UnitedEnertech

THE ENERTECH EDGE

Fire & Air: The Damper Series

By Kent Maune

Fire and Combination Fire/Smoke Damper Installation

Understanding the Critical Requirements for a UL Classified Installation

Introduction

Fire dampers and combination fire/smoke dampers are critical components of a building's passive fire protection system. Their purpose is to maintain the fire-resistance rating of a wall or floor assembly after it has been penetrated by HVAC ductwork, thereby limiting the spread of fire and smoke throughout the building.

These dampers are tested in accordance with **UL 555** (Fire Dampers) and **UL 555S** (Smoke Dampers). In addition to product testing, Underwriters Laboratories (UL) conducts periodic inspections at the manufacturer's facility to verify that the products continue to be manufactured exactly as they were originally tested and classified.

However, once a damper leaves the factory, neither the manufacturer nor UL has control over how it is installed in the field. For that reason, both the **International Building Code (IBC)** and **NFPA 80** and **NFPA 105** require that fire and combination fire/smoke dampers be installed in accordance with the manufacturer's published installation instructions and their UL Classification.

Improper installation can compromise the performance of an otherwise properly tested life safety damper.

Basic Installation Requirements

Although each manufacturer has specific installation details based on its UL Classification, every installation includes the following basic elements:

- Opening clearance
- Wall or floor framing
- Damper placement within the wall or floor
- Sleeve extension beyond the wall or floor
- Mounting angles
- Duct connections
- Access doors

Each of these components is part of the tested UL assembly and must be installed correctly.



Opening Clearance

The wall or floor opening must be larger than the damper assembly to allow proper installation and operation.

If the opening is too small, the damper may become distorted or out of square during installation, preventing proper blade operation or adversely affecting smoke leakage performance.

The standard opening clearance is:

- **1/8 inch per foot of damper dimension**, or
- **A minimum of 1/4 inch total clearance** for smaller dampers.

Some manufacturers permit larger clearances when additional installation details are followed. Always refer to the manufacturer's installation instructions for maximum allowable opening sizes and approved methods.

Vertical Wall Framing

Wall openings must be completely framed using either steel or wood studs.

For openings **36 inches × 36 inches and smaller**, king studs are generally not required.

For larger openings, the outer framing members must typically be doubled to provide adequate structural support.

For wood stud construction, the framing surrounding the opening must be protected with the same fire-rated gypsum board used for the wall assembly to maintain the required fire-resistance rating.

"Always refer to the manufacturer's installation instructions for maximum allowable opening sizes and approved methods."

Horizontal Concrete Floor Installations

Horizontal fire damper installations are permitted in concrete or masonry floor assemblies.

Opening clearances are the same as those required for wall installations.

Wood floor construction does not qualify for this type of installation unless specifically tested and listed.

Floor/Ceiling and Roof/Ceiling Assemblies

A common misconception is that standard fire dampers may be installed in fire-rated ceiling assemblies.

In reality, membrane penetrations in fire-resistance-rated floor/ceiling or roof/ceiling assemblies typically require a **Ceiling Radiation Damper**. These products are sometimes incorrectly referred to as "ceiling fire dampers."

Ceiling radiation dampers are tested to different standards and have completely different installation requirements than standard fire dampers.

Damper Placement Within the Wall or Floor

The damper/sleeve assembly is designed so that the centerline of the closed damper blades is located within the plane of the fire-rated wall or floor.

The entire damper frame does not have to be centered within the wall thickness. This allows contractors some flexibility to shift the assembly slightly to accommodate field conditions while remaining within the tested installation limits.

Several specialty designs – including **Out-of-Wall/Floor (OW), Grille Access (GA),** and **Front Access (FA)** dampers – are specifically tested to permit the leading edge of the damper frame to extend beyond the plane of the wall or floor. Contractors should consult the manufacturer's installation instructions for these applications.

Sleeve Extension Beyond the Wall

The amount a sleeve may project beyond a wall or floor is limited by the UL Classification.

For a standard fire damper without accessories, the sleeve may extend a maximum of **6 inches** beyond each side of the wall or floor.

When accessories such as actuators, blade position switches, or access doors are installed, the sleeve may extend as much as **16 inches** beyond the wall on the accessory side, while the opposite side remains limited to **6 inches**.

Mounting Angles

Mounting angles secure the damper assembly within the wall or floor opening while preventing flames from passing around the outside of the sleeve.

Typical mounting angles are **1½ inches × 1½ inches** and range from **20-gauge to 14-gauge steel**, depending on the manufacturer's UL Classification.

Mounting angles must overlap the wall or floor by at least **1 inch** on all four sides.

For very large openings, longer angle legs may be required to maintain the minimum overlap.

One-Side Mounting Angle Installations

Approximately **80 percent** of all fire and combination fire/smoke damper installations utilize a one-side mounting angle arrangement.

Maximum allowable damper size varies by manufacturer but may be as large as **108 inches × 108 inches** or **36 square feet**.

In this installation, the mounting angle is fastened to the sleeve and directly to the wall framing, either over or beneath the gypsum board, depending on the tested installation.

When one-side mounting angles are used, **no fill material or sealants** are required on the opposite side of the wall unless specifically permitted by the manufacturer. Unapproved sealants may invalidate the UL Classification.

Two-Side Mounting Angle Installations

Two-side mounting angle installations are generally required for:

- 3-hour fire-rated dampers, or
- Dampers exceeding the maximum size permitted for one-side installations.

With this arrangement, mounting angles are attached only to the sleeve on each side of the wall or floor, sandwiching the rated assembly between the two angles.

Fastener size, spacing, and attachment methods must follow the manufacturer's installation instructions.

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Duct Connections

The connection between the ductwork and the damper sleeve is also part of the UL-tested assembly.

Two connection types are commonly used:

- Breakaway connections
- Rigid connections

One important requirement is that the sleeve thickness must be **equal to or greater than the duct gauge** attached to it.

Detailed duct connection requirements are contained in the **SMACNA Fire, Smoke, and Radiation Damper Installation Guide**, as well as the manufacturer's installation instructions.

Access Doors

Access doors are essential for inspection, testing, and maintenance throughout the life of the building.

Without adequate access, dampers cannot be inspected or tested as required by **NFPA 80, NFPA 105,** and the **International Fire Code (IFC**).

These codes require unobstructed access to the damper assembly.

When the damper is equipped with internal components, like actuators or fuse links, the minimum access door size is **12 inches × 12 inches**. Where the duct is smaller than 12 inches, a removable section of ductwork should be provided to allow maintenance personnel access to the damper's internal components.

Conclusion

Fire and combination fire/smoke dampers are among the most thoroughly tested life safety products installed in commercial buildings. However, successful performance during a fire depends on much more than laboratory testing – it depends on proper installation in the field.

Every component of the installation, including framing, opening clearance, sleeve projection, mounting angles, duct connections, and access provisions, is part of the UL Classified assembly. Deviating from the manufacturer's installation instructions can compromise the performance of the damper and the integrity of the fire-resistance-rated barrier.

Following the manufacturer's published installation instructions, coordinating work among all trades, and performing proper acceptance testing are essential steps in ensuring these life safety systems perform as intended when they are needed most.

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