

Positive Pressure and UBC 7-2 1997

What Does It Mean For Door Assemblies?

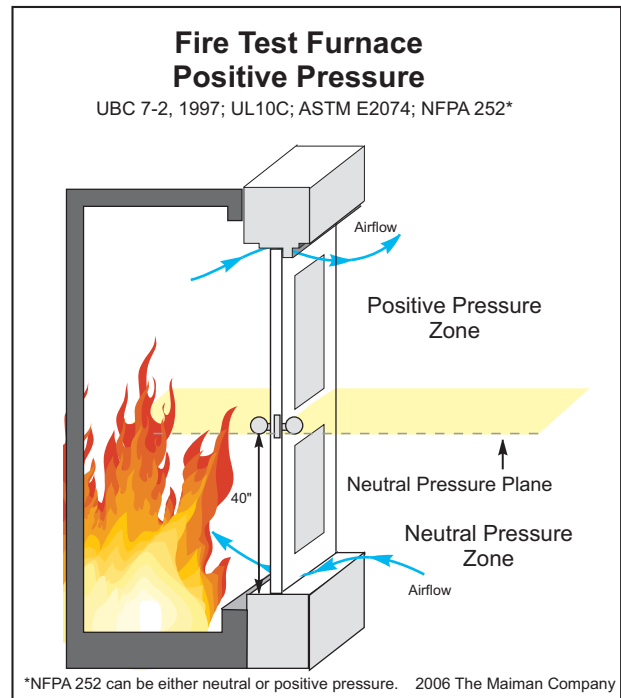
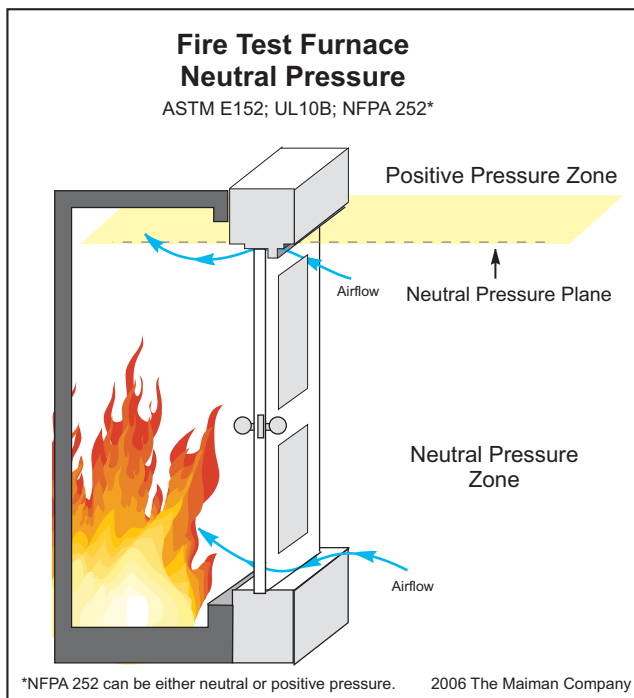
Introduction

With the adoption of the International Conference of Building Officials (ICBO) Uniform Building Code (UBC) 7-2 1997, fire testing standards for swinging fire doors have changed.

Positive Pressure testing more closely simulates real fire conditions. As heat develops within the source area, pressure within an enclosed room begins to build relative to the pressure outside the room. The pressure continues to increase until the availability of oxygen relative to fuel causes the fire to reach equilibrium. This typically will occur when the pressure of the top 2/3 of the room is greater than the outside pressure and the pressure of the bottom 1/3 of the room is less than the outside pressure. The transition area between the higher and lower pressure is referred to as the **neutral pressure plane**. In the positive pressure zone, smoke and hot gases and flames are forced through any openings in the door assembly.

Positive Pressure Testing Conditions

In laboratory furnaces used for testing fire doors, the location of the neutral plane, the point where pressure inside and outside are equal, is controlled by venting. Positioning that point at or above the top of the door, as specified in previous test standards, creates negative pressure so cold air flows in, cooling the assembly. By contrast, UBC 7-2 establishes the neutral pressure plane at 40" or less above the sill. Shifting the plane subjects the upper portion of the door to the positive pressure conditions experienced in actual fires. Positive pressures force super heated gases and flames through gaps and clearances in the door assembly. For wood doors, the superheated flow can cause burning of unprotected edges resulting in failure. It causes problems for metal doors as well because of the tendency of metal to warp at elevated temperatures.



Intumescent Seals

Intumescent seals effectively change the conditions of the positive pressure test. The char formed at elevated temperatures provides a highly heat-resistant barrier that seals off the gaps and stops the circulation of super heated gases, including “warm” smoke. With the vulnerable edges and unexposed face of the door thus protected, flames from the furnace must burn through the door itself before failure occurs. The addition of vinyl or neoprene seals to an intumescent gasketing system can also ensure protection from ambient smoke at temperatures below the activation point of intumescent material.

Gasketing

A critical role for gasketing has emerged from these requirements. In negative pressure testing, gases and sealing systems had a passive role. Gasketing satisfied the standard if it did not promote additional flaming or cause failure. Under UBC 7-2, however, gasketing performs a critical function in protecting door clearances and gaps that can mean the difference between success or failure, as well as how the door performs under actual fire conditions. Without modifications, a negative pressure rated door will fail the new test conditions, but success is easily attainable with appropriate intumescent gasketing systems.

Smoke Leakage Limits

UBC 7-2 also provides code officials with the industry’s first objective test for measuring excessive smoke, and door assemblies must undergo additional procedures to earn a new supplemental “S” label. Testing for air infiltration is performed at either ambient (75 F/24 C) or “warm” smoke (400 F/ 204 C) temperature, whichever is determined the most demanding condition for an assembly.



