



**Fire, Smoke and Radiation
Damper Installation**

Presented by: Mark Terzigni
May, 2010
SMACNA

**FIRE, SMOKE AND
RADIATION DAMPER
INSTALLATION GUIDE
FOR HVAC SYSTEMS**




SHEET METAL AND AIR CONDITIONING CONTRACTORS
NATIONAL ASSOCIATION, INC.



Caution!

The SMACNA Fire Damper Manual
Should Not be Used as the Basis for
a Damper Installation
Use the Manufacturer's Instructions



Caution!

SMACNA CANNOT JUDGE ANY
Fire/Damper Combination Fire-
Smoke Damper Installation as
being "Approved" or
"Acceptable"



Plans/Specifications/Responsibilities

- o Architects – Clearly identify
all fire-resistant assemblies
and their hourly ratings on
the drawings



Plans/Specifications/Responsibilities

- o Engineer – Clearly identify on the
project's drawings all duct penetrations
of fire-resistive assemblies and the
details and methods to install the
required dampers to maintain the fire-
resistive integrity of those assemblies



Plans/Specifications/Responsibilities

- o Code Official – Mandatory that the plans and specifications completely identify all fire-resistant assemblies, and the details of how those penetrations are to be protected



TABLE 5-1 REQUIRED FIRE DAMPER INSTALLATION INSTRUCTIONS

Item	Manufacturer Information to be Provided
1. Damper	a. function b. static or dynamic c. make (mfr.) d. model number
2. Fire Resistance Rating	a. time in hours
3. Approval	a. testing or listing agency



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**TABLE 5-1 REQUIRED FIRE DAMPER
INSTALLATION INSTRUCTIONS**

4. Sleeve	a. material b. thickness c. length (maximum) d. maximum distance of sleeve termination from wall (see UL 555)
5. Duct-to-Sleeve (or Frame) Connection	a. method(s) b. locations
6. Damper Attachment to Sleeve	a. method(s) b. locations



**TABLE 5-1 REQUIRED FIRE DAMPER
INSTALLATION INSTRUCTIONS**

7. Retaining Angle	a. size b. material c. fastener locations
8. Maximum Rated Size of Damper	a. dimension
9. Assembly of Multiple Sections	a. methods b. fastener locations
10. Airflow	a. maximum velocity rating b. static pressure rating



**TABLE 5-1 REQUIRED FIRE DAMPER
INSTALLATION INSTRUCTIONS**

11. Damper Orientation for Proper Closure	a. position
12. Illustrations	a. installation arrangement b. clearance category
13. Any Construction Detail Contingent on Approval for Listing by a Rating Authority	a. pertinent data (e.g. fusible link rating, opening framing provisions, etc.)



FIGURE 5-1 BASIC FIRE DAMPER INSTALLATIONS

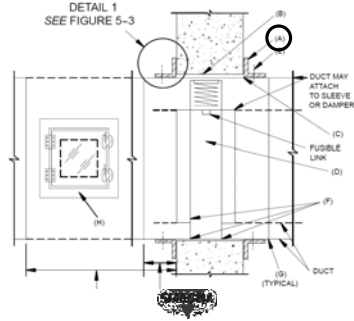


FIGURE 5-1 BASIC FIRE DAMPER INSTALLATIONS

A. RETAINING ANGLES

1. Minimum 1½ × 1½ × 16 ga (40 × 40 × 1.6 mm)
 - a. Retaining angles must overlap structure opening 1 inch minimum and cover corners of openings.
 - b. 16 gage is the most commonly used thickness for the retaining angles. However manufacturers may allow lighter gage angles on some smaller dampers and may require heavier gage angles on larger dampers. Consult the manufacturer's installation instructions for specifics.



FIGURE 5-1 BASIC FIRE DAMPER INSTALLATIONS

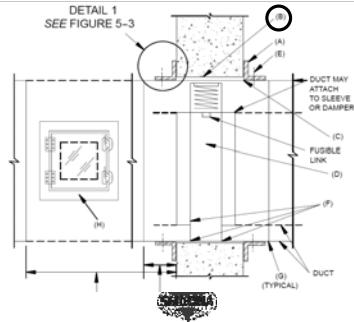


FIGURE 5-1 BASIC FIRE DAMPER INSTALLATIONS

B. EXPANSION SPACE

1. Fire Damper Sleeve Clearance within Wall/
Floor Opening
 - a. Minimum $\frac{1}{8}$ inch per linear foot (10 mm per linear meter) of damper — both dimensions. ($\frac{1}{4}$ " (6 mm) minimum)
 - b. Clearance requirements for damper sleeves within a wall opening are based on $\frac{1}{8}$ inch per foot (10 mm per meter) of width (or height) unless otherwise stated in the listing of the assembly. The sleeve may rest on the bottom of the opening, and need not be centered. (Fractional dimensions shall be taken as the next largest whole foot.)



