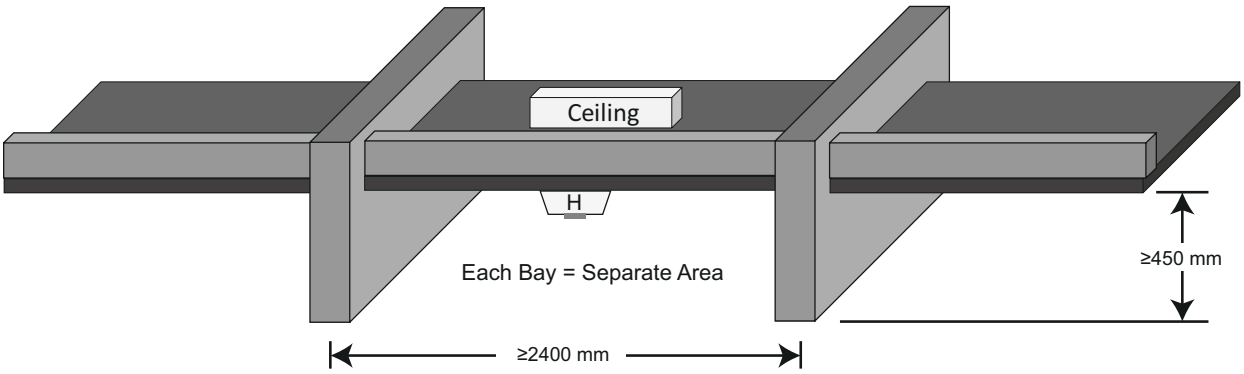
28.10.3 Where the beams project more than 450 mm below the *ceiling*, and are more than 2400 mm apart from the centres, each bay or area formed by the beams shall be treated as a separate area, in accordance with 28, Spot Type Fire Detectors. (Refer to Figure 28.12.)

NOTE: As an alternative to 28.10.3, *detector spacing* for spot type *heat detectors* may be based on calculations as specified in 28.10.3.1 and 28.10.3.2.

Figure 28.12
Spacing of Spot Type Heat Detectors in Beam Pockets



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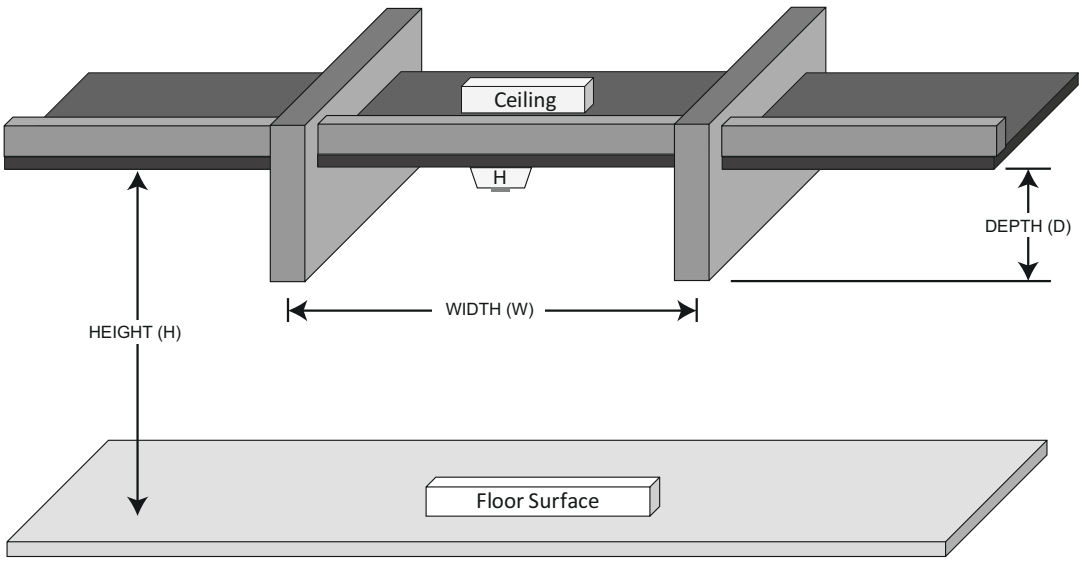
28.10.3.1 Spot type *heat detectors* shall be located in each beam pocket where (refer to Figure 28.13):

