

Positive Pressure: The Basics

Now that the codes requiring doors to be tested to positive pressure test methods are being adopted and enforced throughout much of the country, it is probably a good time to review the changes and practices being utilized in the wood door industry. When UBC 1997 (the Uniform Building Code) was in the initial stages of being implemented, there was a lot of confusion and uncertainty concerning how the industry was going to comply with the new requirement. Most of the smoke has now settled, and a much clearer picture of what is required has emerged. Parts of the country have yet to require positive pressure rated doors, so I will start with the basics and progress into how these changes are currently being implemented.

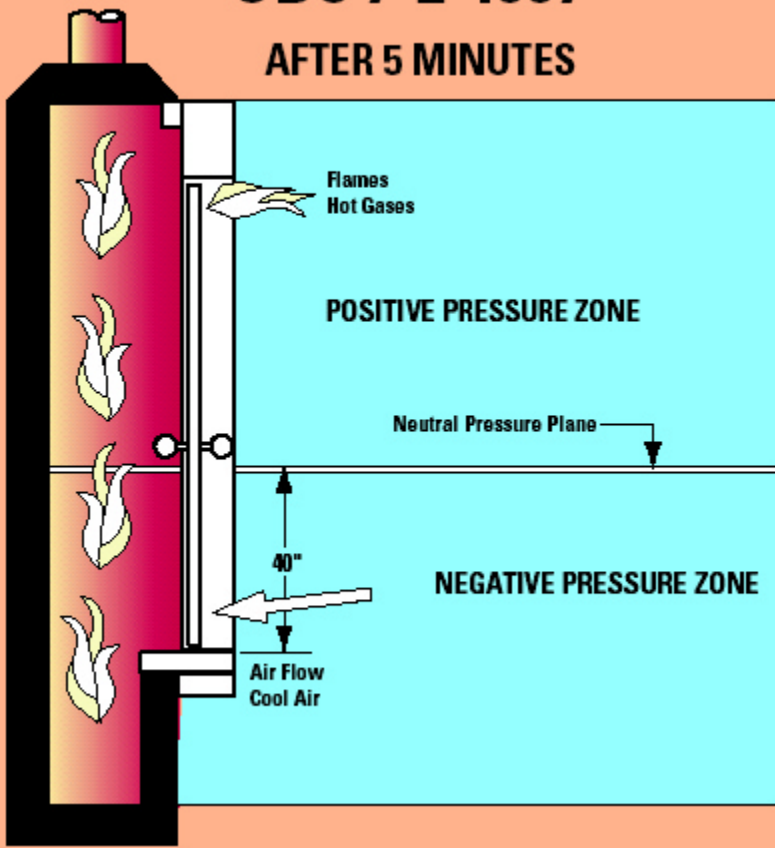
What Is a Positive Pressure Door?

A positive pressure fire door is a door that has successfully been tested to the new test methods [UBC 7-2-97 and UL-10C (Underwriters Laboratories)] for life safety concerns. These tests were designed to be more consistent with real world fire conditions than the old neutral/negative pressure test. The positive pressure test, which takes place in a furnace, establishes a neutral pressure plane 40" above the bottom of the door. Above the neutral pressure plane, the pressure in the furnace is greater than outside of the furnace, causing hot gases and flames to flow around the door. Below the neutral pressure plane, cool air from outside the furnace flows into the furnace. (See detail of furnace on next page.) The UBC 7-2-97 test method is included in the UBC 1997 code. There are two main parts of the code with references to fire doors. *These are two completely different items* (see table below). The reason the word "might" is underlined is that at least one gasket manufacturer has achieved compliance with Part I, positive pressure, for 20-minute doors with gasketing only, so intumescents are not required. Also, special internal door components have recently emerged that eliminate the need for intumescents up to 90 minutes.

Part Number	Item Referencing	Type of "Smoke"	What <u>Might</u> Need to Be Supplied
7-2 Part I	Positive Pressure	Hot Smoke	Intumescents
7-2 Part II	Smoke Control	Cold Smoke	Gaskets

UBC 7-2-1997

AFTER 5 MINUTES



The Building Codes and Positive Pressure

The International Conference of Building Officials (ICBO) changed its code, the UBC, in 1997 to require fire doors to be tested in a positive pressure environment to reflect conditions that occur in actual fires. In 2000, ICBO joined with two other major code groups, BOCA and SBCCI (Building Officials and Code Administrators, and Southern Building Code Congress International), and formed a new set of codes: the IBC (International Building Code). The IBC also requires doors to be tested to positive pressure. By 2003, a total of 35 states will have adopted the IBC. Positive pressure doors will be the typical fire door required throughout the United States in the future.

