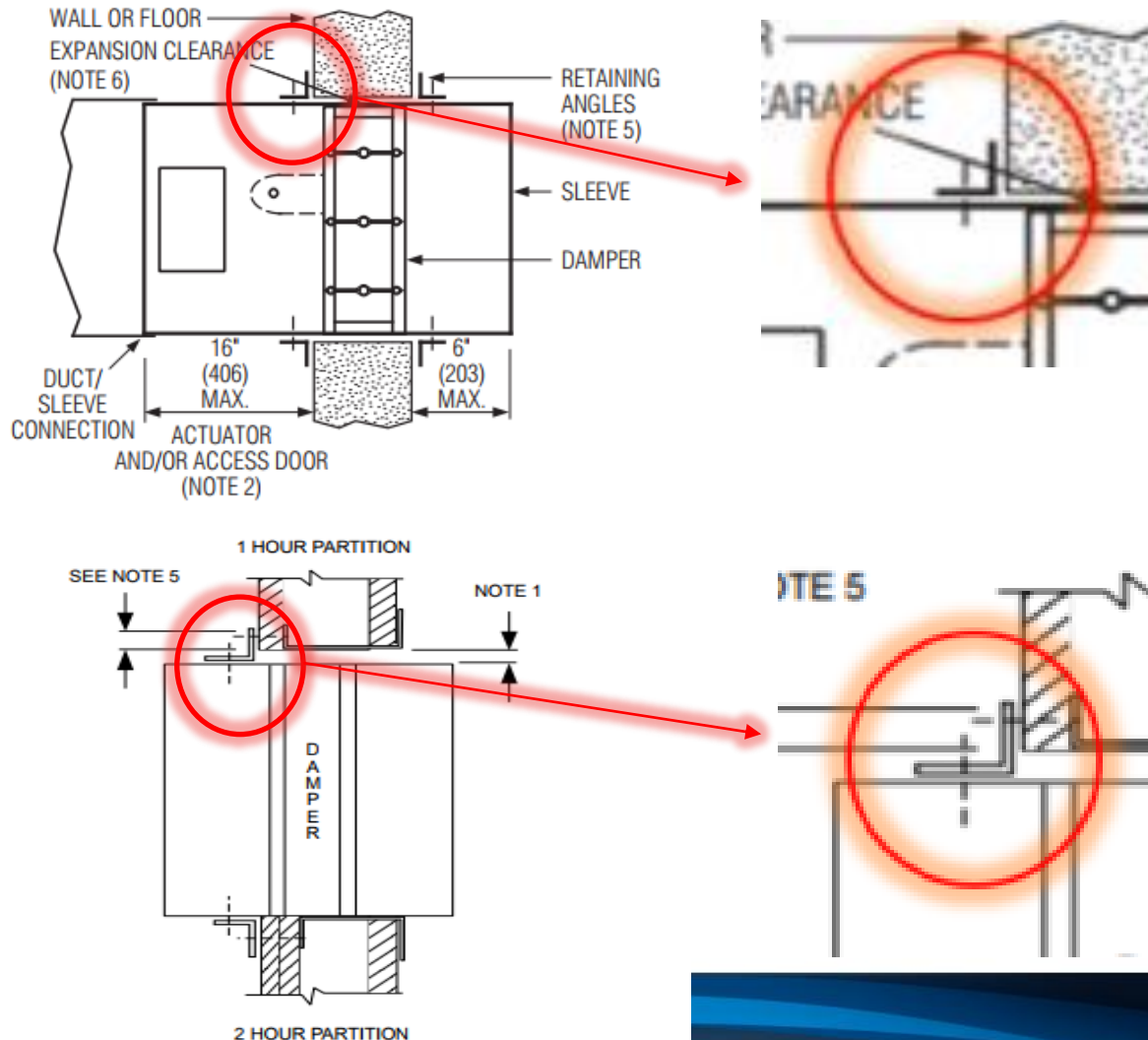
Common question: Do I HAVE TO fill the gap around fire dampers?

- The space around a fire damper or fire/smoke damper is commonly referred to as the annular space or expansion gap.
- Almost every manufacturer and damper on the market states **“DO NOT”** to fill the gap!!
- However, there has an optional installation method using fire stopping caulk around the damper in the gap. THIS INSTALLATION IS VERY SPECIFIC.

Consult manufacturer's installation manual for specific requirements for each damper manufacturer and damper type.



Common question: Do I HAVE TO anchor the retaining angle into the wall?



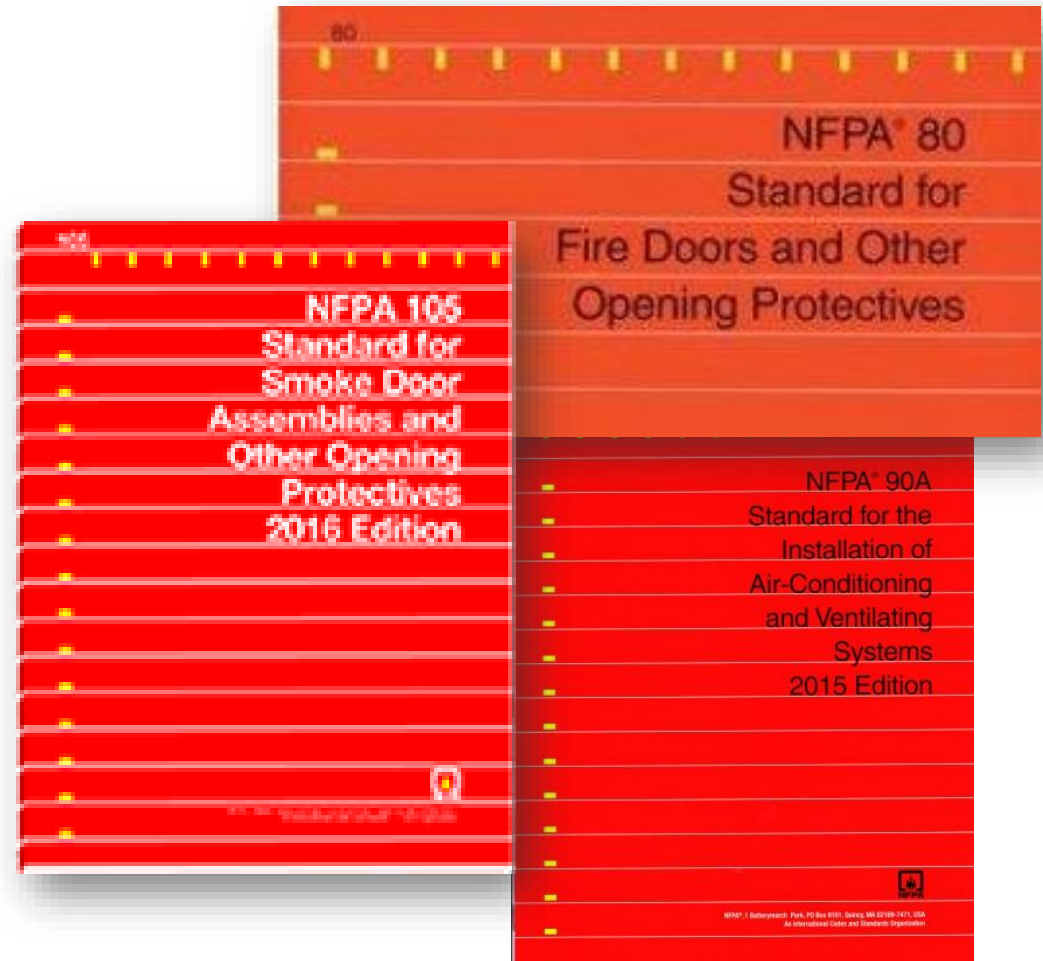
- Anchoring the retaining angle into the wall is usually **NOT REQUIRED** on a standard 2 sided angle installation (partition wall).
- Anchoring the retaining angle into the wall is usually **REQUIRED** on a standard 1 sided angle installation (shaft wall).

Consult manufacturer's installation manual for specific requirements for each damper manufacturer and damper type.

Code Required Testing

NFPA Standards

- Regulates the installation and maintenance of assemblies and devices used to protect openings in walls, floors, and ceilings.
 - NFPA 80
 - Standard for Fire Doors
 - NFPA 105
 - Standard for Smoke Doors
 - NFPA 90A and 90B
 - Standard for Installation of Air-conditioning and Ventilating Systems
 - NFPA 92
 - Standard for Smoke-Control System



Code Required Testing of Dampers

The various model building codes do not detail all of the periodic testing requirements. They refer to the NFPA standard that applies to the specific damper type.

General testing requirements are as follows:

- Each damper undergoes an operational test after installation.
- Each damper is commissioned - an acceptance test is performed after HVAC system balancing.
- Periodic testing begins:
 - Each damper shall be tested and inspected 1 year after installation.
 - Each damper shall be tested and inspected every 4 years thereafter, except in hospitals where the frequency shall be every 6 years.

