

PART 3

Building and Equipment Design Features

Chapters 5 through 12

- Chapter 5 Fire Service Features
- Chapter 6 Building Services and Systems
- Chapter 7 Fire and Smoke Protection Features
- Chapter 8 Interior Finish, Decorative Materials and Furnishings
- Chapter 9 Fire Protection and Life Safety Systems
- Chapter 10 Means of Egress
- Chapter 11 Construction Requirements for Existing Buildings
- Chapter 12 Energy Systems
- Chapters 13 through 19 (Reserved)

International Fire Code (IFC) Part III contains requirements that provide fire fighters with a means of accessing a building and establishing a fire protection water supply for that building. Chapter 5 contains requirements for address numbers on buildings and provisions for fire department access roadways. Chapter 6 contains requirements for building systems, such as elevators, commercial cooking operations, commercial clothes dryers and refrigeration systems. When specified by the *International Building Code* (IBC), buildings constructed using fire-resistant materials must be properly maintained to ensure the specified fire-resistance ratings are maintained. Chapter 7 specifies the requirements for maintenance of fire-resistance-rated construction.

Interior finish and decorative materials or furnishings offer fuel contribution and surfaces through which a fire can spread and transport heat and smoke to other parts of a room or to other rooms. Chapter 8 contains

requirements for regulating wall and ceiling finishes, decorative materials and furnishings.

Fire protection systems and life safety systems are required in accordance with Chapter 9. Chapter 9 specifies the requirements for automatic sprinkler systems, alternative fire-extinguishing systems, fire alarm and detection systems, standpipes, portable fire extinguishers and other fire appliances, emergency alarm systems, mass notification, smoke and heat vents, smoke control systems, carbon monoxide alarms, and gas detection systems. For materials that can have a detonation or deflagration hazard, Chapter 9 specifies the requirements for explosion control systems.

Merriam-Webster's *New Collegiate Dictionary* defines egress as "a place or means of going out." In the event of a fire or an emergency that requires the occupants to safely exit a building, Chapter 10 establishes the minimum requirements for means of egress from buildings.

Chapter 11 sets forth retroactive construction requirements for existing buildings. These provisions establish minimum fire-resistance rating requirements for shafts as well as minimum means of egress requirements in existing buildings. It also establishes retroactive requirements for the installation of automatic sprinkler systems and fire alarm systems in existing buildings or occupancies.

Chapter 12 addresses energy storage and energy generation systems. This chapter includes emergency and standby power, portable generators, solar photovoltaic power, fuel cells and energy storage systems. This chapter includes other battery technologies, fuel cell power systems and energy storage systems, such as capacitor energy storage. ■



508.1, 508.1.1, 508.1.3, 508.1.7 (NEW)

Fire Command Center

510.4.1, 510.4.1.1, 202

Emergency Responder Communication Coverage – Signals

510.4, 510.4.2.4, 510.4.2.5, 510.4.2.8, 510.5.1 (NEW), 510.5.4

Emergency Responder Communication Coverage – Interference

603.4

Electrical Working Space

604.5.4 (NEW), 604.5.5 (NEW), 315.3.3

Storage in Elevator Machine Rooms and Lobbies

605.1, 605.4, 605.4.1.1 (NEW), 605.4.2.1 (NEW), 605.4.2.2

Fuel Oil Storage Tanks

610

Clothes Dryer Exhaust Ducts

701.6

Maintenance of Fire-Resistance-Rated Construction

703.2, 704.2

Repair of Penetrations and Voids

708, 708.1

Maintenance of Spray Fire-Resistant Materials

808.5 (NEW)

Play Structures

202 (NEW), 901.1, 901.2, 901.2.1, 901.4, 901.4.1, 901.4.2, 901.4.3 (NEW), 901.4.5, 901.6

Life Safety Systems

903.2.4.2 (NEW), 903.2.9.3 (NEW)

Distilled Spirits

903.2.4, 903.2.4.3 (NEW), 903.2.7, 903.2.7.2 (NEW), 903.2.9, 903.2.9.4 (NEW)

Upholstered Furniture and Mattresses

903.2.10, 903.2.11.3

Group S-2 Parking Garages

903.2.10.2, IBC 202

Mechanical-Access Parking Garages

903.3.1.2

NFPA 13R Sprinkler Systems

903.3.1.2.2

Sprinklers on Means of Egress Balconies

905.3.1

Standpipes in Parking Garages

906.1

Portable Fire Extinguishers

907.2.10 (NEW)

