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Exhibit 18/19.88 Smoke barrier duct penetration protected by smoke damper.



Exhibit 18/19.89 Placard with warning against penetration of smoke barrier.

permitted if an engineered smoke control system required a damper at this point. Openings for transfer grilles require automatic-closing dampers.

Exhibit 18/19.90 and Exhibit 18/19.91 illustrate some of the detailed requirements of 18/19.3.7 for subdividing building spaces through the use of smoke barriers.

In Exhibit 18/19.92, the smoke barrier requirement for a building with an atrium is satisfied by running the smoke barrier partition directly through the building from one outside wall to the opposite outside wall

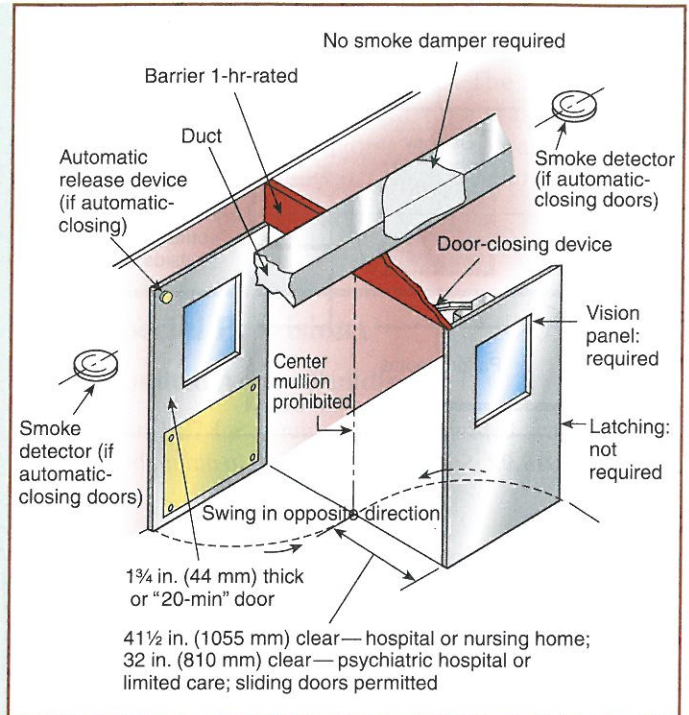


Exhibit 18/19.90 Details of new smoke barrier.

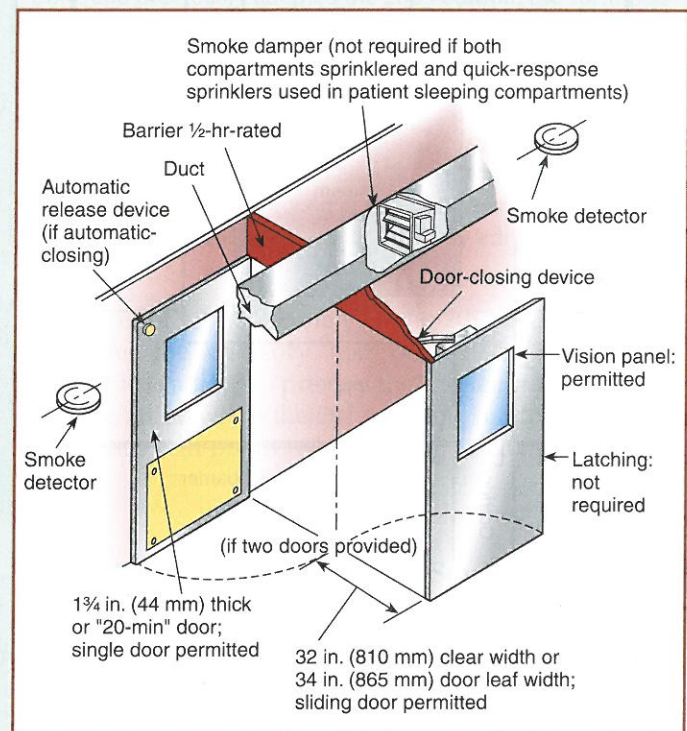


Exhibit 18/19.91 Details of existing smoke barrier.

