



fast facts

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Fire Barriers Limit the Movement of Fire and Smoke August 2010

Efficient fire barriers are the main passive fire protection technology that limits the spread of fire and restricts smoke and toxic gas movement to other parts of a building. They divide a building into fire compartments that are enclosed on all sides to confine the fire and smoke to the compartment in which the fire started. Fire barriers are extremely important, especially in multi-story buildings, because they provide extra time for employees and visitors to safely evacuate the building in a fire emergency. High hazard areas are enclosed in fire barriers to protect people and buildings. The Occupational Safety and Health Administration (OSHA) regulations require that exit stairwells be enclosed with properly rated and approved fire walls and doors. Open vertical shafts and stairways are the main pathways that will permit the smoke and toxic gases to rapidly spread upward from a fire on a lower floor level.

Fire Barrier Penetrations



Figure 1: Pipe Poking Through a Fire Wall

Fire barrier penetrations are items that pass through fire walls, floors or ceilings to accommodate utility systems like electrical, mechanical, plumbing or other systems. See Figures 1 and 2. Where fire walls or other fire barriers are penetrated, the openings must be filled with approved materials equally fire resistant as the surrounding walls or barriers, such as

fire caulking materials. If left unsealed, fire, smoke and toxic gases driven by the heat and pressure of the fire will move through the holes and travel rapidly to other parts of the building.



Figure 2: Floor Penetration Through Pipe Sleeves

Even small holes can pose a serious fire, smoke and toxic gas exposure risk to building occupants, especially those in adjoining spaces or on the floors above the fire location. See Figure 3.



Figure 3: Hole Through Fire Door

Unenclosed Stairwells

Stairwells are the primary way to escape a multi-story building from the upper floors in a fire or other emergency. An open stairwell such as those shown in Figures 4 and 5 allows the rapid spread of fire and products of combustion to upper floors, exposing occupants to intense heat, smoke, and toxic gases as they attempt to evacuate the building. People have perished from smoke inhalation while attempting to use exit stairways that were not properly enclosed, such as the MGM Grand Hotel fire in 1980 (9 deaths) and the Cook County Administration Building fire in 2003 (6 deaths).



Figure 4: Unenclosed Exit Stairway



Figure 5: Open Stairwell

Open exit stairwells in multi-story buildings must be enclosed by fire-rated barrier walls and side swinging fire doors. Fire doors are part of an exit component

that must be fire rated, equipped with proper hardware and labeled by an OSHA recognized test laboratory. See Figure 6.



Figure 6: Exit Stairway Door with Panic Bar Hardware

fast stats

In 2009, fires and smoke caused 3,010 civilian fatalities in the United States of America.
In 2009, fires and smoke caused 17,050 nonfatal civilian injuries in the United States of America.

Source: National Fire Protection Association (NFPA) Journal, September/October 2010

The National Center for Injury Prevention and Control, a part of the Centers for Disease Control and Prevention of the U.S. Dept. of Health and Human Services, states in its *Fire Deaths and Injuries: Fact Sheet* that most victims of fires die from smoke and toxic gases and not from burns. A National Fire Protection Association (NFPA) 2008 report of Home Fire Victims found that smoke inhalation was the leading cause of fire deaths and that smoke inhalation was twice as likely to kill a victim as burns from a fire.

Applicable Regulations

- An exit door must be unlocked and employees must be able to open an exit route door from the inside at all times without keys, tools, or special knowledge. (29 CFR §1910.36 (d)(1))
- NFPA Life Safety Code 2000 edition [adopted by OSHA in 29 CFR§1910.35] permits delayed opening for exit discharge doors where the delay can be set for 15 or 30 seconds of delay to permit security concerns to be addressed before the exit discharge door can be opened. Once the panic bar is pushed, an alarm sounds. After the elapsed time, the door lock releases. If the building fire alarm is activated, it will immediately release the door lock so that it can be opened without delay. (NFPA 101 Section 7.2.1.6.1)
- An exit stair must be separated from other building compartments by fire resistant materials: a one-hour fire resistance-rating if the exit connects three or fewer stories, and a two-hour fire resistance-rating if the exit connects four or more stories. (29 CFR §1910.36 (a)(2) and NFPA 101 section 7.1.3.2.1)
- Every large building needs to be divided into fire compartments to limit the spread of fire and restrict the movement of smoke. (NFPA 101 Section 8.2.2.1)
- Fire compartments are formed by fire barriers that are continuous from outside wall to outside wall or from one fire barrier to another, or a combination thereof, including continuity through all concealed spaces, such as those found above a ceiling, including interstitial spaces. (NFPA 101 Section 8.2.2.2)
- Penetrations constructed as a fire barrier shall be protected by an approved firestop system or device. (NFPA 101 Section 8.2.3.24). Some examples of these penetrations are cables, cable trays, conduits, pipes, tubes, combustion vents and exhaust vents, wires and similar items to accommodate electrical, mechanical, plumbing, communications and other systems that pass through a wall, floor, or floor/ceiling assembly.



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