Manual Fire Alarm in Public-Storage and Self-Storage Facilities

907.4, 907.5, 907.5.1 (NEW), 907.5.2.1.3 (NEW), 907.5.2.1.3.1 (NEW), 907.5.2.1.3.2 (NEW)

Low-frequency Alarms in Sleeping Rooms

907.5.2.1.2

Sound Pressure Level for Audible Alarms

907.5.2.2.5, 1203.2.4

Standby Power for Emergency Voice/Alarm Communications Systems

907.5.2.3.3, 907.5.2.3.3.1 (NEW)

Expansion Capability for Fire Alarms in Group R-2

907.6.6.1, 907.6.6.2 (NEW)

Fire Alarm System Monitoring

908.3

Emergency Alarm and Fire Alarm Interface

909.17

Smoke Control System Response Time

910.3.4 (NEW), 910.3.5 (NEW)

Smoke and Heat Vent Operation

913.1

Fire Pumps

913.2.2

Protection of Circuits for Electric Fire Pumps

914.3.1.2

Water Supply to Fire Pumps

914.7, 914.7.1, 914.7.2, 202

Puzzle Rooms

1006.3, 1006.3.1, 1006.3.2, 1017.3.2.3

Exit Access Stairways in Atriums

1006.3.2, EXCEPTION 7; 1006.3, 1006.3.1

Egress from Occupied Roofs

1006.3.4, TABLE 1006.3.4(1), TABLE 1006.3.4(2)

Single Exit – Exit Access vs. Common Path

1009.2.1

Elevator Serving Occupied Roof

1010.1.1

Size of Doors

1010.2.4

Locks and Latches

1010.2.8, 1010.2.8.1, 1031.2.2

Locking Arrangements in Educational Occupancies

1010.2.9, 1010.2.9.1, 1010.2.9.2

Panic Hardware and Fire Exit Hardware

1020.5

Dead-End Corridors in Group I-2

1030.16, 1030.16.1

Handrails at Social Stairs

1103.5.4

Sprinklers in High-Rise Buildings

1103.7.5.1

Group R-1 Hotel and Motel Fire Alarm System

1103.9

Carbon Monoxide Detection in Existing Buildings

1203.1.2

Fuel Line Piping Protection

1204

Portable Generators

1205.3.3

Smoke Ventilation with Solar PV

1207

Electrical Energy Storage Systems

508.1, 508.1.1, 508.1.3, 508.1.7 (New)

Fire Command Center

CHANGE TYPE: Modification

CHANGE SUMMARY: A fire command center is required in large buildings classified as Group F-1 and S-1 occupancies.

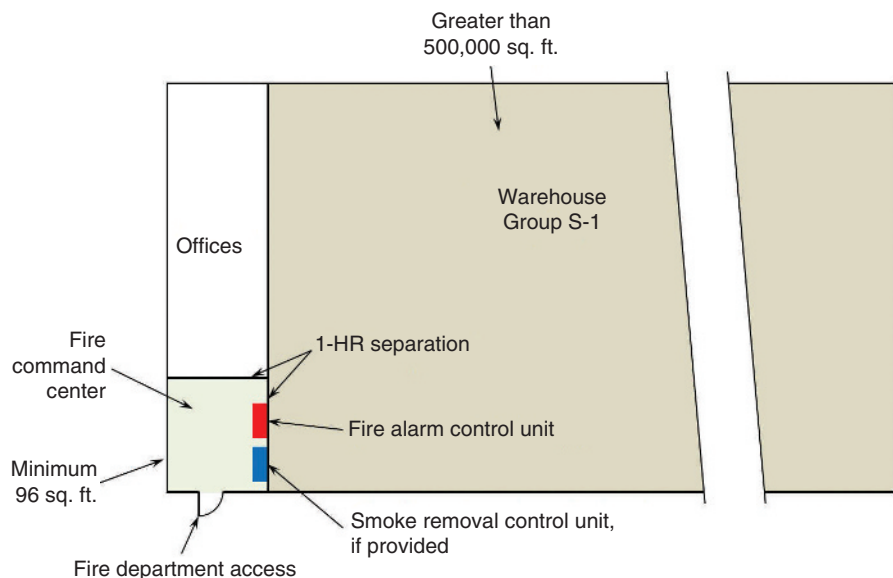
2021 CODE TEXT: 508.1 General. Where required by other sections of this code and in all buildings classified as high-rise buildings by the *International Building Code* and in all F-1 and S-1 Occupancies with a building footprint of over 500,000 square feet, a fire command center for fire department operations shall be provided and shall comply with Sections 508.1.1 through 508.1.7.