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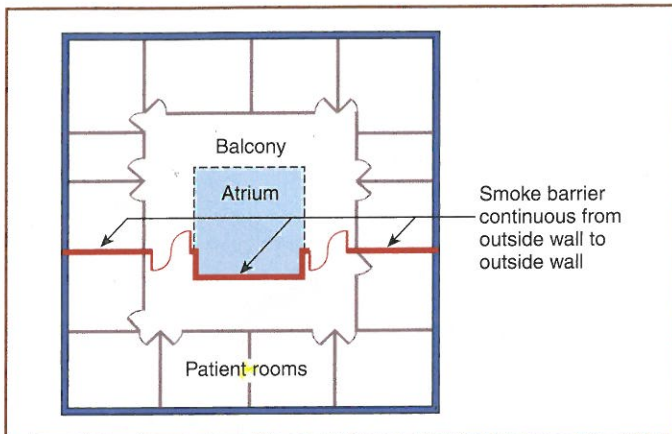


Exhibit 18/19.92 Smoke compartments in atrium building.

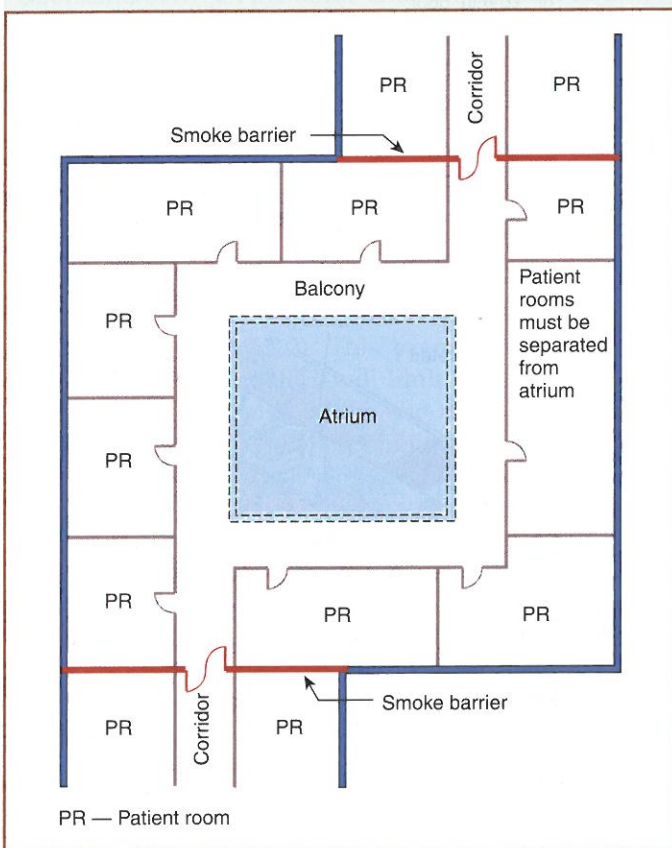


Exhibit 18/19.93 Atrium smoke compartment with unlimited area.

and hugging one edge of the open atrium space. In Exhibit 18/19.93, 18/19.3.7.1(3) is used to permit the smoke compartment containing the atrium to be unlimited in size. The patient floor is divided into three smoke compartments by locating two smoke barriers away from the atrium opening, thus preserving the visual impact of the atrium. The center smoke compartment, which includes the atrium, is not limited in size, but the distance of travel from any point to a smoke barrier door is limited to 200 ft (61 m).

The provisions of 18/19.3.7 provide details for the design and installation of smoke barriers. As with other systems and features required by the Code, maintenance and care are important to the proper functioning of smoke barriers under fire or similar emergency. Exhibit 18/19.94 shows an open cross-corridor smoke barrier door on a nonpatient floor of a hospital. Tables line the corridor to support a crafts sale. Note that the door and its required space for proper operation have been left free of obstruction to help ensure that the door will close automatically, without interference, when needed.



Exhibit 18/19.94 Smoke barrier door left free of obstruction to permit proper closing.

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1. They limit the spread of fire and smoke.
2. They limit the number of occupants exposed to a single fire.
3. They provide for the horizontal relocation of patients by creating a safe area on the same floor level.