Categories of Positive Pressure Openings

Companies have developed different constructions and systems to make openings that comply with positive pressure. Due to the possible variations, Intertek Testing Services/Warnock Hersey (ITS/WH) and Underwriters Laboratories (UL) have developed a category system to simplify and standardize the different types of products that openings can consist of to be in compliance with the new codes. It is a system that breaks doors and components into categories.

Category "A" doors – fire doors that do not require the addition of other components such as edge seals to comply with positive pressure requirements. This can be accomplished by intumescent being incorporated in the door construction, or it may not be needed at all.

Category "B" doors – fire doors that require the addition of an edge seal to comply with positive pressure requirements. Edge seals could be intumescent and/or gasketing—whatever the manufacturer has approval for. The edge seals are typically added to the frame.

Category "C" frames – fire door frames that play an integral part in the door assembly in complying with positive pressure requirements. An example would be a frame with built-in intumescent.

Category "D" door/frame assemblies – doors and frames that together are labeled as an assembly.

Category "F" light kits – light kits that have been evaluated for positive pressure.

Category "G" edge sealing systems – edge seals that are surface-applied to frames or doors. These seals may or may not have an effect on meeting the leakage requirements for the smoke ("S") rating.

Category "H" smoke and draft control gasketing – gasketing materials that are added to a door assembly to comply with the requirements of UBC 7-2-97 Part II.

Category "J" gaskets – gasketing materials that are added to a door assembly for purposes other than Category "G" edge seals and Category "H" smoke and draft control gaskets. They are used for purposes such as weather-stripping and for sound control. They meet the requirements for positive pressure tests and can be used on these assemblies.

There can be some overlapping when you use the category system, as the following example illustrates: You have an acoustical door that needs to be 20-minute fire rated. For the acoustics, you use Category "J" gaskets. The "J" gaskets are also approved Category "G" edge sealing systems for 20-minute doors to qualify the door as a Category "B" door. In this case, the edge seals qualify as both Category "G" and "J" for use on a Category "B" door.

Smoke Control Doors

As previously discussed, in the new codes, there are two completely different parts that need to be addressed. The first part, UBC 7-2-97 Part I, is concerned with positive pressure; the second part, 7-2-97 Part II, is concerned with smoke control. Smoke control doors require Category "H" gasketing to be in compliance with UBC 7-2-97 Part I. ITS/WH and UL require smoke control doors to have an "S" on their labels to signify that the door can comply with the smoke control requirement if installed per the manufacturer's installation requirements. This "S" on the label has caused some people to refer in specifications to an "S-labeled" door. A door can have a separate S-label on it, but the "S" is typically incorporated as part of the fire label.

Who Is Responsible for Determining if Openings Comply?

The ultimate authority that determines if an opening meets the code requirements is the code official or AHJ (Authority Having Jurisdiction). Since there are many varying combinations of products that can be put together to be in compliance with the codes, we need to give the AHJ the tools to determine whether an opening is compliant or not. ITS/WH and UL require all positive pressure labels to have printed on them "See installation instructions." Each order that door manufacturers ship with positive pressure doors is required to be accompanied by a packet of installation

instructions. It is important that these instructions are passed along so that they are available when the AHJ makes its inspection.

How Do I Know if a Project Is for Positive Pressure or Not?

With all the changes that are taking place, specifications for jobs will probably be confusing at times. Below are some key phrases to look for when reading specifications.

1. Key Phrases Indicating Positive Pressure

- A. UBC 7-2-1997 Code
- B. IBC 2000 Code
- C. UL-10C Fire Test
- D. ASTM 2074-00 Fire Test
- E. After 5 minutes into the test, the neutral pressure plane should be at 40"
- F. Shall meet positive pressure requirements
- G. Intumescent seals – a phrase that implies positive pressure

2. Key Phrases Indicating Negative (Neutral) Pressure

- A. UL-10B Fire Tested
- B. UBC 7-2-1994 Code
- C. UBC 43-2 UBC Fire Test
- D. Tested at atmospheric pressure
- E. ASTM E-152 Test Method

3. Phrases that Don't Indicate Positive or Negative Pressure

- 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
- D. UBC with no date given could be either positive or negative
- E. UL-1784 Air Leakage Test for Door Assemblies
- F. NFPA-80 Installation Standard for Fire Doors and Windows

