FIRE DOORS AND THROUGH-PENETRATION PROTECTION

INTRODUCTION

This document provides loss prevention guidance for construction, maintenance and installation of fire door assemblies and through-penetration protection in fire walls and fire barriers as described in PRC.2.2.1 and NFPA 221. Design and install fire doors in accordance with NFPA 80.

Any unprotected opening or through-penetration in a fire wall significantly reduces the ability of the wall to prevent the spread of fire. Install and maintain protection in accordance with applicable listings and manufacturers' specifications.

POSITION

Minimize the number and size of openings in fire walls. The aggregate width of all openings in a fire wall must not exceed 25% of the fire wall length. Protect all openings in fire walls and fire barriers with listed fire doors, shutters, dampers or through-penetration fire stop assemblies. Install an assembly that has a fire resistance rating equal to or greater than the wall.

Inspect all fire doors and shutters annually. See NFPA 80 for the requirements.

Manually operated doors, windows and shutters and water curtains are not acceptable means of protecting openings in fire walls or fire barriers.

Fire Doors

Use fire door assemblies that are listed by a nationally recognized testing laboratory. The listing should be based on testing in accordance with NFPA 252, UL 10B, EN 1634-1, or BS 476: Part 20 based on the maximum temperature rise on the unexposed side of 250°F (121°C) average or 325°F (161°C) single-point. Since doors larger than 120 ft^2 (11 m^2) are not tested, use oversized doors that have been certified and labeled as an "Oversized Door" by a nationally recognized testing laboratory. When an oversized door is contemplated, consult AXA XL Risk Consulting.

Use listed hardware for the type of door in which it is being installed. Install the hardware according to manufacturers' specifications.

Design and install fire doors used as a means of egress in accordance with the requirements of NFPA 101. See Figure 1 as an example. Do not use single personnel doors larger than 3 ft $\times$ 7 ft (1 m $\times$ 2 m). Glass is allowed in a 1½ hr rated fire door.

Provide fire doors in all openings in fire walls and fire barriers as outlined in Table 1.

TABLE 1
Opening Protection

Hourly Rating of Wall	Number and Hourly Rating of the Door(s)
4 hr	Two - 3 hr
3 hr	One - 3 hr
2 hr	One - 3 hr or Two - 1½ hr in Stair Towers, Shafts, or Vestibules.
1½ hr	One - 1½ hr

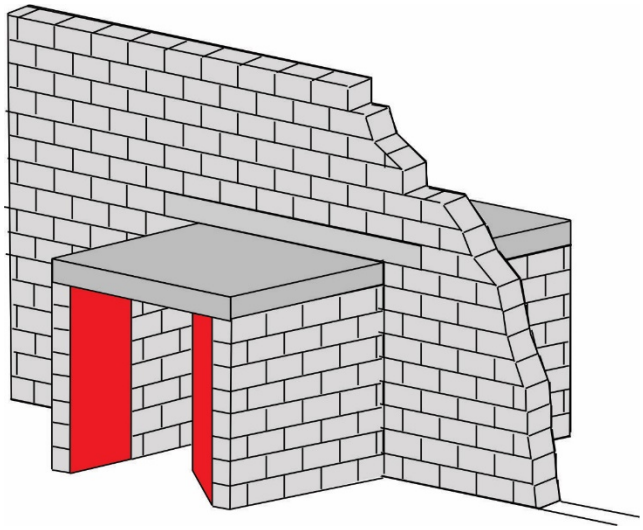

Figure 1: Double Fire Doors For Means Of Egress

Install fusible links over the opening on both sides of the wall. When detectors are used, locate detectors on both side of the wall, either over the opening or at the ceiling.

Select simple, direct acting and reliable design of fire doors. When selecting a design ensure that:

- Self-releasing features are incorporated in the design of the track, chain, supports, etc.
- Sprinkler discharge will not impede operation of any fusible link on the fire door.
- Counterweights, springs and other components are designed with enough strength to push material on conveyor belts out of the way.

Conduct weekly and monthly inspections in accordance with AXA XL Risk Consulting recommendations outlined in *OVERVIEW*. Instruct employees about the purpose of fire doors and the need to close all fire doors at the end of the each workday and during shutdown periods such as holidays and weekends. See PRC.2.2.3 for additional information.

Inspect weekly to visually check for any signs of damage and for proper operation of such devices as detectors, tracks, cables, hoods and fusible links.

Monthly inspections should include:

- Close the fire doors and shutters manually by raising counterweights of automatic sliding and counterbalanced doors to see if doors close;
- Inspecting doors for damage;
- Inspecting all hardware, including latches, guides and thresholds, for proper function;
- Checking fusible links of automatic closing mechanisms to ensure they are free of paint and other foreign material, and test other releasing devices.

Annually operate the doors and shutters by disconnecting the fusible links or activating the smoke detectors.

Do not store combustibles near a fire door or protected opening. The minimum distance between a fire door or protected opening and stored combustibles should be 80% of the largest dimension of the door or opening but not less than 6 ft (1.8 m). Promptly remove all obstacles found blocking any door.

