

IFC-510

Section 510 Emergency Responder Communication Coverage

The delayed effective date of this Rule is January 1, 2022.

The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.1 Emergency Responder Radio Communication Coverage in New Buildings

Approved in-building 2- way emergency responder communication coverage shall be provided in all new buildings. In-building 2- way emergency responder communication coverage 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:

1. 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 communications coverage system.
2. Where it is determined by the fire code official that the communications coverage system is not needed.
3. In facilities where emergency responder communications 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 communication coverage system.
4. New buildings 7,500 square feet or less and not more than 1 story above grade plane.

1. This exception does not apply to windowless buildings, underground buildings or buildings with a basement.

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The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.2 Emergency Responder Communications Coverage in Existing Buildings

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The delayed effective date of this Rule is January 1, 2022.

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510.3 Permit Required

A construction permit for the installation of or modification to emergency inbuilding 2- way emergency responder communication coverage systems and related equipment is required as specified in Section 105.7.5. Maintenance performed in accordance with this code is not considered a modification and does not require a permit.

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The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.4 Technical Requirements

Equipment required to provide 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 communication coverage system shall comply with Sections 510.4.1 through 510.4.2.8.

The delayed effective date of this Rule is January 1, 2022.

The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.4.1 Emergency Communication Coverage System Signal Strength

The building shall be considered to have acceptable in-building 2- way emergency responder communication system coverage when signal strength measurements in 95 percent of all areas on each floor of the building and critical areas shall be provided with 99 percent floor area radio coverage. Critical areas are fire command centers, fire pump rooms, exit stairs, exit passageways, elevator lobbies, sprinkler rooms, riser rooms, standpipe cabinets, sprinkler sectional valve locations, and other areas deemed critical by the AHJ. The signal strength shall meet requirements in Sections 510.4.1.1 through 510.4.1.3.

The delayed effective date of this Rule is January 1, 2022.

The Statutory authority for Rule-making is G. S. 143-136; 143-138.

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.

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The Statutory authority for Rule-making is G. S. 143-136; 143-138.

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.

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The Statutory authority for Rule-making is G. S. 143-136; 143-138.

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.

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The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.4.2 System Design

The in-building 2- 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.

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The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.4.2.1 Amplification Systems and Components

Buildings and structures that cannot support the required level of in-building 2- way emergency responder communication coverage shall be equipped with systems and components to enhance the radio signals and achieve the required level of emergency communication coverage specified in Sections 510.4.1 through 510.4.1.3. Emergency 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.

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The Statutory authority for Rule-making is G. S. 143-136; 143-138.

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 2- 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.

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The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.4.2.3 Standby Power

In-building 2- way emergency responder communication coverage systems shall be provided with dedicated standby power or provided with 2-hour standby batteries and connected to the facility generator power system in accordance with Section 604. The standby power supply shall be capable of operating the in-building 2- way emergency responder communication coverage system at 100-percent system capacity for a duration of not less than 12 hours.

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The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.4.2.4 Signal Booster Requirements

If used, signal boosters shall meet the following requirements:

1. All signal booster components shall be contained in a National Electrical Manufacturer's Association (NEMA) 4-type waterproof cabinet.
2. Battery systems used for the emergency power source shall be contained in a NEMA 3R or higher-rated cabinet.
3. Equipment shall have FCC or other radio licensing authority certification and be suitable for public safety use prior to installation.
4. 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.
5. Active RF emitting devices used in in-building 2- way emergency responder communication coverage systems shall have built-in oscillation detection and control circuitry.
6. The installation of amplification systems or systems that operate on or provide the means to cause interference on any in-building 2- way emergency responder communication coverage network shall be coordinated and approved by the *fire code official*.