FIGURE 5-1 BASIC FIRE DAMPER INSTALLATIONS

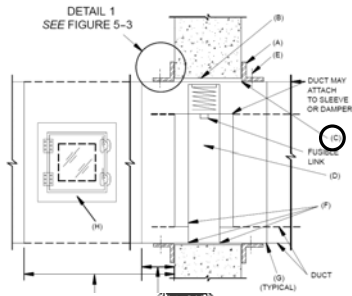


FIGURE 5-1 BASIC FIRE DAMPER INSTALLATIONS

C. DAMPER SLEEVE

1. Steel Sleeve, see Table 5-2 for details



Table 5-2 Recommended Minimum Sleeve Thickness for Fire Dampers

Type of Connection	Duct	Duct Dimension	Sleeve Gage
Rigid	Round - Rectangular	24 in. (610 mm) maximum diameter 24 in. (610 mm) maximum height and 36 in. (915 mm) maximum width	16" (1.613" mm)
Rigid	Round - Rectangular	over 24 in. (610 mm) diameter over 24 in. (610 mm) height and over 36 in. (915 mm) width	14" (1.994" mm)
Breakaway (See Figure 5-2 on pages 5.5 and 5.6)	Round or Rectangular	12 in. (305 mm) and down 13 - 30 in. (330 - 760 mm) 31 - 54 in. (785 - 1370 mm) 55 - 84 in. (1400 - 2130 mm) 85 in. (2160 mm) and up	26 (0.55 mm) 24 (0.70 mm) 22 (0.85 mm) 20 (1.0 mm) 18 (1.3 mm)

NOTES:
* Breakaway connection not required.
* See Figure 5-2, pages 5.5 and 5.6, for details and exceptions.




Table 5-2 Recommended Minimum Sleeve Thickness for Fire Dampers

By UL 555, all ducts are required to terminate at the fire damper sleeves or the damper frames. Sleeve thickness is contingent on the type of connection. All UL listed dampers also have maximum dimensions associated with the test rating. Contingent on sleeve thickness a rigid connection may be used in lieu of a breakaway connection. Sleeves may be omitted where dampers are designed to be in non-ducted air passages or where damper housing permits attachment of retaining angles to the housing. Attachment of retaining angles must not restrict operation of the fire damper. Certain UL approved designs do not require retaining angles.

Where the fire damper sleeve is exposed to the airstream, the metal sleeve will be of the same material as the duct system. A steel sleeve, of the type or finish specified by the system designer, will be used for fibrous glass ductwork and where the fire damper sleeve is not exposed to the airstream.



FIGURE 5-1 BASIC FIRE DAMPER INSTALLATIONS

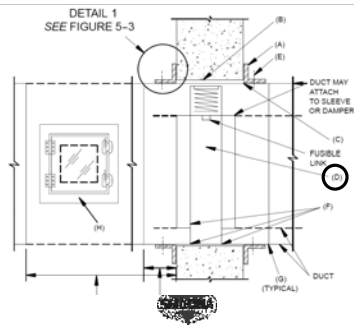


FIGURE 5-1 BASIC FIRE DAMPER INSTALLATIONS

D. FIRE DAMPER/COMBINATION FIRE/ SMOKE DAMPER

1. Approved Fire Damper — Curtain or multi-blade type



FIGURE 5-1 BASIC FIRE DAMPER INSTALLATIONS

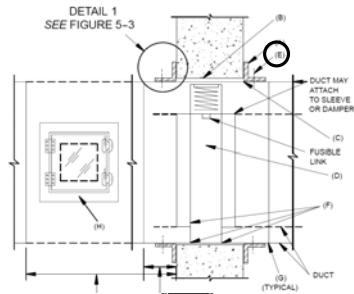


FIGURE 5-1 BASIC FIRE DAMPER INSTALLATIONS

E. RETAINING ANGLES FASTENED TO SLEEVE

1. Secure Retaining Angles to Sleeve ONLY on 8" centers (203 mm) with:
 - a. 1/2" (12 mm) long welds
 - b. 1/4" (6 mm) bolts and nuts
 - c. No. 10 Sheet Metal Screws
 - d. Minimum 3/16" (5 mm) steel rivets
 - e. *Note:* The size and spacing requirements may differ by damper manufacturer. Consult manufacturer's installation instructions for specifics.



