

IMPLEMENTING FIRE & SMOKE CONTROL IN HVAC SYSTEMS

Fire Dampers are required by all building codes to maintain the required fire resistance ratings of walls, partitions, and floor when they are penetrated by air ducts or other ventilation openings. One of the basic requirements of building fire protection as required by all building codes is the compartmentation or division of buildings using fire rating walls, floors, or other partitioning methods. This compartmentation is intended to contain any fire to the compartment of the fire origin and thereby minimise damage to property and protect the lives of people living and/or working in the building. Smoke dampers on the other hand can be effectively employed to control the spread of smoke or by simply shutting off the circulation of air and smoke through ducts or ventilation openings or more actively to be applied as part of an "Engineered Smoke Control System"

A. FIRE DAMPERS

A duct or ventilation opening in any of the fire rated partitions would permit a fire to spread from the compartment of origin to adjoining compartments.

Fire dampers are installed in these ducts or ventilation openings. Upon detection of heat, these dampers close (at melting of a UL Stamped fusible link or through a thermal cutoff and Solenoid) thus blocking the opening and thus prevent the spread of fire into the adjoining compartment.



Unprotected Partition



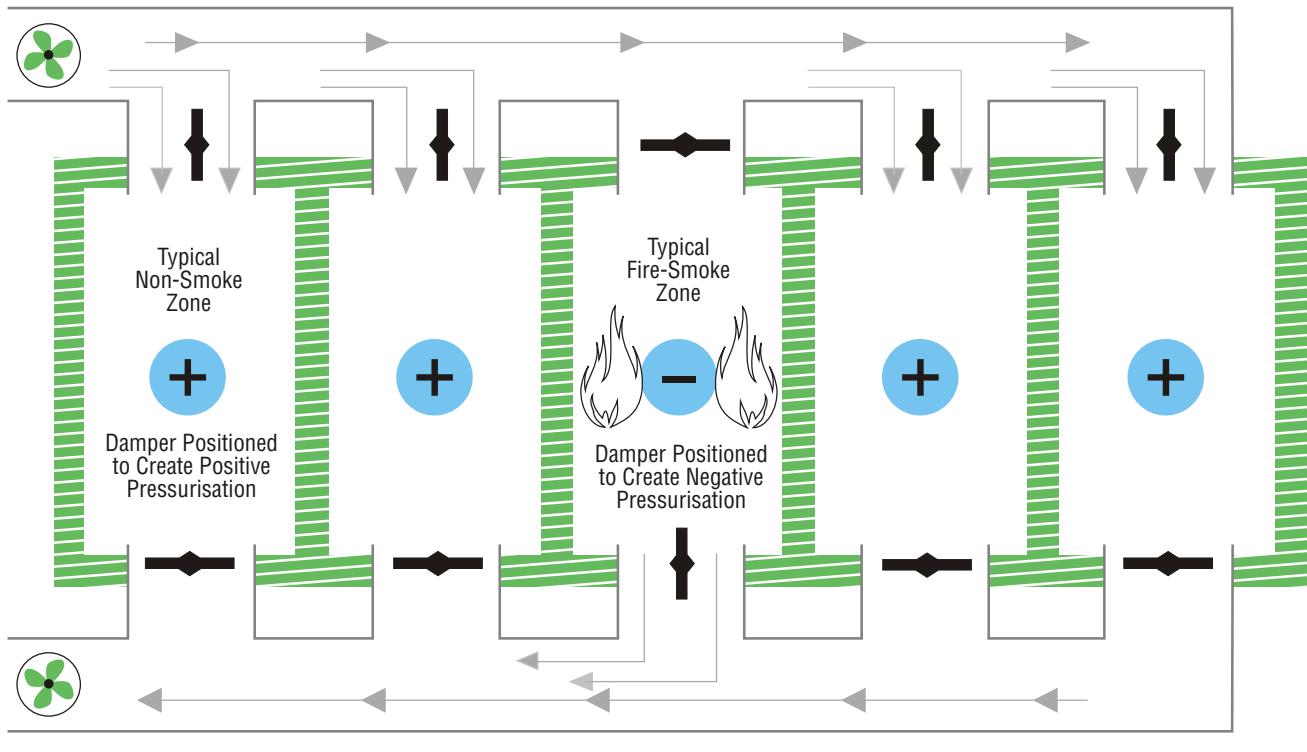
Protected Partition

B. SMOKE DAMPERS

Smoke dampers applied in a “Passive Smoke Control System” simply close and prevent the circulation of air and smoke through a duct or a ventilation opening.