a) The ratio of beam depth (D) to *ceiling height* (H) is greater than 0.1; and

b) The ratio of beam spacing (W) to *ceiling height* (H), is greater than 0.4.

Figure 28.13
Location of Spot Type Heat Detectors in Beam Pockets



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NOTE 1: If D : H > 0.1 and W : H . 0.4, spot type *heat detectors* shall be located in each beam pocket.
NOTE 2: If D : H ≤ 0.1 or W : H ≤ 0.4, spot type *heat detectors* shall be installed on the bottom of the beams.

28.10.3.2 Spot type *heat detectors* shall be installed on the bottom of the beams where (refer to Figure 28.13) either the:

a) Ratio of beam depth (D) to *ceiling height* (H) is less than or equal to 0.1; or

b) Ratio of beam spacing (W) to *ceiling height* (H) is less than or equal to 0.4.

28.10.4 Where beams project more than 450 mm below the *ceiling* and are 2400 mm or less on centres, 28.10.3.1 or 28.10.3.2 shall apply.

28.10.5 Where beams are less than 300 mm in depth and less than 2400 mm on centre, *heat detectors* shall be installed on the bottom of the beams.

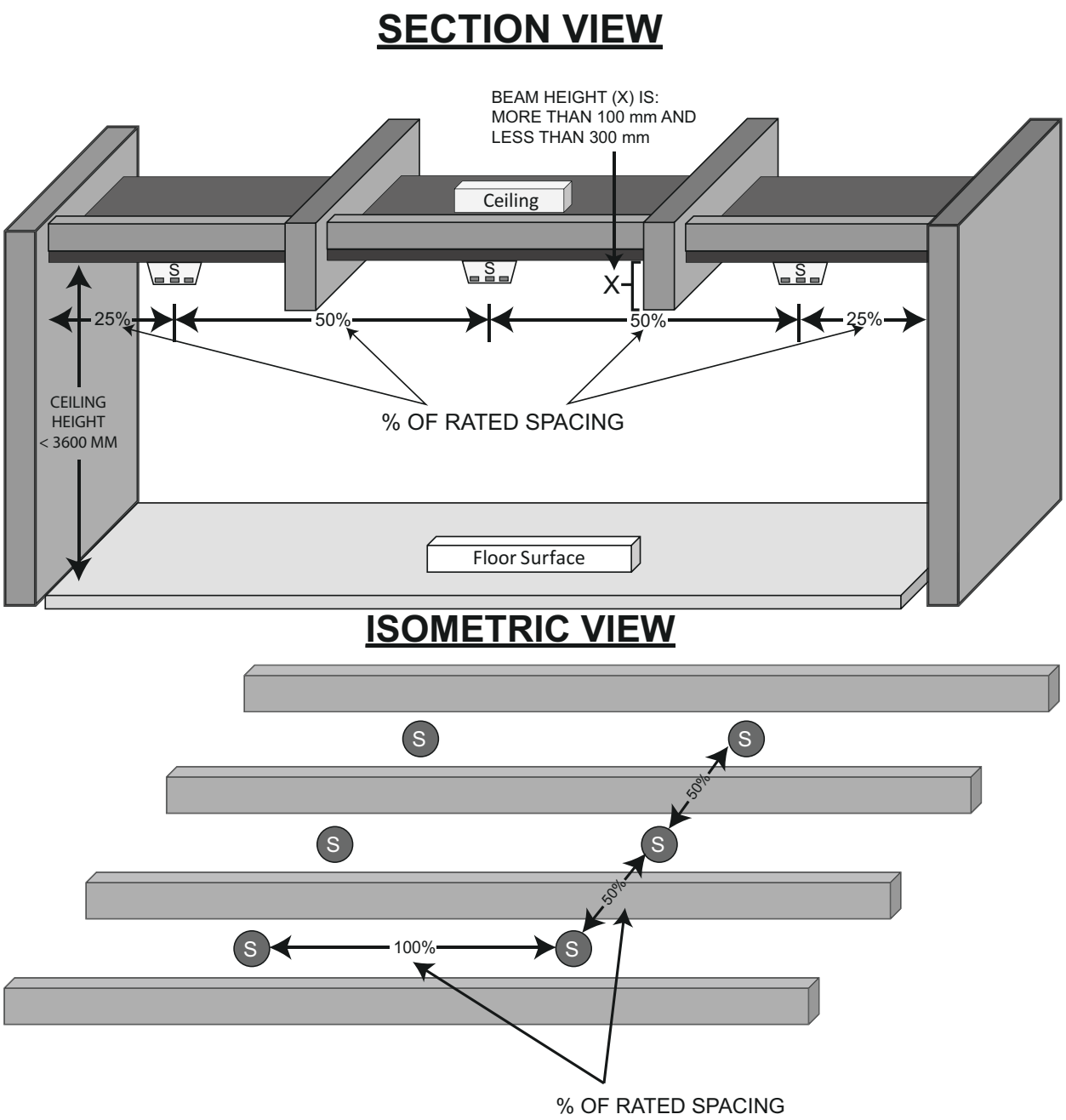
28.10.6 Spot type *heat detector spacing* shall be further reduced based on the *ceiling height*, as required by 28.8, High Ceilings.

