FS112-21

IBC: 909.20, 909.20.4, 909.20.4.1, 909.20.4.2, 909.20.4.2.1, 909.20.4.3, 909.20.4.4, 909.20.7; IFC: [BF] 909.20, [BF] 909.20.4, [BF] 909.20.4.1, [BF] 909.20.4.2, [BF] 909.20.4.2.1, [BF] 909.20.4.3, [BF] 909.20.4.4

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2021 International Building Code

Revise as follows:

909.20 Smokeproof enclosures. Where required by Section 1023.12, a*smokeproof enclosure* shall be constructed in accordance with this section. A *smokeproof enclosure* shall consist of an *interior exit stairway* or *ramp* that is enclosed in accordance with the applicable provisions of Section 1023 and an open exterior balcony, ~~ventilated vestibule~~ or pressurized *stair* and pressurized entrance vestibule meeting the requirements of this section. Where access to the roof is required by the *International Fire Code*, such access shall be from the *smokeproof enclosure* where a *smokeproof enclosure* is required.

Delete without substitution:

~~**909.20.4 Mechanical ventilation alternative.** The provisions of Sections 909.20.4.1 through 909.20.4.4 shall apply to ventilation of *smokeproof enclosures* by mechanical means.~~

~~**909.20.4.1 Vestibule doors.** The door assembly from the building into the vestibule shall be a *fire door assembly* complying with Section 716.2.2.1. The door assembly from the vestibule to the *stairway* or *ramp* shall not have less than a 20-minute *fire protection rating* and shall meet the requirements for a smoke door assembly in accordance with Section 716.2.2.1. The door shall be installed in accordance with NFPA 105.~~

~~**909.20.4.2 Vestibule ventilation.** The vestibule shall be supplied with not less than one air change per minute and the exhaust shall be not less than 150 percent of supply. Supply air shall enter and exhaust air shall discharge from the vestibule through separate, tightly constructed ducts used only for that purpose. Supply air shall enter the vestibule within 6 inches (152 mm) of the floor level. The top of the exhaust register shall be located at the top of the smoke trap but not more than 6 inches (152 mm) down from the top of the trap, and shall be entirely within the smoke trap area. Doors in the open position shall not obstruct duct openings. Duct openings with controlling *dampers* are permitted where necessary to meet the design requirements, but *dampers* are not otherwise required.~~

~~**909.20.4.2.1 Engineered ventilation system.** Where a specially engineered system is used, the system shall exhaust a quantity of air equal to not less than 90 air changes per hour from any vestibule in emergency operation mode and shall be sized to handle three vestibules simultaneously. Smoke detectors shall be located at the floor-side entrance to each vestibule and shall activate the system for the affected vestibule. Smoke detectors shall be installed in accordance with Section 907.3.~~

~~**909.20.4.3 Smoke trap.**~~
~~The vestibule ceiling shall be not less than 20 inches (508 mm) higher than the door opening into the vestibule to serve as a smoke and heat trap and to provide an upward-moving air column. The height shall not be decreased unless *approved* and justified by design and test.~~

~~**909.20.4.4 Stairway or ramp shaft air movement system.** The *stairway* or *ramp shaft* shall be provided with a dampered relief opening and supplied with sufficient air to maintain a minimum positive pressure of 0.10 inch of water (25 Pa) in the *shaft* relative to the vestibule with all doors closed.~~

Revise as follows:

909.20.7 Ventilating equipment. The activation of ventilating equipment required by the alternatives in Sections ~~**909.20.4,**~~ 909.20.5 and 909.20.6 shall be by smoke detectors installed at each floor level at an *approved* location at the entrance to the *smokeproof enclosure*. When the closing device for the *stairway* and *ramp shaft* and vestibule doors is activated by smoke detection or power failure, the mechanical equipment shall activate and operate at the required performance levels. Smoke detectors shall be installed in accordance with Section 907.3.

2021 International Fire Code

Revise as follows:

[BF] 909.20 Smokeproof enclosures. Where required by Section 1023.12, a*smokeproof enclosure* shall be constructed in accordance with this section. A smokeproof enclosure shall consist of an *interior exit stairway* or *ramp* that is enclosed in accordance with the applicable provisions of Section 1023 and an open exterior balcony or ~~ventilated vestibule~~ meeting the requirements of this section. Where access to the roof is required, such access shall be from the smokeproof enclosure where a *smokeproof enclosure* is required.