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The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.4.2.5 System Monitoring

The in-building 2-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 signal shall include the following:

1. Loss of normal AC power supply.
2. System battery charger(s) failure.
3. Malfunction of the donor antenna(s).
4. Failure of active RF-emitting device(s).
5. Low-battery capacity at 70-percent reduction of operating capacity.
6. Failure of critical system components.
7. The communications link between the *fire alarm system* and the in-building 2- way emergency responder communication coverage system.
8. Oscillation of active RF-emitting device(s)

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The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.4.2.6 Additional Frequencies and Change of Frequencies

The in-building 2- 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.

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The Statutory authority for Rule-making is G. S. 143-136; 143-138.

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 2- way emergency responder communication coverage systems. The documents shall be in a format acceptable to the *fire code official*.

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The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.4.2.8 Radio Communication Antenna Density

Systems shall be engineered to minimize the near-far effect. In-building 2- way emergency responder communication coverage system designs shall include sufficient antenna density to address reduced gain conditions.

Exception:

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

The delayed effective date of this Rule is January 1, 2022.

The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.5 Installation Requirements

The installation of the in-building 2- way emergency responder communication coverage system shall be in accordance with NFPA 1221 and Sections 510.5.1 through 510.5.5.

The delayed effective date of this Rule is January 1, 2022.

The Statutory authority for Rule-making is G. S. 143-136; 143-138.

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. The delayed effective date of this Rule is January 1, 2022.

The Statutory authority for Rule-making is G. S. 143-136; 143-138.

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 and the frequency license holder(s).

The delayed effective date of this Rule is January 1, 2022.

The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.5.3 Minimum Qualifications of Personnel

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

1. A valid FCC-issued general radio operator's license.
2. 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.

The delayed effective date of this Rule is January 1, 2022.

The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.5.4 Acceptance Test Procedure

Where an in-building 2- 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:

1. Each floor of the building shall be divided into a grid of 20 approximately equal test areas. Where a floor exceeds 128,000 ft² (11,900 m²), which is the floor area that can be covered by the maximum grid dimension of 80 ft. (24.4m), the floor shall be subdivided into sectors each having an area less than or equal to 128,000 ft² (11,900 m²), and each sector be tested individually with 20 grid cells in each sector. Signal strength measurements should be taken at the center of each grid and should be performed using standardized parameters as specified by NFPA 1221.
2. 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.
3. Failure of more than one test area shall result in failure of the test.

4. 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.
5. 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.
6. 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.
7. 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.
8. 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.

The delayed effective date of this Rule is January 1, 2022.

The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.5.5 FCC Compliance

The in-building 2- way emergency responder communication coverage system installation and components shall comply with all applicable federal regulations including, but not limited to, FCC 47 CFR Part 90.219.

The delayed effective date of this Rule is January 1, 2022.

The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.6 Maintenance

The in-building 2- way emergency responder communication coverage system shall be maintained operational at all times in accordance with Sections 510.6.1 through 510.6.4.

The delayed effective date of this Rule is January 1, 2022.

The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.6.1 Testing and Proof of Compliance

The owner of the building or owner's authorized agent shall have the in-building 2- way emergency responder communication coverage system shall be 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:

1. In-building coverage test as described in Section 510.5.3.
2. 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.

3. 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.
4. All active components shall be checked to verify operation within the manufacturer's specifications.
5. 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.

The delayed effective date of this Rule is January 1, 2022.

The Statutory authority for Rule-making is G. S. 143-136; 143-138.

510.6.2 Additional Frequencies

The building owner shall modify or expand the in-building 2-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 2-way emergency responder communication coverage system on previous frequencies does not exempt this section.

The delayed effective date of this Rule is January 1, 2022.

The Statutory authority for Rule-making is G. S. 143-136; 143-138.

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 2-way emergency responder communication coverage system, the nonpublic safety amplification system shall be corrected or removed.

The delayed effective date of this Rule is January 1, 2022.

The Statutory authority for Rule-making is G. S. 143-136; 143-138.

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.

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The Statutory authority for Rule-making is G. S. 143-136; 143-138.