Code Required Testing of Dampers

- Operational Test
- Acceptance Testing (“Commissioning”)
 - Actuated Dampers vs. Non-Actuator Dampers
- Periodic Testing Requirements
 - Fusible Link vs. Non-Fusible Link Operated Dampers
 - Remote method acceptable if visual method used in acceptance testing

Checklist – Fire & Fire/Smoke Dampers

- ✓ Position of damper in opening
- ✓ Damper sleeve
- ✓ Clearance between Damper and Wall/Floor Opening
- ✓ Securing Damper and Sleeve to the Wall/Floor Openings
- ✓ Duct to Sleeve Connection
- ✓ Damper Access
- ✓ Damper Flow and Pressure Ratings
- ✓ Operation of the Damper

Damper Test Requirements – NFPA 80

19.3 Operational Test.

19.3.1 Fire Dampers. After the installation of a damper is completed, an operational test shall be conducted.

19.3.1.1 The damper shall fully close from the open position.

19.3.1.2 When equipped with smoke detection activation, testing shall be performed in accordance with NFPA 4.

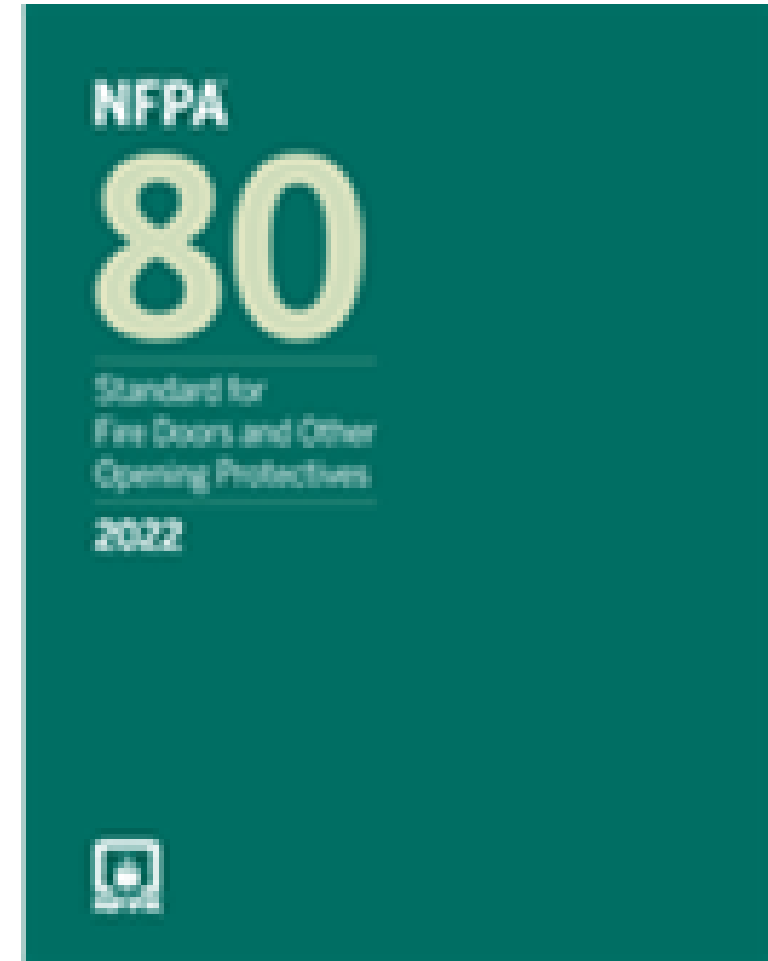
19.3.1.3 For dynamic dampers, it shall be verified that the system airflow where the damper is installed is within the velocity rating of the damper listing.

19.3.1.4 The operational test shall verify that there are no obstructions to the operation of the damper.

19.3.1.5 The operational test shall verify that there is full and unobstructed access to the fire damper and all listed components.

19.3.1.6 All indicating devices shall be verified to work and report to the intended location.

19.3.1.7* The fusible link operating temperature shall be in accordance with NFPA 90A and UL 33, *Heat Responsive Links for Fire-Protection Service*, temperature classifications and ratings.



Damper Test Requirements – NFPA 80

19.3.2 Combination Fire and Smoke Dampers. After the installation of a dynamic combination fire and smoke damper is complete, an operational test shall be conducted.

19.3.2.1 The test shall determine that the system has been installed and functions as intended.

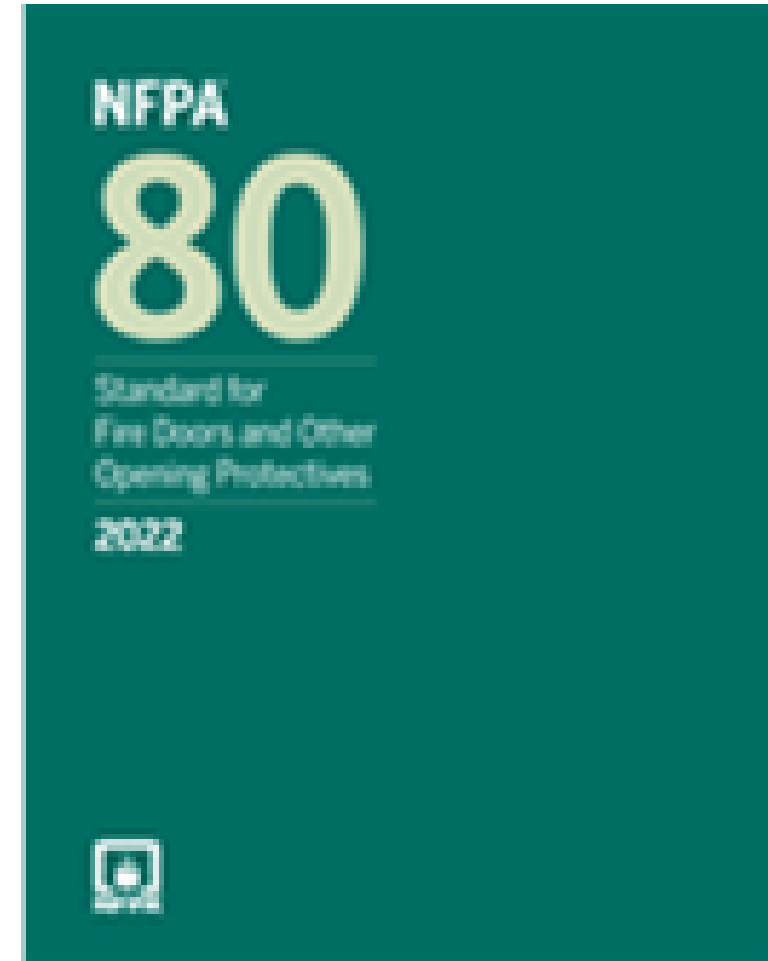
19.3.2.2 The operational test shall be conducted under nonfire HVAC airflow conditions as well as static flow conditions.

19.3.2.3 The operational test shall verify that there are no obstructions to the operation of the dynamic combination fire and smoke damper.

19.3.2.4 The operational test shall verify that there is full and unobstructed access to the dynamic combination fire and smoke damper and all listed components.

19.3.2.5 All indicating devices shall be verified to work and report to the intended location.

19.3.2.6 The dynamic combination fire and smoke damper shall also meet the testing requirements contained in Chapter 7 of NFPA 105.



Damper Test Requirements – NFPA 80

19.4 Acceptance Testing.

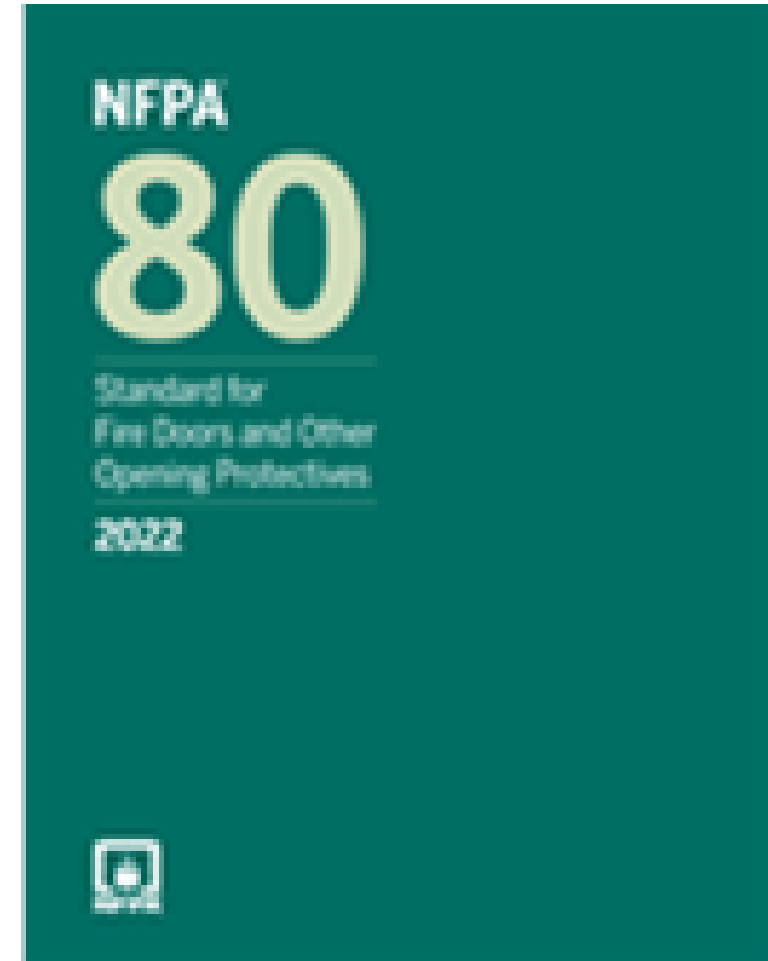
19.4.1 Acceptance testing of dampers shall be performed by a qualified person with knowledge and understanding of the operating components of the type of assembly being tested and the system in which it is installed.

