Construction Concerns: Curtain Wall Fire-Stopping

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For www.fireengineering.com

Recently, a remodeling project in a school exposed the structure supporting the upper floors, the open joints between the edges of the upper floors, and the nonload-bearing aluminum-framed glass curtain wall.

Photo 1 shows a high-rise building with similar aluminum-framed glass curtain walls on three sides.
Photo 2 shows the underside of the second floor of the school exposed by the removal of the perforated metal plenum ceiling panels at the exterior (curtain) wall. The structural steel and the underside of the floor are covered with spray-on fireproofing insulation (except for the foot-wide strip next to the exterior wall). This was supposed to be a one-hour-rated floor assembly, but it actually isn’t since the fireproofing is not complete and there is no joint sealing system to prevent fire or smoke from moving between floors.
Photo 3 shows that the only separation between floors is the plywood bottom shelf in the bookcase against the exterior wall (as viewed from above in another room).
A plywood bookcase shelf does not have noncombustible and other physical properties to prevent fire or smoke from moving between floors. Today’s building and fire codes require the use of a tested and approved sealing system for the joints between curtain walls and floors and at the penetration of fire-rated walls and floors by cables, pipes, and ducts. Lack of an approved sealing system at these joints and penetrations can permit the spread of fire and smoke throughout a building, much as they do in a combustible building of balloon-frame construction.

In new construction and in buildings under renovation or remodeling, the requirement for installation of firestopping at the joint between a fire-resistance-rated floor and the curtain wall is enforced by the municipal building inspector and must follow the building and fire codes as adopted and modified by the state and municipality in which the building is located. Visits by fire department members to buildings under construction can assist the building inspectors.

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After the building is complete, the maintenance of firestopping joint and penetration systems is the responsibility of the property owner and the fire prevention bureau or fire inspector.

At the time this article was written, it had not yet been determined whether the joint sealing system was omitted in the school because there was no code requirement for it at the time of construction or if it had simply been omitted. It also had not yet been determined how the missing firestopping and insulation in this school would be addressed.

When responding to any building, always check for smoke and fire extension in the areas of the building adjacent to the room or area of fire origin. Just as the lumber used to firestop between floors in a balloon-frame house can be missing, too frequently the joint and penetration sealing systems in fire-resistive and noncombustible buildings are compromised or missing.

Joint and penetration sealing systems in buildings under renovation and remodeling are required by the current model building and life safety codes.


**“8.3.5 Joints.”**

**“8.3.5.1 General.”**

“8.3.5.1.1 The provisions of 8.3.5 shall govern the materials and methods of construction used to protect joints in fire barriers, in between fire barriers, and at the perimeter of fire barriers where fire barriers meet other fire barriers, the floor or roof deck above, or the outside walls.”

**“8.3.5.2 Joint System Requirements.”**

“8.3.5.2.1 Joints made within or at the perimeter of fire barriers, between fire resistance-rated assemblies, or where fire barriers meet other fire barriers, the floor or roof deck above, or the outside walls shall be protected with a joint system that is designed and tested to prevent the spread of fire for a time period equal to that of the assembly in which the joint is located.”

“8.3.5.2.3 Joints shall be installed in accordance with a tested system, and installed and maintained in accordance with the manufacturer’s instructions.”

**“8.3.5.4 Exterior Curtain Walls and Perimeter Joints.”**

“8.3.5.4.1 Voids created between the fire resistance-rated floor assembly and the exterior curtain wall shall be protected with a perimeter joint system that is designed and tested in accordance with ASTM E2307, *Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Apparatus*. 8.5.3.4.2 The perimeter joint system shall have an F rating equal to the fire resistance rating of the floor assembly.”

Chapters 14-15 of NFPA 101-2018 contain more detailed requirements for educational occupancies. Adjacent chapters detail the requirements for other types of occupancies.


The *International Building Code*, 2018 edition, Chapter 7 “Fire and Smoke Control Features” contains similar requirements:

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• Section 707 Fire Barriers: “707.8 Joints. Joints made in or between fire barriers, and joints made at the intersection of fire barriers with fire-resistance-rated floor or roof sheathing, slab or deck above and the exterior vertical wall intersection shall comply with Section 715.”

• Section 712 Vertical Openings: “712.1.5.1 Joints made in or between horizontal assemblies shall comply with Section 715. The void created at the intersection of a floor/ceiling assembly and an exterior curtain wall assembly shall be permitted when protected in accordance with Section 715.4.”

• Section 715 Fire-Resistant Joint Systems:
  o “715.1.1 Curtain Wall Assembly. The void created at the intersection of a floor/ceiling assembly and an exterior curtain wall assembly shall be protected in accordance with Section 715.4.”
  o “715.4 Exterior curtain wall/floor intersection. Where fire-resistance rated floor or floor/ceiling assemblies are required, voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies shall be sealed with and approved system to prevent the interior spread of fire. Such material shall be securely installed and capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E119 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (0.254 mm) of water column (2.5 Pa) for the time period not less than the fire-resistance rating of the floor assembly.”

For an example of an approved firestopping method for the joint between a concrete floor and an aluminum/glass curtain wall, visit the Underwriters Laboratories online certifications directory at http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.html?_ga=2.158747256.39647048.1530484240-2128410945.1530484240 and search for “XHDG” or System Number “CW-D-1017.”

To review NFPA codes and standards in print or online, visit your fire department’s fire prevention bureau or the library at your local technical college or fire training school. To review the NFPA codes and standards by way of free access (read only), visit https://www.nfpa.org/codes-and-standards/all-codes-and-standards/free-access, create your log-in password, and use the table of contents to locate the standard and chapter you need.


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