Or they may be applied as part of an “Engineered Smoke Control System” to control the spread of smoke by using the building’s HVAC system and/or dedicated fans to create pressure differences. Higher pressures surround the fire area and prevent the spread of smoke from the fire zone to other areas. In this application, the smoke dampers are motorised with electric or pneumatic actuators. They can be controlled by a smoke or a heat detector signal, or in a variety of ways by the building control system to accomplish the intent of the design.

Supply Fan

*Engineered Smoke Control System*

C. SMOKE DAMPERS

Combination Fire Smoke Damper performs the function of both a Fire Damper and a Smoke Damper at a same location. Combination Fire Smoke Dampers must be qualified under UL Standard 555 as a Fire Damper and under UL Standard 555S as a Smoke Dampers.

DAMPER SELECTION

D. FIRE RESISTANCE RATING

Selection Process

Four basic decisions are required to select a Fire, Smoke, or a Combination Fire Smoke Damper. The process involves defining requirements for the following:

For walls, floors, or partitions (barriers) where applicable building codes require fire resistance ratings of less than 3 hours, a fire damper with a 1½ hour fire rating may be selected. If the barriers have a fire resistance rating of 3 hours or more, the damper too must have a rating of 3 hours. In case where barriers are not required to have a fire resistance rating, no fire rating is required of the damper as well and a smoke damper may be selected.

Type of Penetration	Minimum Damper Rating (Hours)
Less than 3-hr Fire resistance-rated assemblies	1.5
3-hr or greater Fire resistance-rated assemblies	3

E. LEAKAGE RATING DECISION

UL Standard 555S identifies three leakage classes as follows:

Leakage Class	Maximum Leakage in cfm/ft ²		Maximum Leakage in cmh/m ²	
	@ 4 in. wg	@ 8 in. wg	@ 1 kPa	@ 2 kPa
Class I	8	11	146	201
Class II	20	28	366	512
Class III	80	112	1463	2048

Designers are generally advised to select the lowest leakage class. Even though Building Code requires a minimum of Leakage Class II

F. ELEVATED TEMPERATURE RATING DECISION

The purpose of a building Smoke Control System is to keep certain areas free from smoke during the early phases of a fire enabling occupants to evacuate and allow firefighters to locate and tackle the fire. The UL555S Elevated Temperature Rating is 30 minutes to ensure the damper (and its installed actuator) can withstand this exposure to elevated temperature and still operate as required.

250°F (121°C) is the minimum elevated temperature rating, while 350°F (177°C) is also available as an option.

G. OPERATIONAL RATING DECISIONS

Operational ratings are dependent on the damper's installed actuator and on the damper size. Both UL555 and UL555S require that a combination fire smoke damper and its installed actuator be rated for a maximum airflow rate (velocity in fpm) through the open damper and a maximum pressure (inches wg) across the closed damper. The installed actuator must operate the damper open and close against these rated velocities and pressures.

Conaire combination fire smoke dampers are rated up to 2000 fpm (10.2 m/s) and pressure up to 4 in. wg (1 kPa).

INSTALLATION REQUIREMENTS FOR FIRE / SMOKE DAMPERS

When a Fire & Smoke Damper is being installed, it must fit in the space available with room for wiring or piping. After the damper is installed it must work properly and perform its important function for the life of the building. The damper, its actuator and any optional accessories must be accessible for inspection, testing and service. Actuators and other components may require replacement as a part of the planned maintenance programme. While space requirements are somewhat predictable, spending a little time making sure everything will fit can eliminate many problems and save money for all concerned.

H. ACTUATOR CONNECTIONS

The damper actuator and optional accessories are normally externally mounted on one side of the damper's sleeve. It is Conaire's standard practice for these items to be on the right hand side of the sleeve as illustrated. This is a right hand mount. When specifically requested, they may be mounted on the left side of the sleeve, which we call a left hand mount.

Internal actuator mounting should be considered only as a last resort solution to the clearance problems. Even with internal actuator mounting, external clearances may still be required. Access to the actuator for wiring or piping, inspection and service must be provided. Internal mounting may not be available on smaller size dampers because there simply isn't room enough for actuator to fit inside.

