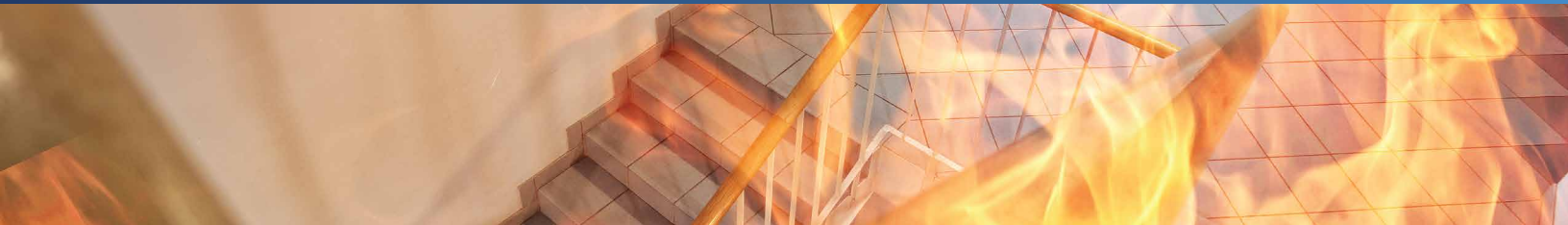


2021 International Fire Code | Section 510



Meet Your IFC 510 Mandated In-Building Wireless Coverage Requirements with Help from The Experts at MCA

Emergency Responder Radio Coverage Systems (ERRCS)

Meeting IFC-510 Codes and Standards

When it comes to safety standards for emergency communications, our highly experienced team of certified professionals will help your organization navigate and meet the various code requirements of your local authority having jurisdiction (AHJ). Successfully passing building testing to meet all code requirements can be challenging for many owners and developers. This guide includes the specific details associated with section 510 of the International Fire Code, that sets the requirements for emergency communications. If you have any questions about our RF benchmark testing for any existing buildings, or iBwave design services for new facilities, please reach out to us and a qualified team member will reach out promptly to answer any and all questions you may have.

IFC-510 Overview

IFC 510, specifies that "All new buildings shall have approved radio coverage for emergency responders within the building based upon the existing coverage levels of the public safety communication systems of the jurisdiction at the exterior of the building". By adopting this requirement, public safety agency first responders will have more effective and reliable in-building radio communications.

Over the last five years, many local governments across the USA have adopted the International Fire Code Section 510 (IFC-510), as a standard for all buildings within their communities. IFC-510 requires in-building coverage for public safety radio communication systems and has caused some confusion and surprised some building owners and developers. While this specific section of the IFC has been a part of their standards since 2009, because of sporadic local adoption many were and still are unprepared to account for its accommodation within build plans and designs.

Luckily for them, and you, the team at MCA is fully equipped to help you design, engineer, implement, and maintain Public Safety Radio Distributed Antenna Systems (PSR DAS) that meet, and often exceed, the requirements laid out by the IFC-510 code and many other similar codes adopted across the nation.



International Fire Code | Section 510

510.1 Emergency responder communication coverage in new buildings.

Approved in-building, two-way emergency responder communication coverage for emergency responders shall be provided in all new buildings. In-building, two-way emergency responder communication coverage within the building shall be based on the existing coverage levels of the public safety communication systems utilized by the jurisdiction, measured at the exterior of the building. This section shall not require improvement of the existing public safety communication systems.

Exceptions:

- Where approved by the building official and the fire code official, a wired communication system in accordance with Section 907.2.13.2 shall be permitted to be installed or maintained instead of an approved radio coverage system.
- Where it is determined by the fire code official that the radio coverage system is not needed.
- In facilities where emergency responder radio coverage is required and such systems, components or equipment required could have a negative impact on the normal operations of that facility, the fire code official shall have the authority to accept an automatically activated emergency responder radio coverage system.

510.2 Emergency responder communication coverage in existing buildings.

Existing buildings shall be provided with approved in-building, two-way emergency responder communication coverage for emergency responders as required in Chapter 11.

