Fire, Smoke, and Combination Fire Smoke Dampers
Agenda

- Installation/Configuration
  - Fire Dampers
  - Smoke Dampers
  - Combination Fire/Smoke Dampers
  - Ceiling Radiation Dampers

- Operational Test/Inspection

- Periodic Test/Maintenance
Damper Selection

- Comply with code requirements
- Design for long term use
- Modification restrictions
What makes an approved system?

- Barrier
- Product
- Installation
What is it?

Labels
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Category Name</th>
<th>Link to File</th>
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<tr>
<td>ACME ENGINEERING &amp; MFG CORP</td>
<td>Dampers for Fire Barrier and Smoke Applications</td>
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UL 555: Fire Dampers
UL 555 Classifications

- **Static**
  - For use in HVAC systems that shut off in case of a fire emergency.

- **Dynamic**
  - For use in HVAC systems that continue running during a fire emergency.
  - Dynamic airflow test
  - Increments of 1000 fpm
Damper Construction

- **Type**
  - Curtain
  - Multi-blade
    - Blade Type

- **Material**
  - Galvanized
  - 304 stainless steel
  - 316 stainless steel

- **Mounting**
  - Vertical
  - Horizontal
Damper Ratings

- **Closure Temperature**
  - 165° F (160 minimum per IBC)
  - 350° F (maximum per IBC)

- **Operational Temperature**
  - 250° F (minimum)
  - 100° F increments
Operational Airflow Rating
- 2000 fpm
- 3000 fpm
- 4000 fpm
- +

Operational Closure Pressure Rating
- 4 in. wg.
- 6 in. wg.
- 8 in. wg.
- +
IBC

- 717.3.2.1 Fire Protection rating. Fire dampers shall have the minimum fire protection rating specified in table for the type of penetration.

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<tr>
<th>Type of Penetration</th>
<th>Minimum Damper Rating (hours)</th>
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<td>Less than 3-hour fire resistance rated assemblies</td>
<td>1.5</td>
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<tr>
<td>3-hour or greater fire resistance rated assemblies</td>
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</table>
Installation Requirements

title

Framing of Opening

- Vertical studs must run floor to ceiling
- Double vertical studs over 36” x 36”
- Wood studs must be covered with sheet rock
- Steel studs do not need to be covered with sheet rock

Diagram showing:
- Gypsum wallboard
- Stud or runner
- Retaining angle
- Damper sleeve

In wood stud construction, gypsum wallboard must cover all wood stud surfaces.

In metal stud construction, exposed steel surfaces need not be covered with gypsum wallboard.
Installed with sleeves
  - factory or field mounted
  - sleeve requirements
Installation Requirements
Fire and Fire Smoke Dampers

**Traditional Installation**

1. The centerline of the damper frame must be in the plane of the wall/floor

2. Annular Space Requirements
Installation Requirements

Fire and Fire Smoke Dampers

**Traditional Installation**

3. Retaining Angle Installation

- Angles must be fastened to the sleeve (not to the barrier)
- Attachments 2” from corners then 6” O.C.
- Angles must overlap barrier by at least 1”
- Angles are continuous with no gaps
Installation Requirements

Fire and Fire Smoke Dampers

Alternate Installation

- Single Side Angle
Caulking/Sealing Angles

Recommendations

• Consult MFG
  • Approved with/without
  • Leakage
  • Protection
  • Etc.

• Consult AHJ
• Use tested installation
• Use approved material
Installation Requirements

Fire and Fire Smoke Dampers

Alternate Installation

- Firestop
Firestop Installation

Part number 469419

INSTALLATION INSTRUCTION SUPPLEMENT

DFD Series
1/2 Hour Multi-Blade Fire Dampers and
FSD Series
1/2 Hour Combination Fire Smoke Dampers - Vertical Mount

Refer to:
Installation Instructions for FSD-XXX, DFD-XXX,
SSPD-XXX & CFSD-XXX Series Fire & Combination Fire
Smoke Dampers (Part #46136)

These instructions apply to 1/2 hour rated combination
fire smoke dampers and dynamic rated multi-blade fire
dampers mounted in masonry, block, or metal or wood
stud walls. Specific requirements in these instructions are
mandatory. These instructions meet the requirements of
UL 555.

Installation shall comply with the requirements of NFPA
90A (Standard for the Installation of Air Conditioning and
Ventilating Systems) and UL Classification RI-317,
Fire and Combination Fire/Smoke dampers up to a
maximum size of 72 in. W x 66 in. H (1828mm x 2438mm)
may be installed as instructed below.