FIGURE 5-1 BASIC FIRE DAMPER INSTALLATIONS

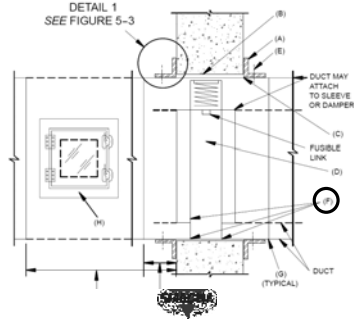


FIGURE 5-1 BASIC FIRE DAMPER INSTALLATIONS

F. DAMPER ATTACHMENT TO SLEEVE

1. Secure Damper to Sleeve on 8" centers (203 mm) with:
 - a. 1/2" (12 mm) long welds
 - b. 1/4" (6 mm) bolts and nuts
 - c. No. 10 Sheet Metal Screws
 - d. Minimum 3/16" (5 mm) steel rivets

See note in Item E above.
 e. *Note:* The size and spacing requirements may differ by damper manufacturer. Consult manufacturer's installation instructions for specifics.



FIGURE 5-1 BASIC FIRE DAMPER INSTALLATIONS

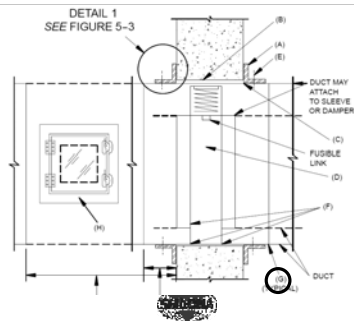


FIGURE 5-1 BASIC FIRE DAMPER INSTALLATIONS

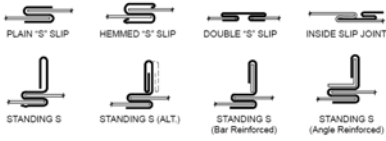
G. CONNECTION TO DUCT

1. Connect Duct to Sleeve as shown in Table 5-2 and as indicated in Figure 5-2.



Figure 5-2 UL Breakaway Connections

1. DUCT-SLEEVE CONNECTIONS LISTED IN UL 555, SIXTH EDITION, STANDARD FOR FIRE DAMPERS.



2. ADDITIONAL DUCT-SLEEVE CONNECTIONS WERE TESTED BY SMACNA AND WITNESSED BY UL IN 1991. THE CONNECTIONS PERFORMED WITHIN THE REQUIREMENTS OF THE UL TEST CRITERIA. SEE NOTE 1, FIGURE 5-2 ON PAGE 5.6.



Figure 5-2 UL Breakaway Connections

3. FASTENERS MAY BE USED AS FOLLOWS.

(A) JOINTS USING CONNECTIONS SHOWN IN 1. ABOVE WITH A MAXIMUM OF TWO #10 SHEET METAL SCREWS ON EACH SIDE AND ON THE BOTTOM LOCATED IN THE CENTER OF THE SLIP POCKET AND PENETRATING BOTH SIDES OF THE SLIP POCKET.



(B) JOINTS USING CONNECTORS OF THE TYPE SHOWN IN 1. ABOVE ON THE TOP AND THE BOTTOM AND USING FLAT DRIVE SLIPS NOT EXCEEDING 20 in. (510 mm) DUCT HEIGHT ON THE SIDES (SEE SKETCH ABOVE).



Figure 5-2 UL Breakaway Connections

(C) JOINTS WHERE ROUND OR OVAL SPIRAL DUCTS ATTACH TO ROUND OR OVAL COLLARS WHICH ARE PART OF THE DAMPER SLEEVE AS SHOWN BELOW. #10 SHEET METAL SCREWS ARE SPACED EQUALLY AROUND THE CIRCUMFERENCE OF THE DUCT PER THE FOLLOWING:

- DUCT DIAMETERS 22 in. (560 mm) AND SMALLER—3 SCREWS.
- DUCT DIAMETERS OVER 22 in. (560 mm) TO AND INCLUDING 36 in. (915 mm)—5 SCREWS.

NOTES:

- (1) FOR FLAT OVAL DUCTS, THE DIAMETER SHALL BE CONSIDERED THE LARGEST (MAJOR) DIMENSION OF THE DUCT.
- (2) DUCT SEALANT MAY BE USED AS RECOMMENDED BY THE DAMPER MANUFACTURER.



DAMPER/SLEEVE ASSEMBLIES WITH COLLARS FOR ROUND AND FLAT OVAL DUCTS

Figure 5-2 UL Breakaway Connections

(D) TDC AND TDF ROLL-FORMED 4-BOLT FLANGED CONNECTIONS ASSEMBLED PER THE MANUFACTURER'S INSTRUCTIONS USING GASKETS, METAL CLEATS AND FOUR 3/8 in. (9.5 mm) METAL NUTS AND BOLTS.