510.3 Permit required.

A construction permit for the installation of or modification to in-building, two-way emergency responder communication coverage systems and related equipment is required as specified in Section 105.7.6. Maintenance performed in accordance with this code is not considered a modification and does not require a permit.

510.4 Technical requirements.

Equipment required to provide in-building, two-way emergency responder communication coverage shall be listed in accordance with UL 2524. Systems, components and equipment required to provide the in-building, two-way emergency responder communication coverage system shall comply with Sections 510.4.1 through 510.4.2.8.

510.4.1 Emergency responder communication coverage system signal strength.

The building shall be considered to have acceptable in-building, two-way emergency responder communication system coverage where signal strength measurements in 95 percent of all areas and 99 percent of 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 -95dBm 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.

510.4.1.2 Minimum signal strength out of the building.

The minimum outbound signal strength shall be sufficient to provide usable voice communications throughout the coverage area as specified by the fire code official. The outbound signal level shall be sufficient to provide not less than a DAQ of 3.0 or an equivalent SINR applicable to the technology for either analog or digital signals.

510.4.1.3 System performance.

Signal strength shall be sufficient to meet the requirements of the applications being utilized by public safety for emergency operations through the coverage area as specified by the fire code official in Section 510.4.2.2.

510.4.2 System design.

The in-building, two-way emergency responder communication coverage system shall be designed in accordance with Sections 510.4.2.1 through 510.4.2.8 and NFPA 1221.

510.4.2.1 Amplification systems and components.

Buildings and structures that cannot support the required level of in-building, two-way emergency responder communication coverage shall be equipped with systems and components to enhance the radio signals and achieve the required level of in-building, two-way emergency responder communication coverage specified in Sections 510.4.1 through 510.4.1.3. In-building, two-way emergency responder communication systems utilizing radio-frequency-emitting devices and cabling shall be approved by the fire code official. Prior to installation, all RF-emitting devices shall have the certification of the radio licensing authority and be suitable for public safety use.

510.4.2.2 Technical criteria.

The fire code official shall maintain a document providing the specific technical information and requirements for the in-building, two-way emergency responder communication coverage system. This document shall contain, but not be limited to, the various frequencies required, the location of radio sites, the effective radiated power of radio sites, the maximum propagation delay in microseconds, the applications being used and other supporting technical information necessary for system design.

510.4.2.3 Standby power.

In-building, two-way emergency responder communication radio coverage systems shall be provided with dedicated standby batteries or provided with 2-hour standby batteries and connected to the facility generator power system in accordance with Section 1203. The standby power supply shall be capable of operating the in-building, two-way emergency responder communication coverage system at 100-percent system capacity for a duration of not less than 12 hours.

510.4.2.4 Signal booster requirements.

If used, signal boosters shall meet the following requirements:

All signal booster components shall be contained in a National Electrical Manufacturer's Association (NEMA) 4-type waterproof cabinet.

- Battery systems used for the emergency power source shall be contained in a NEMA 3R or higher-rated cabinet.
- Equipment shall have FCC or other radio licensing authority certification and be suitable for public safety use prior to installation.
- Where a donor antenna exists, isolation shall be maintained between the donor antenna and all inside antennas to not less than 20dB greater than the system gain under all operating conditions.
- Active RR-emitting devices used for in-building, two-way emergency responder communication coverage systems shall have built-in oscillation detection and control circuitry
- The installation of amplification systems or systems that operate on or provide the means to cause interference on any in-building, two-way emergency responder communication coverage network shall be coordinated and approved by the fire code official.

510.4.2.5 System monitoring.

The in-building, two-way emergency responder communication coverage system shall be monitored by a listed fire alarm control unit, or where approved by the fire code official, shall sound an audible signal at a constantly attended on-site location.

Automatic supervisory signals shall include the following:

- Loss of normal AC power supply.
- System battery charger(s) failure.
- Malfunction of the donor antenna(s).
- Failure of active RF-emitting device(s).
- Low-battery capacity at 70-percent reduction of operating capacity.
- Failure of critical system components.
- The communications link between the fire alarm system and the in-building, two-way emergency responder communication system.
- Oscillation of active RF-emitting device(s).

