

Portable Fire Extinguishers

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The modern portable fire extinguisher was invented by British Captain George W. Manby. There is no consensus on the year in which it was invented, but based on the many sources available, it was somewhere between 1813 and 1819. The Manby extinguisher consisted of copper cylinders containing a potassium carbonate solution and compressed air. When released by a valve, the compressed air forced the solution onto the fire. Throughout the 19th century and into the early 20th century the portable fire extinguisher saw a series of improvements from soda-acid to the common dry chemical extinguisher used today.

Portable fire extinguishers are a fire protection feature often overlooked by architects. When a building design does include portable fire extinguishers, the number provided and the locations where they are indicated usually do not meet the requirements of the building and fire codes. The location and number of portable fire extinguishers provided need to be clearly indicated in the construction documents to eliminate costly and possibly unsightly field modifications.

Portable fire extinguishers include the hand-held types as well as the wheeled types. Both types have to comply with the same requirements, except that wheeled-type extinguishers do not have to comply with the mounting requirements specific to hand-held extinguishers, such as brackets and hangers.

Code Requirements

Surprisingly, the *International Building Code* (IBC)[†] had very little content regarding portable fire extinguishers until the publication of the 2009 edition. Prior to 2009, the IBC just referred users to the *International Fire Code* (IFC)[†]. To simplify searching, the 2009 IBC now includes in Chapter 9 the portable fire extinguisher requirements that had been exclusively located in the IFC.

The IBC/IFC require fire extinguishers in all occupancies except for Group R-3. There is an exception for Group A, B, and E occupancies when quick-response sprinklers are installed throughout the building. The exception, however, does not eliminate portable fire extinguishers entirely; portable fire extinguishers must still be provided in all occupancies (except Group R-3) in the locations listed below:

- Within 30 feet of commercial cooking equipment;
- In locations where combustible or flammable liquids are either used, dispensed, or stored;
- On each floor of a building under construction;
- Where required by Table 906.1[‡]; and
- In laboratories, computer rooms, generator rooms, and other locations determined by the fire code official to be special hazards.

Referenced by the IBC/IFC, NFPA 10, 2007 Edition, *Standard for Portable Fire Extinguishers*, provides requirements regarding the selection, placement, and maintenance of portable fire extinguishers.

[†] The 2009 IBC and IFC, Second Printings, are used in the preparation of this article. Since the content of both are identical, the article will use IBC/IFC to reference both codes.

[‡] Table 906.1 includes several locations and conditions too numerous to list in this article. For each item in the Table there is a reference to the IFC Section for specific requirements.

Most of the standard’s content is focused on maintenance, inspection, and testing of portable fire extinguishers. However, many of the requirements in NFPA 10 are included in the texts of the IBC/IFC.

Selection of Fire Extinguishers

The selection of portable fire extinguishers is based primarily on the type of fire most likely to be encountered in the building. NFPA 10 defines the five types of fire classes:

- Class A: Fires involving ordinary combustible materials, such as wood, cloth, paper, rubber, and most plastics. This is the type of fire that would occur in most building conditions.
- Class B: Fires involving flammable and combustible liquids, petroleum-based materials, paints, solvents, alcohols, and flammable gases. This type of fire would likely occur where such materials are used, dispensed, or stored.
- Class C: Fires involving energized electrical equipment. In addition to building electrical service equipment, this type of fire could occur with electric equipment, such as computers and copiers.
- Class D: Fires involving combustible metals, such as magnesium, titanium, zirconium, sodium, lithium, and potassium.
- Class K: Fires in cooking appliances involving combustible cooking materials, such as vegetable or animal oils and fats.

In addition to the fire classifications, spaces are also classified based on their perceived hazard level. The three hazard classifications are determined using the anticipated quantity of Class A and Class B materials. The table below organizes the classification criteria provided in NFPA 10.