The smoke barrier requirements result in a floor's area being divided by a barrier into a minimum of two compartments. Although not stated in the *Code*, it would be desirable to subdivide health care facilities in such a way as to have separate banks of elevators in different smoke zones. If evacuation of the building becomes necessary, patients can first be moved horizontally to a temporary area of refuge and then be removed from the floor via elevators.

In new health care occupancies, the openings between the meeting edges of pairs of smoke barrier doors and between the doors and frames must be minimized to retard the transfer of smoke. Because 18.3.7.6(3) requires swinging doors to swing in directions opposite from each other, the protection at the meeting edge does not create a door-closing coordination problem and, therefore, is simple to provide. An overlapping astragal plate on the leading edge of one of the doors will usually suffice for compliance with 18.3.7.8(4).

Dampers are not required in ducted penetrations of smoke barriers in new health care occupancies, as addressed in 18.3.7.3(2). This exemption anticipates that automatic sprinklers will limit fire size and that duct systems will also inhibit the transfer of smoke. This exemption does not prohibit the installation of smoke dampers, nor does it permit the omission of the smoke damper if the damper is required for other reasons. For example, if the building has a smoke control system that needs a smoke damper at the smoke barrier, such a damper must be installed. An automatic-closing damper, activated by a smoke detector, would be required to protect a transfer grille.

Exhibit 18/19.86 shows a cross-corridor door opening in a smoke barrier for which Exhibit 18/19.87, Exhibit 18/19.88, and Exhibit 18/19.89 address penetrations of the smoke barrier in the above-ceiling space. Exhibit 18/19.87 shows wiring and pipe penetrations of the smoke barrier. Exhibit 18/19.88 shows a duct penetration protected by a smoke damper. Exhibit 18/19.89 shows a placard that reminds workers who access the above-ceiling space not to penetrate the smoke barrier.

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Exhibit 18/19.86 Smoke barrier where penetrations are located above ceiling.

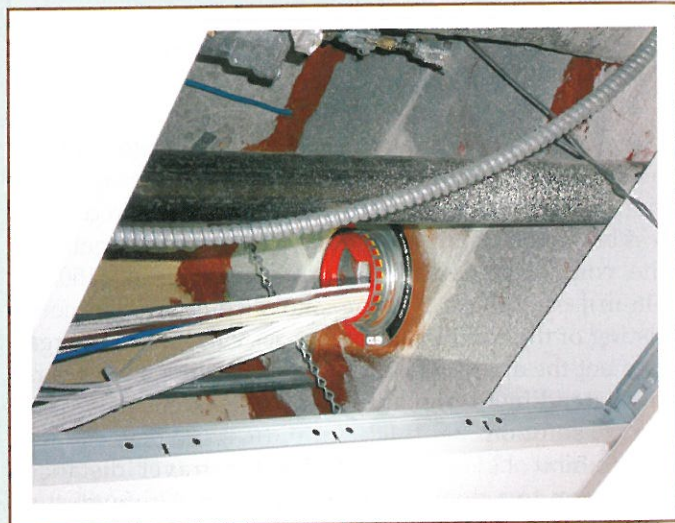


Exhibit 18/19.87 Wiring and pipe penetrations of smoke barrier above ceiling.

Note that, for existing smoke barriers, the combination fire/smoke dampers required in 8.5.5.2 are permitted to be omitted in engineered smoke control systems if the system design is such that a damper is not required at that point. Paragraph 19.3.7.3(2) also permits deletion of dampers in ducted penetrations of smoke barriers where compartments adjacent to the barrier are protected by automatic sprinklers (quick-response sprinklers in any smoke compartments used for patient sleeping). This exemption would not be