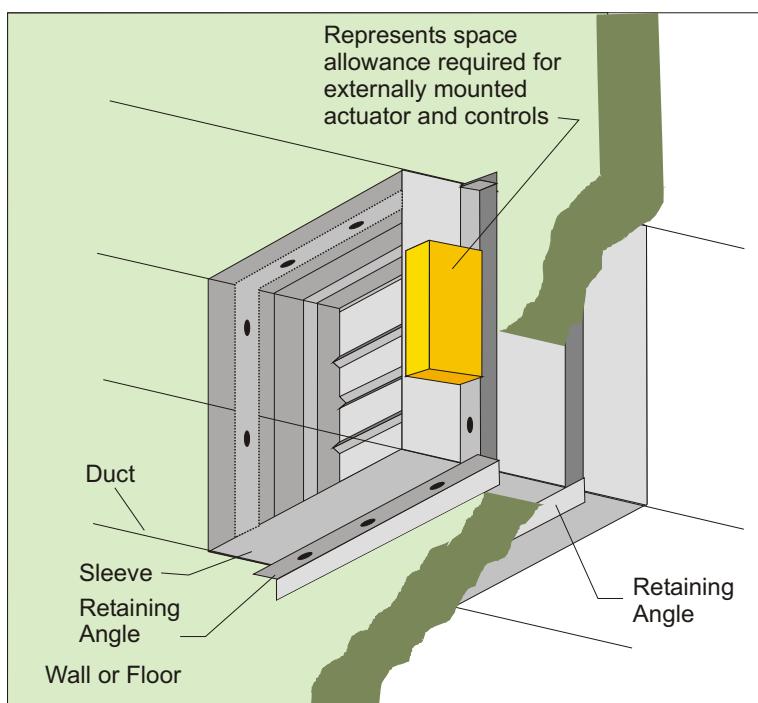
KEY POINTS TO REMEMBER

Actuators and Optional Accessories occupy space outside of the Fire Smoke Damper sleeve or sideplate and appropriate clearances are required.

Actuators will be Right Hand mounted as standard, but can be Left Hand mounted upon request.

Internal actuator mounting is not a good solution to lack of clearance and should not be used unless there is no other solution.

Conaire's Fire Smoke Dampers do not have a "Top" or "This side Up" and can be turned upside down to overcome unforeseen clearance problems.



I. SLEEVE LENGTH AND WALL THICKNESS

Insert the sleeved damper assembly into the prepared opening, to appropriate depth (refer to label on outside of sleeve for location of damper in wall).

The sleeve may extend a maximum of 16 in. (406mm) beyond the wall or floor on the actuator side of the damper and a maximum of 6 in. on the opposite side.

SLEEVE THICKNESS

Dampers are supplied with sleeves and actuators from the factory and can be installed without the need for additional field installed sleeves.

Gauge of factory furnished sleeve determines the type of duct to sleeve connections required (see table). Any duct connection other than the breakaway connections described on next page are considered rigid.

Recommended standard sleeve lengths for various wall thicknesses

Wall Thickness Dimension (Tw)	Sleeve Length Dimension (L)
4-6 in.	16 in.
7-10 in.	21 in.
11-13 in.	24 in.

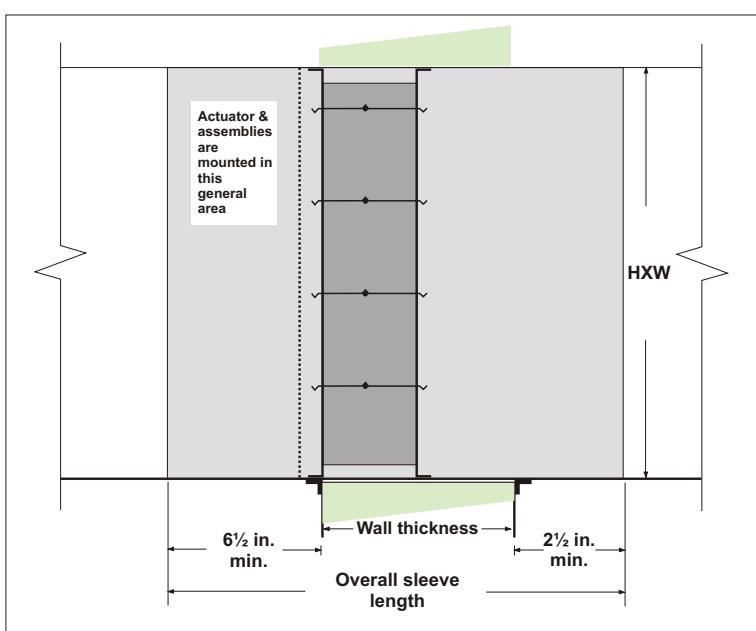
KEY POINTS TO REMEMBER

All combination Fire Smoke Dampers require sleeves.