Fire Door Ratings and Openings Classification

From the WDMA I.S.1A-04 Industry Standard for Architectural Wood Flush Doors

The Model Codes have established a fire door rating system for doors that protect openings in fire resistant rated wall constructions. The Fire Door Ratings Table provides the relationship between the fire door rating and the wall rating.

In 1997, the International Council of Building Officials (ICBO) approved a change to the Uniform Building Code (UBC) that requires fire doors to be tested under positive pressure instead of neutral pressure. Many states and local jurisdictions across the U.S. have adopted the International Building Code (IBC) which also contains the requirement for positive pressure.

It is very important that architects, contractors and distributors are aware of the requirements in their area so the appropriate type of door is supplied (neutral or positive pressure). Door manufacturers are not responsible for interpretations of local codes.

All fire doors must meet the requirements of recognized fire door tests and bear certifying labels of an independent testing agency approved by the building official.

Installation is required to be in accordance with the National Fire Protection Association's Publication NFPA 80, "Standard for Fire Doors and Fire Windows". Machined fire doors shall be provided with detailed installation instructions when doors bear a label indicating compliance to UBC 7-2-1997 or UL 10C.

*DOORS MAY BE EITHER NEUTRAL OR POSITIVE PRESSURE DEPENDING ON LOCAL CODE

Important Facts to Consider When Reading Specifications

<p>1. Key phrases indicating positive pressure:</p> <ul style="list-style-type: none"> A. UBC 7-2-1997 – UBC Fire Test B. IBC 2000 or IBC 2003 – Code C. NFPA 5000 - Code D. UL 10-C – Fire Test E. ASTM 2074-00 – Fire Test F. After 5 minutes into the test the neutral pressure plane should be at 40" G. Shall meet positive pressure requirements H. Intumescent seals – not telling you it is positive pressure but implying that it is. 	<p>2. Key phrases indicating negative (neutral) pressure:</p> <ul style="list-style-type: none"> A. UL 10-B – Fire Test B. UBC 7-2-1994 – UBC Fire Test C. UBC 43-2 – UBC Fire Test D. Tested at atmospheric pressure E. Neutral pressure F. Negative pressure G. ASTM E-152 – Test Method 	<p>3. Phrases that don't tell you if it is positive or negative:</p> <ul style="list-style-type: none"> A. NFPA 101 – Life Safety Code B. NFPA 105 – Smoke and Draft Control Document C. NFPA 252 – Fire Test method which gives the option to be positive or negative E. UBC – With no date given could be either positive or negative F. UL 1784 – Air Leakage Test for Door Assemblies G. NFPA 80 – Installation standard for fire doors and windows
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Positive pressure openings can be accomplished in two basic ways:

CATEGORY "A" DOORS –NO ADDITIONAL EDGE-SEALING SYSTEM REQUIRED -This category includes doors evaluated without an edgesealing system between the door and frame. It also includes doors evaluated with a sealing system incorporated (concealed or visible) into the edge of the door by the licensed manufacturer or machining distributor. Meeting edges of pairs may require an astragal or edge sealing system. Please refer to individual door listing.

CATEGORY "B"DOORS –ADDITIONAL EDGE-SEALING SYSTEM REQUIRED - This category includes doors evaluated with an edge-sealing system applied to the labeled frame or door. The application of the edge-sealing system does not require any field machining of the frame or door. Please refer to Category "G", "Edge-Sealing Systems" for individual manufacturer's listing.

Minimum Fire Protection Ratings		
	Walls & Partitions (minutes)	Fire Doors (minutes)
Elevator Hoistways	120	90
	60	60
Vertical Shafts ¹	120	90
	60	60
Fire Barrier	120	90
	60	45
Horizontal Exit	120	90
Exit Access Corridors	60	20
	30	20
Smoke Barrier	60	20
Smoke Partition	30	20

¹ excluding stairways, exit and refuse chutes

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S LABEL SMOKE RATING (Category “H”)

Many positive pressure openings will also require a smoke seal. An “S” label requirement indicates the opening needs to have Smoke and Draft Control Gasketing. Category “H” includes gasket systems that are surface-applied (such as kerf applied, adhesive backed or mechanically attached) to frames or doors. It includes gasketing for the meeting edges for use in pair and double egress assemblies. This category covers gasket systems that have been evaluated for use in positive pressure rated assemblies but do not provide an edge-sealing system to the opening as described below.

EDGE-SEALING SYSTEMS (Category “G”)

Category “G” includes field applied systems only. Category “G” “Edge-Sealing Systems” are for use on Category “B” doors, or meeting edges (only) of Category “A” doors. These systems are surface-applied to either the perimeter of the door or frame, or meeting edge of the door. They may be kerf-applied, adhesive-backed, or mechanically fastened.

DOOR SPECIFICATION DESCRIPTORS

Section D-1, of the WDMA I.S.1A lists the different types of flush door constructions available in the industry. Fire rated flush doors for positive pressure openings are designated with the “PP” suffix. Stile and Rail doors as described by WDMA I.S. 6A are also available for positive pressure openings based on specific manufacturer’s approvals.

LABELING AND LISTING

The U.S. model building codes require fire doors to be labeled. The label indicates the rating and is a permanent identifying mark attached to the door. A testing organization provides random unannounced inspection of the production of the fire door. Labeling on the door indicates compliance with the standard for fire door tests. In addition to the door, the door frame and hardware are required to be labeled for use with a specific fire door. NFPA 80 requires that all fire doors must be self-closing and self-latching.