28.10.7 Girders, support beams or joists, which run at right angles to the beams or joists, and are within 100 mm of the *ceiling*, shall be considered as beams.

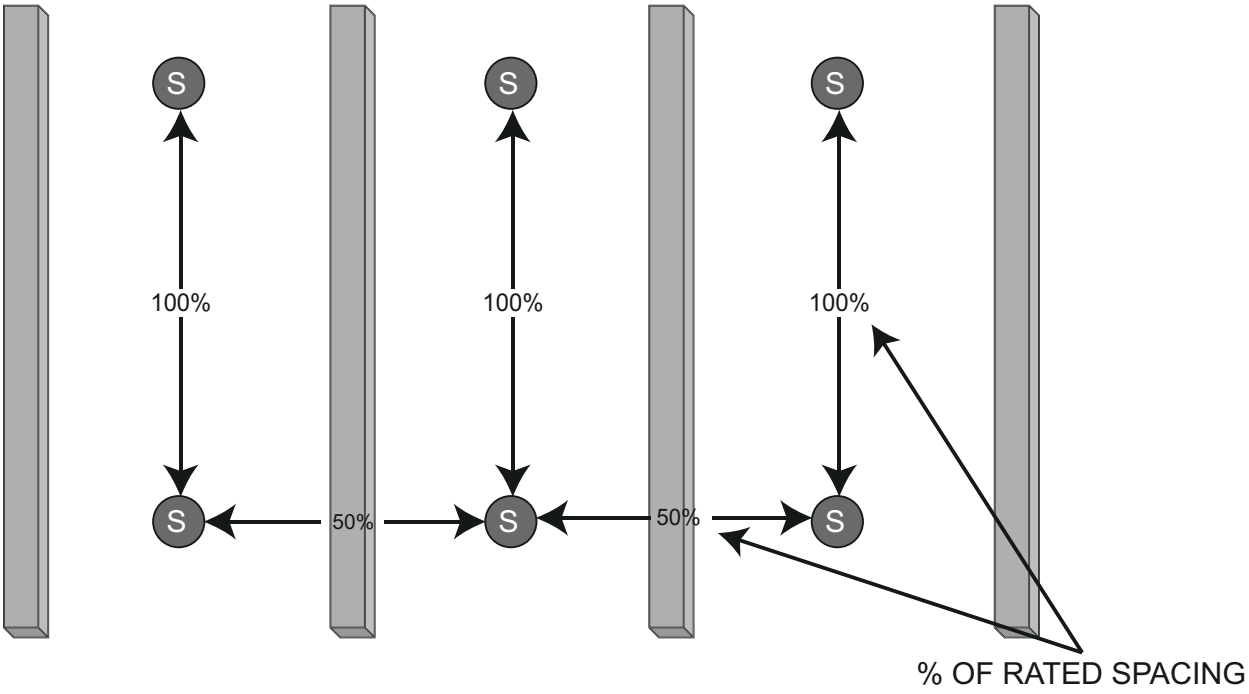
28.10.8 Where beams and/or joists cross each other to form a "honeycomb" or "grid style" pattern, and the minimum measurement in the compartments is less than 2400 mm across, the spot type *heat detector* shall be mounted at the cross point of the beams. The spacing shall be a maximum of 66% of the *smooth ceiling detector spacing* allowable in accordance with 28, Spot Type Fire Detectors.