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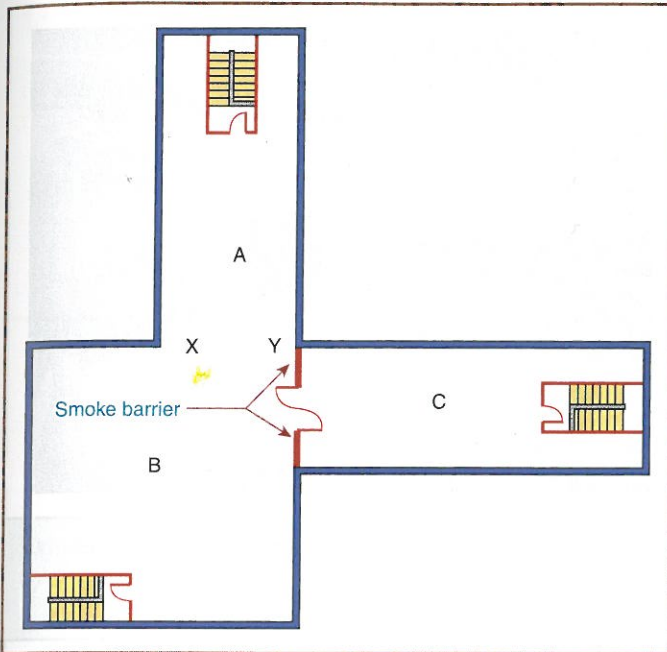


Exhibit 18/19.84 Smoke barrier dividing floor into two smoke compartments.

quires occupant travel in excess of 200 ft (61 m) to reach the doors in the smoke barrier, further subdivision using additional smoke barriers is required [unless both are existing smoke compartments and neither the compartment length nor width exceeds 150 ft (46 m)]. Assuming that the smoke compartment consisting of the combination of areas A and B is too large to meet the specified conditions, a second smoke barrier extending from point X to point Y might provide a logical solution.

Exhibit 18/19.85 illustrates the travel distance limitation to a door in a smoke barrier. Although the room positioned at the top of the exhibit between the smoke barrier and the enclosed exit stair has a short travel distance to an exit (X to E), the enclosed exit stair is not usable by those incapable of self-preservation. Therefore, the distance of travel to the doors in the smoke barrier (X to B) must not exceed 200 ft (61 m). For the existing smoke compartment, the 200 ft (61 m) criterion would be exempted if neither the smoke compartment length nor the width exceeds 150 ft (46 m). For this floor plan, an additional pair of doors in the smoke barrier where it crosses the corridor in the top half of the exhibit might provide a logical solution to a smoke compartment travel distance problem.

Horizontal exits are permitted to be substituted

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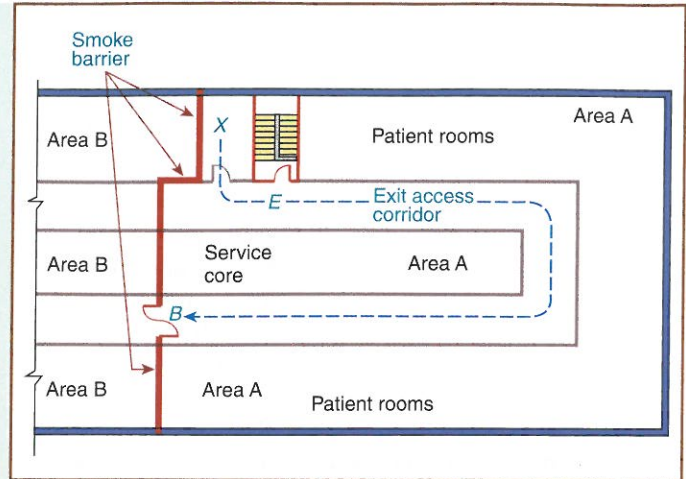


Exhibit 18/19.85 Limited travel distance to door in smoke barrier.

for smoke barriers. In such cases, the horizontal exit would also have to be constructed to comply with the smoke barrier requirements. See 7.2.4 and Section 8.5.

Areas open to atriums are not permitted to be used for patient sleeping or treatment areas (see 18/19.3.1.3). Atrium smoke compartments arranged in accordance with 8.6.7 are not limited in size.

