

# Emergency Responder Radio Coverage System

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## GRAND JUNCTION FIRE DEPARTMENT DIVISION OF FIRE PREVENTION



If you have any questions or comments regarding the information contained within, or if you need assistance interpreting these requirements, please contact:

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## PURPOSE AND SCOPE

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Safety provisions in the 2012 International Fire Code (IFC) address concerns regarding the reliability of portable radios used inside buildings by emergency responders including fire, emergency medical and police personnel. Building construction features and materials can have a negative impact on emergency personnel communications by blocking critical messages. These provisions set forth requirements for certain new and existing structures that will be equipped with an emergency responder radio coverage system.

Emergency Responder Radio Coverage (ERRC) system shall meet the criteria of the International Fire Code (2012 ED.), NFPA 72 National Fire Alarm and Signaling Code (2010 ED.), and any other applicable documents and standards adopted by reference in the IFC. It is the designer's responsibility to ensure that the system complies with all applicable federal regulations including, but not limited to, FCC 47 CFR Part 90.219.

## GUIDELINES

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**Emergency Responder Radio Coverage in New Buildings.** All new buildings shall have approved radio coverage for emergency responders within the building based upon the existing coverage levels of the public safety communications systems of the jurisdiction at the exterior of the building (Grand Junction Regional Communications Center). This regulation shall not require the improvement of the existing public safety communication system. The applicability of the exceptions below is at the discretion of the fire code official based on the totality of the circumstances (2012 IFC Sec. 510.1).

### Exceptions:

1. New buildings that can demonstrate minimum radio coverage signal strength levels of the Grand Junction Regional Communications Center (GJRCC) 800 MHz radio system throughout the interior of the building.
2. New buildings constructed with an area of less than 50,000 s.f. and do not contain a basement or extend one or more levels below grade.
3. New buildings that are less than five (5) stories in height that do not contain a basement or extend one or more levels below grade.
4. One and two-family dwellings and townhouses that are built to the International Residential Code (IRC).

**Essentially, the ERRC system requirements above apply to all new buildings that:**

1. Are 50,000 s.f or more in area,
2. Are Five (5) or more stories in height,
3. Have a basement or levels/floors below grade,
4. Demonstrates a lack of proper ERRC coverage and the issue has been designated a distinct hazard by the fire code official.

**Emergency Responder Radio Coverage in Existing Buildings.** The 2012 IFC allows for the fire code official to establish when emergency responder radio coverage is applicable to existing buildings (2012 IFC Sec. 1103.2, exception). Buildings constructed prior to the adoption of the 2012 IFC shall not be required to comply with emergency responder radio coverage provisions except as follows:

1. Whenever an existing wired communication system cannot be repaired or is being replaced, or where not approved in accordance with 2012 IFC Section Sec. 510.
2. Buildings undergoing a substantial alteration as determined by the fire code official.
3. When buildings, complex of buildings or specific occupancies do not demonstrate the minimum emergency radio coverage signal strength, and the Fire Chief or his designee determines a lack of minimum signal strength poses an undue risk to emergency responders that cannot be reasonably mitigated by other means.

**Informational.** *Where an emergency responder radio coverage system is required in an existing building, the fire code official is authorized to institute a work plan to include a time frame in which code compliance shall be established by the building owner(s).*

## **TECHNICAL REQUIREMENTS**

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**Radio Signal Strength.** The building shall be considered to have acceptable ERRC when signal strength measurements in 95 percent of all areas on each floor of the building meet the signal strength requirements. All elevators (measured at primary recall floor), stairwell shafts, rooms housing fire protection equipment (i.e. fire alarm control unit, fire sprinkler riser, etc.) and fire command centers must meet minimum signal strength requirements (2012 IFC Sec 510.4).

**Minimum Signal Strength into Buildings.** A minimum signal strength of -95 dBm shall be received within the building.

**Minimum Signal Strength out of Buildings.** A minimum signal strength of -95 dBm shall be received by the Grand Junction Regional Communications Center when transmitted from within the building.

**Amplification Systems Allowed.** Buildings and structures which cannot support the required level of ERRC shall be equipped with one of the following:

1. A radiating cable system;
2. An internal multiple antenna system with FCC certified bi-directional 800 Mhz amplifiers;
3. A system otherwise approved by the fire code official in order to achieve the required adequate radio coverage.

### **Frequency Range.**

The frequency range which must be supported shall be 806 MHz to 824 MHz and 851 MHz to 869 MHz and such other frequencies as determined by the GJRCC in all areas of the building specified by the 2012 IFC.