28.10.9 Where the beams project more than 100 mm and less than 300 mm below the *ceiling*, and the *ceiling height* is less than 3600 mm, the *detector spacing* of spot type *smoke detectors* at right angles to the direction of beam travel shall be a maximum of 50% of the *smooth ceiling detector spacing* allowable. (Refer to Figure 28.14.)

Figure 28.14
Detector Spacing of Spot Type Smoke Detectors

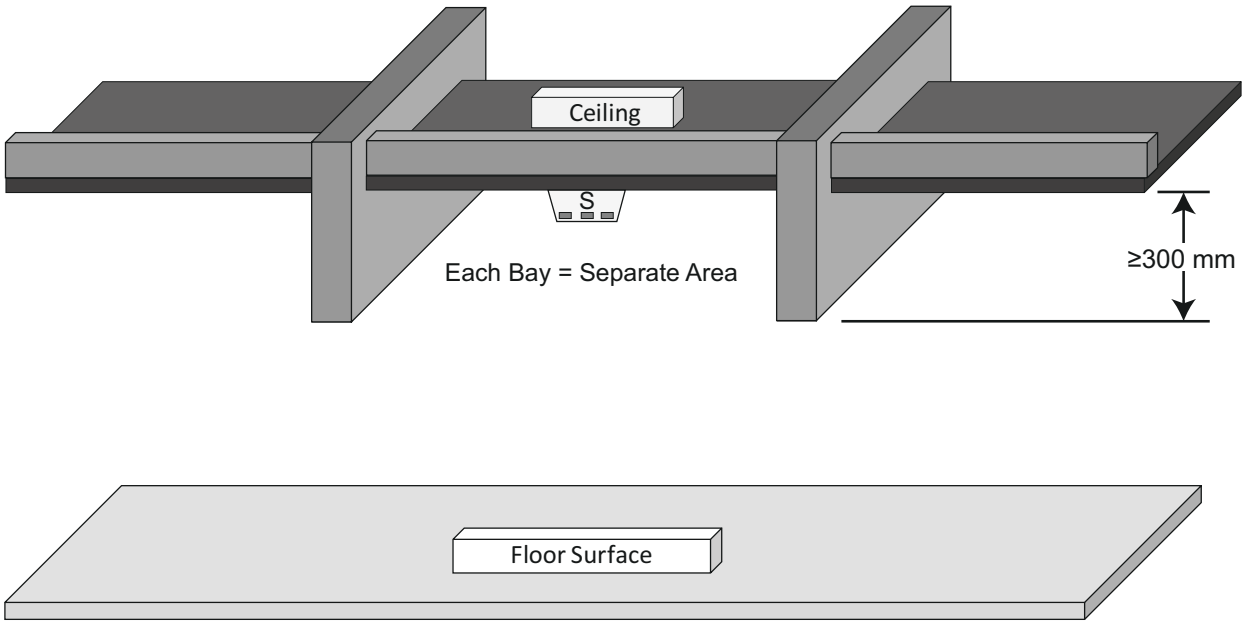


TOP VIEW



28.10.10 Where the beams project more than 300 mm below the *ceiling*, each bay or area formed by the beams shall be treated as a separate area. (Refer to Figure 28.15.)