19.4.2 Before testing, a visual inspection shall be performed to identify any damaged or missing parts that can create a hazard during testing or affect operation or resetting.

19.4.3 Acceptance testing for dampers without fusible links shall be conducted after the building mechanical ventilation system has been balanced.

19.4.3.1 If the damper is equipped with a variable air volume system, acceptance testing shall be conducted under maximum airflow.

19.4.3.2* Acceptance testing for dampers with fusible links shall be permitted to have the fan shut off during testing.



Damper Test Requirements – NFPA 80

19.4.4 Actuated Damper.

19.4.4.1 Acceptance testing of dampers designed to close via an electric or pneumatic actuator shall be conducted by removing electrical power or air pressure from the actuator and ensuring that the damper closes properly.

19.4.4.2 Electrical power or air pressure shall then be reapplied to the damper to confirm that it returns to its full-open position.

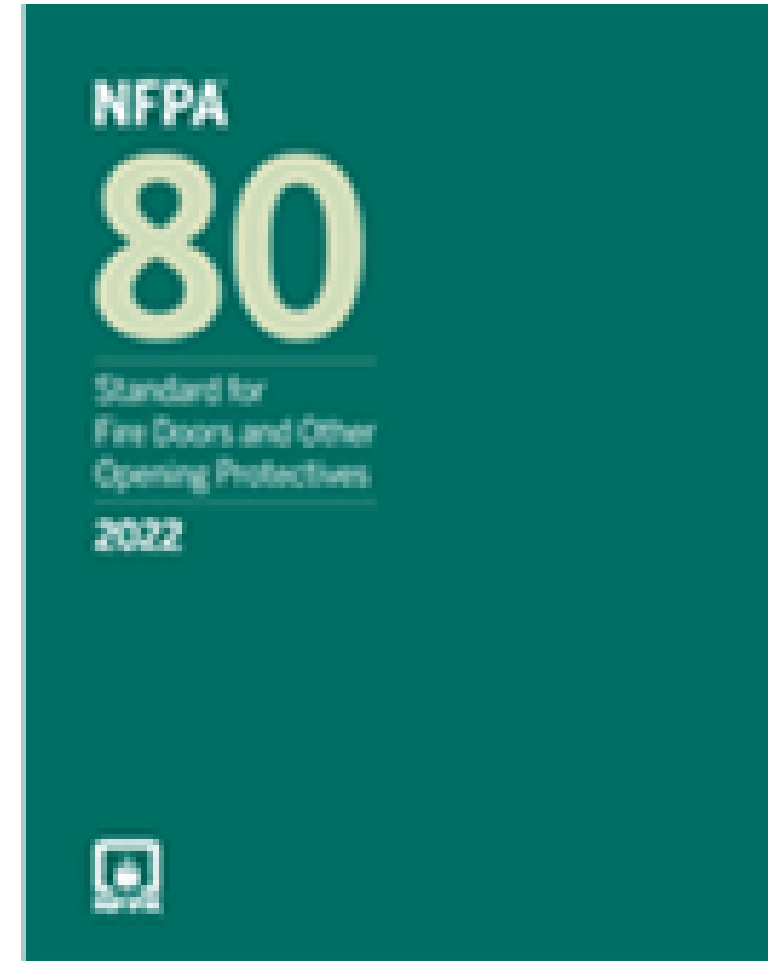
19.4.5* Nonactuated Damper.

19.4.5.1 Acceptance testing of dampers designed to close via a spring(s) or by gravity shall be conducted by removing the fusible link and confirming that the damper closes properly.

19.4.5.2 The damper shall then be manually reset to its full-open position and the fusible link shall be reinstalled.

19.4.6 If the damper is equipped with a variable air volume system, acceptance testing shall be conducted after the building mechanical ventilation system has been balanced and in operation under maximum air flow.

19.4.7 A record of these inspections and testing shall be made in accordance with 19.5.3.



Damper Test Requirements – NFPA 80

19.5.2 Test Method.

19.5.2.1 General. All tests shall be completed in a safe manner by personnel wearing personal protective equipment.

19.5.2.2* Periodic Testing for Fusible Link Operated Dampers.

19.5.2.2.1 Fusible links or other moveable parts shall not be painted or coated, unless listed by the testing agency.

19.5.2.2.2 The fan shall be permitted to be shut off during testing.

19.5.2.2.3* The fusible link shall be removed or activated with the damper in the full-open position.

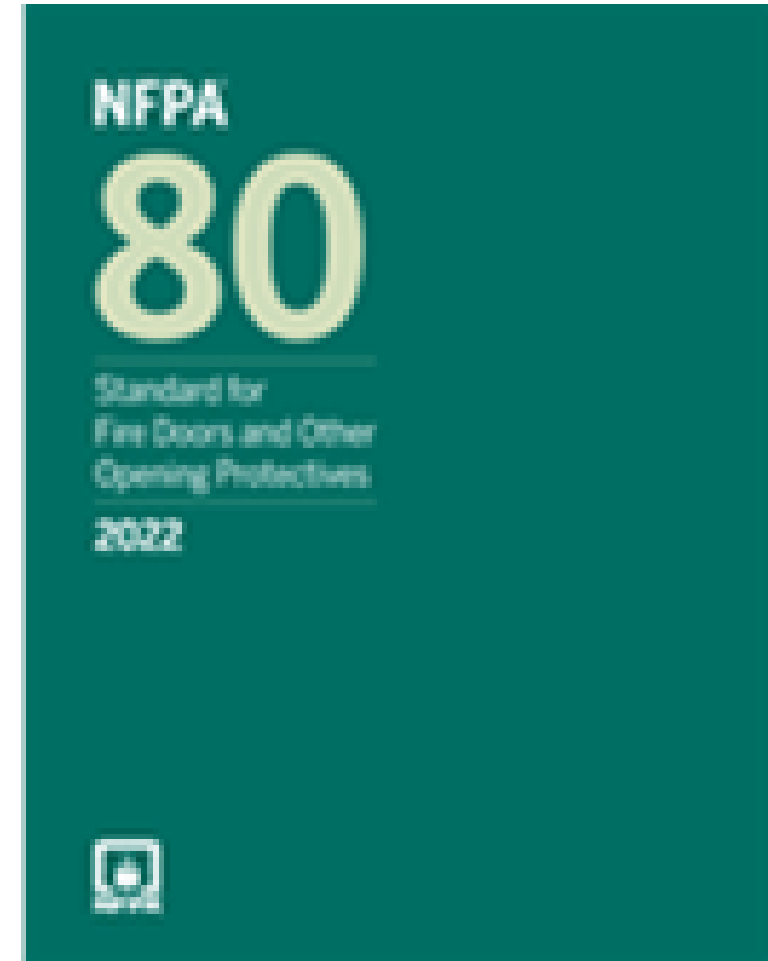
19.5.2.2.4 With the fusible link removed or activated, the damper shall close completely without assistance.

19.5.2.2.5 Where the damper is designed with a latch to hold the damper in the full-closed position, the operation of the latch shall be confirmed.

19.5.2.2.6 At the completion of the test, the damper shall be returned to the full-open position, and the fusible link shall be reinstalled or replaced.