The Damper and Sleeve are part of the wall. Connecting duct-work is not continuous. The duct-work terminates at each end of the damper sleeve.

Attachments made through the retaining angle do not penetrate the 'No Screw' area designated on the damper sleeve.

Damper size and RIGID or BREAKAWAY duct to sleeve connections determine the thickness of sleeve required. Sleeve gauge or thickness also depends on the damper size. Please refer next page for UL qualified breakaway sleeve connections.



MINIMUM SLEEVE THICKNESS FOR FIRE DAMPER

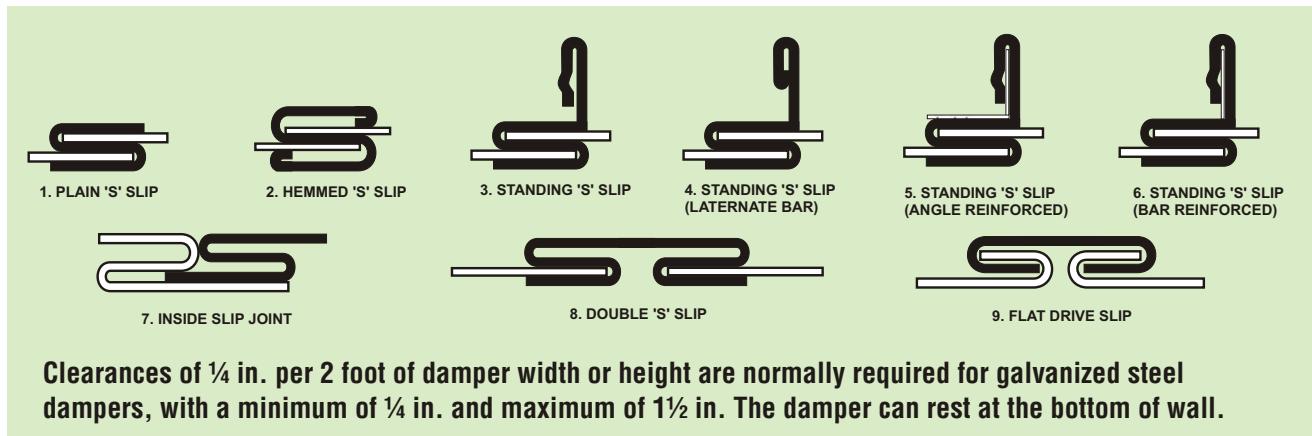
Type of duct to sleeve connection	Duct Dimension	Sleeve Gauge
Rigid	36 in. Maximum width or 24 in. maximum height	16 (1.5 mm)
Rigid	over 36 in. width or over 24 in. height	14 (2.0 mm)
Breakaway (or no duct)	12 in. wide and under 13-30 in. wide 31-54 in. wide 55-84 in. wide 85 in. wide and over	26 (0.46 mm) 24 (0.6 mm) 22 (0.8 mm) 20 (1.0 mm) 18 (1.2mm)

Important Note :
Sleeve thickness must not be less than the gauge of the connecting duct.

J. DUCT TO SLEEVE CONNECTION

Breakaway joints of the types shown in fig. nos. 1-8 shall have no more than two no. 10 (4.8 mm dia.) Sheet metal screws on each side and on the bottom located in the centre of the slip pocket and shall penetrate both sides of the slip pocket.

Breakaway joints of the types shown in fig. nos. 1-8 are permitted on the top and on the bottom of horizontal ducts (vertical dampers) with flat drive slips not exceeding 500 mm in length as shown in fig. no. 9 on the sides.



Clearances of $\frac{1}{4}$ in. per 2 foot of damper width or height are normally required for galvanized steel dampers, with a minimum of $\frac{1}{4}$ in. and maximum of $1\frac{1}{2}$ in. The damper can rest at the bottom of wall.

