

Fire doors are an important code requirement for most buildings larger than two-family residences. The ratings of the doors and their components are specified according to the amount of time they will hold up in a fire, the classification of wall opening, the use of the wall, and the fire rating of the wall itself.

Proper installation can be a matter of life or death when a fire breaks out. Detailed knowledge of code provisions is required. The following is a brief introduction to the subject, excerpted with permission from the booklet *Fire Code Summary* published by the Architectural Woodwork Institute.

It is fairly standard throughout the industry to install fire door assemblies in accordance with *NFPA 80: Standard for Fire Doors and Windows*.

This standard, published by the National Fire Protection Association, is referenced directly or indirectly in all of the major model codes. It regulates all aspects of the installation of fire door assemblies including wired glass lites, hardware, frames, sills, fastenings, louvers, and viewing devices.

Furthermore, limitations are included regarding modifications that can be made to fire doors in the field.

The model codes have universally established a fire door rating and opening classification system for use in protecting door openings in fire resistive rated wall constructions. (See Table 1.)

When a fire door assembly is specified, it should be designated with both the hourly rating and the classification of the wall opening in which it is to be installed. For example, a fire door to be installed in a one-hour partition should be specified as a ¾-hour "C" label fire door assembly.

Similarly, a fire door to be installed in a one-hour shaft enclosure should be specified as a one-hour "B" label fire door assembly. However, a fire door to be installed in a one-hour corridor wall would be specified as a 20-minute fire protection rated door. This provides precise guidance as to the hourly rating or the door and its intended use in fire resistive wall assemblies.

The requirements are least strict for 20-minute doors and smoke doors. The intent in using these doors is to achieve some degree of smoke control in the early stages of a fire. Therefore, these doors are not required to meet the hose-stream portion of the fire door tests.

In reality, the 20-minute door is equivalent to a 1½-inch-thick particle-board core or wood stave core door which historically has performed quite satisfactorily in protecting door openings in one-hour corridor walls. The 20-minute performance is now specified in order to eliminate the potential for abuse of the "solid-core wood door" which could refer to any type wood core door. As long as it was not hollow, a door could be classified as a solid-core wood door even if it were a honeycomb core, for example.

Some of the national model codes reference the use of doors for smoke control in smoke-stop partitions, such as in institutional occupancies. Normally, a 20-minute fire protection door is utilized in these situations. Smoke control doors are normally not required to latch and, therefore, do not meet the requirements for a fire door installation in accordance with the requirements of *NFPA 80*. Latching is not required because the intent is to retard the transmission of smoke in the early stages of fire when pressures resulting from the fire are relatively small.

Wood Fire Doors: Meeting the Codes

Door Limitations

Transoms and side panels installed in conjunction with fire doors must be fixed in place. The maximum area of the entire opening—including the transom, side panels, and fire doors—must be less than 120 square feet, with no dimension greater than 12 feet.

Frames with transoms but no side panels can cover no more than 40 square feet for single-door installations, and 80 square feet where pairs of doors are installed.

Transoms must be solid except in ¾-hour door assemblies where wired glass lites may be permitted. Transoms and side panels must be labeled for the particular fire door installation.

Normally, the model codes do not require that temperatures on the unexposed surface of the fire door assembly be limited. However, in the case of fire doors opening into exit stair enclosures, the model codes have established a maximum temperature rise of 450°F after the first 30 minutes. This is provided so that people exiting the building can pass by the door without being adversely affected by the heat that may be radiated from the unexposed surface.

Other Restrictions

Latching devices, door closers, door frames, louvers, and glass lites must be listed or labeled for use in fire door assemblies. Louvers must be automatic closing by a heat-activated device such as a fusible link. The size of louvers is limited according to the fire door listing as to the maximum area and dimensions.

Latching devices must be positive so that when the door is in a closed position, it is always latched to prevent expanding fire gases or impacting objects from opening the door.

A special type of builders' hardware, called fire exit hardware or panic hardware, is labelled for use on fire doors.

When any type of fire door is installed, combustible floor coverings may not extend through the door opening. This may require interrupting the floor at the door opening with a non-combustible sill directly beneath the door.