19.5.2.2.7 If the link appears damaged, it shall be replaced with a functionally equivalently listed link.

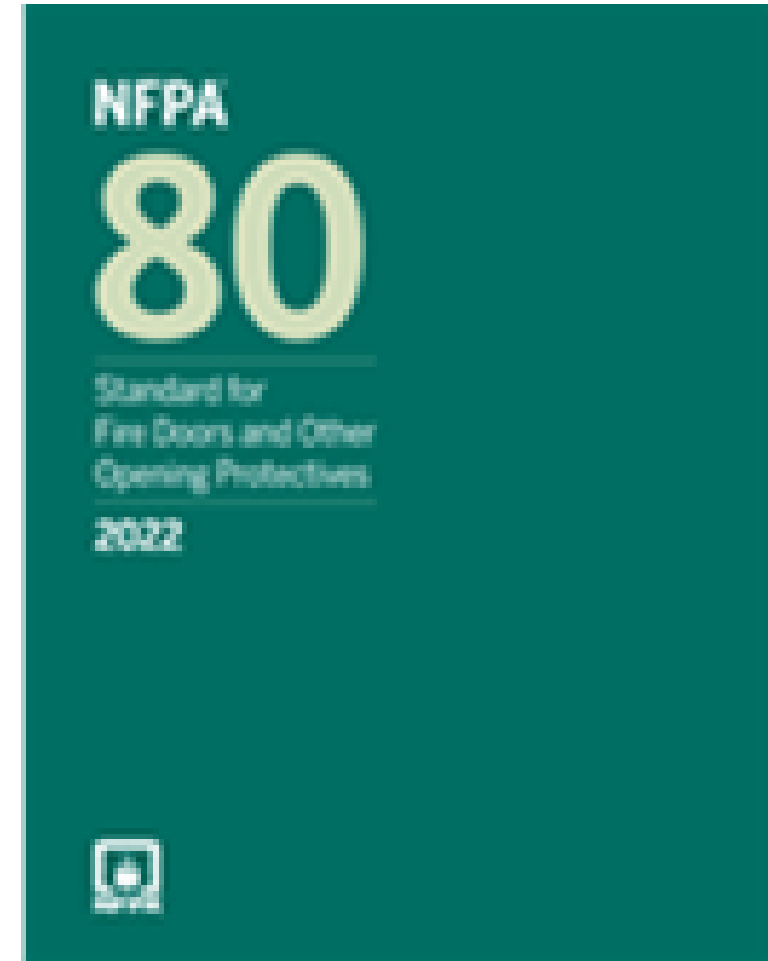
19.5.2.2.8 At the completion of the test, it shall be verified that the damper is unobstructed and in a fully operational mode.



Damper Test Requirements – NFPA 80

19.5.2.3 Periodic Testing for Dampers That Do Not Use a Fusible Link to Operate.

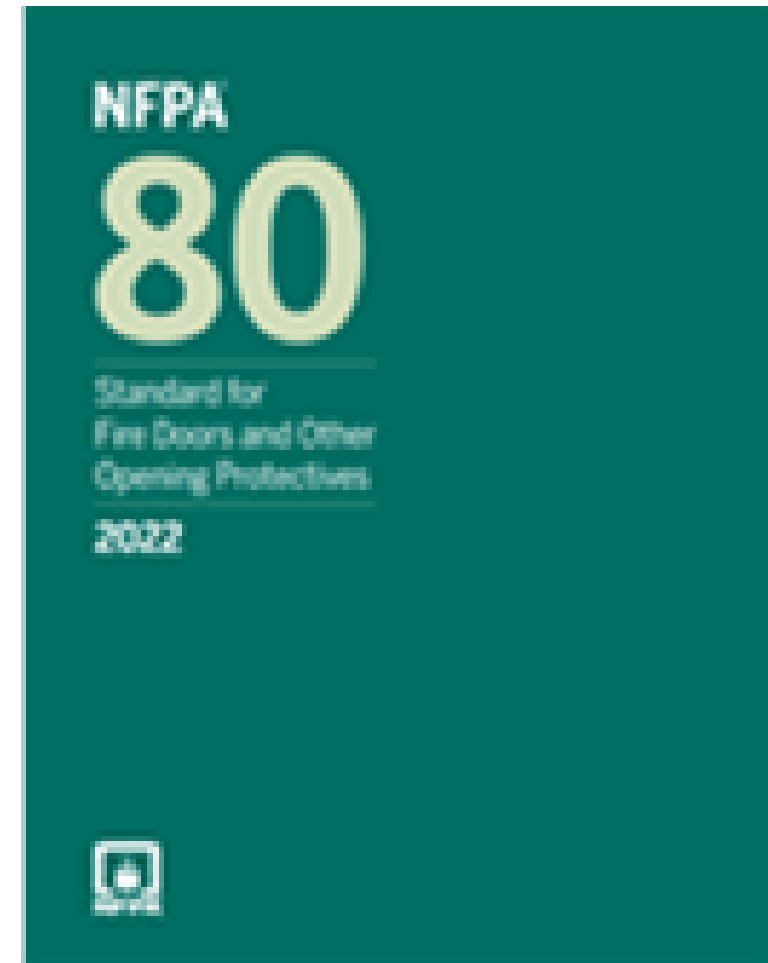
19.5.2.3.1* General. Fans shall not be permitted to be shut down during the test.



Damper Test Requirements – NFPA 80

19.5.2.3.3.2 Test Procedure.

- (A) A signal from the damper's position indication device 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.

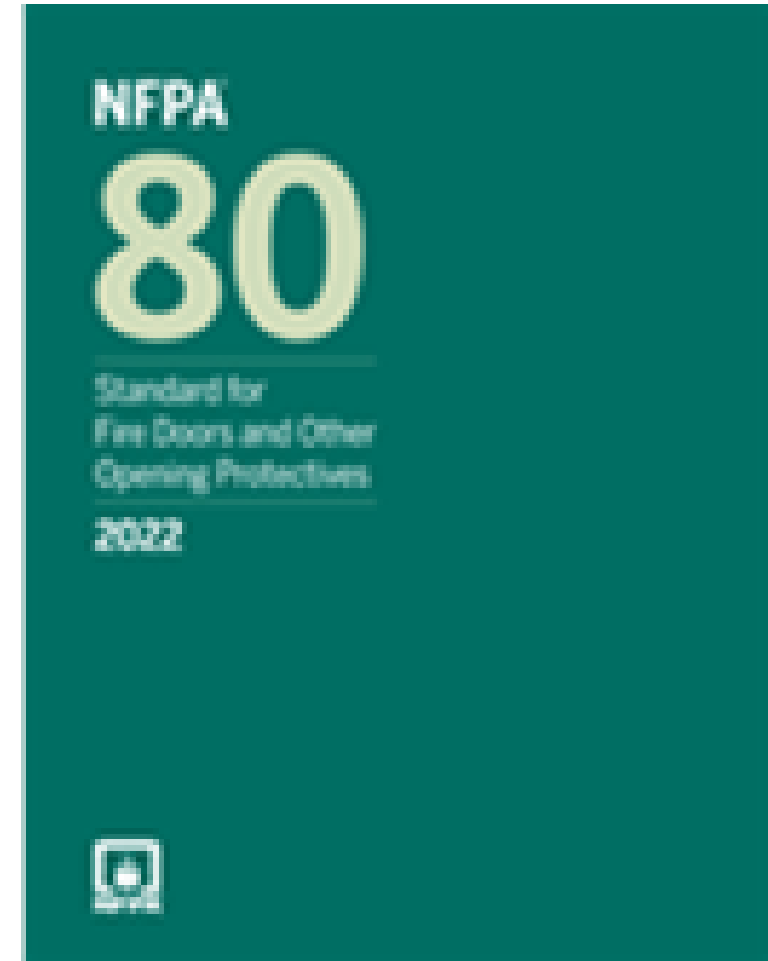


Damper Test Requirements – NFPA 80

Exceptions and notes:

19.5.1.3* In existing, fully ducted HVAC systems, periodic testing shall not be required for a single damper that is not accessible within a rated barrier or shaft.

19.5.1.4 Position indication functionality shall be permitted to be added to an existing damper not originally designed with position indication provided that the accuracy of the open and closed indication method is confirmed as required by 19.5.2.3.3.1(C). Any field modifications made to the damper shall be installed per the manufacturer's installation instructions for retrofitted equipment.



Checklist – Smoke Dampers

- ✓ Positioning of the Damper Relative to the Opening
- ✓ Sealing the Damper Frame to the Ductwork
- ✓ Damper Access
- ✓ Damper Flow and Pressure Ratings
- ✓ Operation of the Damper

Damper Test Requirements – NFPA 105

7.4 Operational Test.

7.4.1 Smoke, Combination Fire and Smoke, and Corridor Dampers. An operational test shall be conducted after the building's HVAC system has been balanced.

7.4.1.1 The test shall be adequate to determine that the damper has been installed and functions as intended.

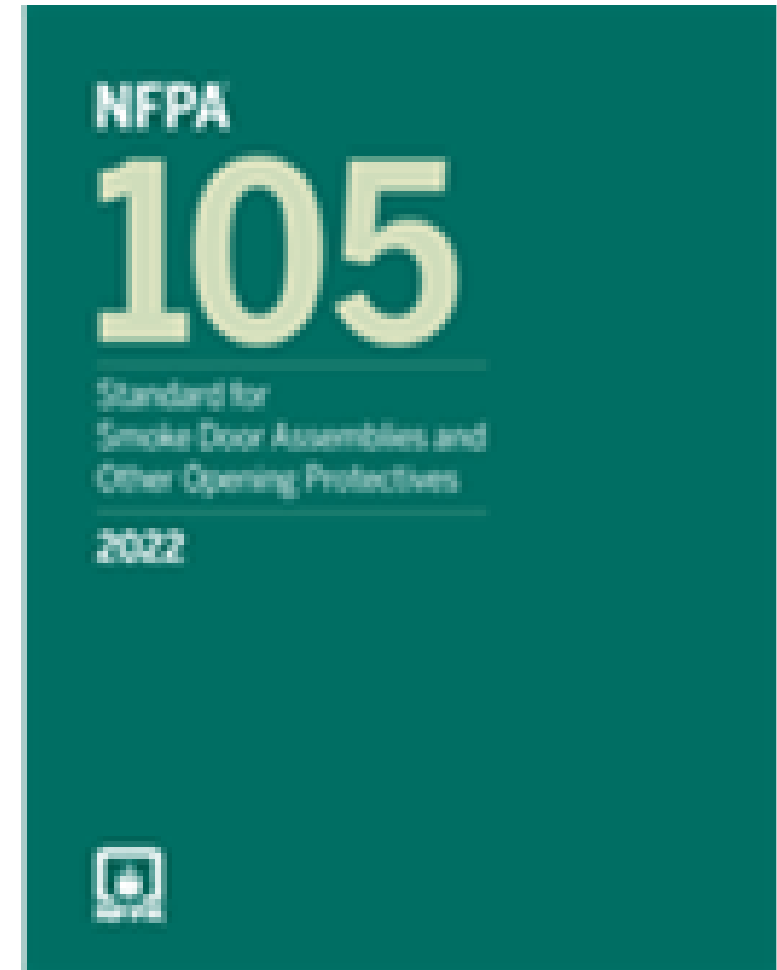
7.4.1.2 The operational test shall be conducted under normal HVAC airflow and nonairflow conditions. The damper shall fully close under both test conditions.