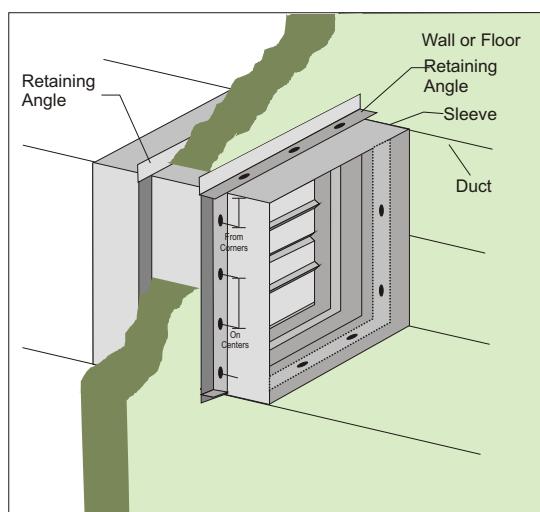
L. SECURING DAMPER/SLEEVE ASSEMBLY TO WALL AND FLOOR

Opening Damper/sleeve assemblies must be installed in wall and floor openings using retaining angles on at least one side of the wall or floor as follows.

Retaining angles for $1\frac{1}{2}$ hour rated dampers with a width and height 48 in. or less must be a minimum of 18 ga. (1.2mm). The leg of the retaining angle on the damper sleeve shall be a minimum of 11/4 in. (32mm). The leg of the retaining angle on the wall/floor shall be long enough to cover the annular space and overlap the wall/floor by a minimum of 1 in. (25mm).

Retaining angles must be attached to the damper using one or more of the following methods of attachment (refer to label on outside of sleeve for 'No Screw' area):

- Tack or spot welds
- #10 (3/4 in. [19mm] max.) sheet metal screws
- 1/4 in. (6mm) bolts and nuts



A minimum of two connections per side, top, and bottom, 6 in. (152.4mm) On centers and 2 in. from corner maximum for openings of 48 in. W x 36 in. H (1219mm x 914mm) and less. The angles must be attached to all 4 sides of the sleeve. Ensure that attachment device does not interfere with the operation of the damper and the free movement of the damper blades. The angles need not be attached to each other at the corners. Do not secure the retaining angle to the fire separation.

Retaining angles should not be fastened to the wall/floor material. The angles should only sandwich the wall/floor and allow for damper expansion during periods of intense heat.

These instructions apply to combination fire smoke dampers mounted (blades must be horizontal) in:

1) masonry, block or stud walls , 2) concrete floors or ceilings. Specific requirements in these instructions are mandatory.

Dampers must be installed in accordance with these instructions to meet the requirements of UL 555 and UL 555S. The installation of the damper and all duct connections to the damper sleeve shall conform to the latest editions of NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems, and the SMACNA Fire, Smoke and Radiation Damper Installation Guide.

PRE -INSTALLATION GUIDELINES

INSPECTION

1. Make sure the unit is not damaged in any way in transportation.
2. Check the model & Size as per your order.
3. Actuator position is as ordered. Standard is right hand mount if not specified in order.

BEFORE INSTALATION

1. Lift damper using sleeve or frame. Do not lift damper using blades or actuators.
2. Store the dampers in a covered place only.
3. Clean the damper to remove any foreign material especially on critical components.
4. Insulate the damper and actuator from building material such as mortar dust, drywall dust, firesafing material, paint over spray, etc prior to and after installation.
5. Check the damper and control operation before actual installation.

CAUTION

1. Do not install screws into “No Screw Area” mentioned on damper sleeves as they may interfere with unexposed blade linkage and prevent proper movement of damper blades.
2. Always disconnect the power supply before attending to the motorised dampers.
3. Keep clothes, fingers safely outside the damper frame while removing links from spring return dampers.
4. Suitable access (such that closure device and actuators can be maintained, etc.) must be provided for damper inspection and servicing. Where it is not possible to achieve sufficient size access, it will be necessary to install a removable section of duct. (Refer to NFPA 90A).
5. Refer to the Electrical Connections diagram, while making the connections.
6. All wiring shall be done in accordance with the National Electrical Code ANSI/NFPA-70 latest edition, or any other codes that may apply.