Temperature Rise Requirements

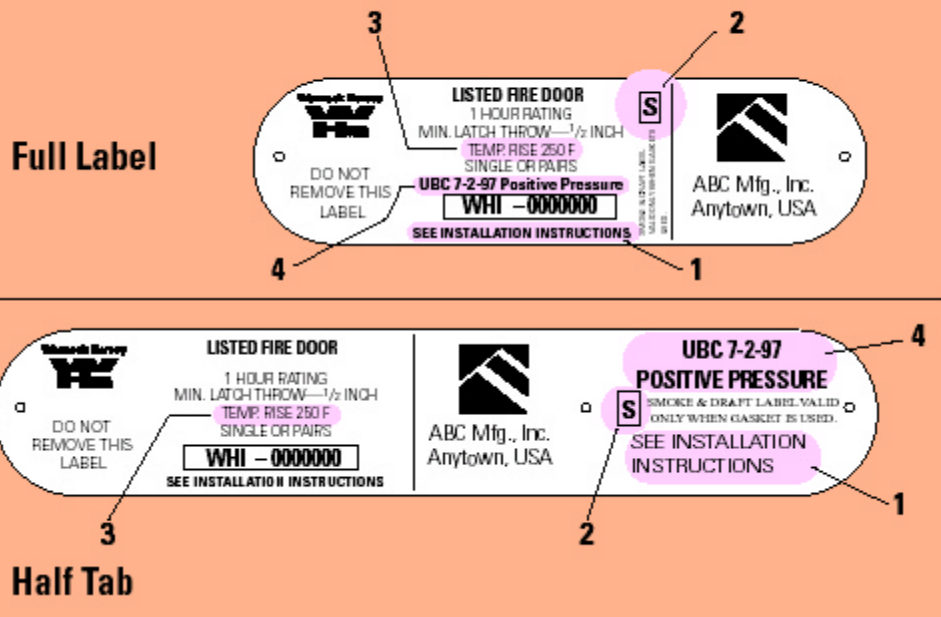
The new codes also have temperature rise requirements. Doors are available in three classifications: above 650° F, 450° F and 250° F. The lower the number, the better the door. A maximum temperature rise of 450° F is required for exit enclosures. The temperature rise designation must be on the fire label. Wood doors are very good insulators; on 60- and 90-minute doors, you will typically see a designation that states "Maximum 250 Degrees F after 30 Minutes." Below is a description of how temperature rise levels are derived.

1. Before the fire test begins, the temperature on the non fire-side of the door is measured.
2. After 30 minutes into the test, the temperature is measured again.
3. The difference between the two measurements is the temperature rise.
4. Wood doors typically have less than a 250° F temperature rise.
5. As a 250° F rise is less than a 450° F rise, it exceeds the standard.
6. Typically, on 60- and 90-minute wood doors, a 250° F temperature rise is designated right on the fire label.
7. The exceptions to this are doors with louvers and doors with non-insulated glass over 100 square inches.

Labeling Requirements

Here is a recap of the new information that you will see on positive pressure fire labels.

Options and Details of WH Labels



1. You will see "See Installation Instructions."
2. You will see an "S" on the label. This designates that the door can be a smoke control door, if the installation instructions are followed. Door manufacturers are allowed to put an "S" on all of their labels, but the door doesn't become a smoke control door until the installation instructions have been followed.
3. You will see on 60- and 90-minute labels either a 250° F or 450° F maximum temperature rise designation. If the door does not meet the 450° F temperature rise rating, the designation will read "Temp Rise in Excess of 650F Degrees."
4. Positive pressure labels will also reference the new code UBC 7-2- 1997 and could reference the positive pressure test methods UL-10C.

There are two basic ways in which the doors can supply this new information. One way is on a full label, and the other way is on a half tab that is put on in addition to a current negative pressure label. Both are shown above.

Changes typically make people uncomfortable until they become familiar with the new ideas. The new codes can be confusing, but with time and education, it will not be too long before this new way will be accepted as "the way we do things."

There have been some positive outcomes that have come from the changes already. With the use of materials that expand when heated (intumescent), the wood door industry has approvals it didn't have in the past—i.e., concealed vertical rods with no metal edges, 90-minute double egress openings, concealed closers, and less bottom rod applications (available now because of auxiliary fire latches, sometimes called "poppers"). Most importantly, however, the biggest positive is an improvement in life safety.

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