

Issue DS 2016-078: The petitioner Joseph Hauf, PE Vice President of Engineering Services of Conquest Firespray, LLC seeks a declaratory statement on whether the symmetry testing as per 703.2.1 applies to “fire resistive protection duct” when used as an option in the following applications: an elevation shaft application, a smoke proof enclosure ventilation application, and a stairwell pressurization application.

Background:

The Owner has approached the applicant with a request for protection of building features as described below. According to the petitioner, they can accomplish this fire resistive protection with multiple options for compliance which range from providing a variety of built drywall fire resistive assemblies to providing various listed fire resistive product assemblies. Available listings for built assemblies and products range from those which are fire resistance tested on one side only and those which are tested to fire exposure on both the inside and the outside. All of these built assemblies and products being considered are non-symmetrical in their construction. There are several applications described herein which are in the design phase for which the Declaratory Statement is necessary.

Section 703.2.1 says fire resistance must be determined by testing to ASTM E 119 or UL 263. These two are considered equivalent fire resistance test standards, each set forth by two different standards bodies. However, to comply fully with Section 703.2.1, there are two parts:

1. Testing to ASTM E 119/UL 263 and
2. Testing for fire exposure on both sides, if the assembly is not symmetrical

The code requires testing from both sides for various applications as referenced back to Section 703.2.1. If the assembly is not symmetrical because a fire attacks the individual materials in a different order of fire penetration where the materials may react differently depending on that order of attack. Section 703.2.1 says these non-symmetrical assemblies must be tested twice for fire exposure on each side. This is necessary to make sure the assembly will perform for the required time, regardless of the source of actual fire exposure.

5th Edition (2014) Florida Building Code, Building

[A] 104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material, design or method of construction shall be *approved* where the *building official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, *fire resistance*, durability and safety.

703.2 Fire-resistance ratings.

The fire-resistance rating of building elements, components or assemblies shall be determined in accordance with the test procedures set forth in ASTM E 119 or UL 263 or in accordance with Section 703.3. Where materials, systems or devices that have not been tested as part of a fire-resistance-rated assembly are incorporated into the building element, component or assembly, sufficient data shall be made available to the building official to show that the required fire-

resistance rating is not reduced. Materials and methods of construction used to protect joints and penetrations in fire-resistance-rated building elements, components or assemblies shall not reduce the required fire-resistance rating.

Exception: In determining the fire-resistance rating of exterior bearing walls, compliance with the ASTM E 119 or UL 263 criteria for unexposed surface temperature rise and ignition of cotton waste due to passage of flame or gases is required only for a period of time corresponding to the required fire-resistance rating of an exterior nonbearing wall with the same fire separation distance, and in a building of the same group. When the fire-resistance rating determined in accordance with this exception exceeds the fire-resistance rating determined in accordance with ASTM E 119 or UL 263, the fire exposure time period, water pressure and application duration criteria for the hose stream test of ASTM E 119 or UL 263 shall be based upon the fire-resistance rating determined in accordance with this exception.

703.2.1 Nonsymmetrical wall construction.

Interior walls and partitions of **nonsymmetrical construction** shall be tested with both faces exposed to the furnace, and the assigned fire-resistance rating shall be the shortest duration obtained from the two tests conducted in compliance with ASTM E 119 or UL 263. **When evidence is furnished to show that the wall was tested with the least fire-resistant side exposed to the furnace, subject to acceptance of the building official, the wall need not be subjected to tests from the opposite side (see Section 705.5 for exterior walls).**

703.2.2 Combustible components.

Combustible aggregates are permitted in gypsum and Portland cement concrete mixtures for fire-resistance-rated construction. Any component material or admixture is permitted in assemblies if the resulting tested assembly meets the fire-resistance test requirements of this code.

703.2.3 Restrained classification.

Fire-resistance-rated assemblies tested under ASTM E 119 or UL 263 shall not be considered to be restrained unless evidence satisfactory to the *building official* is furnished by the *registered design professional* showing that the construction qualifies for a restrained classification in accordance with ASTM E 119 or UL 263. Restrained construction shall be identified on the plans.

703.3 Alternative methods for determining fire resistance.

The application of any of the alternative methods listed in this section shall be based on the fire exposure and acceptance criteria specified in ASTM E 119 or UL 263. The required *fire resistance* of a building element, component or assembly shall be permitted to be established by any of the following methods or procedures:

1. Fire-resistance designs documented in sources.
2. Prescriptive designs of fire-resistance-rated building elements, components or assemblies as prescribed in Section 721.
3. Calculations in accordance with Section 722.
4. Engineering analysis based on a comparison of building element, component or assemblies designs having *fire-resistance ratings* as determined by the test procedures set forth in ASTM E 119 or UL 263.