Paragraphs 18.3.7.6 through 18.3.7.10 and 19.3.7.6 through 19.3.7.10 address smoke barrier doors. Although the cross-corridor smoke barrier doors in new health care occupancies are required to resist the penetration of fire for at least 20 minutes, they are not required to have a true fire protection rating. Similarly, the smoke barrier doors in existing health care occupancies are not required to have a true fire protection rating. Yet, some incorrectly consider these 1¾ in. (44 mm) thick, solid-bonded wood doors to be 20-minute fire protection-rated doors from which the latch has been omitted. If the door were truly a 20-minute fire protection-rated assembly, field-applied protective plates would be prohibited. Paragraphs 18.3.7.6(1) and 19.3.7.6.1 remind the user that factory- or field-applied protective plates are permitted without any height restriction.

During a fire, the emergency evacuation of patients in a health care facility is an inefficient, time-consuming process. Realistically, if patients must be moved, sizable numbers of occupants can be relocated only through horizontal travel. Smoke barriers and horizontal exits used to subdivide a building serve the following three purposes fundamental to the protection of inpatients:

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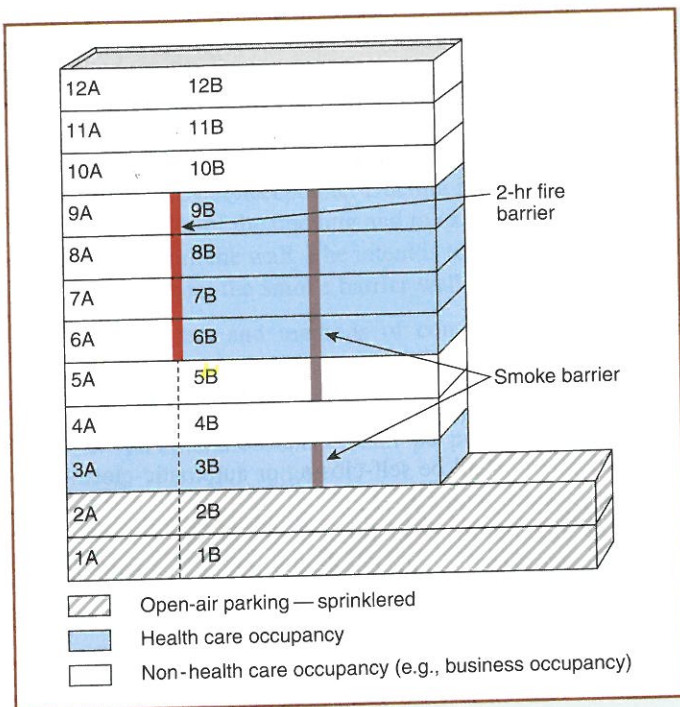


Exhibit 18/19.83 Smoke barriers for new health care occupancy buildings.

- Floors 10 through 12 do not contain a health care occupancy and are located above the health care occupancy — per 18.3.7.2(1), they do not require smoke barriers.
- Floors 6B through 9B are health care occupancy floors used for inpatient sleeping or treatment — per 18.3.7.1(1), they must be subdivided by smoke barriers.
- Floors 6A through 9A do not contain a health care occupancy and are separated from the health care occupancy by 2-hour fire resistance-rated barriers complying with the provisions of 7.2.4.3, applicable to horizontal exit fire barriers — per 18.3.7.2(2), they do not require smoke barriers.
- Floor 5 does not contain a health care occupancy and does not meet 18.3.7.2(3), because it is not more than one story below the health care occupancy — per 18.3.7.1(2), it must be subdivided by smoke barriers if it has an occupant load of 50 or more persons. If Floor 5 housed mechanical equipment only and was separated from Floor 6 by 2-hour fire resistance-rated construction, smoke barriers would be exempted by 18.3.7.2(4).
- Floor 4 does not contain a health care occupancy and is more than one story below the health care

occupancy — per 18.3.7.2(3), it does not require smoke barriers.

- Floor 3 is a health care occupancy floor used for inpatient sleeping or treatment — per 18.3.7.1(1), it must be subdivided by smoke barriers.
- Floors 1 and 2 are used as an open-air parking structure and are protected by a supervised automatic sprinkler system — even though floor 2 is located immediately below a health care occupancy floor, 18.3.7.2(5) exempts these floors from the smoke barrier requirement.