7.4.1.3 The operational test shall verify that there are no obstructions to the operation of the damper.

7.4.1.4 The operational test shall verify that there is full and unobstructed access to the damper and all appurtenances.

7.4.1.5 All indicating devices shall be verified to work properly and report to the intended location.

7.4.1.6 Combination fire and smoke dampers and corridor dampers shall also meet the testing requirements contained in NFPA 80, Section 19.3.



Damper Test Requirements – NFPA 105

7.5.2 Periodic Testing.

7.5.2.1 General.

7.5.2.1.1 Smoke dampers for dedicated and nondedicated smoke control systems shall be inspected and tested in accordance with NFPA 92.

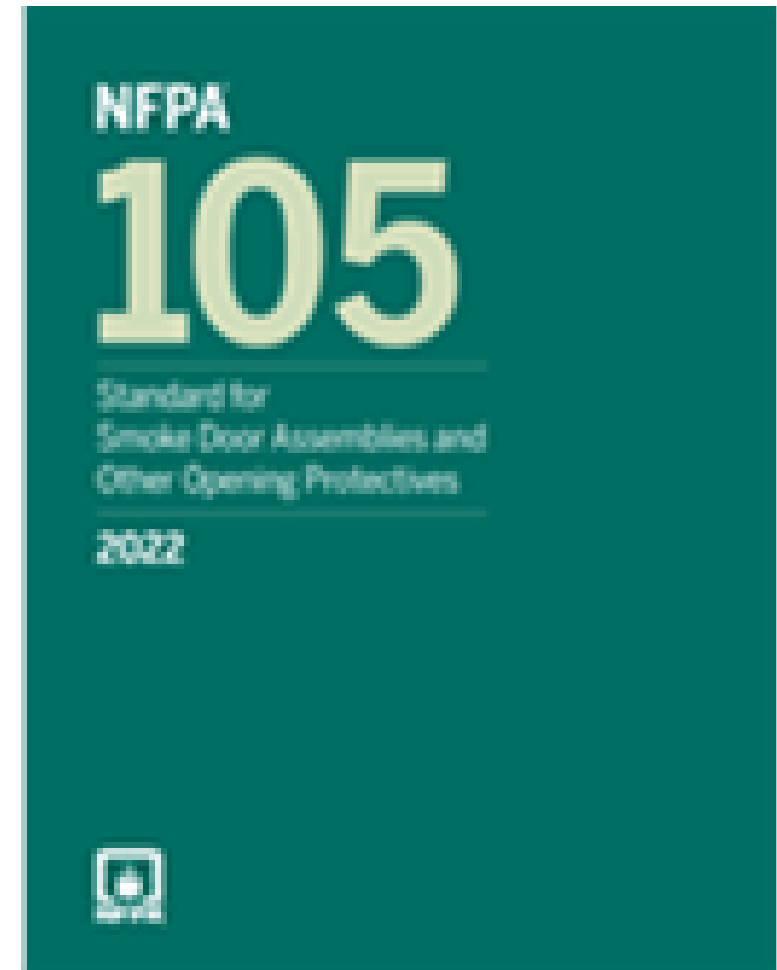
7.5.2.1.2 Combination fire and smoke dampers and corridor dampers shall be inspected and tested in accordance with NFPA 80.

7.5.2.2* Testing Frequency.

7.5.2.2.1 Each damper shall be inspected and tested 1 year after the completion of acceptance testing.

7.5.2.2.2* After the inspection and test required by 7.5.2.2.1, the test and inspection frequency shall then be every 4 years, except in buildings containing a hospital, where the frequency shall be every 6 years.

7.5.2.2.3* In existing, fully ducted HVAC systems, periodic testing shall not be required for a single damper that is not accessible within a rated barrier or shaft.



Damper Test Requirements – NFPA 105

7.5.2.3 Test Method.

7.5.2.3.1 General.

7.5.2.3.1.1 All tests shall be completed in a safe manner by personnel wearing personal protective equipment (PPE).

7.5.2.3.1.2 Fans shall not be permitted to be shut down during the test.

7.5.2.3.2 Visual Inspection Method. Visual inspection shall include all of the following:

- (1) Visually confirm that the damper is in the full-open or full-closed position as required by the system design.
- (2) Command and visually confirm the damper to the full-closed or full-open position.
- (3) Restore and visually confirm the damper to the original operating position as required by the system design.

7.5.2.3.3 Remote Inspection Method.

7.5.2.3.3.1 General.

(A) A damper with remote inspection capability shall positively indicate when the damper is fully open and fully closed.

(B) The initial remote inspection shall include a visual inspection of the damper in accordance with 7.5.2.3.2.

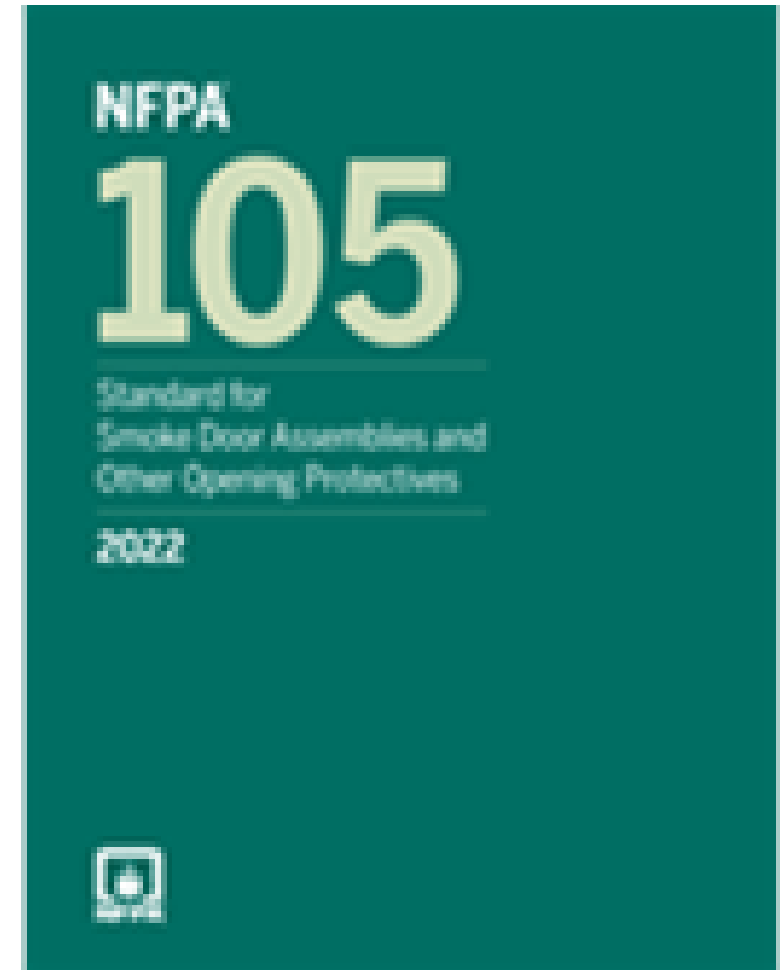
(C) The visual inspection shall confirm that the position indication method accurately reflects the full-open and full-closed position of the damper.



Damper Test Requirements – NFPA 105

7.5.2.3.3.2 Test Procedure.

- (A) The full-open or full-closed position, as required by the system design, shall be confirmed via the damper's position indication device.
- (B) The damper shall be commanded and confirmed to the full-closed or full-open position.
- (C) The damper shall be confirmed to be in the original operating position as required by the system design.
- (D) If the remote inspection fails to comply with the requirements of 7.5.2.3.3.2(A) through 7.5.2.3.3.2(C), a visual inspection shall be performed in accordance with 7.5.2.3.2.