1. Expansion Clearance - Fire damper and sleeve
assemblies expand during periods of intense heat.
Therefore, it is essential that openings in walls or
floors be larger than the fire or fire/smoke damper and
sleeve assembly to allow for this expansion. Minimum
clearances required between the outside of fire or fire/
smoke damper sleeve assemblies and wall openings are:
- Galvanized steel fire dampers and sleeves: 1/4 in.
(6mm) per foot of damper width and height with a
minimum clearance of 1/4 in. (6mm), maximum of 1
(25mm). Recommended clearances for width
and/or height dimensions of:
  1) 48 in. (1219mm) or less: 1/4 in. (6mm) clearance
  2) More than 48 in. (1219mm) and 96 in.
    (2438mm) or less: 1 in. (25mm) clearance
  3) More than 96 in. (2438mm): 1/4 in. (6mm)
- Stainless steel fire/smoke dampers and stainless
  steel or galvanized sleeves: 3/8 in. (9.5mm) per
  foot of damper width and height with a minimum
  clearance of 1/4 in. (6mm), maximum of 2 in.
  (51mm)

2. Packing (optional) - Polyethylene backer cord, receded
from surfaces of wall to accommodate the required thickness of
fill material.

3. Fill Material - Hilti Corporation - FS-One fire stop caulk
applied to a minimum 5/8 in. (16mm) thickness within the
annular space and flush with both surfaces of the wall
with a 1 in. (25mm) overlap onto the gypsum board. If the
damper/sleeve assembly comes into contact with the wall,
a minimum of 3/8 in. (10mm) diameter bead shall be applied to
the interface between the sleeve and contact surface.
Firestop should be installed according to manufacturer's
instructions and construction instructions given in the 2007 UL

4. Retaining Clip - Retaining clip: 1 in. x 2 in. x 2 in. x 16 gauge
(25mm x 51mm x 51mm x 1.5mm) is attached to one side of
the wall with 1 1/2 in. (38mm) long #10 sheet metal screws or
masonry screws in the masonry wall. The 1 in. (25mm) leg of
the clip shall be attached to the damper sleeve with 1/2 in.
(13mm) long #10 sheet metal screws. The retaining clips are
required to be spaced a maximum of 6 in. (152mm) from the
top of the sleeve and spaced a maximum of 12 in. (305mm)
on center of the sides of the unit only.

Figure 1

Figure 2
Firestop Installation
Out-Of-Wall Installations

Commonly used in shaft walls installations where there is no external access to the actuator.
Out-of-Wall
Fire and Fire Smoke Dampers
Objective - Protect a 160 x 94 ventilation penetration in a 2 hr rated barrier

Challenge - The largest tested and listed damper system in the world for this application is 144 x 96

Solution -
Over-Sized Opening

- **Static**
  - For use in HVAC systems that shut off in case of a fire emergency.

- **Solution(s)**
  - Make smaller openings
  - Same construction as barrier
  - Mullion

*SPECIAL NOTE: Support mullions may only be used with statically-rated fire damper assemblies; they cannot be used to install combination fire-smoke dampers in wall openings that exceed the maximum UL-approved size for the fire-smoke damper module being installed.*
These installation instructions apply to the fabrication and construction of generic support mullions. Support mullions are necessary whenever static fire dampers are installed into a vertical opening that is larger than the largest UL rated size for that damper. The mullions allow construction of a fire barrier that is larger than the maximum available size.

Sleeves are to be around each damper assembly. Mullions are not intended to be in the airstream, (i.e. exposed to flow) or to be a part of the ductwork.

**SPECIAL NOTE:** Support mullions may only be used with static-rated fire damper assemblies; they cannot be used to install combination fire-smoke dampers in wall openings that exceed the maximum UL-approved size for the fire-smoke damper model being installed.
Static

- For use in HVAC systems that shut off in case of a fire emergency.

Solution(s)

- Make smaller openings
- Same construction as barrier
- Mullion
- AHJ Approved
Over-Sized Opening

- **Dynamic**
  - For use in HVAC systems that continue running during a fire emergency.
  - Dynamic airflow test
  - Increments of 1000 fpm

- **Solution(s)**
  - Much harder

  *Cannot exceed the velocity rating of the tested and listed system*
Sleeves are to be around each damper assembly. Mullions are not intended to be in the airstream, i.e. exposed to flow or to be a part of the ductwork.

**SPECIAL NOTE:** Support mullions may only be used with static-rated fire damper assemblies; they cannot be used to install combination fire-smoke dampers in wall openings that exceed the maximum UL-approved size for the fire-smoke damper model being installed.

2,000 FPM (23 MPH)

8,000 FPM (92 MPH)
Traditional Installation

4. Duct to Sleeve Connections
   • Transverse Joints
   • TDC/TDF
   • Manufactured Systems
   • Rigid Connection (when allowed)
Greenheck
Connect-All
Breakaway Test
UL 555S: Smoke Dampers
Smoke Damper Construction

- **Type**
  - multi-blade
  - 3-V or airfoil blade

- **Construction**
  - blade and jamb seals
  - *always* with a UL-approved actuator
Smoke Damper Actuators

Mounting
- must be factory mounted
- internal or external

Operation
- spring return
- two position or modulating
UL 555S Classifications

- **Leakage Class**
  - I (8 cfm/sq. ft @ 4 in.wg)
  - II (20 cfm/sq. ft @ 4 in.wg)
  - III (80 cfm/sq. ft @ 4 in.wg)

- **IBC 716.3.2**
  - Smoke damper leakage ratings shall not be less than Class II.