For existing health care occupancies, the introductory portion of 19.3.7.1 requires smoke barriers only for the purpose of subdividing stories having sleeping rooms for more than 30 patients. Subdivision is not required on treatment floors (provided that there are no sleeping rooms), regardless of floor area or number of patients. Patient bed capacity is to be used to determine the number of patients per story (see 19.3.7.2).

Paragraphs 18.3.7.1(3) and (4) and 19.3.7.1(1) do not present criteria related to whether smoke barriers are required in a building. Rather, they specify dimensional criteria for smoke compartments where the presence of smoke barriers is required by 18.3.7.1(1) and (2) or the introductory portion of 19.3.7.1. The maximum area of any smoke compartment created by subdividing the floor cannot exceed 22,500 ft² (2100 m²). If the compartment were perfectly square, the maximum area would measure 150 ft × 150 ft (46 m × 46 m). However, to provide the facility and designer with flexibility in the arrangement of smoke compartments, the arbitrary 150 ft (46 m) length and width limits of earlier editions were replaced in 1991 by a 200 ft (61 m) travel limitation from any point in the smoke compartment to a door in the smoke barrier [see 18.3.7.1(4) and 19.3.7.1(1)]. Smoke compartments must be designed so that a person is able to reach a smoke barrier door within a distance of travel of 200 ft (61 m) from any point in a compartment, measured along the natural path of travel in accordance with 7.6.1. However, the travel limitation is exempted by 19.3.7.1(2) for existing smoke compartments where neither the length nor width of the smoke compartment exceeds 150 ft (46 m).

In Exhibit 18/19.84, the construction of one smoke barrier divides the floor into two smoke compartments. If either smoke compartment — one consisting of the combination of areas A and B and the other consisting of area C — exceeds 22,500 ft² (2100 m²) or re-

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A.18.3.7.6 Smoke barrier doors are intended to provide access to adjacent zones. The pair of cross-corridor doors are required to be opposite swinging. Access to both zones is required.

It is not the intent of 18.3.7.6 to prohibit the application of push plates, hardware, or other attachments on some barrier doors in health care occupancies.

18.3.7.7 Cross-corridor openings in smoke barriers that are not in required means of egress from a health care space shall be permitted to be protected by a single-leaf door.

18.3.7.8* Doors in smoke barriers shall comply with 8.5.4 and all of the following:

- (1) The doors shall be self-closing or automatic-closing in accordance with 18.2.2.2.7.
- (2) Latching hardware shall not be required.
- (3) Stops shall be required at the head and sides of door frames.
- (4) Rabbits, bevels, or astragals shall be required at the meeting edges of pairs of doors.
- (5) Center mullions shall be prohibited.

A.18.3.7.8 Smoke barriers might include walls having door openings other than cross-corridor doors. There is no restriction in the *Code* regarding which doors or how many doors form part of a smoke barrier. For example, doors from the corridor to individual rooms are permitted to form part of a smoke barrier. Split astragals (i.e., astragals installed on both door leaves) are also considered astragals.

18.3.7.9* Vision panels consisting of fire-rated glazing in approved frames shall be provided in each cross-corridor swinging door and at each cross-corridor horizontal-sliding door in a smoke barrier.

A.18.3.7.9 It is not the intent to require the frame to be a listed assembly.

18.3.7.10 Vision panels in doors in smoke barriers, if provided, shall be of fire-rated glazing in approved frames.

Paragraph 18.3.7.1 requires that all floors of a building housing a new health care occupancy — other than those meeting one of the five exemptions offered by 18.3.7.2 — be subdivided into smoke compartments.

Per 18.3.7.1(1), any floor used by inpatients for sleeping or treatment must be subdivided into at least two smoke compartments, regardless of floor size or number of patients. Also, 18.3.7.1(2) requires any floor with an occupant load of 50 or more persons, regardless of size or use, to be subdivided into at least two

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19.3.7.7 Reserved.

19.3.7.8* Doors in smoke barriers shall comply with 8.5.4 and all of the following:

- (1) The doors shall be self-closing or automatic-closing in accordance with 19.2.2.2.7.
- (2) Latching hardware shall not be required.
- (3) The doors shall not be required to swing in the direction of egress travel.

