

Fire and Smoke Dampers – The First Line of Defense

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Natural disasters are an unavoidable part of life. But unlike hurricanes, earthquakes and the like, most residential and commercial fires are avoidable and can be controlled. During a fire, HVAC ducts can transport and circulate smoke and/or toxins throughout a structure. Rooms and offices far away from the initial fire may be at risk because of this.

According to the National Fire Protection Association (NFPA), smoke travels at 120-420 feet per minute (fpm) during an active fire. Thick, black smoke from a fire can fill a structure in mere minutes, and only a few breaths of the toxic smoke can cause unconsciousness or even death. Statistics show that approximately 70 percent of all building-related deaths are associated with smoke inhalation. Surprisingly, most victims are not located in the same room as the fire's origin.

To address this issue, fire and smoke dampers are used as a key component of a structure's fire and smoke barrier. Dampers are typically installed in the fire-rated separation and become a part of the wall system. Without fire and smoke dampers, smoke and fire can travel through rated walls via open ductwork. In case of a fire these devices act as the first line of defense to prevent flames, smoke, and toxins from spreading throughout a building. Because they serve such a vital safety role it is extremely important to keep dampers up to code and functioning properly.

The role of fire dampers is addressed in Chapter 6 of the *Uniform Mechanical Code (UMC®)* under the section dealing with fire protection requirements. Section 605.0 of the 2018 *UMC* provides the minimum requirements for smoke dampers and fire dampers for HVAC systems. Fire and smoke dampers can also be used in other applications, such as in exhausts for commercial kitchens or in product-conveying systems. These dampers are typically installed to control, capture and remove emissions from the use of appliances or products.

Section 605.2 requires fire dampers to be tested and labeled in accordance with UL 555 and shall be listed for installation in ducts and air transfer openings. These dampers are designed to close when they detect heat. The detection method activates when the fusible link melts at a specified temperature rating.

Section 605.1 requires smoke dampers to be tested and labeled in accordance with UL 555S. Smoke dampers are required to be used in or adjacent to smoke barriers. These dampers are typically triggered by smoke detectors internal to the ductwork. The damper is closed by means of electric or pneumatic actuator assemblies and is designed to restrict the spread of smoke. In engineered smoke control systems, smoke dampers can be used to control the movement of smoke within a building; such HVAC systems automatically open or shut the damper depending on the design.

Combination fire and smoke dampers may be used where the partition is rated as both a fire and smoke barrier. Combination fire and smoke dampers must meet the test requirements for both fire and smoke damper test standards. Based on these testing standards, fire dampers are given a fire rating, smoke dampers are given a leakage rating, and combination fire and smoke dampers are given both a fire and leakage rating.

Dampers need to be correctly installed and regularly maintained, inspected, and tested to ensure that they will work in times of need. Dampers that are not inspected and maintained

frequently fail. According to the National Energy Management Institute Committee (NEMIC), smoke and fire dampers can experience a failure rate of up to 60 percent. Most damper issues can be identified and corrected by regular and thorough testing and inspection.

The first step to maintaining properly functioning fire dampers is the physical inspection and function testing of the dampers. Section 605.5 of the *UMC* requires dampers to 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 can fail for a variety of reasons, and there are a range of issues that make damper inspection, testing, and repair extremely critical for the building's fire protection. Improper installation, misalignment issues, rust or corrosion, and broken fusible links are just a few of these issues. Dampers need to be clearly accessible, unobstructed and functioning properly, as required by Section 605.6 of the *UMC*. This means that no objects are to pass through or obstruct the operation of the device.

The installation of code compliant dampers should always be in accordance with the manufacturer's instructions. When deviations from the installation instructions are unavoidable, such deviations should be specifically approved by the manufacturer and the Authority Having Jurisdiction, as they could compromise the intended function of the damper.

Following the requirements of the *UMC* will contribute to the successful operation of fire and smoke dampers. This can mean the difference between a controllable fire and an uncontrollable disaster. Most natural disasters cannot be prevented, but they can be less destructive if we understand how to control them. The best defense is a good offense. Proactively maintaining and repairing fire and smoke dampers— the first line of defense in a fire — is the best way to keep them functioning properly and protect against avoidable injury.