510.4.2.6 Additional frequencies and change of frequencies.

The in-building, two-way emergency responder communication coverage system shall be capable of modification or expansion in the event frequency changes are required by the FCC or other radio licensing authority, or additional frequencies are made available by the FCC or other radio licensing authority.

510.4.2.7 Design documents.

The fire code official shall have the authority to require "as-built" design documents and specifications for in-building, two-way emergency responder communication coverage systems. The documents shall be in a format acceptable to the fire code official.

510.4.2.8 Radio communication antenna density.

Systems shall be engineered to minimize the near-far effect. In-building, two-way emergency responder communication coverage system designs shall include sufficient antenna density to address reduced gain conditions.

Exception:

- Systems where all portable devices within the same band use active power control features.

510.5 Installation requirements.

The installation of the in-building, two-way emergency responder communication coverage system shall be in accordance with NFPA 1221 and Sections 510.5.2 through 510.5.5.

510.5.1 Mounting of the donor antenna(s).

To maintain proper alignment with the system designed donor site, donor antennas shall be permanently affixed on the building or where approved, mounted on a movable sled with a clearly visible sign stating "MOVEMENT OR REPOSITIONING OF THIS ANTENNA IS PROHIBITED WITHOUT APPROVAL FROM THE FIRE CODE OFFICIAL." The antenna installation shall be in accordance with the applicable requirements in the International Building Code for weather protection of the building envelope.

510.5.2 Approval prior to installation.

Amplification systems capable of operating on frequencies licensed to any public safety agency by the FCC or other radio licensing authority shall not be installed without prior coordination and approval of the fire code official.

510.5.3 Minimum qualifications of personnel.

The minimum qualifications of the system designer and lead installation personnel shall include both of the following:

A valid FCC-issued general radio operators license.

Certification of in-building system training issued by an approved organization or approved school, or a certificate issued by the manufacturer of the equipment being installed.

These qualifications shall not be required where demonstration of adequate skills and experience satisfactory to the fire code official is provided.

510.5.4 Acceptance test procedure.

Where an in-building, two-way emergency responder communication coverage system is required, and upon completion of installation, the building owner shall have the radio system tested to verify that two-way coverage on each floor of the building is not less than 95 percent. The test procedure shall be conducted as follows:

- Each floor of the building shall be divided into a grid of 20 approximately equal test areas.
- The test shall be conducted using a calibrated portable radio of the latest brand and model used by the agency talking through the agency's radio communications system or equipment approved by the fire code official.
- Failure of more than one test area shall result in failure of the test.
- In the event that two of the test areas fail the test, in order to be more statistically accurate, the floor shall be permitted to be divided into 40 equal test areas. Failure of not more than two nonadjacent test areas shall not result in failure of the test. If the system fails the 40-area test, the system shall be altered to meet the 95-percent coverage requirement.
- A test location approximately in the center of each test area shall be selected for the test, with the radio enabled to verify two-way communications to and from the outside of the building through the public agency's radio communications system. Once the test location has been selected, that location shall represent the entire test area. Failure in the selected test location shall be considered to be a failure of that test area. Additional test locations shall not be permitted.
- The gain values of all amplifiers shall be measured and the test measurement results shall be kept on file with the building owner so that the measurements can be verified during annual tests. In the event that the measurement results become lost, the building owner shall be required to rerun the acceptance test to reestablish the gain values.
- As part of the installation, a spectrum analyzer or other suitable test equipment shall be utilized to ensure spurious oscillations are not being generated by the subject signal booster. This test shall be conducted at the time of installation and at subsequent annual inspections.
- Systems shall be tested using two portable radios simultaneously conducting subjective voice quality checks. One portable radio shall be positioned not greater than 10 feet (3048 mm) from the indoor antenna. The second portable radio shall be positioned at a distance that represents the farthest distance from any indoor antenna. With both portable radios simultaneously keyed up on different frequencies within the same band, subjective audio testing shall be conducted and comply with DAQ levels as specified in Sections 510.4.1.1 and 510.4.1.2.