5. Alternative protection methods as allowed by Section 104.11.

707.3 Fire-resistance rating.

The *fire-resistance rating* of *fire barriers* shall comply with this section.

707.3.1 Shaft enclosures.

The *fire-resistance rating* of the *fire barrier* separating building areas from a shaft shall comply with Section 713.4.

707.3.2 Interior exit stairway and ramp construction. The *fire-resistance rating* of the *fire barrier* separating building areas from an *interior exit stairway* or *ramp* shall comply with Section 1022.1.

707.3.3 Enclosures for exit access stairways.

The *fire-resistance rating* of the *fire barrier* separating building areas from an *exit access stairway* or *ramp* shall comply with Section 1009.3.1.2.

707.3.4 Exit passageway.

The *fire-resistance rating* of the *fire barrier* separating building areas from an *exit passageway* shall comply with Section 1023.3.

713.4 Fire-resistance rating.

Shaft enclosures shall have a *fire-resistance rating* of not less than 2 hours where connecting four *stories* or more, and not less than 1 hour where connecting less than four *stories*. The number of *stories* connected by the shaft enclosure shall include any basements but not any *mezzanines*. Shaft enclosures shall have a *fire resistance rating* not less than the floor assembly penetrated, but need not exceed 2 hours. Shaft enclosures shall meet the requirements of Section 703.2.1.

713.14 Elevator, dumbwaiter and other hoistways.

Elevator, dumbwaiter and other hoistway enclosures shall be constructed in accordance with Section 713 and Chapter 30.

909.20.2 Construction.

The smokeproof enclosure shall be separated from the remainder of the building by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. Openings are not permitted other than the required *means of egress* doors. The vestibule shall be separated from the *stairway* by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. The open exterior balcony shall be constructed in accordance with the *fire-resistance rating* requirements for floor assemblies.

909.20.6.1 Ventilation systems.

Smokeproof enclosure ventilation systems shall be independent of other building ventilation systems. The equipment, control wiring, power wiring and ductwork shall comply with one of the following:

1. Equipment, control wiring, power wiring and ductwork shall be located exterior to the building and directly connected to the smokeproof enclosure or connected to the smokeproof enclosure

by ductwork enclosed by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

2. Equipment, control wiring, power wiring and ductwork shall be located within the smokeproof enclosure with intake or exhaust directly from and to the outside or through ductwork enclosed by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

3. Equipment, control wiring, power wiring and ductwork shall be located within the building if separated from the remainder of the building, including other mechanical equipment, by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

1009.2.2 Enclosure. All *interior exit stairways* shall be enclosed in accordance with the provisions of Section 1022.

1009.3.1.2 Fire-resistance rating.

Exit access stairway enclosures shall have a *fire-resistance rating* of not less than 2 hours where connecting four stories or more, and not less than 1 hour where connecting less than four stories. The number of stories connected by the *exit access stairway* enclosures shall include any basements, but not any mezzanines. *Exit access stairway* enclosures shall have a *fire-resistance rating* not less than the floor assembly penetrated, but need not exceed 2 hours.

1022.1 General.

Interior exit stairways and *interior exit ramps* serving as an *exit* component in a *means of egress* system shall comply with the requirements of this section. *Interior exit stairways* and *ramps* shall lead directly to the exterior of the building or shall be extended to the exterior of the building with an *exit passageway* conforming to the requirements of Section 1023, except as permitted in Section 1027.1. An *interior exit stairway* or *ramp* shall not be used for any purpose other than as a *means of egress*.

1022.6 Ventilation.

Equipment and ductwork for *interior exit stairway* and *ramp* ventilation as permitted by Section 1022.5 shall comply with one of the following items:

1. Such equipment and ductwork shall be located exterior to the building and shall be directly connected to the *interior exit stairway* and *ramp* by ductwork enclosed in construction as required for shafts.

2. Where such equipment and ductwork is located within the *interior exit stairway* and *ramp*, the intake air shall be taken directly from the outdoors and the exhaust air shall be discharged directly to the outdoors, or such air shall be conveyed through ducts enclosed in construction as required for shafts.