508.1.1 Location and access. The location and ~~accessibility of~~ access to the fire command center shall be approved by the fire code official.

508.1.3 Size. The fire command center shall be not less than 0.015 percent of the total building area of the facility served or 200 square feet (19 m²) in area, whichever is greater, with a minimum dimension of 0.7 times the square root of the room area or 10 feet (3048 mm), whichever is greater.

Where a fire command center is required for Group F-1 and S-1 occupancies with a building footprint greater than 500,000 square feet (46 452 m²) in area the fire command center shall have a minimum size of 96 square feet (9 m²) with a minimum dimension of 8 feet (2348 mm) where approved by the fire code official.

508.1.7 Fire command center identification. The fire command center shall be identified by a permanent easily visible sign stating “FIRE COMMAND CENTER” located on the door to the fire command center.



The fire command center is separated from the remainder of the building by 1-hour construction.

CHANGE SIGNIFICANCE: Fire-fighting operations at large warehouse buildings in excess of 500,000 square feet can be as challenging for fire fighters as operating in high-rise buildings. Adding a fire command center to these types of buildings will allow the incident commander to see at a glance where the fire is, the building layout and any active fire protection systems. The ability to access this information in one location that is protected from the remainder of the building allows the incident commander to provide the best strategy possible to combat the fire and protect the lives of fire fighters.

Large structures of this size pose numerous challenges to emergency responders due to the large amount of fuel loading from the storage, manufacturing or processing of high-hazard commodities and plastics within the building. Fire-fighting challenges include the wide distribution of smoke throughout the structure, difficulty for firefighters to locate and reach the fire and difficulty in search and evacuation of the public, employees and fire fighters. These structures typically require numerous fire protection and detection systems that may include fire pumps, multiple fire sprinkler systems, advanced fire alarm systems, smoke control systems and refrigeration gas detection systems. During a fire, the incident commander must have the ability to readily identify the status of the various fire protection and detection systems and have access to other building information details that may include building floor plans, high-pile storage details, smoke control systems, fire sprinkler zone details, mechanical refrigeration equipment, information on hazardous materials and safety data.

A fire command center provides a centralized location for the incident commander to review details about the building and the incident and to effectively coordinate emergency responders and suppression activities with increased efficiency and speed. Section 508.1.2 would require that the fire command center is separated by 1-hour construction from the remainder of the building.

Fire-fighting experience based on multiple incidents in buildings with and without a fire command center has demonstrated that having detailed information on built-in fire protection systems and controls, building schematics and hazardous materials storage plans are vital towards mitigating the event.

The location of the room must be approved by the fire code official and the entry door to the room must be identified as the fire command center.

The items required in the fire command center listed in Section 508.1.6 would be limited to those components already in the building. This section would not require additional items that were otherwise not required for the construction of the building.

Note that the size of a fire command center in Group F-1 and S-1 occupancies is different from that in a high-rise building. This is appropriate since the number of systems required in these occupancies is less than in a high-rise. The minimum size of a fire command center is 96 square feet.

There was discussion at the code hearing to utilize the fire pump room as the fire command center. This would not be advisable because the noise level in a pump room while the pump is running will most likely prohibit any type of communication within the room. It is intended that the fire pump room and the fire command center be separate rooms.

The term “accessibility” is revised in Section 508.1.1 to eliminate confusion around the concept of “accessibility” as used in Chapter 11 of the *International Building Code* (IBC).

510.4.1, 510.4.1.1, 202

Emergency Responder Communication Coverage – Signals

CHANGE TYPE: Modification

CHANGE SUMMARY: The testing criteria for in-building 2-way emergency responder coverage systems is enhanced by requiring 99 percent coverage in critical areas and by adding a second test criteria for inbound signals.

2021 CODE TEXT: **510.4.1 Emergency responder communication enhancement coverage system signal strength.** The building shall be considered to have acceptable in-building 2-way emergency responder ~~communications enhancement system~~ communication coverage when signal strength measurements in 95 percent of all areas and 99 percent in areas designated as critical areas by the fire code official on each floor of the building meet the signal strength requirements in Sections 510.4.1.1 through 510.4.1.3.