Smoke Control Dampers

- **Smoke Control System damper testing:** After initial commissioning and testing:
 - Dedicated smoke control systems must be tested **2x/year**
 - Non-dedicated systems must be tested **1x/year.**

Common Field Issues



Field Replacement of Actuator

- “*Field mounting or substitution of actuators is not covered within the scope of the UL certification of the product. However, this does not necessarily preclude replacement of actuators in the field.*”
(Damper Marketing & Application Guide)
- NFPA80 and NFPA 105 state that “If the damper is not operable, repairs shall begin without delay.”, “Following any repairs the damper shall be tested for operation.”
- Consult damper manufacturer for correct actuator replacement.
- Should have approval from AHJ/owner.

External to Internal Mount Actuator

- Follow damper manufacturer's recommended best practice.
- Should have approval from AHJ/owner.
- May require UL Field Inspection services

Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage!

There are situations in the field where the actuator is provided on the damper externally but due to interferences the actuator needs to be moved internally. These instructions give you the steps you need to change from external to internal mount. The AHJ (Authority Having Jurisdiction) and building owner will need to determine if UL Field Inspection will be required.

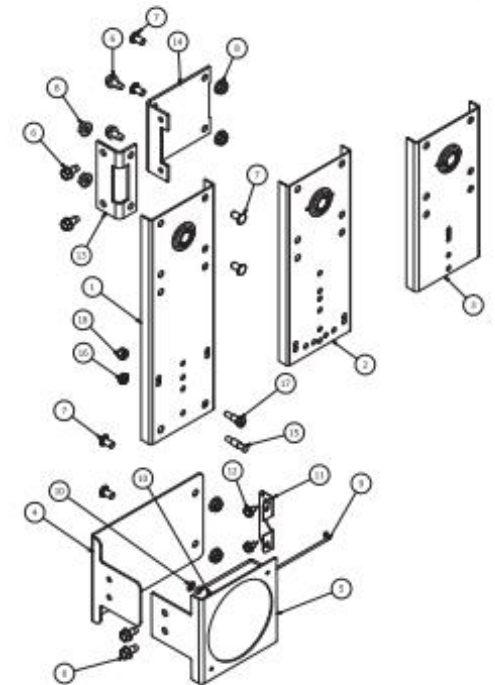
Tools needed:

Phillips screwdriver
Flat screwdriver
Allen wrench
Pliers
1/8", 3/8", and 1/2" inch sockets
Socket driver

Kit Number 878883 for 1/2 in. Jackshaft

ITEM QTY	PART NO.	DESCRIPTION
1	41300	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BLACK)
2	41301	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (WHITE)
3	41302	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (SILVER)
4	41303	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (RED)
5	41304	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BLUE)
6	41305	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (GREEN)
7	41306	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (YELLOW)
8	41307	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (ORANGE)
9	41308	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (PURPLE)
10	41309	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (PINK)
11	41310	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BROWN)
12	41311	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BLACK)
13	41312	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (WHITE)
14	41313	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (SILVER)
15	41314	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (RED)
16	41315	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BLUE)
17	41316	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (GREEN)
18	41317	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (YELLOW)
19	41318	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (ORANGE)
20	41319	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (PURPLE)
21	41320	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (PINK)
22	41321	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BROWN)
23	41322	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BLACK)
24	41323	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (WHITE)
25	41324	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (SILVER)
26	41325	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (RED)
27	41326	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BLUE)
28	41327	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (GREEN)
29	41328	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (YELLOW)
30	41329	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (ORANGE)
31	41330	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (PURPLE)
32	41331	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (PINK)
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38	41337	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BLUE)
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46	41345	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (WHITE)
47	41346	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (SILVER)
48	41347	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (RED)
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65	41364	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (PINK)
66	41365	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BROWN)
67	41366	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BLACK)
68	41367	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (WHITE)
69	41368	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (SILVER)
70	41369	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (RED)
71	41370	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BLUE)
72	41371	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (GREEN)
73	41372	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (YELLOW)
74	41373	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (ORANGE)
75	41374	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (PURPLE)
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77	41376	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BROWN)
78	41377	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BLACK)
79	41378	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (WHITE)
80	41379	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (SILVER)
81	41380	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (RED)
82	41381	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BLUE)
83	41382	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (GREEN)
84	41383	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (YELLOW)
85	41384	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (ORANGE)
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91	41390	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (SILVER)
92	41391	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (RED)
93	41392	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BLUE)
94	41393	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (GREEN)
95	41394	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (YELLOW)
96	41395	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (ORANGE)
97	41396	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (PURPLE)
98	41397	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (PINK)
99	41398	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BROWN)
100	41399	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (BLACK)
101	41400	ACTUATOR (1/2" JACKSHAFT) (FSD/SMD) (WHITE)

NOTE: ITEMS 9, 10, 11, 12 NOT USED ON RAL GREY UNITS



“In-wall” to “Out-of-wall” Damper

- Should have approval from AHJ/owner.
- Follow damper manufacturer’s recommended best practice.
- May require UL Field Inspection services

Parts needed:

Part No.	Description
879163	36 in. x 36 in. thermal blanket kit
220079	3M Type FSK 1525 SCW tape

“Standard” fire dampers (FD and DFD series) and combination fire smoke dampers (FSD series) are designed to be mounted such that the centerline of their blades, when closed, are in the plane of a fire rated barrier. These instructions describe the requirements for modifying a standard fire or fire smoke damper when it is necessary to mount the damper such that the centerline of the closed blades are outside the plane of the fire rated barrier.

Note: Field modifications to UL classified dampers are not covered under the scope of UL’s follow-up service. Therefore it may be deemed necessary for dampers modified in the field to be re-inspected to confirm compliance with Greenheck’s UL construction requirements. If a re-inspection of a field modified damper is deemed to be required contact Greenheck to coordinate an on-site UL field inspection.

Dampers mounted with the centerline of the blades outside the plane of the rated barrier are required to have ceramic fiber thermal blanket installed around the damper sleeve. Kit number 879163 includes enough thermal blanket to insulate a 36 in. x 36 in. (915mm x 915mm) damper.

The thermal blanket is not required to extend past the damper frame on the side opposite the barrier (see Figure 1). One end of the thermal blanket shall be mechanically fastened with #10 sheet metal screws or 3/16 in. steel rivets. The fasteners shall be a maximum of 2 inches (51mm) from the corners and then every 6 inches (152mm) on center. The blanket shall be fastened on all four sides in this manner. The thermal blanket may be attached on the other side of the sleeve using 3M Type FSK 1525CW tape. The seam where the thermal blanket comes together requires to be taped with 3M Type FSK 1525CW. The Greenheck part number for this tape is 220079.

Once the thermal blanket is properly installed the damper must be installed as required by Greenheck’s UL approved installation instructions for out of wall fire and combination fire smoke dampers (Document Number 461337).

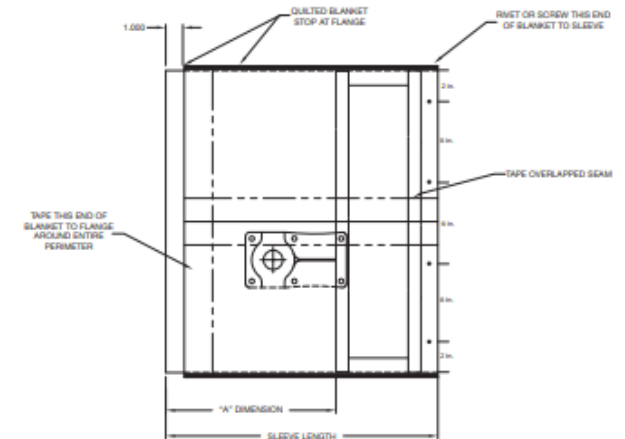


Figure 1: Attaching Thermal Blanket



Field Sleeve Extension

- Should have approval from AHJ/owner.
- Follow damper manufacturer's recommended best practice.



Refer to:

'Installation Instructions for FD, DFD, DFD X series, and FD X series Fire Damper Models' (Part #481324)
or
'Installation Instructions for FSD-XXX, DFD-XXX, and SSFSD-XXX Series Fire & Combination Fire Smoke Dampers' (Part #481318) for additional details.

Application

Factory installed sleeves may need to be extended in the field. This supplement covers the following applications:

- When the factory sleeve extends all the way through the rated barrier (**Figure 1**)
- When the factory sleeve ends in the plane of the rated barrier (**Figure 2**).

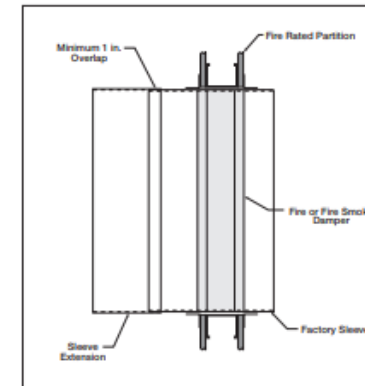


Figure 1: Factory sleeve extends all the way through the rated barrier.

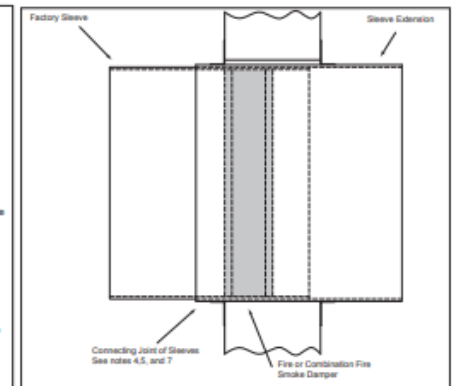


Figure 2: Factory sleeve ends in the plane of the rated barrier.