- **Operational Temperature**
  - Maximum operating temperature for damper
    - 250° F
    - 350° F
## Amount of Time to Fill a Room with Smoke Based on Leakage Class

<table>
<thead>
<tr>
<th>Leakage Class</th>
<th>Length of Time</th>
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<tbody>
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<td>I</td>
<td>100 minutes</td>
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<tr>
<td>II</td>
<td>40 minutes</td>
</tr>
<tr>
<td>III</td>
<td>10 minutes</td>
</tr>
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24” x 24” (610mm x 610mm) Damper
Smoke Damper Installation

- Installed in ductwork
  - with sleeve
  - without sleeve
- Location
  - Centerline within 24” of the barrier

Fig. 2
Smoke Damper Installation

- In Accordance with Manufacturer’s IOMs

- Sealing Damper
  - It is acceptable to seal damper frame and duct with approved sealants.

- Actuator Requirements
  - Wire actuator in compliance with local wiring codes.
  - Refer to wiring diagrams for each actuator.
Combination Fire/Smoke Dampers
Purpose of Fire/Smoke Damper

- Provide the same level of protection as individual fire and smoke dampers.
- Installation guidelines of fire and smoke dampers apply.
Fire Smoke Installation

- **Actuators**
  - UL-certified actuators
  - installed at factory

- **Operation**
  - spring return
  - two position or modulating
Fire/Smoke Damper Closure Devices

- **Fuse Link**
- **Electronic Link**
  - bi-metallic sensor
  - wired in series with actuator
  - cuts power to actuator when temperature is reached
  - resettable
UL 555C Ceiling Radiation Dampers
Ceiling Radiation Dampers

Used in the protection of ceiling openings in fire rated floor/ceiling assemblies.
Ceiling Design

- No penetration shown
- No damper required
Trap Door Type

- Trap Door Style
Ceiling Designs

Design No. P554
October 22, 2010
Unrestrained Assembly Rating - 1 Hr.
Finish Rating - 25 Min.
Load Restricted for Canadian Applications — See Guide RXYVZ
Operational Test/Inspection
Importance of Inspection

Damper installed racked.
Misaligned jackshaft on damper.
Importance of Inspection

Actuator in the barrier.
Importance of Inspection
Operational Test

NFPA 80
Standard for Fire Doors and Other Opening Protectives

Frequency

“After the installation of a damper is completed, an operational test shall be conducted.”

Test Method

“The damper shall fully close from the open position.”

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

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

“The operational test shall be conducted under non-fire HVAC airflow conditions as well as static flow conditions.”
Operational Test

NFPA 105

Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives

Frequency

“An operational test shall be conducted after the building’s HVAC system has been balanced.”

Test Method

“The operational test shall be conducted under normal HVAC airflow conditions as well as static flow conditions. The damper shall fully close/seal under both test conditions.”

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

“Combination fire/smoke dampers shall also meet the testing requirements contained in NFPA 80.”
Period Tests/Maintenance
Garbage placed inside of damper.
Periodic Testing Requirements

NFPA 80
Standard for Fire Doors and Other Opening Protectives

Frequency

“Each damper shall be tested and inspected 1 year after installation” and then “every 4 years, except in hospitals, where the frequency shall be every 6 years.”

Test Method

“If the fire damper is equipped with a fusible link, the link shall be removed for testing to ensure full closure.”

“The operational test of the damper shall verify that there is no damper interference due to rusted, bent, misaligned, or damaged frame or blades.”
Periodic Testing Requirements

**NFPA 80**
Standard for Fire Doors and Other Opening Protectives

**Maintenance**

“All exposed moving parts of the damper shall be dry lubricated as required by the manufacturer”

“If the damper is not operable, repairs shall begin without delay”

“Following any repairs, the damper shall be test for operation in accordance with Section 19.4(Inspection and Testing)”
Periodic Testing Requirements

NFPA 105
Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives

Frequency
“Each damper shall be tested and inspected 1 year after installation” and then “every 4 years, except in hospitals, where the frequency shall be every 6 years.”

Test Method
“If the fire damper is equipped with a fusible link, the link shall be removed for testing to ensure full closure.”

“The operational test of the damper shall verify that there is no damper interference due to rusted, bent, misaligned, or damaged frame or blades.”
NFPA 105
Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives

Maintenance

“All exposed moving parts of the damper shall be dry lubricated as required by the manufacturer.”

“If the damper is not operable, repairs shall begin without delay.”

“Following any repairs, the damper shall be test for operation in accordance with Section 6.5(Inspection and Testing).”
Periodic Testing Requirements

New AMCA Maintenance Guide

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