

## Fire Areas

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

You've probably heard the term "fire area" before, but it was most likely in the context of describing areas of land ravaged by a wildfire, or land areas that were subdivided into smaller units of land based on fire risk and other fire-potential factors. Actually, the latter is very similar to the "fire area" concept that this article will cover, but as applicable to buildings. For most building code users, this concept is something completely new; but for users of the *National Building Code*, published by the former Building Officials and Code Administrators (BOCA), the use of "fire areas" in a building is nothing new.

The concept of a "fire area" is really quite simple, as I'll explain later on, but to understand the concept, you need to know how it is defined in the code. The definition of a fire area in the *International Building Code* (2006 Edition) is very similar to the one provided in the *National Building Code*, except that terminology has been changed to reflect the current terms now used. The definition of a "fire area" in the IBC is:

*The aggregate floor area enclosed and bounded by fire walls, fire barriers, exterior walls or fire-resistance-rated horizontal assemblies of a building.*

You'll notice that not all of the fire-resistance-rated construction defined by the IBC is included. Missing from the list are fire partitions and smoke barriers. Also missing are shaft enclosures, but these technically are not excluded, since a shaft enclosure, per Section 707.1, must be constructed to the requirements of fire barriers and horizontal assemblies, which are included. Therefore, to determine a fire area you identify all the fire-resistive construction in the building as listed in the definition, plus the exterior walls. Each compartment created within those boundaries is considered a fire area (see Figure 1).

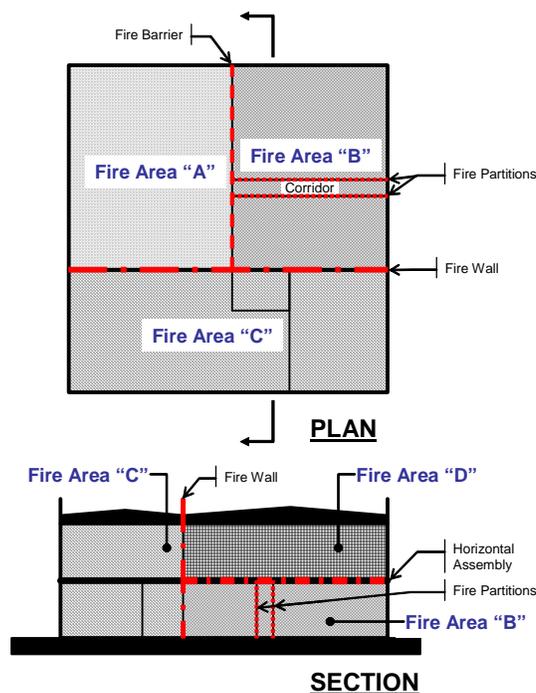


Figure 1 - Fire Area Example

Each compartment created within those boundaries is considered a fire area (see Figure 1).

It is important to note that a single fire area may have one or more occupancy groups, especially if nonseparated uses (or a combination of separated and nonseparated uses) are utilized in the building's code compliance strategy. Now that you know how fire areas are determined, the next question is: what is the purpose of a fire area?

There are several locations where fire areas are used in the requirements of the code. The most significant use of fire areas is in requiring the installation of a sprinkler system in a portion of or throughout a building. Section 903.2 identifies the locations where automatic sprinkler systems are required. For example, in Section 903.2.1.2 for Group A-2 occupancies, there are three conditions where an automatic sprinkler system is required to be installed;

all of which are based on fire areas and are applicable to the entire fire area, whether or not there are multiple spaces or occupancy groups within the fire area. If any one of the three conditions apply, then the sprinkler system is required. These conditions are:

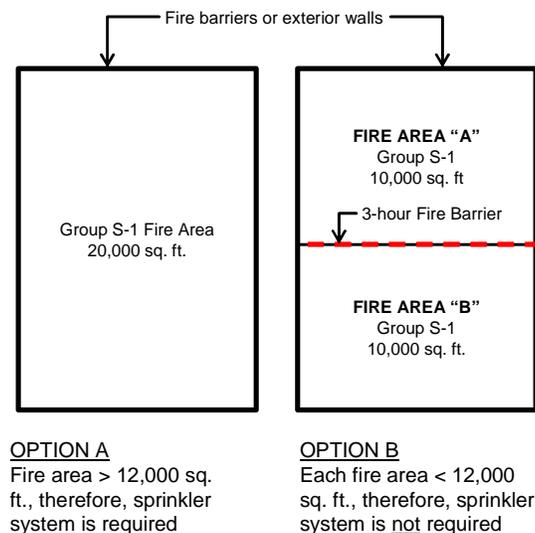
1. If the fire area exceeds 5,000 square feet.
2. If the fire area has an occupant load of 100 or more. For example, in Figure 1, if Fire Area “B” included a Group A-2 occupancy on one side of the corridor with an occupant load of 60, and a Group B occupancy on the other side with an occupant load of 45, the total occupant load of the fire area would be 105, thereby requiring a sprinkler system.
3. If the fire area is located on a floor other than the level of exit discharge. This includes fire areas that extend into upper floors. For example, in Figure 1, if Fire Area “C” had a Group A-2 occupancy on the first floor, a sprinkler system would still be required because the fire area includes the second floor.

