Metal Construction Association

March 2003

Exterior Curtain Wall/Floor Intersection

Curtain walls of many types are being used in the construction of modern buildings for a variety of uses. This type of construction has become popular due to its ability to provide exterior walls that are aesthetically pleasing, energy efficient, functional and cost competitive with respect to materials and installation.

When a curtain wall is constructed on a building, a gap or void is created at the intersection of the floor assembly and the interior face of the curtain wall. Building Codes require the sealing of these voids along the perimeter of the building. Based on a careful review of the specific requirements and intent of Section 713.4 Exterior Curtain Wall/Floor Intersection of the International Building Code (IBC) 2003 it specifies that sealing of the void between the floor slab and the curtain wall is required when a fire resistant rated floor is required. (See Attachment 1). As further detailed in the IBC, and its predecessor model codes, the sealing material or system used in this perimeter void must:

- Be an approved material or system (approved means acceptable to the building official per IBC Sec. 201 Definitions.)
- Be securely installed
- Be capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E119 fire conditions under a minimum positive pressure of 0.01 inch of water column for the time period at least equal to the fire resistance of the floor assembly.

For years, the above specific requirements have been followed in the construction of buildings with curtain walls of various materials. Construction voids of various widths have been sealed with fire resistive noncombustible materials such as rockwool or slag mineral wool batts or blankets and fastened in place with steel pins or clips. These materials have been shown to be capable of withstanding exposure to the rigors of the ASTM E119 time-temperature fire environment. Figures 1 and 2 illustrate typical details of the construction void and the seal material between the slab and the curtain wall. In most buildings with fire resistant floor assemblies, except perhaps storage and factory uses, the construction void is concealed by the interior finish.

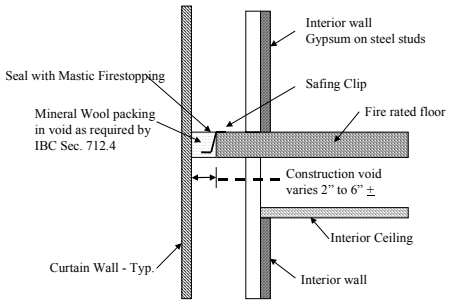

Fig.1 Exterior Curtain Wall/Floor Intersection with interior wall

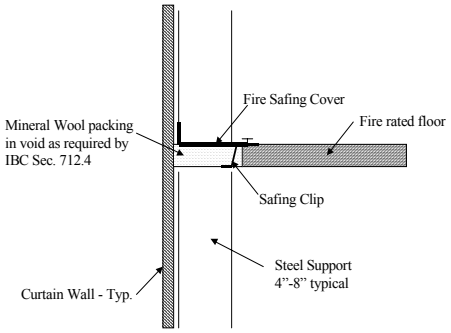

Fig.2 Exterior Curtain Wall/Floor Intersection with no interior wall

Several years ago certain manufacturers of fire resistive materials began work on a new test method to evaluate exterior walls joining rated floors. This work continues today by an ASTM Task Group and as yet, no consensus standard has been developed. However, it has been brought to our attention that some purveyors of fire-resistant insulating materials are advising architects, engineers and building owners that they should use materials that have been tested and listed by testing laboratories as having passed a proposed fire test known as "ASTM Draft Designation – Z7211A Standard Test Method for Determining the Fire-Endurance of Perimeter Fire Barrier Systems Using the Intermediate-Scale Multi-Story Test Apparatus". To pass the early versions of this proposed test standard, approved fire resistive materials are required to not only be inserted into the void, but the materials must also be installed above and below the void. This increases the complexity and the cost of these systems. MCA does not believe that the testing laboratories have made it clear to the reader that such listings are for voluntary testing to an incomplete proposed fire test that has not been adopted by any building code in the United States.

Fire resistive materials that pass the proposed test go far beyond that which is required by the IBC. The proposed test is purported to represent a method of testing the sealing of the construction void between the slab and a curtain wall, yet it appears to be more of a curtain wall test involving a curtain wall specimen 13'4" wide by 17'6" high. The two-story wall is exposed to ASTM E119 fire conditions on the inside of the lower story with additional gas jets located on the exterior to simulate flames from a post flashover compartment fire. The proposed test standard is of concern to the metal curtain wall industry for several reasons:

1. The proposed test establishes requirements for thermocouple temperature measurements and ASTM E119 conditions that the IBC and other building codes have never required. Such requirements would necessitate that curtain walls have some level of fire resistance, yet building codes presently permit non-fire rated exterior walls to be used based on occupancy and fire separation.
2. A significant hardship to manufacturers may occur due to the fact that there are a limited number of properly equipped laboratory facilities capable of performing the proposed test. This may cause lengthy delays in obtaining results due to the large number of tests required to be performed on the multitude of slab/void/curtain wall material combinations. The proposed test requirements would mandate testing multiple wall systems. Even when the wall system is constructed using the same panel material, changes in fastening techniques or joining methods could require additional testing.
3. The difficulty of shipping specimen curtain walls to distant laboratories equipped with the multi-story apparatus and to conduct the number of tests of the slab/void/curtain wall combinations may be cost prohibitive to many manufacturers.
4. The use of a full-size two-story curtain wall specimen to determine if the material used to meet the requirements of the code for the slab/curtain wall interface is believed to be excessive and inappropriate.

While potential problems may be perceived by the manufacturers of fire resistive materials no actual adverse fire experience has been specifically identified with curtain wall type buildings (i.e. no vertical spread of fire at the floor/wall intersection) when the curtain wall/floor void is properly sealed. It should be recognized that buildings over three stories high must have not less than one-hour fire resistive spandrel walls at least three feet high or be fully sprinklered. We believe the present requirements of the IBC, and its predecessor model codes, have been proven adequate in two ways. First, there is an absence of documentation or actual fire reports indicating that fires in buildings have frequently spread from floor to floor through sealed voids between the slab and curtain wall. Secondly, the recent publication by NFPA of statistical data on structure fires in office occupancies between 1980 and 1998 shows that during that 18-year period structure fires in office occupancies fell 51 percent. We therefore believe it is reasonable to conclude that the current requirements of Section 713.4 Exterior Curtain Wall/Floor Intersection, of the IBC are adequate.

MCA hopes the information contained herein will be helpful to you in your understanding of the requirements of the building code and compliance with their specific requirements pertaining to exterior curtain wall/floor intersections.

Attachment 1. Text of Section 713.4 of International Building Code – 2003 Edition

Section 713.4 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 an approved material. 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 at least equal to the fire resistance rating of the floor assembly. Height and fire-resistance requirements for curtain wall spandrels shall comply with Section 704.9.