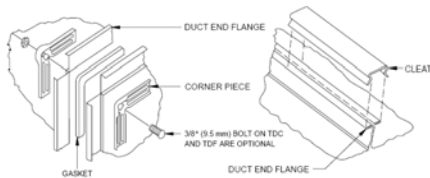
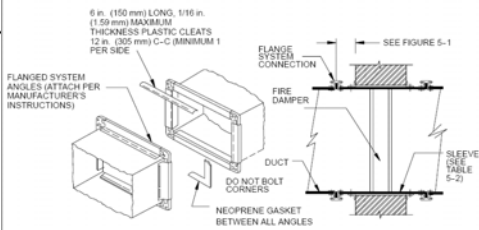
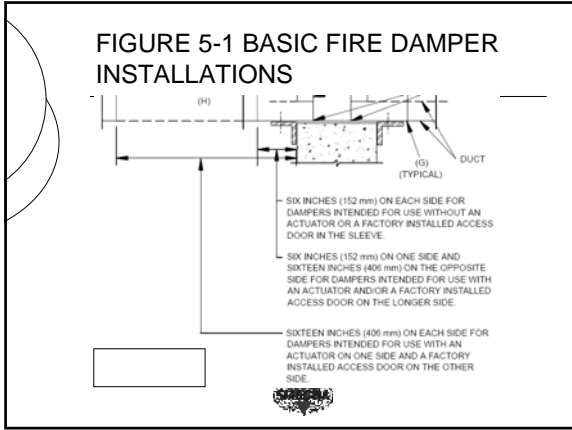
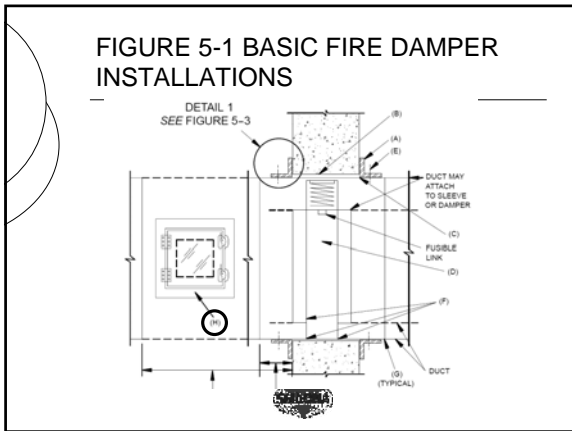


Figure 5-2 UL Breakaway Connections

(E) MANUFACTURED SLIP ON 4-BOLT FLANGED CONNECTIONS ASSEMBLED PER THE MANUFACTURER'S INSTRUCTIONS USING GASKETS AND PLASTIC CLEATS AS SHOWN BELOW.







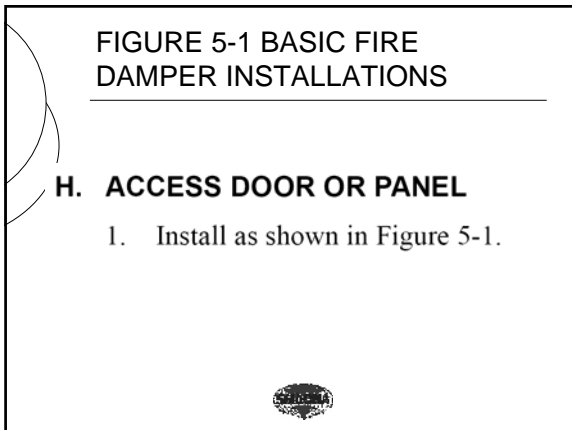


FIGURE 5-1 BASIC FIRE DAMPER INSTALLATIONS

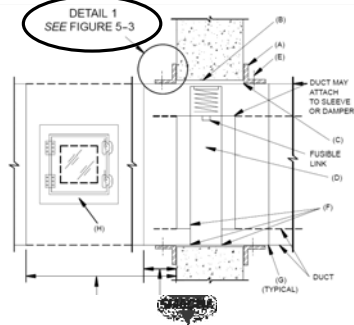


Figure 5-3 Improper Fire Damper Installation

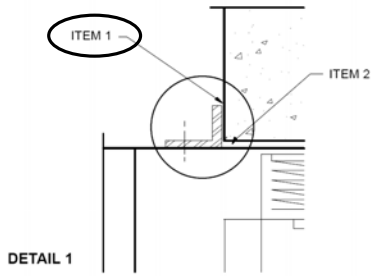


Figure 5-3 Improper Fire Damper Installation

ITEM 1

Sealing of the fire damper retaining angles is not a requirement of an approved damper installation. This detail is seldom specified by system designers and is virtually never included in the contractor's pricing for the dampers on a project. If the local authority having jurisdiction mandates that the angles be sealed, contractors should issue a Request For Information (RFI) to design professionals such that the proper approved sealants be used. In no case should the retaining angles be sealed with any product not approved by the damper manufacturer including Through Penetration Firestop products. Using unapproved products could be a violation of the damper manufacturer's conditions of test and listing, could void the UL listing of the damper and could render the damper inoperable.

