

# International Building Code: Smoke Door Requirements



From the well-known blog [idighardware.com](http://idighardware.com), Lori Greene brings some much-needed clarity to codes.

BY LORI GREENE, AHC/CDC, CCPR

**I'M OFTEN ASKED ABOUT THE CODE** requirements for "smoke doors."

What makes these questions difficult to answer is the fact that there are several types of doors that can be called smoke doors, and they have very different requirements. For this article, I used the 2009 edition of the International Building Code (IBC) to answer basic questions about each of the types: where they are typically found, and whether the doors require a fire rating, a closer, a latch, and gasketing. The types of smoke doors I identified are:

- Doors required to provide an effective barrier to limit the transfer of smoke
- Doors in smoke partitions
- Doors in smoke barriers
- Fire door assemblies in corridors and smoke barriers
- Doors in exit enclosures and exit passageways

My goal was to boil down the IBC requirements into a quick reference. Keep in mind that other codes may have different requirements for these doors.

## **UL 1784 – Air Leakage Tests of Door Assemblies**

Before I begin to summarize the requirements for each opening type, I need to briefly explain UL 1784 – *Air Leakage Tests of Door Assemblies* and its relationship to gasketing requirements. The IBC requires certain doors to be tested in accordance with UL 1784, and the maximum amount of air flow allowed by the IBC is 3.0 cubic feet per minute per square foot [0.015424 m<sup>3</sup>/(s m<sup>2</sup>)] of door opening at 0.10 inch (24.9 Pa) of water for both the ambient temperature test and the elevated temperature exposure test.

I have reviewed several sets of test results, and it appears that when a door is required to meet the stated limits when tested in accordance with UL 1784, it is difficult or impossible to achieve these values without gasketing. For the purpose of this analysis, doors that have to meet these limits are noted with a requirement for gasketing. The requirement for testing in accordance

with UL 1784 (and the same allowable maximum) is also included in NFPA 105 – *Standard for Smoke Door Assemblies and Other Opening Protectives*.

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## Opening Type: Doors required to provide an effective barrier to limit the transfer of smoke

**Typical Location:** These requirements apply to smoke partition corridor doors in Use Group I-2 (hospitals, mental hospitals, nursing homes, detox facilities). They are corridor doors that are not part of a vertical opening/exit (stair or shaft) and that do not require a fire rating per Section 508.2.5 – *Incidental Accessory Occupancies*. Some typical examples of doors that are required by Section 508.2.5 to be fire rated are Group I-2 waste and linen collection rooms, laundry rooms over 100 square feet, and boiler and furnace rooms meeting certain criteria. The IBC 2009 Commentary states that “this provision is primarily intended to apply to patient room corridor doors.”

**Fire Rating Required?** No. Section 407.3.1 states that corridor doors that are not in a wall required to be rated (per Section 508.2.5 or for the enclosure of a vertical opening or exit) are not required to have a fire protection rating.

**Closer Required?** No. Section 407.3.1 states that these non-fire-rated corridor doors are not required to be equipped with self-closing or automatic-closing devices.

**Latch Required?** Yes. Section 407.3.1 states that these doors must have positive latching and that roller latches are not permitted.

**Gasketing Required?** Whether gasketing is required is unclear, and there are experts on both sides of the argument. Section 407.3.1 states that these doors “shall provide an effective barrier to limit the transfer of smoke,” but this is not clearly defined. There is no requirement in the IBC for these doors to be tested in accordance with UL 1784.

In the past, a solid core door with minimal clearances required for proper operation was thought to provide this effective barrier. However, the IBC 2009 Commentary states in Section 711.5.2, describing the air infiltration requirements for smoke and draft control doors, that “**Section 407.3.1 requires corridor doors in Group I-2 to ‘limit the transfer of smoke’; therefore, those doors must meet this section.**” I don’t know how someone would find their way from Section 407.3.1 to the Section 711.5.2 Commentary, as there is no reference between the two, but the Commentary is basically establishing (unofficially) what is required to limit

the transfer of smoke. I think it makes sense to gasket these doors since patients may be in their rooms during firefighting procedures, but on the other hand, the Commentary is not part of the code.