Hazard Classification	Class A Materials	Class B Materials
Light (Low) Hazard	Normally expected quantities of furnishings	Expected quantities to be less than 1 gal.
Ordinary (Moderate) Hazard	Occasionally contains materials beyond normal anticipated furnishings	Expected quantities to be from 1 gal. to 5 gal.
Extra (High) Hazard	Involve the storage, packaging, handling, or manufacture of materials	Expected quantities to be more than 5 gal.

Once the fire and hazard classifications are established, the next step is to select the type of extinguisher to use. Portable fire extinguishers use a variety of agents to extinguish fires, but the IBC/IFC do not establish requirements for specific agents, while NFPA 10 sets some restrictions. For the most part, the determination of extinguisher type is performance-based. Portable fire extinguisher performance ratings are determined by ANSI/UL 711, *Rating and Fire Testing of Fire Extinguishers*, 7th Edition.

Ratings identify the type of fire or fires that a portable fire extinguisher can extinguish and the effectiveness of the extinguisher. For example, a “2-A” rating means that the extinguisher can be used only on Class A fires and the number “2,” when multiplied by 1.25, gives the equivalent extinguishing capability in gallons of water—the higher the number, the more effective the extinguisher. The preceding number is used only with Class A and B fire ratings. Portable fire extinguishers can have multiple ratings, such as “3-A:10-B:C,” that allow a single extinguisher to handle multiple types of fires.

Determining Number of Required Extinguishers

A few factors come into play when determining the number of required portable fire extinguishers. These include extinguisher rating, fire classification, hazard classification, and travel distance. IBC/IFC Tables 906.3(1) and 906.3(2) use these factors to determine distribution for Class A and Class B fires, respectively. For example, according to Table 906.3(1), a Class A fire with an Ordinary Hazard requires at minimum a 2-A extinguisher with a 75-foot maximum travel distance to reach the extinguisher. If the travel distance exceeds 75 feet, then an additional extinguisher would be required. The travel distance requirement does not apply to Group A-5 occupancies as provided in an exception in the IBC/IFC.

For Class A fires, Table 906.3(1) sets the maximum areas per unit of “A” and per extinguisher. For an extinguisher in an Ordinary Hazard, the table allows 1,500 sq. ft. per unit of “A”; therefore, a “2-A” extinguisher is limited to a floor area of 3,000 sq. ft. If the area of the building is 6,000 sq. ft., then an additional 2-A extinguisher, or a single 4-A extinguisher, must be provided (as long as the travel distance of 75 feet is not exceeded). Additionally, the table limits any extinguisher, regardless of rating or hazard, to a maximum area of 11,250 sq. ft.; thus, a 10-A extinguisher in an Ordinary Hazard can only cover a 11,250 sq. ft. area and not 15,000 sq. ft. as determined by calculation.

For Class B fires with a flammable or combustible liquid depth of not more than 1/4 inch, use Table 906.3(2). For depths greater than 1/4 inch, the IBC/IFC refer to NFPA 10, which has specific requirements for liquids of “appreciable depth.” According to the IBC/IFC tables, a Class B fire of Ordinary Hazard requires either a 10-B extinguisher with a travel distance of 30 feet, or a 20-B extinguisher with a travel distance of 50 feet; there are no floor area limitations, since the hazard is based on liquid volume and maximum depth.

For Class C fires, the number of extinguishers can be determined based on Class A or Class B requirements. Class D fires require that a portable fire extinguisher is placed within a 75-foot travel distance from the hazard. Class K fires are not specifically mentioned in the IBC/IFC, but NFPA 10 requires that a fire extinguisher is located within a travel distance not exceeding 30 feet from the cooking area.

Location and Installation of Fire Extinguishers

The IBC/IFC and NFPA 10 have nearly identical requirements for the location and installation of portable fire extinguishers. The requirements state that portable fire extinguishers shall be located along normal paths of travel, in conspicuous locations that are readily accessible, and are not obstructed or obscured from view. Although not specifically stated in the IBC/IFC or NFPA 10, locating portable fire extinguishers near a building’s or space’s exits provide a logical choice. Where extinguishers have unavoidable partial visual obstruction, signage or other methods of indicating the location shall be provided.

