

Life Safety Dampers — An Integral Part of Effective Compartmentation... and the IBC

Even when dampers are not required per the IBC due to the inclusion of sprinklers, it's advisable to add them for critical smoke control and enhanced overall protection.

The International Building Code (IBC) was created in 2000 to simplify construction requirements under one common building code for the U.S. Prior to this, three regional codes existed: the Uniform Building Code (UBC), the Standard Building Code (SBCCI), and the National Building Code (BOCA). These three "legacy" codes were based upon many years of knowledge gained from successful and unsuccessful construction methods, life safety improvements, and natural disasters. In addition, the impact of deadly fires, building collapses, hurricanes, and earthquakes all contributed to the extensive body of knowledge that is now contained within the IBC.

Today, IBC council hearings are attended by fire protection engineers, code officials, fire fighters, industry representatives, and government organizations. Proposed amendments and code corrections are discussed, debated, and then acted upon with a goal of striking a balance between occupant safety and the cost of construction.

Maintaining Effective Compartmentation

IBC requirements help ensure life safety during a fire primarily through the concept of compartmentation in which a building is segmented into different "compartments" using fire-rated construction to minimize risk.

For many years, life safety dampers have proven to be a highly effective method for achieving compartmentation. However, in recent years, the IBC has expanded the size of compartments where sprinklers are present and reduced the hourly ratings of barriers where sprinklers are present, which ultimately reduces the number of openings required to be protected by dampers. Expanded compartments reduce the amount of concrete, fire stop, and additional passive methods of preventing fire and smoke spread.

Although sprinklers are a very important and effective

method of controlling fire and flame spread, they do not contain smoke which can continue to spread after the fire is extinguished. Direct exposure to lingering smoke can severely injure or kill occupants and firefighters. Although IBC requirements have changed, it's still wise to continue to protect openings and ultimately provide effective compartmentation. Many life safety experts say the current code is too dependent on sprinklers and are concerned about sprinkler system failure. Although some of the latest data indicates sprinklers are effective 88% of the time, a terrible disaster could occur when the sprinkler system does not effectively contain the fire.

Selecting the Right Damper

Just like building codes, the relatively new damper industry has responded to changing life safety needs. In less than 40 years, life safety dampers have become much more effective, reliable, and easier to install. New minimum testing requirements allow engineers to properly apply products from all manufacturers and for any sized opening with less research. In addition, there have been several installation improvements to help the contractor, including single-sided retaining angles, out-of-barrier fire dampers, and fire stop installations without retaining angles, and adjoining breakaway connections.

Revisions in UL requirements have also prompted the development of a wider range of damper products. The UL-555 Fire Dampers code is now in its seventh revision since 1968 for both static and dynamic dampers. Static dampers are intended for applications where the HVAC system is immediately shut down upon detection of smoke or fire. Dynamic dampers are rated to close when elevated temperatures, velocity, and pressure occur. They are either spring- or actuator-assisted for closure. Dynamic dampers can close immediately while overcoming existing airflow resulting from air movement shut-down lag.

Common questions to answer when deciding on the need for a certain damper type include: "How long will it take for the air flow to be isolated?" "What if there is a fire or smoke detector failure?" The entire air control

system does not need to be converted to dynamic for dynamic-rated fire dampers to be effective.

The UL-555S Smoke Damper code is in its fourth edition since 1983. Combination fire and smoke dampers are required to pass both UL-555(dynamic) and UL-555S codes. Combination fire and smoke dampers are cycled 20,000 times and tested at minimum elevated temperatures of 250F or 350F against a minimum of 2,000 fpm velocity @ 4-in. w.g. of pressure. Extended temperature, pressure, and velocity ratings can be classified in increments of 100F, 1,000 fpm velocity, and 2-in. w.g. Actuators are now designed to operate at these elevated temperatures versus ambient conditions.

Refer to the “IBC Summary Requirements for Life Safety Dampers” sidebar for damper selection criteria.

Get Involved

Today, regional IBC chapters located around the country continue to advance important issues relevant to the safety and effectiveness of building structures. Hurricane-resistant construction in the southeast and seismic-resistant structures in the west are just two examples of how regional input has positively influenced the IBC. Everyone who understands the benefits that life safety dampers provide needs to become more involved at either a regional level or national level in the IBC. Systems that include both sprinklers and smoke management devices need to work in conjunction with each other to provide the most effective ways to save structures and ultimately save lives. Get involved in your regional IBC chapter. You will be heard, and you can have an impact on establishing future IBC changes that will help preserve the important life safety progress that’s already been achieved.

A Summary of IBC Requirements for Life Safety Dampers

The following damper requirements are based on Chapter 7 of the *2006 IBC Fire Resistance Rated Construction*.¹ You can see from this information how the use of sprinklers and expanded compartmentation areas has reduced the number of dampers required. These definitions can help you achieve proper building construction and compartmentation per IBC requirements and guide you in life safety damper

applications. However, even when dampers are not required per the IBC due to the inclusion of sprinklers, it’s advisable to add them for critical smoke control.

Fire Dampers are required to protect duct penetrations and air transfer openings in the following building elements:

Fire Walls (no exceptions)

Fire Barriers – with the following exceptions:

- Penetrations tested in accordance with ASTM E 119 as part of a fire-resistance rated assembly.
- Ducts used as part of an approved smoke control system in accordance with Section 909.
- Penetrations by ducted HVAC systems in fire barriers with a fire resistance rating of one hour or less in sprinklered buildings.

Fire Partitions – with the following exceptions:

- Penetrations of rated corridor walls and tenant separations in a sprinklered building.
- Duct penetrations where the duct area is less than 100 in².

Smoke Dampers are required to protect duct penetrations and air transfer openings in the following building elements:

Fire-rated corridor enclosures in sprinklered buildings that are also required to have draft and smoke control doors in accordance with 715.3.3 with the following two exceptions:

- There is no opening in the duct serving the corridor
- Ducts used as part of an approved smoke control system in accordance with Section 909 and where the dampers are not necessary for the smoke control system to operate properly.

Smoke Barriers – with the following exception:

- Where all duct openings occur within a single smoke compartment.

Combination Fire Smoke Dampers are required to protect duct penetrations and air transfer openings in the following building elements:

Shaft Enclosures – with the following exceptions:

- Fire dampers are not required when a duct penetrates a shaft and extends at least 22 in. upward and exhausts directly to the outside. (Figure 716.5.3.1 of the IBC commentary shows this exception.)
- Fire dampers are not required to protect penetrations tested in accordance with ASTM E 119 as part of a fire-resistance rated assembly.
- Fire dampers are not required to protect ducts used as part of an approved smoke control system in accordance with Section 909 and where the dampers are not necessary for the smoke control system to operate properly.
- Fire dampers are not required to protect penetrations in parking garage shafts that are separated from other building shafts by at least two-hour fire resistant construction. (Figure 716.5.3.1 of the IBC commentary shows this exception.)
- Smoke dampers are not required in sprinklered B occupancies to protect an opening for a bathroom exhaust duct that extends at least 22 in. up and directly outside.
- Smoke dampers are not required in sprinklered B occupancies to protect duct openings that are part of an approved 909 smoke control system where the damper could interfere with the smoke control system's operation.
- Smoke dampers are not required to protect penetrations in parking garage shafts that are separated from other building shafts by at least two-hour fire resistant construction. (Figure 716.5.3.1 of the IBC commentary shows this exception.)

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