In speaking with someone from the International Code Council (ICC) on this topic, I was told that the code does not require gasketing if the door can meet the leakage rates specified in Section 715.4.3.1 (3.0 cubic feet per minute per square foot of door opening at 0.10 inch of water for both the ambient temperature and elevated temperature tests), but as I stated before, I’m not sure that it’s possible for an operational door to meet this requirement without gasketing.

## Opening Type: Doors in smoke partitions

**Typical Location:** Section 711 outlines the requirements for smoke partitions, including the door openings therein, but there are limited locations within the IBC that currently refer to this section:

- Section 407.3 permits corridor walls in Group I-2 to have no fire-resistance rating, but it does require that they be constructed as smoke partitions. The door openings in these walls are covered previously as “Doors required to provide an effective barrier to limit the transfer of smoke.”
- Section 708.14.1, Exception 5 allows the use of smoke partitions to form the elevator lobby in a sprinklered building.

**Fire Rating Required?** No. Section 711.3 states that unless required elsewhere in the code, smoke partitions are not required to have a fire-resistance rating. The two sections that currently refer to Section 711 do not require a fire-resistance rating.

**Closer Required?** Yes. Section 711.5.3 states that “**Where required elsewhere in the code, doors in smoke partitions shall be self- or automatic-closing by smoke detection in accordance with Section 715.4.8.3.**” This section is specifically referenced in Section 708.14.1, Exception 5; therefore, it is “required elsewhere in the code” for elevator lobby doors.

**Latch Required?** Yes. Section 715.4.8.1 requires an active latch bolt that will secure the door when it is closed. This section is referenced by Section 708.14.1, Exception 5 for elevator lobby doors as part of Section 715.4.8.

**Gasketing Required?** Yes. Section 711.5.2 states that doors in smoke partitions shall meet the requirements for a smoke and draft control assembly tested in accordance with UL 1784, with the maximum air leakage

stated previously. This section also requires the installation of smoke doors to be in accordance with NFPA 105 – *Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives*. Louvers are not allowed in doors in smoke partitions.

### Opening Type: Doors in smoke barriers

There are three use groups in the IBC that mention smoke barriers: Section 407.4 (I-2), 408.6 (I-3), and 422.2 (Group B Ambulatory Care). All of these sections require compliance with the provisions of Section 710. Section 710 requires openings in smoke barriers to be protected in compliance with Section 715, which includes requirements typical for a fire-rated door.

There is an exception for cross-corridor double egress pairs in Use Group I-2, which lists the requirements for these doors in addition to the requirements of Section 715. There are essentially two sets of requirements for doors in smoke barriers because of the extensive exception for Use Group I-2, so I will summarize the requirements separately.

### Opening Type: Doors in smoke barriers – Use Group I-3 and Use Group B Ambulatory Care

**Typical Location:** These requirements apply to Use Group I-3 (detention/correctional centers) and Use Group B Ambulatory Health Care Facilities. (The exception for use Group I-2 cross-corridor doors is summarized in the next section.)

**Fire Rating Required?** Yes. According to Section 710.5, “**openings in a smoke barrier shall be protected in accordance with Section 715,**” which includes a fire protection rating as indicated in Table 715.4.

**Closer Required?** Yes. Section 715.4.8 states that the doors must be self-closing or automatic-closing. Latch Required? Yes. Section 715.4.8.1 requires an active latch bolt that will secure the door when it is closed.

**Gasketing Required?** Yes. Section 715.4.3.1 states that fire door assemblies shall meet the requirements for a smoke and draft control assembly tested in accordance with UL 1784, with the maximum air leakage stated previously. This section also requires the installation of smoke doors to be in accordance with NFPA 105 – *Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives*. Louvers are prohibited by this section.

### Opening Type: Doors in smoke barriers – Use Group I-2

**Typical Location:** Use Group I-2 (hospitals, mental hospitals, nursing homes, detox facilities) cross-corridor double egress pairs. Because of the complexity of this exception, here is the complete text of this section from the 2009 edition of the IBC:

**“710.5 Openings. Openings in a smoke barrier shall be protected in accordance with Section 715. Exceptions:**

- 1. In Group I-2, where doors are installed across corridors, a pair of opposite-swinging doors without a center mullion shall be installed having vision panels with fire-protection-rated glazing materials in fire-protection-rated frames, the area of which shall not exceed that tested. The doors shall be close fitting within operational tolerances, and shall not have undercuts in excess of 3/4-inch, louvers or grilles. The doors shall have head and jamb stops, astragals or rabbets at meeting edges and shall be automatic-closing by smoke detection in accordance with Section 715.4.8.3. Where permitted by the door manufacturer’s listing, positive-latching devices are not required.**
- 2. In Group I-2, horizontal sliding doors installed in accordance with Section 1008.1.4.3 and protected in accordance with Section 715.”**

**Fire Rating Required?** Yes. I submitted several questions to the ICC regarding this exception because it was unclear to me whether the exception was in lieu of the requirements of Section 715 or in addition to those requirements. I was assured by the ICC that the provisions of Exception 1 are in addition to those of Section 715. Section 715 requires a fire protection rating as indicated in Table 715.4. Exception 1 also requires the doors to have vision panels with appropriate glazing materials.

**Closer Required?** Yes. Doors are required to be automatic-closing by smoke detection per 710.5, Exception 1 (above). Note that this exception does not allow self-closing doors to be used in this application.

**Latch Required?** Yes. In 2006 and prior editions of the IBC, positive latches were not required for these doors because the exception included the specific language: “**Positive-latching devices are not required.**” This sentence was removed in the 2009 edition of the IBC and replaced with: “**Where permitted by the door manufacturer’s listing, positive-latching devices are not required.**” In my experience, door manufacturers require positive-latching devices on doors that are required to be fire rated. It remains to be seen whether any door manufacturers will test and supply these doors without positive latching.

**Gasketing Required?** No. However, Section 710.5, Exception 1 requires astragals or rabbets at the meeting edges, and the doors must be close-fitting within operational tolerances. The maximum allowable undercut is  $\frac{3}{4}$ ", and the doors may not have louvers or grilles. Frame stops are required at the head and jambs.

## Opening Type: Fire door assemblies in corridors and smoke barriers

**Typical Location:** Corridors and smoke barriers requiring fire-rated doors.

**Fire Rating Required?** Yes. Section 715.4 references the fire protection ratings indicated in Table 715.4. Fire door frames with transom lites, sidelites or both shall be permitted in accordance with Section 715.4.5. Fire door assemblies and shutters shall be installed in accordance with the provisions of this section and NFPA 80.

**Closer Required?** Yes. Section 715.4.8 states that the doors must be self-closing or automatic-closing.

**Latch Required?** Yes. Section 715.4.8.1 requires an active latch bolt that will secure the door when it is closed.

**Gasketing Required?** Yes. Section 715.4.3.1 states that fire door assemblies shall meet the requirements for a smoke and draft control assembly tested in accordance with UL 1784, with the maximum air leakage stated previously. This section also requires the installation of smoke doors to be in accordance with NFPA 105 – *Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives*. Louvers are prohibited by this section.

## Opening Type: Doors in exit enclosures and exit passageways

**Typical Location:** Stair doors required to be fire rated, and occasionally the exit passageway connecting the stair to the exit discharge.

**Fire Rating Required?** Yes. Section 715.4 references the fire protection ratings indicated in Table 715.4. Fire door frames with transom lites, sidelites or both shall be permitted in accordance with Section 715.4.5. Fire door assemblies and shutters shall be installed in accordance with the provisions of this section and NFPA 80. This section includes a requirement for temperature-rise doors, but the exception exempts buildings that are equipped throughout with an automatic sprinkler system.


**Closer Required?** Yes. Section 715.4.8 states that the

doors must be self-closing or automatic-closing.

**Latch Required?** Yes. Section 715.4.8.1 requires an active latch bolt that will secure the door when it is closed.

**Gasketing Required?** Section 715.4.4 does not include a reference to UL 1784, but gasketing and a door bottom/sweep may be necessary to maintain stair pressurization.

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I hope this summary helps clear up some of the questions about smoke door requirements and explains the intent of the grey areas. The summary included in this article is a result of my research of the 2009 International Building Code and information I received from the International Code Council. The actual code publications should be consulted when comprehensive data is required and to ensure compliance with the applicable codes, and the Authority Having Jurisdiction is the ultimate decision maker. 

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14150 Newbrook Drive, Suite 200  
Chantilly, VA 20151-2223

Phone (703) 222-2010, Fax (703)222-2410, [www.dhi.org](http://www.dhi.org)