3. Where located within the building, such equipment and ductwork shall be separated from the remainder of the building, including other mechanical equipment, with construction as required for shafts. In each case, openings into the fire-resistance-rated construction shall be limited to those needed for maintenance and operation and shall be protected by opening protectives in

accordance with Section 716 for shaft enclosures. The *interior exit stairway* and *ramp* ventilation systems shall be independent of other building ventilation systems.

1022.2 Construction.

Enclosures for *interior exit stairways* and ramps shall be constructed as *fire barriers* in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. *Interior exit stairway* and *ramp* enclosures shall have a *fire-resistance rating* of not less than 2 hours where connecting four stories or more and not less than 1 hour where connecting less than four stories. The number of stories connected by the *interior exit stairways* or *ramps* shall include any basements, but not any *mezzanines*. *Interior exit stairways* and *ramps* shall have a *fire-resistance rating* not less than the floor assembly penetrated, but need not exceed 2 hours.

Exception: *Interior exit stairways* and *ramps* in Group I-3 occupancies in accordance with the provisions of Section 408.3.8.

1023.3 Construction.

Exit passageway enclosures shall have walls, floors and ceilings of not less than a 1-hour *fire-resistance rating*, and not less than that required for any connecting *interior exit stairway* or *ramp*. *Exit passageways* shall be constructed as *fire barriers* in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

Staff Analysis

Part One:

Situation:

On this project, a vertical riser duct is specified for fire resistive protection, which would be subject to this thread below from 707.3.1 to 713.4, which refers to 703.2.1 for symmetry testing requirements.

707.3.1 Shaft enclosures.

The *fire-resistance rating* of the *fire barrier* separating building areas from a shaft shall comply with Section 713.4.

713.4 Fire-resistance rating.

Shaft enclosures shall have a *fire-resistance rating* of not less than 2 hours where connecting four *stories* or more, and not less than 1 hour where connecting less than four *stories*. The number of *stories* connected by the shaft enclosure shall include any basements but not any *mezzanines*. Shaft enclosures shall have a *fire resistance rating* not less than the floor assembly penetrated, but need not exceed 2 hours. Shaft enclosures shall meet the requirements of Section 703.2.1.

Question: Is it the requirement of the Code that symmetry testing is required by Section 703 .2.1 for this vertical riser application, as referenced by the above Code Paths, whether the vertical riser application is satisfied by built assemblies or listed products?

Answer:

Option #1/Petitioner: Petitioner respectfully believes the answers to these questions are “YES.”

To be a compliant design option for each of these project applications, a fire rated assembly must be tested to the same standard of care, regardless of whether it is a “built” shaft wall assembly or listed product. This is because either assembly performs exactly the same function within the building, as far as the Code is concerned. A listed product assembly is no different with respect to the fire exposures to which it must perform, just as the “built” assembly is required to perform. Many options may be available to address the same problem, but **all** options must demonstrate compliance with the risks assigned by the Code. So, any non-symmetrical fire rated assembly must demonstrate that it is capable of performing for the required hourly rating for both **inside** and **outside** fire exposures. The only exceptions are:

- for exterior walls, which rely upon setbacks (Note: none of the above project applications are for exterior walls), or
- for assemblies where the non-symmetrical assembly has clearly been tested on its weakest exposure (Note: none of the considered products/assemblies have any evidence of testing which might establish that a single fire exposure test was for the weakest assembly exposure).

There is no exception to symmetry requirements for fire resistive testing, as defined by Section 703.2.1, whether the protected duct serves supply air, exhaust air, return air or otherwise. Symmetry testing applies in all referenced applications, regardless.

The Petitioner understands that fire resistance protection of ventilation ducts is not always checked for compliance with symmetry testing in accordance with Section 703.2.1, even when the Code Paths described herein lead to this requirement. Petitioner believes that for each of the applications described above for this project, this situation is capable of being reconciled by a clear expression of the Commission as to the requirement of the Code relative to symmetry testing, regardless of the mode of construction, whether by prescriptive compliance, by calculated compliance, or by use of listed products tested by Approved Agencies.

Option #2/Staff: The product in question “a **vertical riser duct is specified for fire resistive protection**” is a proposed alternative to the prescribed shaft enclosure as specified in Sections 707.3.1 and 713.4 of the Florida Building Code “FBC”, Building. As per Sections 104.11 and 703.3 of the Florida Building Code, Building, an alternative method of construction to that prescribed in the FBC is subject to review and approval by the local building official, when such alternative is substantiated to be equivalent of that prescribed in the FBC in quality, strength, effectiveness, durability and safety.