510.4.1.1 Minimum signal strength into the building. The minimum inbound signal strength shall be sufficient to provide usable voice communications throughout the coverage area as specified by the fire code official. The inbound signal level shall be a minimum of -95 dBm throughout the coverage area and sufficient to provide not less than a Delivered Audio Quality (DAQ) of 3.0 or an equivalent Signal-to-Interference-Plus-Noise Ratio (SINR) applicable to the technology for either analog or digital signals.

202 Definitions

CRITICAL AREAS. Areas that are designated for the highest level of emergency responder radio coverage including but not limited to areas such as exit stairs, exit passageways, elevator lobbies, fire protection equipment room and control valve locations, fire command centers.



Photo courtesy of rocketegg/E+/Getty Images

Coordinating operations between emergency responders inside a building and personnel outside the building is critical. Emergency responder communication coverage systems provide the ability for responders to communicate.

CHANGE SIGNIFICANCE: Several revisions occurred in Section 510. The first revision which affects the entire system is the new term of “in-building 2-way emergency responder communication coverage system (ERCCS).” The 2018 *International Fire Code* (IFC) used several different terms interchangeably to refer to these systems. This new term is now consistently used throughout the *International Building Code* (IBC) and IFC when referring to ERCCS. The new term provides a clear description of the communication system and is intended to avoid confusion.

Section 510.4.1 is revised by requiring 99 percent coverage in critical areas of the facility. This requirement correlates with Section 9.6.7.3 in the referenced standard, NFPA 1221 “Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems.” NFPA 1221 requires 99 percent coverage of the floor area in critical areas. This change provides consistency with the application and enforcement of the standard.

A new definition is added in Section 202 for “critical areas.” Critical areas in a building are vital to the operations of the emergency responders. Critical areas are considered to be fire command centers, exit stairs, exit passageways, elevator lobbies, fire pump rooms and sprinkler control valve locations. These critical areas must be provided with 99 percent coverage of the floor area. These areas are used during fire-fighting operations and are critical to the operation and fire fighter safety. These are areas where fire fighters typically manage operations, use to reach fire locations, stage for suppression operations, use to access and rescue trapped occupants and control fire protection systems. It is imperative that emergency communication, for both transmitting and receiving, is available.

Section 510.4.1.1 is revised by reinserting the minimum design criteria of -95 dBm into the code for the inbound signal also known as the downlink. “dBm” is an abbreviation for the power ratio in decibels (dB) of the measured power referenced to one milliwatt (mW). This unit of measurement is used in radio, microwave and fiber-optical communication networks as a convenient measure of absolute power because of its capability to express both very large and very small values in a short form. Specifying the minimum design criteria for the downlink provides a benchmark for system designers to utilize when designing a system. The signal must be tested for minimum signal strength in addition to the delivered audio quality (DAQ) or the Signal-to-Interference-Plus-Noise Ratio (SINR), whichever is appropriate for the system. For example, the minimum signal strength of -95 dBm must be provided in addition to a minimum DAQ of 3.0.

See also Significant Change discussion for Emergency Responder Communication – Interference.

510.4, 510.4.2.4, 510.4.2.5, 510.4.2.8, 510.5.1 (New), 510.5.4

Emergency Responder Communication Coverage – Interference

CHANGE TYPE: Modification

CHANGE SUMMARY: This series of revisions addresses potential sources of radio interference to in-building 2-way emergency responder communication coverage systems.

2021 CODE TEXT: 510.4 Technical requirements. Equipment required to provide in-building 2-way emergency responder communication coverage shall be listed in accordance with UL 2524. Systems, components and equipment required to provide the in-building 2-way emergency responder radio communication coverage system shall comply with Sections 510.4.1 through 510.4.2.8.

510.4.2.4 Signal booster requirements. If used, signal boosters shall meet the following requirements:

1. through 4. *(No change in text.)*
5. Bi-Directional Amplifiers (BDAs) Active RF emitting devices used in in-building 2-way emergency responder radio communication coverage systems shall have oscillation prevention built-in oscillation detection and control circuitry.



Photo courtesy of Radio Solutions, Inc., Norwell, MA

Emergency responder communication coverage system with a bi-directional amplifier.