



# Inspection and Evaluation of Swinging Fire Doors in Existing Buildings

An Online Continuing Education Course for Engineers

**Course Number: M-2079**

**Credit: 2 Hours / 2 PDH / 2 CPD**

# Inspection and Evaluation of Swinging Fire Doors in Existing Buildings

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## Introduction

Engineers and architects are often retained on behalf of an owner, buyer or interested third party, to conduct property condition assessments of existing buildings. The assessment may be intended to evaluate a number of aspects of the property, but invariably the buildings compliance with applicable buildings codes and standards make up a critical component associated with the survey. Taken individually, a single deficiency in a facility may not result in a significant increase in the level of risk in the building, but the aggregate impact of a number of deficiencies can quickly lead to unsafe conditions, and increase the level of risk to occupants, property and business continuity.

This course is intended to briefly review some of the common construction deficiencies that an engineer or architect may encounter when performing an existing building property condition assessment, with a specific focus on the code compliance associated with fire doors and fire door hardware. This course is intended to summarize building code requirements applicable to rated opening protectives and review basic inspection criteria and concepts for these building elements. This information provides useful guidance on how to identify code compliance issues during a brief building walk through survey or fire door inspection. This course does not address more detailed inspection and testing methodologies that are available to professionals performing more detailed building surveys or forensic investigations.

A general discussion of the governing codes and standard requirements in the United States are also referenced. Specific codes and standards requirements vary from country to country, state to state, and city to city. Private entities, federal, state and local governments, insurance companies, and building tenants may also have their own standards that could be applicable to a building or portion of a building. Therefore, care should be taken to ensure an understanding of applicable code requirements prior to conducting a property condition assessment or fire door inspection that all applicable codes and standards are addressed. For the purpose of this course, requirements of the International Building Code (IBC) and National Fire Protection Association (NFPA), specifically those of NFPA 80, Standard for Fire Doors and Other Opening Protectives (NFPA 80) are used as our general references.

## **Passive Fire Protection**

Building codes quantify the degree of fire protection afforded by various building elements based on how the protected assembly performs in carefully controlled laboratory tests. In the United States, fire resistance ratings for building construction assemblies such as floors, beams, columns and walls, are tested this way as a means of establishing a relative comparison as to the level of fire resistance provided by each assembly when compared to a standard fire exposure. The standard fire exposure utilized in the United States is the ASTM E 119 time temperature curve. Similar standard fire tests are used to evaluate the relative fire protection afforded for protection of openings used in such assemblies such as those required for doors, windows, joints, and through penetrations (fire stopping).

Columns, beams, floors, ceilings, and wall assemblies are given ratings based on their ability to withstand fire exposure in hourly increments ranging from one to four hours. Opening protective, such as dampers, doors, and windows, use similar test procedures. These products are rated in smaller increments, which can be as short as 20 minutes, and as long as 3 hours.

When considering the results of these standardized laboratory tests, it is important to recognize what the tests are intended to indicate, and what they are not. Fire door testing results are specifically intended to be applicable to door assembly's ability to resist the passage of fire and function as a barrier during a fire endurance test and to evaluate the ability of the door assembly to remain in an opening during the test followed by the application of a hose stream test. Doors intended for use in exit enclosures are also required by applicable building codes to pass minimum criteria regarding resistance to temperature transmission of no more than 450 degrees Fahrenheit for 30 minutes at the test end point.

The test fire exposure is not intended to be representative of all fire conditions. Fire have too many variables, such as changes in the amount, type, and distribution of the fuel, ventilation, compartment size and configuration, etcetera to be able to be effectively represented by a single laboratory test. It does, however, provide a consistent means with which to gauge relative fire endurance of opening protectives and associated assemblies under test fire conditions. The hose stream test is not intended to represent standard fire department suppression efforts.

### **Opening Protectives (Fire Protection Rated Doors)**

Openings in fire resistance rated construction are required to be protected with opening protectives (for example, doors, dampers, fire shutters, or window glazing) having a fire protection rating appropriate for the building element in which they are installed. Rated

opening protectives are required to maintain the fire resistive integrity of the partition in which they are installed. The rating of opening protectives is demonstrated through laboratory testing similar to that applied to structural members, floors, and ceilings. The table below provides a summary of common wall ratings and associated fire protection ratings for associated opening protectives.