Delete without substitution:

~~**[BF] 909.20.4 Mechanical ventilation alternative.** The provisions of Sections 909.20.4.1 through 909.20.4.4 shall apply to ventilation of *smokeproof enclosures* by mechanical means.~~

~~**[BF] 909.20.4.1 Vestibule doors.** The door assembly from the building into the vestibule shall be a fire door assembly complying with Section~~

~~716.2.2.1 of the *International Building Code*. The door assembly from the vestibule to the *stairway* or *ramp* shall have not less than a 20-minute *fire protection rating* and shall meet the requirements for a smoke door assembly in accordance with Section 716.2.2.1 of the *International Building Code*. The door shall be installed in accordance with NFPA 105.~~

~~**[BF] 909.20.4.2 Vestibule ventilation.** The vestibule shall be supplied with not less than one air change per minute and the exhaust shall be not less than 150 percent of supply. Supply air shall enter and exhaust air shall discharge from the vestibule through separate, tightly constructed ducts used only for that purpose. Supply air shall enter the vestibule within 6 inches (152 mm) of the floor level. The top of the exhaust register shall be located at the top of the smoke trap but not more than 6 inches (152 mm) down from the top of the trap, and shall be entirely within the smoke trap area. Doors in the open position shall not obstruct duct openings. Duct openings with controlling dampers are permitted where necessary to meet the design requirements, but dampers are not otherwise required.~~

~~**[BF] 909.20.4.2.1 Engineered ventilation system.** Where a specially engineered system is used, the system shall exhaust a quantity of air equal to not less than 90 air changes per hour from any vestibule when in emergency operation mode and shall be sized to handle three vestibules simultaneously. Smoke detectors shall be located at the floor-side entrance to each vestibule and shall activate the system for the affected vestibule. Smoke detectors shall be installed in accordance with Section 907.3.~~

~~**[BF] 909.20.4.3 Smoke trap.** The vestibule ceiling shall be not less than 20 inches (508 mm) higher than the door opening into the vestibule to serve as a smoke and heat trap and to provide an upward-moving air column. The height shall not be decreased unless approved and justified by design and test.~~

~~**[BF] 909.20.4.4 Stairway or ramp shaft air movement system.** The *stairway* or *ramp* shaft shall be provided with a dampered relief opening and supplied with sufficient air to maintain a minimum positive pressure of 0.10 inch of water (25 Pa) in the shaft relative to the vestibule with all doors closed.~~

Reason: This proposal will eliminate the mechanical ventilation alternative. Although the mechanical ventilation alternative has been in the IBC since inception, it seems unlikely this option is used very often, if at all. This is due to the complexity of the design and the additional equipment necessary to achieve the specified results.
There are two primary approaches to meet the mechanical ventilation option. One approach requires large supply and exhaust fans, as well as the associated ducts to serve all vestibules simultaneously. A second approach requires not only the supply and exhaust ducts, but also one supply and one exhaust damper in each vestibule. With this approach, each damper in every vestibule will have to properly configure for the system to function, as well as be monitored to confirm status.

Section 909.20.4.2 requires the vestibule exhaust to be at least 150 percent of supply. This means the vestibule is negative relative to the adjacent floor and smoke can be drawn into the vestibule. As such, this design concept actually contradicts the intent, which is to limit smoke intrusion into the exit enclosure.

Section 909.20.4.3 requires a minimum ceiling height of 20 inches above the door. With a minimum door opening height of 80 inches as required by Section 1010.1.1, these constraints dictate a minimum of 8 feet 4 inches from the top of one slab to the bottom of the slab above. Adding another 6 inches for a reasonable slab thickness gives almost 9 foot slab-to-slab height. Although this may not be a hardship for most multi-story buildings, this will impact some designs.

Cost Impact: The code change proposal will decrease the cost of construction
Due to the complexity of this option, it is more expensive to design, construction, commission, and maintain than other recognized approaches for smokeproof enclosures.