PART TWO

Situation:

On this project, a duct is specified for fire resistive protection, which would be subject to this thread below from 909.21.3 back through to symmetry testing requirements, since the ductwork is within the building.

Per Section 909.21.3, ducts serving as elevator shaft pressurization must be the “same” protection as that of the “shaft” served, which by 713.14 refers to Section 713 compliance, where again 713.4 refers back symmetry testing via 703.2.1 (see Section 713.4 above)

713.4 Fire-resistance rating.

Shaft enclosures shall have a *fire-resistance rating* of not less than 2 hours where connecting four *stories* or more, and not less than 1 hour where connecting less than four *stories*. The number of *stories* connected by the shaft enclosure shall include any basements but not any *mezzanines*. Shaft enclosures shall have a *fire resistance rating* not less than the floor assembly penetrated, but need not exceed 2 hours. Shaft enclosures shall meet the requirements of Section 703.2.1.

909.21.3 Ducts for system. Any duct system that is part of the pressurization system shall be protected with the same *fire-resistance rating* as required for the elevator shaft enclosure.

Question: Is it the requirement of the Code that symmetry testing is required by Section 703.2.1 for this application, as referenced by the above Code Paths, whether the elevator shaft pressurization application is satisfied by built assemblies or listed products?

Answer:

Option #1/Petitioner: Petitioner respectfully believes the answers to these questions are “YES.”

Note: for more clarification with regard to the Petitioner’s answer, please see answer to “Part One” above.

Option #2/Staff: The product in question “**a duct is specified for fire resistive protection**” is a proposed alternative to the prescribed elevator shaft pressurization application as specified in Sections 713.14 and 909.21.3 of the Florida Building Code “FBC”, Building. As per Sections 104.11 and 703.3 of the Florida Building Code, Building, an alternative method of construction to that prescribed in the FBC is subject to review and approval by the local building official, when such alternative is substantiated to be equivalent of that prescribed in the FBC in quality, strength, effectiveness, durability and safety.

PART THREE

Situation

On this project, **a duct is specified for fire resistive protection**, which would be subject to this thread below from 909.20.2 back through to symmetry testing requirements.

Section 909.20.2 for smoke proof enclosures refers back to Section 707, where in the below subsections of 707.3 and subsequent references, we see similar paths back to symmetry testing requirements, since the ductwork is within the building.

909.20.2 Construction.

The smoke proof enclosure shall be separated from the remainder of the building by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. Openings are not permitted other than the required *means of egress* doors. The vestibule shall be separated from the *stairway* by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. The open exterior balcony shall be constructed in accordance with the *fire-resistance rating* requirements for floor assemblies.

707.3.2 Interior exit stairway and ramp construction. The *fire-resistance rating* of the *fire barrier* separating building areas from an *interior exit stairway* or *ramp* shall comply with Section 1022.1.

707.3.3 Enclosures for exit access stairways.

The *fire resistance rating* of the *fire barrier* separating building areas from an *exit access stairway* or *ramp* shall comply with Section 1009.3.1.2.

707.3.4 Exit passageway.

The *fire-resistance rating* of the *fire barrier* separating building areas from an *exit passageway* shall comply with Section 1023.3.

1009.3.1.2 Fire-resistance rating.

Exit access stairway enclosures shall have a *fire-resistance rating* of not less than 2 hours where connecting four stories or more, and not less than 1 hour where connecting less than four stories. The number of stories connected by the *exit access stairway* enclosures shall include any basements, but not any mezzanines. *Exit access stairway* enclosures shall have a *fire-resistance rating* not less than the floor assembly penetrated, but need not exceed 2 hours.

1022.1 General.

Interior exit stairways and *interior exit ramps* serving as an *exit* component in a *means of egress* system shall comply with the requirements of this section. *Interior exit stairways* and *ramps* shall lead directly to the exterior of the building or shall be extended to the exterior of the building with an *exit passageway* conforming to the requirements of Section 1023, except as permitted in Section 1027.1. An *interior exit stairway* or *ramp* shall not be used for any purpose other than as a *means of egress*.

1022.6 Ventilation.

Equipment and ductwork for *interior exit stairway* and *ramp* ventilation as permitted by Section 1022.5 shall comply with one of the following items:

1. Such equipment and ductwork shall be located exterior to the building and shall be directly connected to the *interior exit stairway* and *ramp* by ductwork enclosed in construction as

required for shafts.

2. Where such equipment and ductwork is located within the *interior exit stairway* and *ramp*, the intake air shall be taken directly from the outdoors and the exhaust air shall be discharged directly to the outdoors, or such air shall be conveyed through ducts enclosed in construction as required for shafts.