Partition Rating (hours)	Typical Minimum Opening Protective Rating (minutes or hours)
One hour	60 minutes, 45 minutes, 30 minutes, or 20 minutes permitted, depending on specifics of use and arrangement.
1.5 hours	90 minutes
2 hours	90 minutes
3 hours	3 hours
4 hours	4 hours

In some cases, fire doors are referred to using letter designations related to their hourly ratings. Doors with 3 or 4 hour ratings are often referred to as ‘A-label’ doors, while the designations of ‘B-label, is applied to both 1 and 1 ½ hour rated doors, and ‘C-label’ is used refer to 45 minute and sometimes 20-minute rated doors.

As can be observed from the table, the fire protection ratings of opening protectives are oftentimes less than the required fire resistance rating of the assembly in which they are installed. The reason for this has much to do with the practical reasons behind the need for the opening protective, and how it will likely be used. For example, doors, which are used for pedestrian traffic and as a means to get from one space to another, are much less likely to have miscellaneous storage or combustibles stored directly adjacent to them than are walls. As a result, this makes them less likely to be exposed to direct fire and heat impingement against the wall, and makes them less likely to perpetuate fire spread through the partition as a result of conductive heat transfer to combustibles on the non-fire side than walls. The same holds true for shutters, dampers, and windows. National, and international, fire testing laboratories

recognize this practical reality, and incorporate these factors into the testing requirements for opening protectives and various partition types.

### **Evaluating and Inspecting Fire Doors in Existing Buildings**

The proper installation and maintenance of required fire doors in existing building construction requires a number of aspects of the assembly and associated hardware to be installed and maintained correctly in order for it to perform as intended. In the section below we review various aspects associated with fire doors that need to be considered when conducting a fire door inspection or building evaluation.

- A. Labeled Doors, Frames, and Associated Hardware: When evaluating the fire protection rating of opening protectives in existing construction while performing a building evaluation, the sole reliable means by which to identify the actual laboratory tested fire protection rating is inspection of the factory attached label. In the United States, nationally Recognized Testing Laboratories such as Warnock Hersey and Underwriters Laboratories (UL) perform the laboratory evaluation tests for these products, and affix their labels to products which have undergone and passed these tests.

Similar testing facilities exist in Europe and other parts of the world as well. European standardized testing for opening protectives use nearly identical laboratory tests to evaluate opening protectives as those required in the United States. That said, the labeling system as well as minimum fire protection rating for opening protectives in fire resistance rated wall required by European countries applicable building codes are slightly different. See Figure 1 below.



Figure 1 - Labeled Door – Italy

In addition to an opening protective fire protection rating in hours, the label for a fire door may contain additional information, such as smoke rating designations, requirements for fire hardware, and/or any requirements for gaskets.

Per NFPA 80, these listed materials must be affixed with labels attached in areas readily observable to the local authority having jurisdiction. In most cases, this label can be found along the hinge side of the door, typically at eye level, although in some older doors these labels might be located at the top of the door, which can make them difficult to view. It is very common to encounter labels that have been painted over, defaced, covered by piano hinges or other appurtenances, or otherwise rendered unreadable. See Figure 2 below.

Most often these labels are steel and are riveted or screwed into place. Labels are not specifically required to be metal, but metal labels tend to be very prevalent and are durable. Mylar, plastic, paper, as well as stamped and die cast labels are also permitted.

Labels are not permitted to be altered in any way and should not be removed from the opening protective.

With the exception of doors having a 3-hour rating and greater, listed fire doors can be provided with factory installed louvers, as permitted by the individual certifications provided by the specific door in question.

One often overlooked means for evaluating the fire resistance rating for unlabeled doors that is permitted by NFPA 80 is the use of field labeling. NFPA 80 permits field labeling of doors subject to the authority having jurisdictions approval. This typically requires use of a certified fire door inspector, a listing agency, or the door manufacturer and associated testing laboratory. For non-labeled existing opening protective devices, the authority having jurisdiction typically must generate a report of field evaluation. This report is then typically must be submitted to the authority having jurisdiction for approval.

This alternative means for evaluating fire doors is an alternative to field evaluations and additional tools and methods. This means for evaluating the compliance with NFPA 80.

The process of field labeling is typically used for potential construction and in good physical condition. This process involves replacing unlabeled existing doors that are not listed with doors that are listed such as Underwriters Laboratories, Effective Listing, or other listing agencies in the United States. Similar service providers are available in other countries.

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