Hand-held portable fire extinguishers must be installed in a hanger or bracket specifically designed or approved for the type of extinguisher, or they must be housed in a cabinet. NFPA 10 indicates that wall recesses are also acceptable; however, since wall recesses are not mentioned in the IBC/IFC, the building or fire code official may not allow them by referencing Sections 102.4 in the IBC or 102.7 in the IFC, which state when “differences occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply.”

If portable fire extinguishers are housed in cabinets, the cabinets can not be locked except in locations subject to vandalism. If locked, cabinets must include a means of accessing the extinguisher in an emergency. In Group I-3 occupancies and in mental health areas of Group I-2 occupancies, portable fire

extinguishers may be locked and located in staff locations provided the staff has keys readily accessible. Since some cabinets will partially obscure the extinguisher, those cabinets must be marked to identify the extinguisher location as mentioned earlier.

The mounting heights of portable fire extinguishers are determined based on weight of the extinguishers. Extinguishers weighing 40 pounds or less must be installed so that the top of the extinguisher is no more than 70 inches above the floor. Extinguishers weighing more than 40 pounds must be installed so that the top of the extinguisher is no more than 42 inches. In no case shall an extinguisher be installed with the bottom of the extinguisher less than 4 inches above the floor. However, when determining installation heights, you also need to consider accessibility requirements.

ICC/ANSI A117.1, *Accessible and Usable Buildings and Facilities*, 2003 Edition, limits the unobstructed forward reach and side reach to 48 inches. In some jurisdictions, this measurement is taken from the floor surface to the handle of the extinguisher. Another thing to keep in mind is the projection of the extinguisher or cabinet into the path of travel. ICC/ANSI A117.1 limits projections to 4 inches when the bottom of the projection is greater than 27 inches above the floor surface (See Figures 1 and 2).

Figure 1 - Noncompliant locations if bottom of cabinet or extinguisher is greater than 27 inches above the floor. Both A and B locations exceed the 4-inch limitation allowed by ICC/ANSI A117.1.

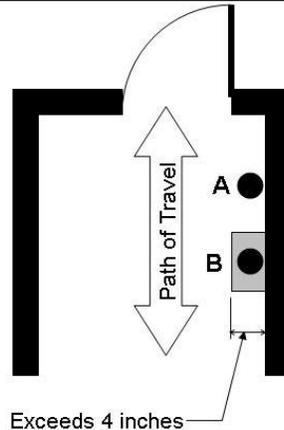
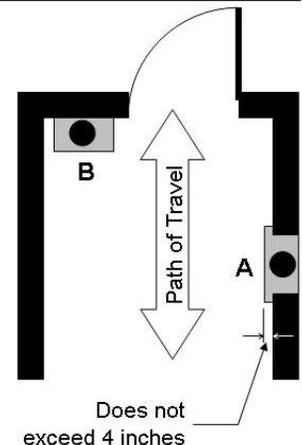


Figure 2 - Compliant locations if bottom of cabinet or extinguisher is greater than 27 inches above the floor. A recessed or semirecessed cabinet at location A will keep the projection to less than 4 inches. The projection at Location B, whether in a cabinet or on a bracket or hanger, may be acceptable—verify with the building official.



If recessed or semirecessed cabinets are installed in fire-resistance-rated wall assemblies such as fire walls, fire barriers, smoke barriers, and fire partitions, the cabinet must have a rating equal to or greater than the wall assembly in which it is installed. Additionally, the penetration must be treated as a membrane penetration as required by IBC Section 713.3.2.

There are many additional requirements in NFPA 10 that apply to portable fire extinguishers; however, they pertain to the maintenance, testing, and inspection of extinguishers, which are owner responsibilities once the building is occupied. Although portable fire extinguishers are not a substitution for an automatic sprinkler system, their presence provides added protection for occupants and structures—that is if the occupants are trained in the use of portable fire extinguishers as required by IFC Section 406.3.4; but that is a topic for another time.

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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