Design conveyors to either pass around fire walls or provide them with fire doors. Construct conveyor tunnels for conveyors passing over or around fire walls of noncombustible material. Equip the conveyor tunnels with fire doors and automatic sprinkler protection. Construct and equip conveyor openings in fire walls in accordance with NFPA 80. See Figures 2 and 3 as an example. Water curtains are not an acceptable substitute for fire doors.

Fire doors for conveyor openings should be capable of closing even if the conveyor is not operating. Provide interlocks to shut the conveyor down when the sprinkler water-flow alarm is activated. In the event of a fire, the drive mechanism should be able to clear the obstruction and close the door(s).

The doors selected should be designed for the type of conveyor used. No portion of a fire door should be cut out to allow for closure about a conveyor track or other component.

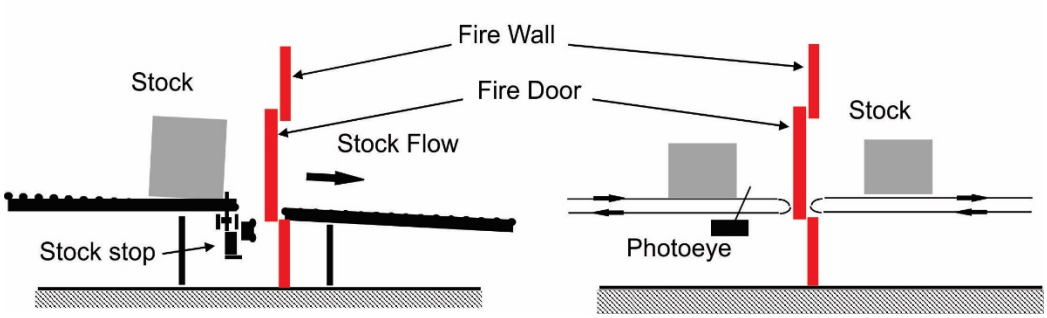

Figure 2: Examples Of Conveyor Openings Protected By Fire Doors

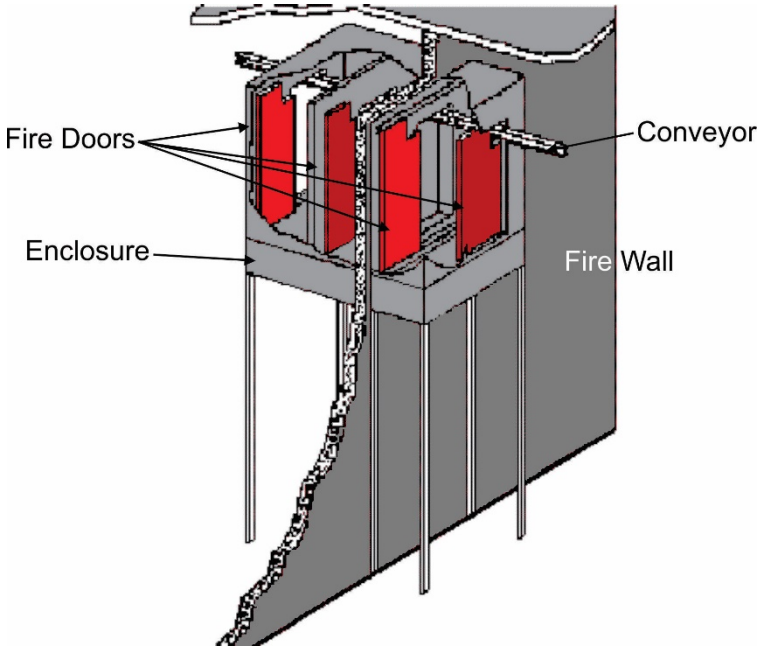

Figure 3: Examples Of Rail Conveyor Openings Protected By Fire Doors

Through-Penetration Protection

Seal through-penetrations in fire walls or fire barriers to allow passage of cables, ducts, pipes and conduits with noncombustible material with a fire resistance rating equal to the rating of the wall. Seal openings no longer required with a material of equal fire resistance to that of the wall.

Construct ducts of noncombustible materials; provide automatically actuated fire dampers where they pass through the fire wall or fire barrier. The number and fire rating of the dampers should be in accordance with Table 1.

If cables, ducts, or cable trays penetrating the wall are not properly designed, they could cause the openings to enlarge during a fire because of roof or equipment collapse. To minimize the adverse effects of these penetrations in a fire wall:

- Install listed fire dampers or a through-penetration system having the same fire resistance rating as that of the wall.
- Seal unused openings with material having a fire resistance rating equivalent to that of the wall.
- Arrange piping, conduits, cables and cable trays to pass around the wall. If they must pass through the wall, loop them downward to pass through the wall within 3 ft (0.9 m) of the floor.
- Install slip joints for cable trays and ducts on each side of the wall so the cable trays and ducts can detach from the wall without exerting force on it during collapse.

See NFPA 221 for additional details.

At locations where the occupancy is considered to be Ordinary Hazard or Extra Hazard as defined in NFPA 13 and modified by PRC.12.1.1.0, inspect all through-penetrations once they are installed or modified, in accordance with ASTM E2174 *Standard Practice for On-Site Inspection of Installed Firestops* and PRC.2.2.4.

