

Atriums

By Ronald L. Geren, AIA, CSI, CCS, CCCA, SCIP

They're almost everywhere in today's corporate and government construction. You can't enter most of today's large shopping malls without being in one, and even smaller business centers have used them. If you haven't figured out already by reading the title, I'm talking about atriums (also called atria).

These large, open, interior spaces allow two or more stories to open into them. Atriums were originally used in Roman residential design as a large open space in the center of the house with an opening at the top, but didn't necessarily connect multiple floors. They were used to receive guests and as places for family events. The term has since been applied to multistory open spaces within a building, usually in public sector design, which are enclosed at the top, typically with a skylight. An open atrium is defined as a "court" in the building codes.

Some architects and mechanical engineers will cringe when they hear the term "atrium" used on a project, since atria has connotations of fire barriers, sprinklers, and worse...smoke control. Although any large opening could be labeled an atrium, all the building codes in the past have attached very specific criteria to the definition of an atrium. As we'll see later in the article, the definition of an atrium in the 2003 *International Building Code* (IBC) has been relaxed a little, but those pesky enclosure, sprinkler and smoke control requirements still remain, which I'll address first.

Remains the Same

Automatic Sprinkler Protection. Buildings having an atrium must be sprinklered throughout. The only exceptions are spaces above and adjacent to the atrium that are separated by a 2-hour fire-resistive barrier, and within the atrium itself if the ceiling is greater than 55 feet above the floor.

Fire Resistive Enclosure. Atriums, regardless of the number of floors involved, must be separated by a 1-hour fire barrier. This isn't as restrictive as it first appears, since it is much better than the 2-hour enclosure required of vertical shafts connecting 4 or more stories. The code permits the use of sprinklers at 6-feet on center along glazed openings in lieu of the 1-hour rating. The sprinklers need only be on the room side if no walkway is provided on the atrium side of the separation. For those wanting glass openings into the atrium, this would be a cost-effective alternative to fire-rated glazing since a sprinkler system is already mandatory.

Other exceptions to the enclosure requirement include the use of glass block, having a 3/4-hour fire protection rating, installed per the code, and up to three floors of the atrium need not be separated provided that the volume of those spaces is included in the smoke control system. Speaking of smoke control...

Smoke Control System. Smoke control, or the removal of smoke from a space, will always remain a significant component of atrium design for a very valid reason. During fires, smoke will eventually fill up the space denying people within the space the necessary visibility and breathable air to quickly exit the building. Smoke control, installed in accordance with IBC Section 909, will hold the smoke to a suitable level.

The Changes

Significant changes have occurred regarding atriums since the publication of the 1997 *Uniform Building Code* (UBC). The most notable change is in the definition itself. The UBC defined an atrium as “an opening through two or more floor levels.” The UBC definition, depending on its interpretation, could apply to floor openings connecting three stories by its reference to openings through floor levels. The UBC didn’t define what a floor level was, so it was logically determined that a floor level was the physical separation between floors. Thus, “through” meant penetrating a floor separation thereby leading to the interpretation of connecting three or more stories. This interpretation was further reinforced by UBC Table 4-A, Atrium Opening and Area, which begins at three stories and goes up.

However, in developing the IBC, the code officials strived to clarify the application of atriums. The IBC defines an atrium as “an opening connecting two or more stories.” This definition refines the UBC definition by changing “floor levels” to “stories,” and calling it a “connection” rather than an “opening through” a floor level. Now, if you haven’t used the IBC for floor openings or atriums yet, then this may come as a shock. But be patient, it does get better as I explain later in the article.

Another notable change affected the minimum opening area and dimensions formally established by UBC Table 4-A, mentioned above. This table set the minimum dimension at 20 feet in any direction, and the minimum area at 400 square feet. Those minimums are for atriums 3 and 4 stories in height. As the number of floors within an atrium increased, so did the minimum dimension and area. But in the IBC, there are no minimum dimensions or opening area; any opening of any size can be treated as an atrium.

I emphasized the words “can be” because I’ve been hearing complaints about all interior, multi-story, open spaces now having to comply with the requirements of atriums under the 2003 IBC; even spaces connecting only two stories. Fortunately, this is not the case.

Clarifying the Confusion...Hopefully

In the UBC, if the opening didn’t meet the dimension and area requirements for atriums, then the space had to be treated as a shaft per UBC Section 711 (although there was no specific reference to this section). It is within this section that an exception allowing unprotected openings connecting two stories is provided. But, when one looks at the IBC, especially after using the UBC for a long time, going straight to Section 404 for atrium requirements would be a logical process to follow. If this route is taken, then it would be understandable for code users to get alarmed since the section doesn’t establish any requirements for dimensions, area, or number of stories, nor does it direct the user to Chapter 7 for requirements (and more importantly, the exceptions to the requirements) for shaft enclosures.

For an IBC user looking for floor opening requirements, they should start in Section 707 for shaft enclosures. In this section, it essentially states that all “openings through a floor/ceiling assembly shall be protected by a shaft enclosure.” However, that basic requirement is followed by 12 possible exceptions, and it is here where the code user should look closely.

One of the exceptions (specifically Exception No. 5) allows the user to comply with the requirements for atriums and malls in lieu of providing a shaft enclosure. So, here is where the connection to Section 404 is made. But, before taking that major step, we’ll take a look at one other important exception.

For those who were extremely upset with the thought that all 2-story openings now had to comply with the requirements for atriums, Exception No. 7 will come to their rescue. As long as the building occupancy isn't classified as I-2 (hospitals, etc.) or I-3 (prisons, etc.), then Exception No. 7, which eliminates the requirement for an enclosure, may apply. Within this exception, there are six additional provisions that must be met in order to take advantage of the exception:

1. The opening cannot connect more than two stories.
2. The opening is not part of a required means of egress system unless permitted by Section 1019.1, which, to paraphrase, allows one half of the required exits to be unenclosed between any two adjacent floors (provided there's no connection to other floors), or between the first and second stories of a building equipped with a sprinkler system. In either case, a minimum of two exits are required.
3. The opening is not concealed within the building construction (i.e. concealed within is a wall).
4. The opening is does not connect to a corridor in occupancies consisting of either I or R.
5. The opening is not exposed to corridors on nonsprinklered floors.
6. The opening is separated from openings to other floors by fire-rated construction for shaft enclosures.

Is this confusing? – Yes.

Does it prohibit the use of two-story open atriums? – Definitely not.

Understanding how building codes are organized is a big step it understanding its specific content. Focusing on one section doesn't necessarily give you the full picture of what is required, or even what is not required. Like construction documents, building codes use the same principle of "say it once, and say it in the right place." You can't look at a single specification section or a sheet of details and expect to go out and construct a building. The same concept applies here...you need the other elements of the code to comprehend the full application of the building code. And, the provisions for atriums are good examples that illustrate this distinctly.

To comment on this article, suggest other topics, or submit a question regarding codes, contact the author at ron@specsandcodes.com.

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