Figure 5-3 Improper Fire Damper Installation

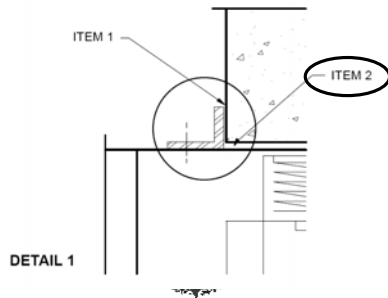


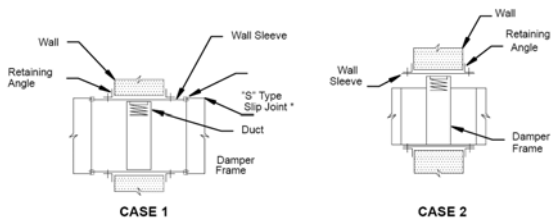
Figure 5-3 Improper Fire Damper Installation

ITEM 2

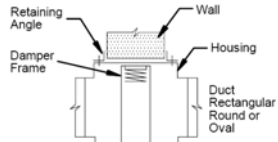
Introduction of any materials including mineral wool, ceramic fiber or sealants of any kind into the required expansion space between the damper sleeve and fire partition has not been tested, has not been approved, and is not permitted by damper manufacturers. Doing so could be a violation of the manufacturer's conditions of test and listing, could void the UL listing of the damper and could render the damper inoperable. Indiscriminate and unnecessary deviations from standard fire damper installations should be avoided. Unless a deviation is specifically approved by the damper manufacturer, it could compromise the function for which the damper was ultimately installed.



Vertical Fire Damper Installations



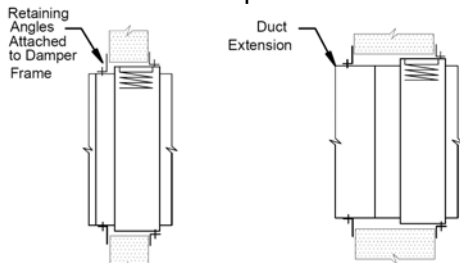
Vertical Fire Damper Installations



CASE 3



Vertical Fire Damper Installations

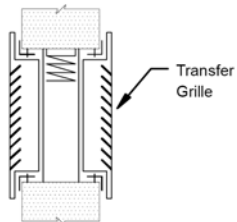


CASE 4

CASE 5

NOTE: IN CASES 4 AND 5, NO SLEEVE IS REQUIRED BUT THE RETAINING ANGLE FASTENERS MUST NOT INTERFERE WITH OPERATION OF DAMPER BLADES. WALL THICKNESS WILL AFFECT THE DEPTH OF THE DAMPER.

Vertical Fire Damper Installations



CASE 6



Vertical Fire Damper Installations

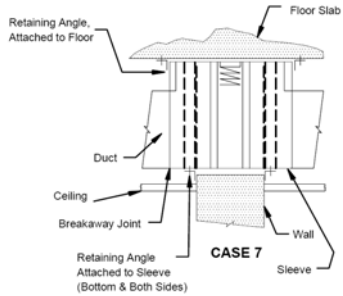
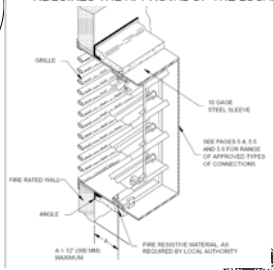


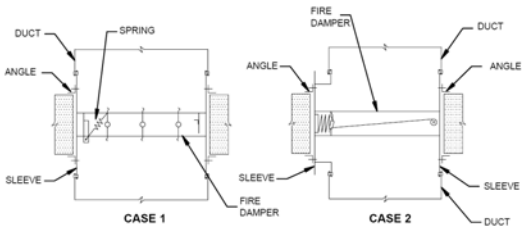
FIGURE 5-5 FIRE DAMPER OUT OF WALL

CAUTION: USE THIS ARRANGEMENT ONLY WHEN PHYSICAL OBSTRUCTIONS PRECLUDE USE OF METHODS SUCH AS THOSE IN FIGURE 5-4. THE USE OF THIS METHOD REQUIRES THE APPROVAL OF THE LOCAL AUTHORITY.



- 10 gage sleeve
- 12" max distance from Damper center to edge of wall
- Fire resistive material as required