Figure 28.15
Detector Spacing of Spot Type Smoke Detectors



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28.10.11 For level *ceilings* with beams extending less than 10 % of the *ceiling height* (0.1 H) from the *ceiling*, the *smooth ceiling* spacing for spot-type *smoke detectors* shall be used. Spot-type *smoke detectors* shall be located on the *ceiling* or on the bottom of beams.

28.10.12 For level *ceilings* with beams extending 10 % or more of the *ceiling height* (0.1 H) and from the *ceiling*, the following shall be applied:

a) Where the beam spacing is equal to or greater than 40 % of the *ceiling height* (0.4 H), spot-type *smoke detectors* shall be located on the *ceiling* in each beam pocket; or

b) Where the beam spacing is less than 40 % of the *ceiling height* (0.4 H), spot-type *smoke detectors* shall be installed using the *smooth ceiling* spacing in the direction parallel to the beams and at one-half *smooth ceiling* spacing in the direction perpendicular to the beams. The spot-type *smoke detectors* shall be mounted either on the *ceiling* or on the bottom of the beams.

28.10.13 For level *ceilings* with beam pockets formed by intersecting beams, including waffle or pan-type *ceilings*, the spacing shall be in accordance with 28.10.12.

28.10.14 For corridors with level *ceilings* that are 4.6 m in width or less having *ceiling* beams or solid joists perpendicular to the corridor length, spot-type *smoke detectors* shall be installed using the *smooth ceiling* spacing with the detectors mounted on the *ceiling*, sidewalls, or the bottom of beams or solid joists.

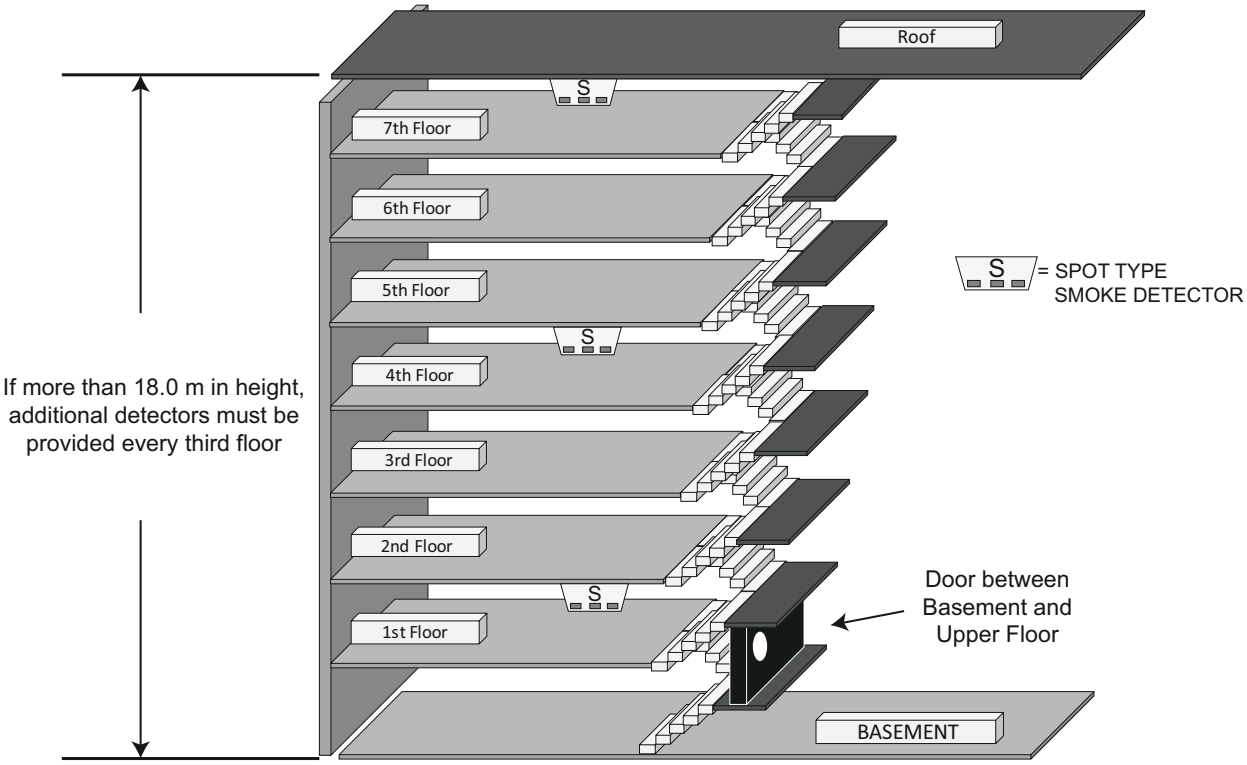
28.10.15 For rooms measuring 84 m^2 or less with *ceiling* beams or solid joists, spot type *smoke detectors* shall be installed using the *smooth ceiling* spacing with the detectors mounted on the *ceiling* or the bottom of beams or solid joists.