3. Where located within the building, such equipment and ductwork shall be separated from the remainder of the building, including other mechanical equipment, with construction as required for shafts. In each case, openings into the fire-resistance-rated construction shall be limited to those needed for maintenance and operation and shall be protected by opening protectives in accordance with Section 716 for shaft enclosures. The *interior exit stairway* and *ramp* ventilation systems shall be independent of other building ventilation systems.

1022.2 Construction.

Enclosures for *interior exit stairways* and ramps shall be constructed as *fire barriers* in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both. *Interior exit stairway* and *ramp* enclosures shall have a *fire-resistance rating* of not less than 2 hours where connecting four stories or more and not less than 1 hour where connecting less than four stories. The number of stories connected by the *interior exit stairways* or *ramps* shall include any basements, but not any *mezzanines*. *Interior exit stairways* and *ramps* shall have a *fire resistance rating* not less than the floor assembly penetrated, but need not exceed 2 hours.

Exception: *Interior exit stairways* and *ramps* in Group I-3 occupancies in accordance with the provisions of Section 408.3.8.

1023.3 Construction.

Exit passageway enclosures shall have walls, floors and ceilings of not less than a 1-hour *fire-resistance rating*, and not less than that required for any connecting *interior exit stairway* or *ramp*. *Exit passageways* shall be constructed as *fire barriers* in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

Question: Is it the requirement of the Code that symmetry testing is required by Section 703.2.1 for this application, as referenced by the above Code Paths, whether the smokeproof enclosure ventilation application is satisfied by built assemblies or listed products?

Answer:

Option #1/Petitioner: Petitioner respectfully believes the answers to these questions are "YES."

Note: for more clarification with regard to the Petitioner's answer, please see answer to "Part One" above.

Option #2/Staff: The product in question "a duct is specified for fire resistive protection" is a proposed alternative to the prescribed smoke proof enclosure ventilation application as specified

in Sections 909.20.2, 707.3.2, 707.3.3, 707.3.4, 1009.2.2, 1009.3.1.2, 1022.1, 1022.2, 1022.6, and 1023.3 of the Florida Building Code “FBC”, Building. As per Sections 104.11 and 703.3 of the Florida Building Code, Building, an alternative method of construction to that prescribed in the FBC is subject to review and approval by the local building official, when such alternative is substantiated to be equivalent of that prescribed in the FBC in quality, strength, effectiveness, durability and safety.

PART FOUR

Situation

On this project, a duct is specified for fire resistive protection, which would be subject to this thread below from 909.20.6.1 back through to symmetry testing requirements, since the ductwork is within the building.

Per Section 909.20.6.1, ducts serving as stairwell shaft pressurization must comply with the construction of a smoke proof enclosure and directly subject to the same thread from Section 707 (see PART THREE above), where through subsections of 707.3 and subsequent references, we see similar paths back to symmetry testing requirements.

909.20.6.1 Ventilation systems.

Smoke proof enclosure ventilation systems shall be independent of other building ventilation systems. The equipment, control wiring, power wiring and ductwork shall comply with one of the following:

1. Equipment, control wiring, power wiring and ductwork shall be located exterior to the building and directly connected to the smoke proof enclosure or connected to the smoke proof enclosure by ductwork enclosed by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.
2. Equipment, control wiring, power wiring and ductwork shall be located within the smoke proof enclosure with intake or exhaust directly from and to the outside or through ductwork enclosed by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.
3. Equipment, control wiring, power wiring and ductwork shall be located within the building if separated from the remainder of the building, including other mechanical equipment, by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.

Question: Is it the requirement of the Code that symmetry testing is required by Section 703 .2.1 for this application, as referenced by the above Code Paths, whether the stairwell pressurization application is satisfied by built assemblies or listed products?

Answer:

Option #1/Petitioner: Petitioner respectfully believes the answers to these questions are “YES.”

Note: for more clarification with regard to the Petitioner's answer, please see answer to "Part One" above.

Option #2/Staff: The product in question "a duct is specified for fire resistive protection" is a proposed alternative to the prescribed stairwell pressurization application as specified in Section 909.20.6.1 of the Florida Building Code "FBC", Building. As per Sections 104.11 and 703.3 of the Florida Building Code, Building, an alternative method of construction to that prescribed in the FBC is subject to review and approval by the local building official, when such alternative is substantiated to be equivalent of that prescribed in the FBC in quality, strength, effectiveness, durability and safety.