This supplemental installation instruction provides details for attachment of the sleeve extension. Consult Authority Having Jurisdiction (AHJ) for approval.

Notes

1. Sleeve extension must be same material and gage as factory sleeve.
2. The inside dimensions of the sleeve extension must be the same dimensions as the outside dimensions of the factory sleeve.

Insufficient Damper Access

717.4 Access and identification. **P**

Access and identification of fire and *smoke dampers* shall comply with Sections 717.4.1 through 717.4.2.

717.4.1 Access. **P** **CDP**

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 (305 mm) square or provided with a removable duct section.

717.4.1.1 Access openings. **P**

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. **P**

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.

Damper Access

7.5.2.3.3 Remote Inspection Method.

7.5.2.3.3.1 General.

(A) A damper with remote inspection capability shall positively indicate when the damper is fully open and fully closed.

(B) The initial remote inspection shall include a visual inspection of the damper in accordance with 7.5.2.3.2.

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

Damper Closure Devices

- Fusible Link
- RRL
 - Electronic link
 - Wired in series with actuator
- RRL/OCI
 - Same as RRL
 - Plus open close indicator
- TOR
 - Secondary override
- PRV
 - Pneumatic relief valve



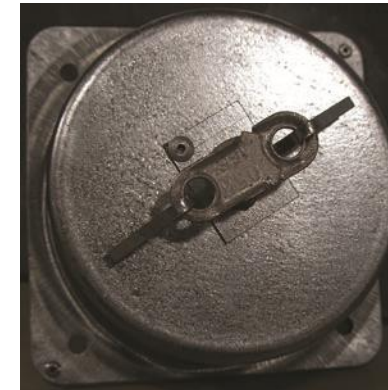
RRL



RRL/OCI



TOR



PRV

Damper Position Indication



- Integral to actuator
- Add-on to drive shaft

- Direct Blade Driven

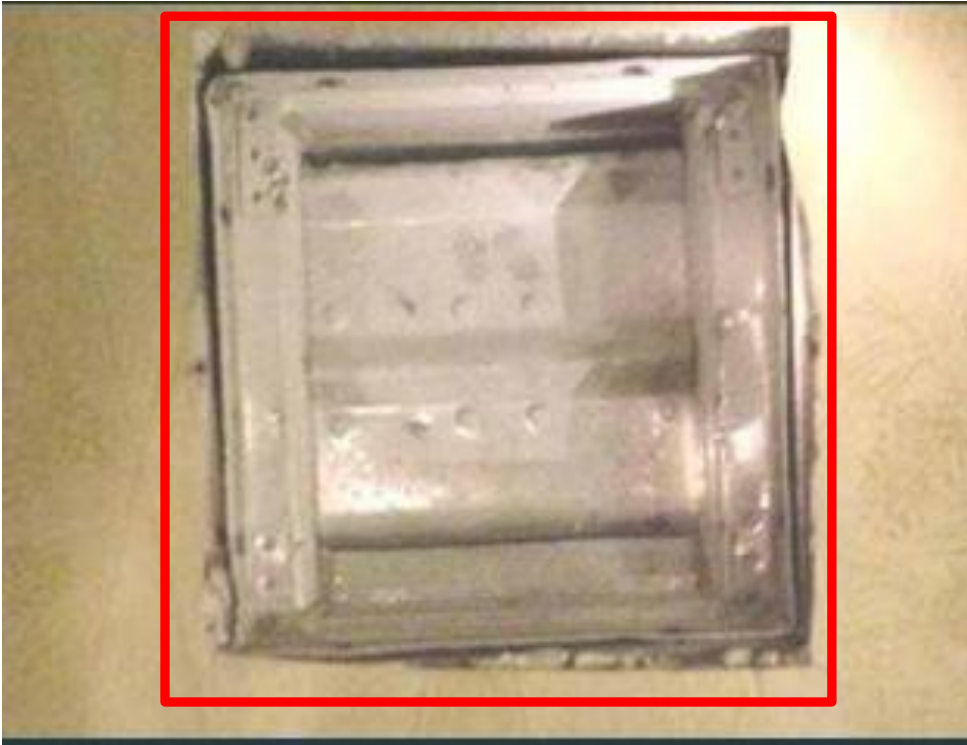
Fire/Smoke Damper Test Switches

- Test Switches
- Purpose: Test the operation of the damper
 - Greenheck Test Switch (GTS)
 - Factory mounted or loose
 - Test at the damper or remote location
 - Momentary Test Switch
 - Factory mounted
 - Test at the damper
 - Toggle Switch
 - Factory mounted
 - Test at the damper



Improper Installations

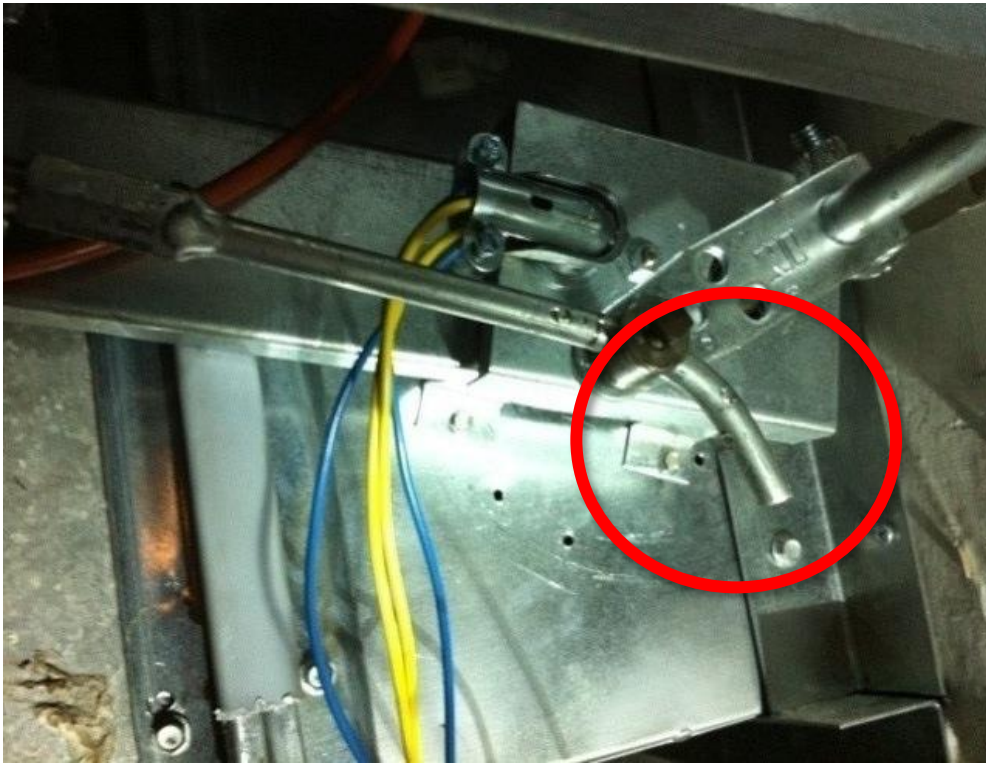
DON'T DO IT.



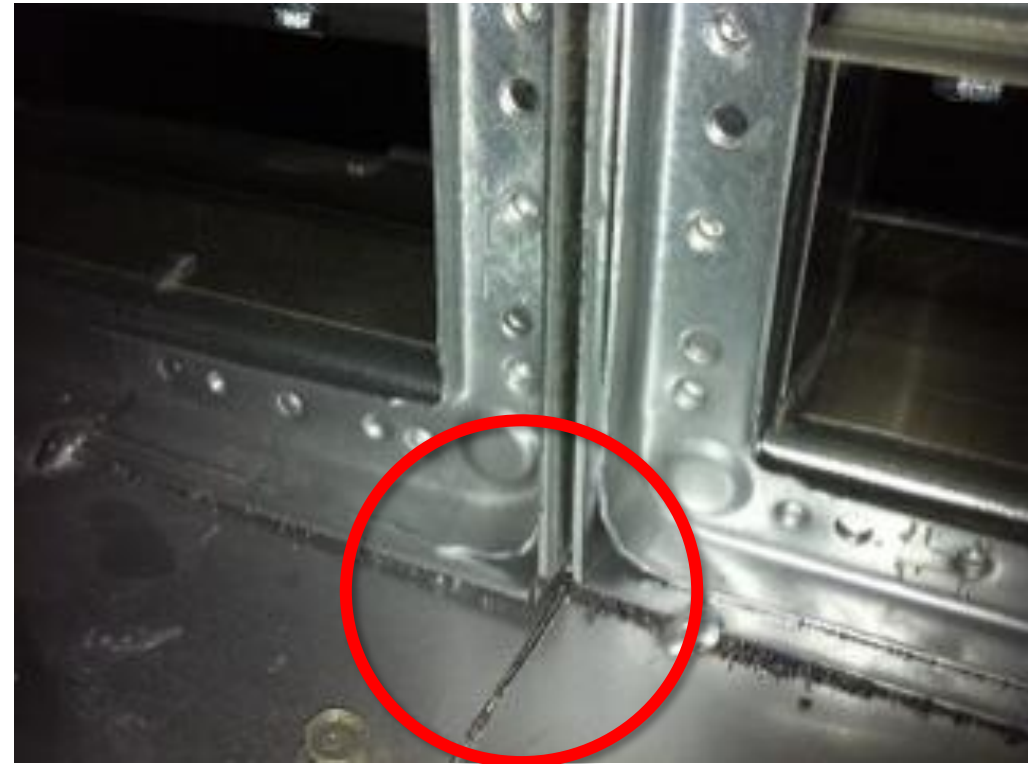
The damper not installed square, plumb, straight, it is installed racked