28.11 Exit Stair Shafts

28.11.1 Where required by the National Building Code of Canada, a *smoke detector* shall be mounted at the highest point of the exit stair shaft.

28.11.2 In exit stair shafts exceeding 18 m in height, measured from the lowest point to the highest point of the shaft, additional *smoke detectors* shall be installed at every third floor. (Refer to Figure 28.16.)

Figure 28.16
Installation of Spot Type Smoke Detectors in Exit Stair Shafts



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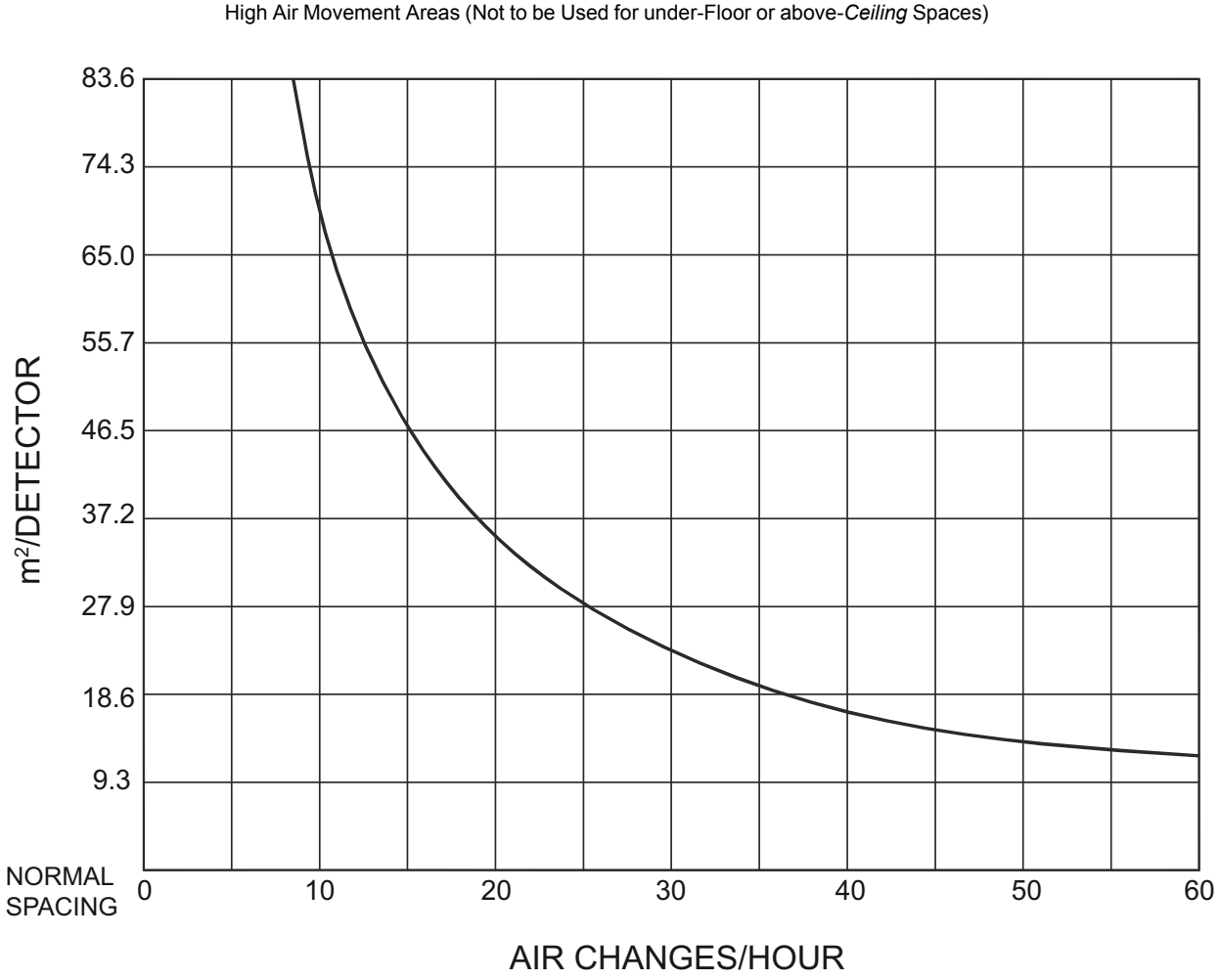
28.11.3 Horizontal portions of exit stair shafts exceeding 18 m in height shall be provided with *smoke detectors* in accordance with 28.1, Smooth Ceiling Spacing, and 28.6, Corridors.

28.11.4 When *smoke detectors* cannot be used due to the ambient temperature being below 0 °C, *heat detectors* suitable for the environment may be installed.

28.12 High Air Movements and Humidity

28.12.1 Spot type *smoke detector spacing* in areas with high air movements shall be in accordance with Figure 28.17 and the *smoke detector* shall not be installed directly in the stream of the air supply.

Figure 28.17
Installation of Spot Type Smoke Detectors in Areas with High Air Movements



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Spot Type Smoke Detector Spacing Based on Air Movement

Air Changes/h	m^2/Detector
6	83.61
6.7	83.61
7.5	83.61
8.6	81.29
10	69.68
12	58.06
15	56.45
20	34.84
30	23.23
60	11.61