Horizontal Fire Damper Installations



Horizontal Fire Damper Installations

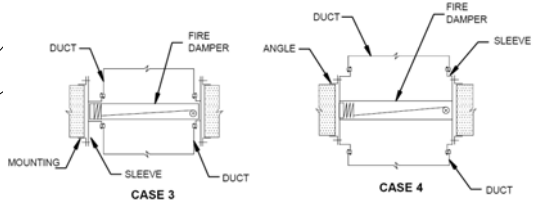
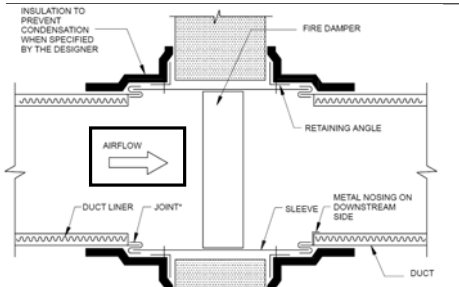
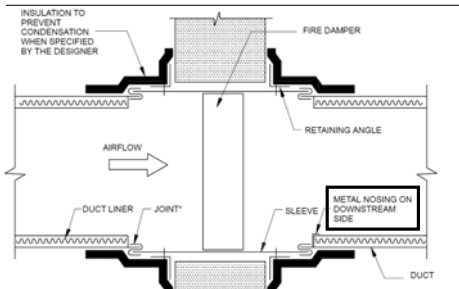


FIGURE 5-8 DUCT LINER INTERRUPTION



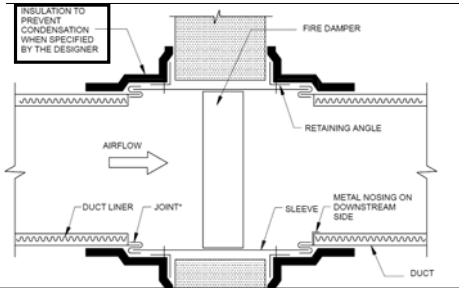
Interruption of duct liner is required by NFPA 90A

FIGURE 5-8 DUCT LINER INTERRUPTION



Interruption of duct liner is required by NFPA 90A

FIGURE 5-8 DUCT LINER INTERRUPTION



Interruption of duct liner is required by NFPA 90A

FIGURE 5-9 FIBROUS GLASS DUCT INSTALLATION

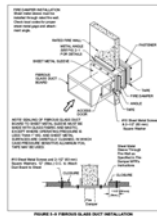


FIGURE 5-9 FIBROUS GLASS DUCT INSTALLATION

FIRE DAMPER INSTALLATION
Sheet metal sleeve must be installed through rated fire wall. Check local codes for proper sheet metal gage and attachment angle.

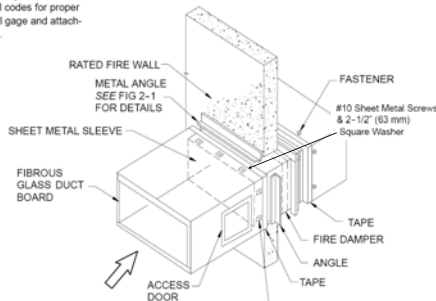


FIGURE 5-9 FIBROUS GLASS DUCT INSTALLATION

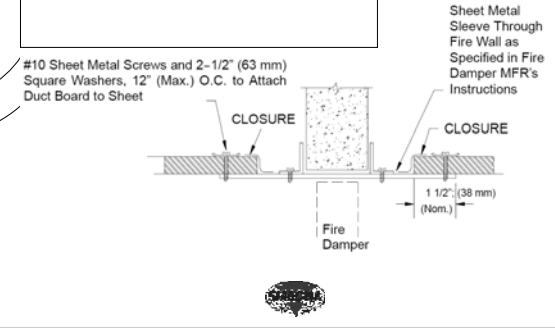


Figure 6-1 Fire Damper Openings

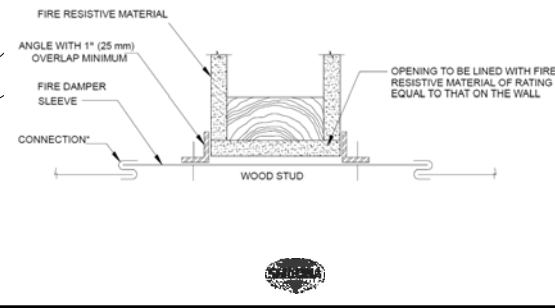


Figure 6-1 Fire Damper Openings

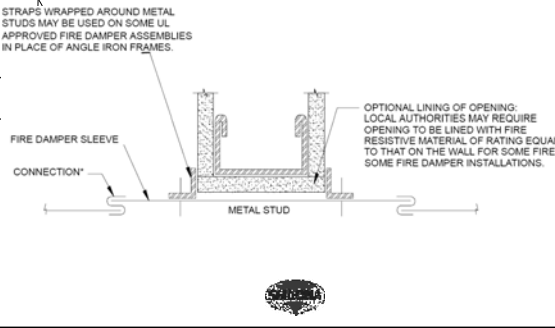
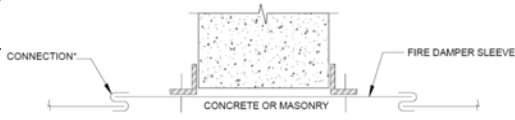


Figure 6-1 Fire Damper Openings



NOTE: THICKNESS AND TYPE OF FIRE RESISTIVE MATERIAL MAY VARY WITH THE JURISDICTION. SPECIFIC FRAMING REQUIREMENTS OF OPENINGS SHOULD BE PROVIDED IN THE ARCHITECTURAL AND STRUCTURAL DRAWINGS THAT ARE SUBMITTED FOR BUILDING PERMITS. ALSO SEE FIRE DAMPER MANUFACTURER'S FRAMING INSTRUCTIONS.



