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THE ATRIUM PROVISIONS AND THE RELIABILITY OF SPRINKLER SYSTEMS: CODE CHANGE PROPOSAL G71-07/08

By Richard Schulte

The International Building Code (IBC) requires floors in a building be separated from each other in order to prevent the rapid spread of fire between floors. In high rise buildings, the IBC requires that the floor construction develop either a one or two hour fire resistance rating.

One exception to the requirement that floors in a building be separated from each other is the atrium provisions. The atrium provisions permit multiple floors in a building to be connected to one another by a floor opening provided that the building is protected by an electrically supervised sprinkler system and the atrium space is provided with a smoke control system.

In addition to sprinkler protection and a smoke control system, the IBC also requires that the floor openings forming the atrium be separated from occupied spaces

by 1 hour fire resistive construction, however, there are several exceptions to this requirement. One of the exceptions to the separation requirement permits a maximum of three floors to be open to the floor openings forming the atrium. Another exception permits non-rated glazing to be utilized as a substitute for the 1 hour separation where the glazing is protected by sprinklers located in close proximity to the glazing.

With respect to the design of the smoke control system, the smoke control provisions contained in the IBC specifically permit the smoke control system to be designed based upon the assumption that the sprinkler system will be operable and will perform as intended.

The atrium provisions permit multiple floors in a building to be connected to one another by a floor opening provided that the building is protected by an electrically supervised sprinkler system and the atrium space is provided with a smoke control system.

The theory behind the atrium provisions is that the sprinkler protection provided will confine the spread of fire to the area of origin and prevent fire spread between floors. By confining the spread of fire to the area of origin, the quantity of combustion products generated by the fire will also be limited and the required smoke control system will prevent the spread of combustion products to floors other than the floor of origin. In other words, the combination of sprinkler protection and smoke control will, in effect, duplicate the protection provided by floor construction.

From a theoretical standpoint, the substitution of sprinkler protection and a smoke control system for floor construction is logical, however, it is obvious that the equivalency hinges on the reliability of both the sprinkler system and the smoke control system.

In other words, the combination of sprinkler protection and smoke control will, in effect, duplicate the protection provided by floor construction.

In the last 10 years or so, the manufacturers of passive fire protection products have questioned the reliability of sprinkler protection, thereby calling into question reductions in passive fire protection permitted by building codes when sprinkler protection is provided. It seems obvious that if sprinkler protection is not considered reliable, then the substitution of sprinkler protection and a smoke control system for floor construction should not be permitted.

The issue of whether or not the atrium provisions should be included in the International Building Code due to a lack of sprinkler system reliability was “tested” in code change proposal G71-07/08. This code change proposed that the atrium provisions be removed from the code.

The issue of whether or not the atrium provisions should be included in the International Building Code due to a lack of sprinkler system reliability was “tested” in code change proposal G71-07/08.

The following are excerpts from the reason statement accompanying code change G71-07/08:

“The purpose of this code change proposal is to delete the atrium provisions in order to prevent buildings with atriums from being constructed.”

“The atrium provisions presently contained in the code allow the most basic compartmentation required by the code, floor-to-floor separations, to be violated if a building is protected by an electrically supervised sprinkler system and the floor opening forming the atrium is provided with some form of smoke control. . .”

“In recent code change cycles, lobbyists for the manufacturers and installers of passive fire protection have questioned the reliability of sprinkler systems. In the “reason” statement for Code Change G57-01, the Association of the Wall and Ceiling Industries, International states that sprinkler protection fails in 23 percent of the fires which occur in buildings protected by a sprinkler system. In an article titled “Is the AFSCC [Alliance for Fire and Smoke Containment and Control] Anti-Sprinkler?”, the AFSCC asserts that the failure rate of sprinkler systems is 1 in every 6 fires which are large enough to activate sprinklers. This same AFSCC article references a report on sprinkler system reliability written by William Koffel of Koffel Associates, Inc.. The “Koffel Report” concludes that the average failure rate of sprinkler systems is 1 in 10 fires large enough to activate sprinklers. Another report on sprinkler reliability published by the National Fire Protection Association titled “U.S. Experience With Sprinklers and Other Fire Extinguishing Equipment,” dated August 2005 (actually released on September 9, 2005) concludes that the average sprinkler system failure rate is 1 in 9 fires large enough to activate sprinklers.”

“Given the above, either the passive fire protection industry is correct about the reliability of sprinkler systems, in which case the atrium provisions should be removed from the code, or the passive fire protection industry’s sprinkler system failure rate statistics are grossly exaggerated and the substitution of sprinkler protection for floor-to-floor compartmentation is acceptable.”

The atrium provisions presently contained in the International Building Code were developed in the late 1970's and the atrium provisions were included in the three regional model building codes utilized in the United States around 1980. Hence, we have had close to 30 years of experience with the application of the atrium provisions. Since 1980, a major fire has never occurred in a sprinklered building containing an atrium in the United States. If sprinkler protection were as unreliable as claimed by representatives of the manufacturers of passive fire protection products, it would seem that there would have been at least one, perhaps multiple, major fires in buildings containing atriums in the last 3 decades.

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In September 2008, the membership of the International Code Council (ICC) considered code change G71-07/08 at the final code development hearing held in Minneapolis, Minnesota. Code change G71-07/08 was disapproved by a unanimous vote of those attending the hearing. In other words, the ICC membership considers sprinkler protection to be reliable enough to justify allowing atriums in buildings, regardless of the height. If sprinkler protection is reliable enough to allow atriums which are 30, 40 or 50 stories in height, it would seem that sprinkler protection should be considered to be reliable enough to justify all of the other reductions in passive fire protection permitted by the code when sprinkler protection is provided.

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