If a building has a fire area that falls within any one of the above conditions, a sprinkler system is required throughout the fire area and not just the Group A-2 occupancy. However, this is just an example of one occupancy group; the IBC has similar requirements for many of the other occupancy groups, as well. Some occupancies are much more restrictive than that described above. Take Group R occupancies for example; they require an automatic sprinkler system throughout all buildings with a Group R fire area. In other words, if a building contains a single dwelling or sleeping unit, even if it is contained within its own fire area, then the entire building requires a sprinkler system.

One option to keep in mind is that if a single occupancy fire area exceeds the threshold for a fire sprinkler system, the fire area can be separated into two or more smaller fire areas to keep the size of each fire area below the threshold. To utilize this strategy, the code user needs to go to Table 706.3.9. This table establishes the minimum fire-resistance rating for fire barriers within single occupancy areas.

As an example, let us assume that an S-1 storage space has an area of 20,000 square feet and is completely separated on all sides by either exterior walls, complying fire barriers, or both (See Figure 2). According to Section 903.2.8, any S-1 fire area exceeding 12,000 square feet requires a sprinkler system. If the owner wants to avoid the cost of a sprinkler system, the storage space can be divided by a fire barrier having a 3-hour fire-resistance rating according to Table 706.3.9. If the fire barrier is located so that each of the smaller fire areas has an area less than or equal to 12,000 square feet, then no sprinkler system is required.

Another area of the code that incorporates the fire area concept is the section on mezzanines. Design professionals who are generally familiar with building codes are probably aware that a floor level that complies with the definition of a



**Figure 2 - Single Occupancy Fire Areas**

mezzanine is not considered a story, and the area of the mezzanine does not contribute to the building area. But, in regard to the definition of a fire area, the floor area of a mezzanine is included. Therefore, if we look back at Condition 1 for Group A-2 occupancies above, and if the fire area has a complying mezzanine, then the area of the mezzanine must be added to the rest of the fire area's floor area when comparing it to the threshold requirement for a sprinkler system.

Fire areas also come into play when determining mixed occupancies, especially when using the option of combining separated and nonseparated uses. This is particularly important when multiple stories are involved and there are some or no horizontal assemblies in the building. For example, using Figure 1, if Fire Area "C" had a Group A-3 on the first floor and a Group B on the second floor, and the building was classified as Type VB construction, then the building would be noncomplying.

The reason? There is no horizontal assembly between the Group A-3 and B occupancies, therefore, the entire fire area—both floors—is considered a Group A-3 occupancy since the A-3 is the most restrictive occupancy group. According to Table 503, a Group A-3 is limited to one story in a Type VB building. To overcome the situation, construct the floor/ceiling assembly in accordance with the requirements for horizontal assemblies; or, see if the building complies with the requirements for Type VA or IIIB construction.

The last location in the IBC where fire areas are used is in Chapter 34 for existing buildings; more specifically, in Section 3410 "Compliance Alternatives." This section is used as an alternative to complying with other provisions of the code when an existing building is considered for repair, alteration, addition, or change of occupancy. This article is won't go into the details of evaluating an existing building under this section, but it is noteworthy to state that some of the evaluation criteria is based on the fire area concept.

Although the fire area concept is new to many users of the IBC, it is not that difficult to comprehend. It is like a multi-door refrigerator/freezer: each compartment (refrigerator and freezer) is fully isolated from the other—like a fire area, but within each isolated compartment are many smaller compartments and shelves that may serve different or similar functions—like the spaces and rooms within a fire area. The intent behind fire areas is to limit the spread of fire in a building that does not have a sprinkler system installed. There are arguments, as stated in previous articles, that compartmentation (i.e. fire areas) and sprinkler systems should be used together and not one in lieu of the other; the "belt and suspenders" method of building safety. But until the time that argument makes its way into the text of the building code, it's one or the other in most cases as the minimum requirement.

*To comment on this article, suggest other topics, or submit a question regarding codes, contact the author at [ron@specsandcodes.com](mailto:ron@specsandcodes.com).*

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