FIGURE 7-1 CURTAIN FIRE DAMPERS

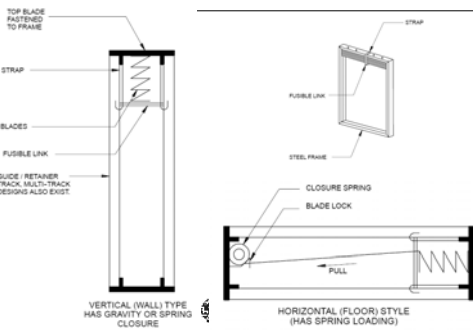
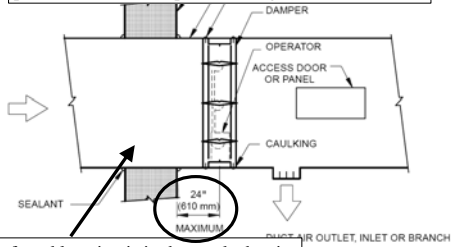
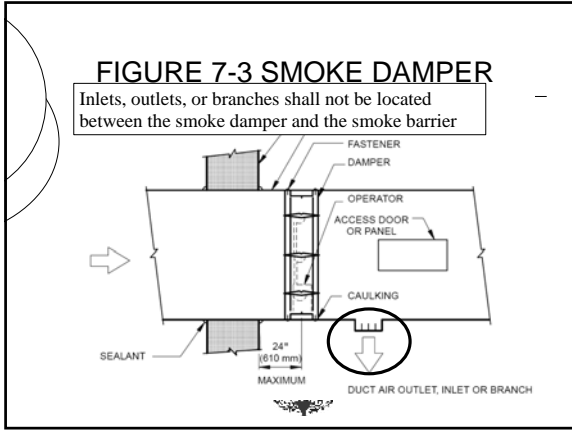


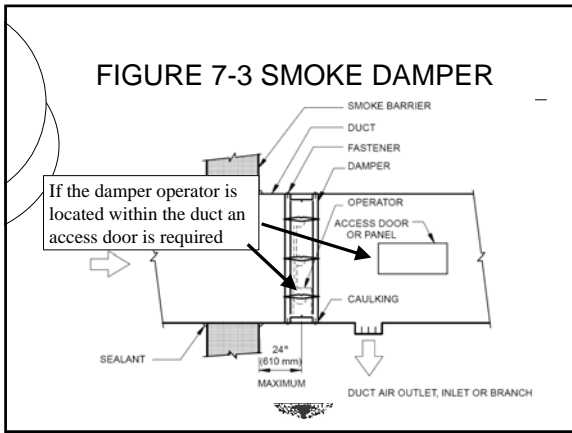
FIGURE 7-3 SMOKE DAMPER

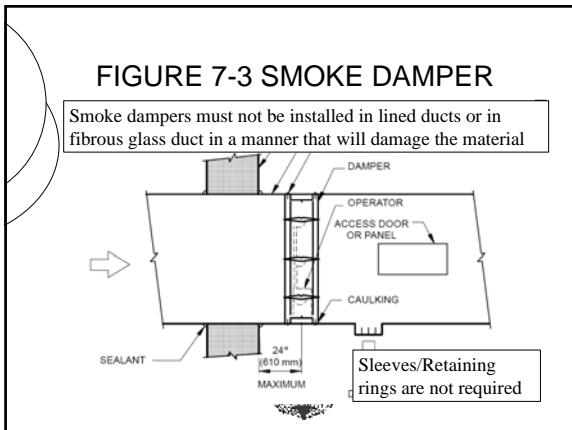
Smoke dampers must be installed at or adjacent to the point where the duct passes through the smoke barrier



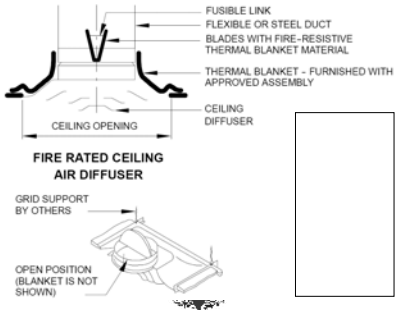
The preferred location is in the smoke barrier