510.5.5 FCC compliance.

The emergency responder radio coverage system installation and components shall comply with all applicable federal regulations including, but not limited to, FCC 47 CFR Part 90.219.

510.6 Maintenance.

The in-building, two-way emergency responder communication coverage system shall be maintained operational at all times in accordance with Sections 510.6.1 through 510.6.4.

510.6.1 Testing and proof of compliance.

The owner of the building or owner's authorized agent shall have the in-building, two-way emergency responder communication coverage system inspected and tested annually or where structural changes occur including additions or remodels that could materially change the original field performance tests.

Testing shall consist of the following:

- In-building coverage test as described in Section 510.5.3.
- Signal boosters shall be tested to verify that the gain is the same as it was upon initial installation and acceptance or set to optimize the performance of the system.
- Backup batteries and power supplies shall be tested under load of a period of 1 hour to verify that they will properly operate during an actual power outage. If within the 1-hour test period the battery exhibits symptoms of failure, the test shall be extended for additional 1-hour periods until the integrity of the battery can be determined.
- All active components shall be checked to verify operation within the manufacturer's specifications. At the conclusion of the testing, a report, which shall verify compliance with Section 510.5.3, shall be submitted to the fire code official.

510.6.2 Additional frequencies.

The building owner shall modify or expand the in-building, two-way emergency responder communication coverage system at his or her expense in the event frequency changes are required by the FCC or other radio licensing authority, or additional frequencies are made available by the FCC or other radio licensing authority. Prior approval of an in-building, two-way emergency responder communication coverage system on previous frequencies does not exempt this section.

510.6.3 Nonpublic safety system.

Where other nonpublic safety amplification systems installed in buildings reduce the performance or cause interference with the in-building, two-way emergency responder communication coverage system, the nonpublic safety amplification system shall be corrected or removed.

510.6.4 Field testing.

Agency personnel shall have the right to enter onto the property at any reasonable time to conduct field testing to verify the required level of radio coverage.

*Check local regulations for code versions of the IFC 510 being enforced by AJH (authority having jurisdiction).

Now That You Know the Codes, Contact MCA to Help You Meet Them

Our Team | In-Building Wireless Solutions

The IBW team at MCA is a premier integrator of in-building and campus-wide wireless solutions — supplying best-in-class engineering design, project management, implementation, commissioning and maintenance services. We engineer and install Commercial Distributed Antenna Systems (DAS), Private LTE/5G systems, Public Safety ERRCs, Wi-Fi, and multi- and single-operator systems and solutions within both public and private venues.

Our high level of expertise in development and deployment enables our team to create customized, future-proof solutions that satisfy our clients wireless coverage and capacity needs. We utilize our neutral approach to developing innovative, multi-operator DAS networks within corporate offices, hospitals, universities, airports, shopping malls, and more across the USA.

About MCA

We are the trusted advisor for a safe, secure, and efficient workplace. MCA offers a carefully researched portfolio of voice, data, and security solutions. As your trusted advisor, we reduce the time and effort needed to research, install, and maintain the right solutions to make your workplace better. When you choose MCA, you're also connecting to our Service-First DNA. With our Managed Technology-as-a-Service (MTaaS) offering, you'll never be surprised by hidden costs or fees. We offer a flat, budget-friendly recurring cost without additional finance charges. Our team of experts will manage your solution from start to finish, giving you the best return on your investment.

When combined with our SecurePlan™ suite of tools and services, we proactively support our customers by ensuring SLA terms compliance — remotely troubleshooting and capturing information, monitoring for predictive signals such as drive failure alerts, thermal conditions, and network loads — to address them prior to failure, maximizing the uptime of your critical security systems. *Avoid training employees on how to use our solutions:* when you partner with MCA, we shoulder the burden of managing technology upgrades and creating road maps for future technology utilization, while maintaining and supporting your solution throughout its life-cycle.

CONTACT MCA TODAY TO MAKE YOUR WORKPLACE BETTER



www.callmc.com • 800-577-3678 • info@callmc.com