The installation screw is in the track of the damper



Bending of Components



Resizing Damper in the Field



Modifying the damper in the field without approval from the AHJ



**Not following
Damper Manufacturer's IOM
for approved installations!**



Resources






Air Movement and Control Association International, Inc. (AMCA)

“Guide for Commissioning and Periodic Performance Testing of Fire, Smoke and Other Life Safety Related Dampers”

- **Free!!**
- “...provide recommendations for the proper commissioning of Fire and Life Safety Related Dampers and to describe the appropriate intervals and methods for performing periodic performance testing of these dampers.”

AMCA International

Guide for Commissioning and Periodic Performance Testing of Fire, Smoke and Other Life Safety Related Dampers

 **AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.**

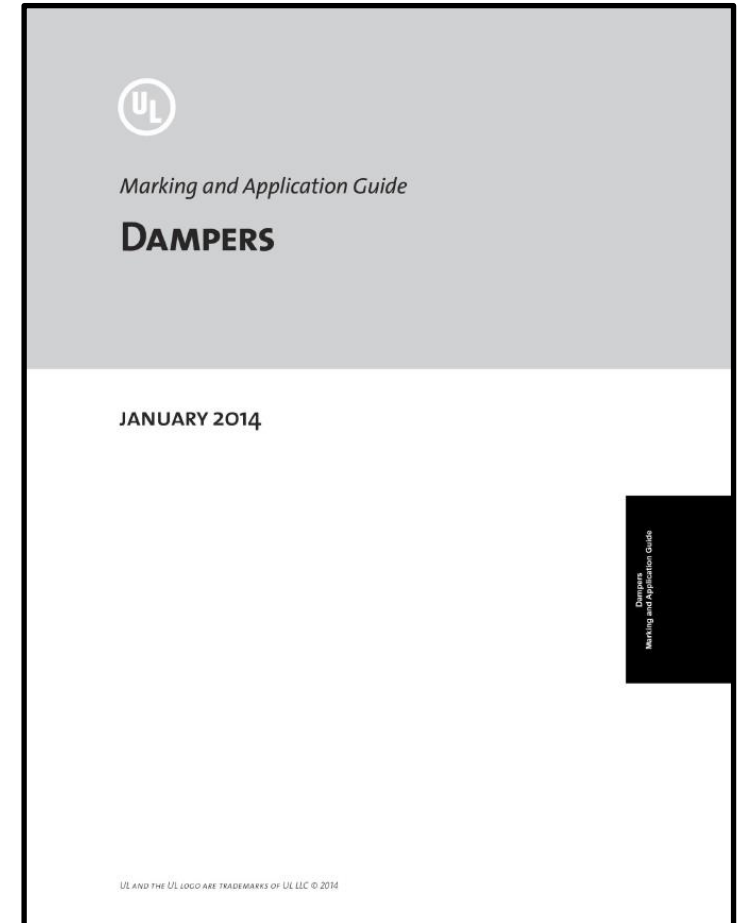
The International Authority on Air System Components



Underwriters Laboratories (UL)

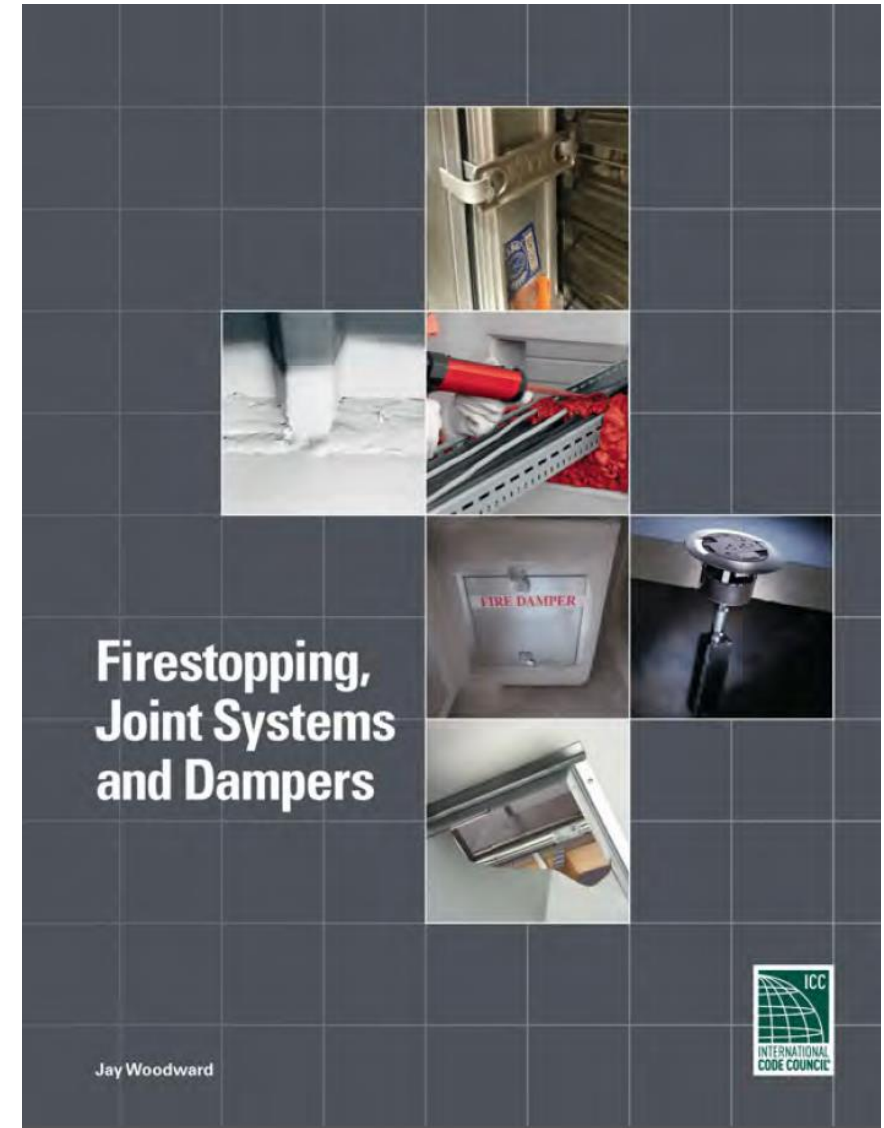
“Marking and Application Guide: Dampers”

- **Free!!**
- “...intended to assist code authorities, architects, contractors, installers and other interested parties in determining the suitability of fire, smoke, combination fire-smoke, ceiling radiation and corridor dampers in a particular installation and use, and to address concerns related to fire and smoke related performance.”

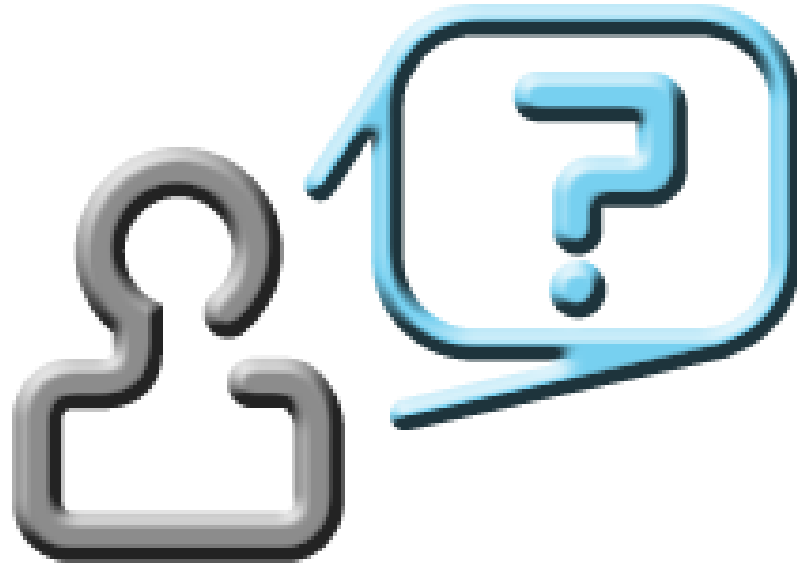


“Firestopping, Joint Systems and Dampers”

- By Jay Woodward with support from ICC International Code Council and IFC International Firestop Council
- Great resource for ALL things dampers



Questions?



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