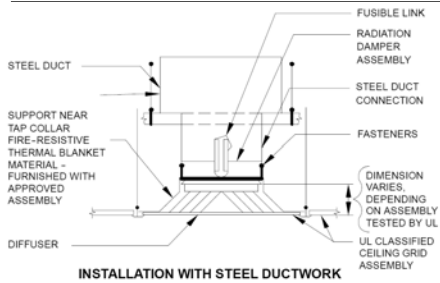




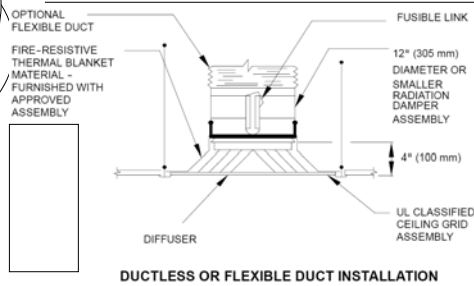
Ceiling Assemblies Figure 9-1

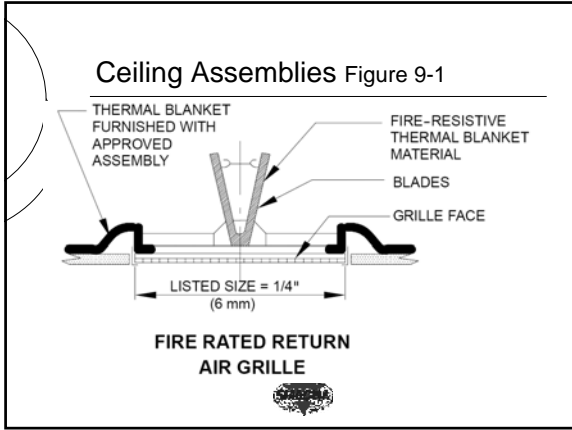


Ceiling Assemblies Figure 9-1



Ceiling Assemblies Figure 9-1





Break Away Connections (others)

- The following were tested and approved as UL listed breakaway connections. These are not in the SMACNA manual

Break Away Connections (others)

Flange breakaway connection for fire damper or combination fire smoke damper. These instructions apply to a connection between a manufactured flange system by Ward, Ductmate, Nexus, TDC and TDF. These connections allow the use of combining mixed flange types or like for like. The following instruction depicts the use of Metal or Plastic Cleats, Butyl or Neoprene Gasket, and Bolted or Non-Bolted corners. Also the flanges may be connected with the use of #10 screws without the cleats.

1. Install the manufactured flange system onto the damper sleeve or duct per the manufacturers instructions.
2. Seal the two flange systems together Neoprene or Butyl gasket may be applied to the mating surfaces.
3. Align the two flange systems together. A 3/8 in. (9mm) bolt may be used in the corners to help with the alignment. The bolt does not have to be removed. Bolted corners are permitted.
4. Install the cleat or # 10 tek screw, approximately equally spaced, per the schedule described:

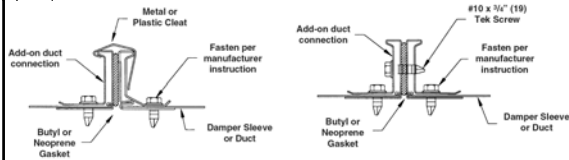
Break Away Connections (others)

- Width or height less than 24 in. (610mm); use one cleat or screw per side
- Width or height 24 in. (610 mm) to less than 36 in. (914mm); use 2 cleats or screws per side
- Width or height 36 in. (914mm) to less than 54 in. (1372mm); use 3 cleats or screws per side
- Width or height 54 in. (1372mm) to less than 72 in. (1829mm); use 4 cleats or screws per side
- Width or height 72 in. (1829mm) or greater; use 5 cleats or screws per side.

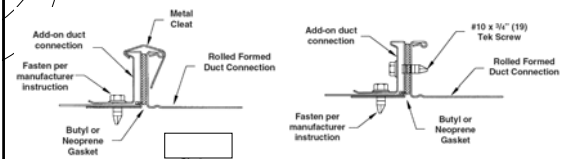


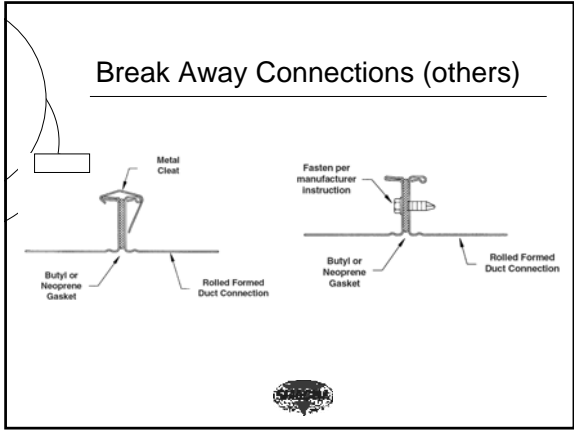
SEE COMPLETE MARKING
ON PRODUCT

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Questions & Answers