Operating clearances for fire doors must be less than 1/8-inch at all locations except that with a raised sill, a 3/8-inch clearance is allowed, and if no raised sill is provided, then a maximum ¾-inch clearance (undercut) is permitted.

It is extremely important that the fire door frame utilized is listed for the type of wall construction in which it will be installed. For example, some fire door frames are listed for use only in masonry or concrete walls, while others are listed for use in gypsum wallboard stud walls. The methods of anchoring are completely different for these two types of fire door frame installations. The appropriate frame is needed to insure that the fire door installation will remain in place for the duration of the anticipated fire exposure.

The entire assembly—
not just the door—
must comply with the
fire code

Labeling and Listing

The model codes require fire doors to be labeled. Essentially, a label indicates the rating and use of the door. It is a permanent identifying mark attached to the door by a testing organization that also provides random unannounced inspection of the production of the fire door.

The manufacturer, by labeling the door, indicates compliance with the standard fire test for fire doors and *NFPA 80*. In addition to the door, the door frame and the door closer are required to be labeled for use with a specific fire door.

The latching device, on the other hand, is required to be listed. Listed equipment is included in a list published by a testing organization. Listing does not normally include a label or other identifying mark of a permanent nature. In many cases, it is simply a stick-on paper symbol identifying the testing organization.

Such stick-ons may accidentally be removed in the field. However, the testing laboratory does maintain the listing which indicates that the latching device is acceptable for use in the fire door for which it has been listed.

Only by providing labeled and listed equipment is it possible to assure that the overall fire resistive door assembly will perform as intended by the standard fire test and *NFPA 80*.

Among the organizations that presently test, inspect, list, and label fire doors and their component assemblies are the following: Underwriters Laboratories Inc. (UL), Warnock Hersey International (WHI), Factory Mutual (FM), and Underwriters Laboratories of Canada (ULC).

When specifying a fire door or when inspecting it in the field, it should only be necessary to require a label from a recognized laboratory to verify that the door was tested in accordance with the

TABLE 1

Fire Door Classifications

Fire Door Rating (Hours)	Opening Class	Use of wall	Rating of Wall (Hours)
3	A	Fire Walls Fire Separations	3 or 4
1½	B	Vertical Shafts Exit Stairs	2
1	B	Fire Separations Vertical Shafts Exit Stairs	1
¾	C	Fire Separations Fire Resistive Partitions Corridors Hazardous Areas	1
½ 1/3 (20 Minutes)		Corridors	1 or Less
1½	D	Smoke Barriers Severe Exterior Exposure	2 or More
¾	E	Moderate To Light Exterior Exposure	1 or Less

* 30-minute doors do not have a referenced code application but can be used in place of 20-minute doors

standard fire door test and manufactured in accordance with the requirements of *NFPA 80*.

Certification vs. labeling is a controversial issue. In some cases field conditions or owner requirements may be

such that a door opening is oversized, or some other portion of the labeling of the fire door assembly must be violated.

In such cases, a certification can be provided by the manufacturer which simply states that the door itself was

constructed in accordance with the requirements for a door of smaller size, or that the installation only varies in accordance with the specifics indicated in the certification.

The practice of self-certification should not generally be utilized unless there is no other possibility for providing the opening with the components and limitations required for a fire door assembly. In general, it is always best to utilize a labeled fire door assembly.

Glazing

Glass installed within fire doors must be G-inch wired glass labeled for installation in a fire door. In general, the model codes limit the amount of wired glass which can be installed within a given fire door.

The limitations range from zero glass in a three-hour door in a Class A opening, to 1,296 square inches of glass in a 45-minute door in a Class C opening.

Wired glass can only be installed in steel frames that comply with the label requirements of the door assembly. The frame must overlap the glass sufficiently to assure the integrity of the lites for the fire exposure period and the subsequent hose stream application.

Fire Tests

The industry standard for determining fire resistance ratings of doors is based on *ASTM E-152: Standard Methods of Fire Tests of Door Assemblies*.

The test requires that an entire door assembly, including the fire door, fire door frame, latching device, and hinges, be installed within a wall assembly for which it will be suitable for use in the field. The entire assembly is installed in a fire test furnace. The furnace is ignited, and temperatures raised in accordance with a standard temperature-time curve.