**Power Supply.** Primary power supplies shall conform to NFPA 72. ERRC Systems shall be provided with an approved secondary power source and shall be capable of operating the ERRC system for a period of 24 hours. When primary power is lost, the power supply to the ERRC system shall automatically transfer to the secondary power supply (i.e. traditional engine driven emergency generator or battery backup system).

**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 4-type waterproof cabinet.
3. The signal booster system and battery system shall be electrically supervised and monitored by a supervisory service, or when approved by the fire code official, shall sound an audible signal at a constantly attended location.
4. Equipment shall have FCC certification prior to installation.

**Additional Frequencies or Changes to Frequencies.** The ERRC system shall be capable of modification or expansion in the event frequency changes are required by the FCC or additional frequencies are made available by the FCC.

## **INSTALLATION REQUIREMENTS**

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**Minimum Qualifications of Personnel.** The minimum qualifications of the system designer and lead installation personnel shall include (2012 IFC Sec 510.5.2):

1. A valid FCC issued general radio operators license; and
2. Certification of in-building system training issued by a nationally recognized organization, school or certificate issued by the manufacturer of the equipment being installed.

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

## **PLAN SUBMITTALS**

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**Approval Prior to Installation.** Amplification systems capable of operating on frequencies licensed to the Grand Junction Regional Communications Center by the FCC shall not be installed without prior coordination and approval of the fire code official (2012 IFC Sec 510.5.1).

**Construction Permit Required.** A construction permit for the installation of or modification to ERRC systems or related equipment is REQUIRED. Maintenance performed in accordance with the IFC is not considered a modification and does not require a permit (2012 IFC Sec 510.3). **Fees** will be assessed upon the conclusion of the plan review according to the locally adopted fee schedule.

**Obtaining a Permit.** Each submittal shall include the following items:

1. A complete and accurate GJFD "General Installation and Operational Permit" Form
2. Documentation concerning designer/installer credentials
3. One complete set of plans signed by the designer of record
4. One copy of all equipment specification sheets
5. One copy of manufacturer instructions where applicable
6. A written project report describing design assumptions and scope of work
7. Where the ERRC system is connected to the Fire Alarm System for supervisory purposes, the submittal shall be accompanied by a letter signed by a minimum NICET Level III fire alarm designer (or Colorado Registered Professional Engineer) on company letterhead indicating the functionality and sequence of events associated with the ERRC system. The ERRC system in its entirety shall be indicated on fire alarm plans where applicable.

## **ACCEPTANCE TESTING PROCEDURE**

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**Test Procedure.** Acceptance testing of an ERRC system is required upon completion and installation. It is the building owner's responsibility to have the radio system tested by qualified personnel to ensure that two-way coverage on each floor of the building is a minimum of 95 percent prior to the building's occupancy.

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.
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.
3. Failure of a maximum of two nonadjacent test areas shall not result in failure of the test.
4. In the event that three 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 a maximum of four 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 communication to and from 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 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 time of the installation and subsequent annual inspections.

**Initial Compliance Report.** A copy of the contractor's final acceptance report for the ERRC system is to be provided to the building owner and maintained onsite at all times for future reference during required annual testing verification. The fire code official may or may not be present during the contractor's final acceptance testing. A copy of the contractor's initial final acceptance report and written code compliance opinion shall be provided to the fire code official for review and acceptance. The contractor's technical reports should include a listing of ERRC system components installed, a list of frequencies used in the building, the location of the nearest repeater communicating with personnel in the structure if permitted by GJRCC, the effective radiating power of the transmitters at the repeater location (expressed in watts), and a description of how the local ERRC system interfaces with the public system (2012 IFC Sec 104.7.2 Technical Assistance & Sec 510.4.2.2 Technical Criteria).

## **MAINTENANCE**

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**Testing and Proof of Compliance.** The ERRC system shall be maintained operational at all times (2012 IFC Sec 510.6 and 510.6.1). The ERRC system shall be inspected and tested annually or whenever 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 the acceptance testing procedure.
2. Signal boosters shall be tested to ensure that the gain is the same as it was upon initial installation and acceptance.
3. Backup batteries and power supplies shall be tested under load of a period of one 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 other 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 shall be submitted to the fire code official.

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### **Code References**

International Fire Code (2012 Edition)  
NFPA 72 (2010 Edition)  
Local, State and Federal Regulations  
Standards & Codes Adopted by Reference

### **Contacts**

Grand Junction Regional Communication Center  
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