A.19.3.7.8 Smoke barriers might include walls having door openings other than cross-corridor doors. There is no restriction in the *Code* regarding which doors or how many doors form part of a smoke barrier. For example, doors from the corridor to individual rooms are permitted to form part of a smoke barrier.

19.3.7.9 Door openings in smoke barriers shall be protected using one of the following methods:

- (1) Swinging door providing a clear width of not less than 32 in. (810 mm)
- (2) Horizontal-sliding door complying with 7.2.1.14 and providing a clear width of not less than 32 in. (810 mm)

19.3.7.10 The requirement of 19.3.7.9 shall not apply to existing 34 in. (865 mm) doors.

smoke compartments, using smoke barriers. However, 18.3.7.2(1) through (5) provide exemptions for some non-health care occupancy floors.

Exhibit 18/19.83 and the text that follows illustrate the use of 18.3.7.1(1) and (2) and the five exemptions of 18.3.7.2. The provision of 18.3.7.2(4) is new to the 2012 edition of the *Code*.

The following requirements are illustrated in Exhibit 18/19.83:

addressed independently of the occupancy in which they are located. The presence of these rooms does not result in a facility being designated a multiple occupancy.

7.12.1 Mechanical equipment rooms, boiler rooms, furnace rooms, and similar spaces shall be arranged to limit common path of travel to a distance not exceeding 50 ft (15 m), unless otherwise permitted by the following:

- (1) A common path of travel not exceeding 100 ft (30 m) shall be permitted in the following locations:
 - (a) In buildings protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7
 - (b) In mechanical equipment rooms with no fuel-fired equipment
 - (c) In existing buildings
- (2) In an existing building, a common path of travel not exceeding 150 ft (46 m) shall be permitted, provided that all of the following criteria are met:
 - (a) The building is protected throughout by an approved, supervised automatic sprinkler system installed in accordance with Section 9.7.
 - (b) No fuel-fired equipment is within the space.
 - (c) The egress path is readily identifiable.
- (3) The requirement of 7.12.1 shall not apply to rooms or spaces in existing health care occupancies complying with the arrangement of means of egress provisions of 19.2.5 and the travel distance limits of 19.2.6.

7.12.2 Stories used exclusively for mechanical equipment, furnaces, or boilers shall be permitted to have a single means of egress where the travel distance to an exit on that story is not in excess of the common path of travel limitations of 7.12.1.

Paragraph 7.12.2 is especially useful in equipment penthouses and for basement furnace and boiler rooms. As long as the common path of travel specified by 7.12.1 is not exceeded, a story used exclusively for mechanical equipment, boilers, or furnaces is permit-

reducing the means of egress features required for normally unoccupied building service equipment support areas. See 3.3.21.6 for a definition of *normally unoccupied building service equipment support area*. The advisory annex text that accompanies the definition is repeated below, as it is important not to permit the leniencies offered by Section 7.13 to be used in spaces that should not be classified as normally unoccupied building service equipment support areas.

A.3.3.21.6 Normally Unoccupied Building Service Equipment Support Area.

Normally unoccupied building service support areas are often found in attics, crawl spaces, chases, and interstitial areas where the space is vacant or intended exclusively for routing ductwork, cables, conduits, piping, and similar services and is rarely accessed. In such spaces, it is often difficult or impossible to fully comply with the egress requirements of Chapter 7. Where portions of such spaces are routinely visited for storage, maintenance, testing, or inspection, that portion is excluded from this definition, but the remainder of the space might be considered a normally unoccupied building service equipment support area. Storage and fuel-fired equipment would not be expected to be permitted in these locations. Roofs are not considered to be normally unoccupied building service equipment support areas.

The two themes that run through Section 7.13 are that the subject means of egress feature that is normally required by Chapter 7 is exempted in the normally unoccupied building service equipment support area if:

1. The normally unoccupied building service equipment support area is not larger than 45,000 ft² (4180 m²) in a building that is not sprinklered throughout, without the presence or absence of sprinklers in the normally unoccupied building service equipment support area affecting the determination of whether the building is sprinklered throughout

2. The normally unoccupied building service equipment support area is not larger than 90,000 ft² (8270 m²) in a building that is sprinklered throughout