The standard curve, shown in Table 2, may not represent the conditions that exist in all fires, but it has been generally recognized as the most universal fire curve for testing fire resistive assemblies. It provides a basis for relative comparison of fire performance of door assemblies. Thus, a 1½-hour door is approximately twice as fire resistive as a ¾-hour door.

The door assembly is exposed to the furnace for the duration desired for the rating, or until it fails to meet one of the conditions for acceptance. Those conditions include: The door must remain in the wall opening; no through openings (holes visible to an observer standing directly in front of the door) may develop in the assembly; and door edge movements are limited to specified maximums.

After the desired fire exposure has been achieved, the door is then exposed to a standard hose stream test, using a fire hose with a straight-tip nozzle at a prescribed pressure. The above conditions must be met for the duration of the hose stream test.

The model codes have exempted 20-minute doors from the hose stream test, since these doors are mainly used for smoke control.

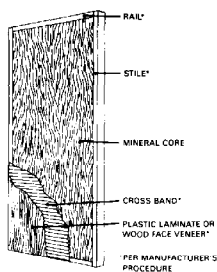
For More Information . . .

A little knowledge can be dangerous, so before you begin installing fire doors, it's important to get as much information as possible.

A good place to start is the booklet from which the above information was excerpted: *Fire Code Summary*. It is available from the Architectural Woodwork Institute, 2310 S. Walter Reed Drive, Arlington, VA 22206; 703/671-9100. ■

Fire Rated Doors

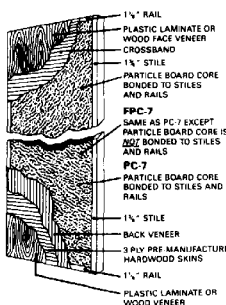
FIRE DOORS FD 1-1/2, FD-1, FD 3/4



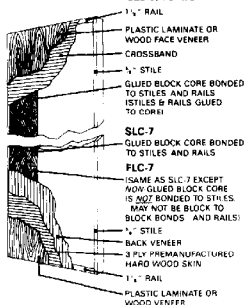
LEGEND

- FPC-7 Part Board Core, 7 Ply Unbonded Core
- PC-7 Part Board Core, 7 Ply Bonded Core
- FLC-7 Non Glued Block Core, 7 Ply Unbonded Core
- PC-5 Part Board Core, 5 Ply Bonded Core
- FD 1/3 Part Board Core, 20 Minute Rated
- FD 1/2 Part Board Core, 30 Minute Rated
- SLC-7 Glued Block Core, 7 Ply Bonded Core
- SLC-5 Glued Block Core, 5 Ply Bonded Core
- FD 3/4 Mineral Core, 3/4 Hr. Rated
- FD 1 Mineral Core, 1 Hr. Rated
- FD 1-1/2 Mineral Core, 1 1/2 Hr. Rated

PARTICLE CORE DOORS PC-5, FD 1/2, FD 1/3



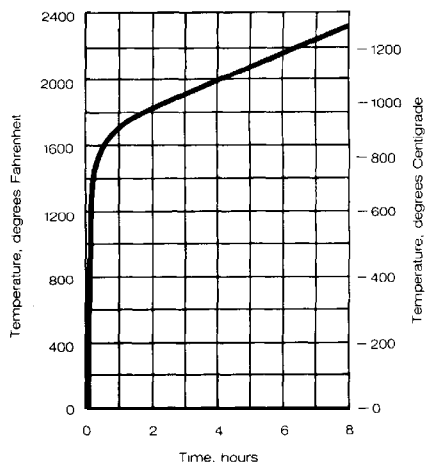
STAVE CORE DOORS SLC-5, FD 1/3



All fire doors must meet ASTM-E152 test requirements and carry identifying labels certified in independent testing agencies. These doors have varying fire ratings, depending upon the materials used, and their assembly.

TABLE 2

Standard Temperature Time Curve



The standard time-temperature represents the conditions of a "typical" building fire, and is used to measure the relative performance of door assemblies. A door that survives these conditions for 1½ hours is considered twice as fire resistive as one that only lasts for 45 minutes.