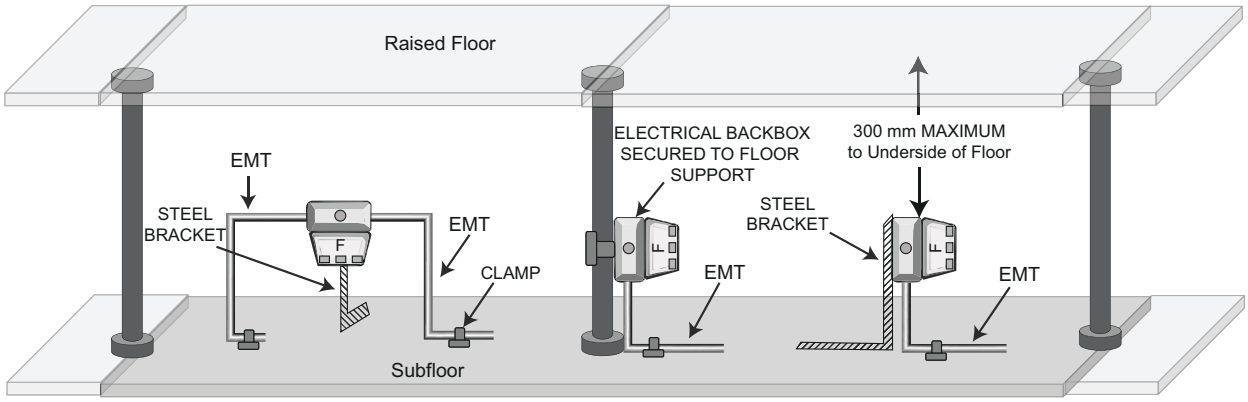
28.12.2 Spot type *smoke detectors* in areas above a relative humidity of 93 % or an air velocity greater than 1.5 m/s shall be of a type suitable for the environment.

28.13 Raised Floors and Suspended Ceilings

28.13.1 Spot type *fire detectors* installed below raised floors or above suspended *ceilings* shall not be used in lieu of providing detection within the *floor area*.

28.13.2 Spot type *fire detectors* provided below raised floors shall be orientated as per manufacturer's published installation instructions. Refer to Figure 28.18.

Figure 28.18
Fire Detector Mounting: Raised Floor



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28.13.3 Spaces beneath raised floors and above suspended *ceilings* shall be treated as separate rooms for *fire detector spacing* purposes.

28.13.4 Where spot type *fire detectors* installed below raised floors are mounted vertically, they shall be installed so as to avoid entry of debris into the detectors.

28.14 Elevator and Dumbwaiter Shafts (Hoistways)

28.14.1 A *fire detector* required in a shaft by the National Building Code of Canada shall be mounted at the highest point of the shaft.

28.14.2 *Heat detectors* installed in the bottom of a shaft (pit) shall be mounted between 100 mm and 300 mm below the lowest point of travel of each car within the shaft.

NOTE: *Heat detectors* installed within shafts can be mechanically affixed to a bracket in a *ceiling*-mounted orientation or mounted in a side wall orientation.

28.14.3 In lieu of spot type heat detection, linear heat detection cable installed around the inside perimeter of the shaft enclosure may be used to protect the bottom of a shaft (pit) per 28.14.2.

29 Multi-Sensor Devices

29.1 *Fire detectors* that contain multiple types of sensing elements shall meet the applicable installation requirements for all types of sensing elements incorporated into the device.

30 Smoke Detectors in lieu of Smoke Alarms

30.1 In suites of residential occupancy equipped with *smoke detectors* in lieu of smoke alarms in accordance with the National Building Code of Canada, the *smoke detectors* shall:

a) Upon activation, cause localized audible and required visible signals within the affected suite to operate;

b) Not activate an *alarm signal* or *alert signal* throughout the *building*; and

c) Provide a visible indication means that describes the physical location of the activated *smoke detector* on the fire alarm *annunciator* and/or *display and control centre*.

30.2 The audible signals required by 30.1 shall:

a) Conform to the temporal pattern defined in National Building Code of Canada; and

b) Be not less than 75 dBA where installed in a sleeping room within a *building* of residential or *care occupancy* when any intervening doors between the device and the sleeping room are closed.

31 Air Duct Type Smoke Detectors

31.1 *Smoke detectors* in air duct systems shall not be used as a substitute for open area protection.

31.2 *Air duct type smoke detectors* shall be installed in the main supply duct, downstream of the mixing box, filters and fan. Where *air duct type smoke detectors* cannot be installed in the main supply duct, they shall be installed in each of the branch lines as close as practical to the supply fan downstream of the mixing box, filters and fan. (Refer to Figure 31.1.)