DISCUSSION

A fire wall without an opening is ideal; however, it is not realistic. Inevitably, openings are required for the passage of personnel, utilities and goods. Protect these openings by a listed fire door to maintain the integrity of the wall. Some of the most destructive fires have spread through improperly protected openings in fire walls. Likewise, improperly protected through-penetrations for cabling and ducts have become the main channels for fire spread and ultimate destruction of a facility.

While used in the past, water curtains are not a good method of protecting wall openings. Water curtains rely on the water supply remaining in tact and of adequate supply. In addition, water curtains will not stop rocketing aerosol cans, spreading flammable liquids and falling stock.

Conveyors can move burning products and combustible belting through the wall if the opening is not properly protected. Provide adequate protection through careful consultation between the user, conveyor manufacturer, fire door manufacturer and loss prevention personnel.

Determine suitability of fire doors, windows, shutters and through-penetration fire stop systems through testing and listing by nationally recognized testing laboratories. Doors, windows, shutters and through-penetration fire stop systems not listed cannot be relied upon for effective protection. Testing methods evaluate the ability of an assembly to remain in an opening during a predetermined test exposure. Ratings of 4 hr, 3 hr, 1½ hr, 1 hr, ¾ hr, 30 or 20 min indicate the duration of exposure to fire. Ratings are based on NFPA 252 for fire doors and ASTM E814, UL 1479, or EN 1366-3 for through-penetration fire stop systems.

Fire door labels indicate the maximum transmitted temperature at the end of 30 min to the unexposed side. These temperature rises are divided into three levels: 250°F (121°C); 450°F (250°C); or 650°F (361°C). A fire door with a temperature level higher than 250°F (121°C) may allow sufficient heat to pass through to ignite combustibles on the nonfire side. Combustibles placed too near some fire doors can be ignited from a fire on the other side of the door.

Arrange fire doors to close automatically by one of several methods. The most common is by heat sensitive fusible links. Install links over openings on both sides of the wall. When activated, a link releases a latch which releases the door or the counterweights. Another method is the use of fire detectors. Locate the detectors on both sides of the wall, either over the opening or at the ceiling. When activated the detector releases the door or a set of weights. A third method is to release the

door through the operation of a fire suppression system such as sprinkler system waterflow alarm, carbon dioxide system discharge, foam systems, etc. When the system actuates, the alarm switch will release the fire door also.

Fire doors may be swinging, horizontally sliding, vertically sliding and rolling metal doors that unroll downward to close. Selection will depend upon how a door will be used and what clearances it will have. Generally the most preferred selection is either a single fire door that closes the entire opening without a center joint, or an assembly with simple closing hardware. Swinging doors are usually designed to be installed in concrete, masonry and nonmasonry walls. Sliding doors are usually designed for installation in concrete and masonry. The following is a brief description of the various types of fire doors.

A composite door is constructed of wood, steel or plastic sheeting. These materials are bonded to a solid noncombustible core overlaid with untreated wood veneer, or plastic or metal facing, or encased in steel. The core material may be manufactured with steel edges, untreated wood edges or chemically impregnated wood edges. These doors are available as single-sliding, biparting and single or double swinging arrangements. Doors that swing in pairs have a coordinator that causes the active leaf to close last. Hardware must include latch devices to keep the doors closed.

A metal clad door, also known as a Kalamein door, is a metal covered wood panel with 24 gage (0.62 mm) or lighter steel. It can be either a swinging or sliding type.

A hollow metal door is a panel, available as a single- or double-swinging unit, with not less than 20 gage (0.93 mm) reinforced steel facing. Flush doors include steel, stiffeners or honeycomb core to support the faces.

A sheet metal sliding or swinging door is a flush door, constructed of corrugated steel or a panel of 22 gage (0.78 mm) or lighter steel.

A rolling steel door consists of interlocking 22 gage (0.78 mm) steel slats that form a curtain attached to an overhead barrel mounted on brackets for attachment to walls. The door assembly is equipped with automatic closing devices released by detectors or fusible links. Roll doors may have a motor drive assembly which does not interfere with the automatic closing device. The assembly is designed to be installed in concrete and masonry walls.

A tin clad door consists of two or three ply wood core, covered with sheet metal. The cover could be either sheet metal of 30 gage (0.311 mm) galvanized steel, or terne plate (maximum size of 14 in. $\times$ 20 in. [0.35 m $\times$ 0.50 m]), or 24 gage (0.63 mm) galvanized steel not more than 48 in. (1.2 m) wide that is bound to the core. It can be counterbalanced or arranged as a swinging, sliding or biparting design.

A wood core door is a 20 or 30 min fire rated fire door that consists of a wood, hardboard or plastic face sheet bonded to wood blocks or wood particle board core material with untreated wood edges.

Special purpose doors are doors that do not fall into the above categories. These doors are the heavy duty swing doors, doors with integral hardware, revolving cylinder type doors, and single side and center biparting folding doors. The label should indicate “Special Purpose Fire Door.”