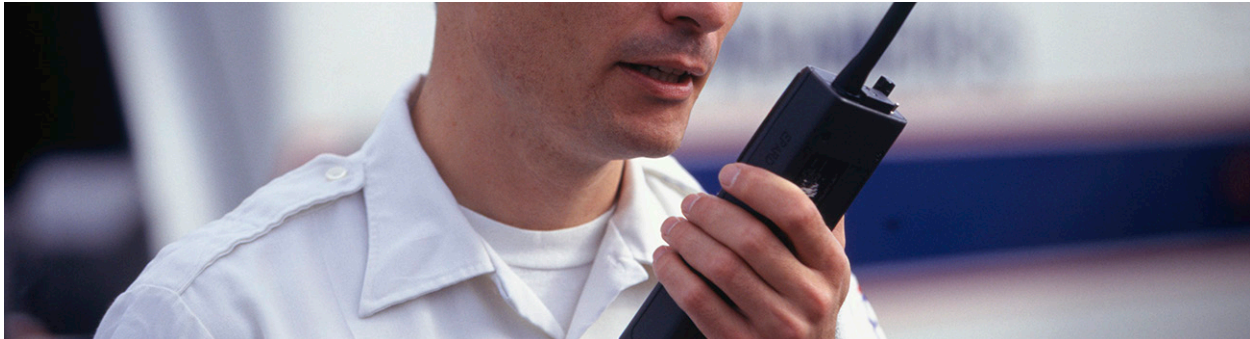




# Emergency Responder Radio Coverage System

March 2019



During emergencies, fire fighters and other emergency response personnel use portable radios to communicate while inside of the building or structure. Buildings and structures interfere with the emergency responder's ability to effectively communicate due to construction types and materials. These features can absorb or block the radio frequency energy used to carry the signals inside or outside of the building, which poses a significant safety hazard to the emergency response personnel and building occupants.

As a safety solution, the International Fire Code (IFC) sets forth requirements for certain new and existing buildings to be equipped with an emergency responder radio coverage system.

## Emergency Responder Radio Coverage

Approved radio coverage for emergency responders shall be provided with buildings meeting any of the following conditions:

1. There are more than five stories above grade plane (as defined by the International Building Code, Section 202)
2. The total building area is 50,000 square feet or more;
3. The total basement area is 10,000 square feet or more; or
4. There are floors used for human occupancy more than 30 feet below the finish floor of the lowest level of exit discharge.

Radio coverage is based upon the existing coverage levels of the public safety communication systems of the jurisdictions at the exterior of the building. This section shall not require improvement of the existing public safety communication system.

**Exception:** Building and area of building that have minimum radio coverage signal strength levels of the King County Regional 800 MHz Radio System within the building in accordance with Section 510.4.1

## Emergency Responder Radio Coverage In Existing Buildings

Buildings constructed prior to the implementation of this code shall not be required to comply with the emergency responder radio coverage provisions except as follows:

1. Whenever an existing wired communication system cannot be repaired or is being replaced.
2. Buildings undergoing substantial alteration as determined by the Fire Code Official.
3. When buildings, classes of buildings or specific occupancies do not have minimum radio coverage signal strength, and the Fire or Police Chief determines a lack of minimum signal strength poses an undue risk to emergency responders that cannot be reasonably mitigated by other means.

### **Construction Permit Required**

A construction permit for the installation of or modification to emergency responder radio coverage systems and related equipment is required. Maintenance performed in accordance with this code is not considered a modification and does not require a permit.

### **Operational Permit**

An operational permit is required to operate an in building radio system in accordance with BMC 23.11.105.6.50.

### **Radio Signal Strength**

The building shall be considered to have acceptable emergency responder radio coverage when signal strength measurements in 95% of all areas of the building and 99% in elevators (measured at the primary recall floor), stair shafts and Fire Command Centers meet the signal strength requirements.

### **Minimum Signal Strength Into the Building**

A minimum signal strength of -95 dBm shall be receivable within the building.

### **Minimum Signal Strength Out of the Building**

A minimum signal strength of -95 dBm shall be received by the agency's radio system when transmitted from within the building.

### **System Design And Installation**

The emergency responder radio coverage system shall be designed and installed in accordance with the applicable sections of the IFC and NFPA 72.

### **Amplification Systems Allowed**

Buildings and structures which cannot support the required level of radio coverage shall be equipped:

1. A radiating cable system and/or
2. An internal multiple antenna system with FCC certificated bi-directional 800 MHz amplifiers, or
3. Systems otherwise approved by the city radio system manager in order to achieve the required adequate radio coverage.

### **Frequency Range**

The frequency range which must be supported shall be 806 MHz to 815 MHz and 851 MHz to 860 MHz and such other frequencies as determined by the Regional Radio System operator in all areas of the building.

### **Power Supply**

Power supplies shall conform to NFPA 72, (Power Supplies).

If any part of the installed system or systems contains an electrically powered component, the installed system or systems shall be provided with an independent battery system or an emergency generator capable of operating for a period of at least twenty four (24) hours without external power input. The battery system shall automatically charge in the presence of external power input.

### **Signal Booster Requirements**

If used, signal boosters shall meet the following requirements:

1. All signal booster components shall be contained in a NEMA4, IP66-type waterproof cabinet or equivalent.
2. The battery system shall be contained in a NEMA4, IP66-waterproof cabinet or equivalent.
3. The system shall include automatic alarming of malfunctions of the signal booster and battery system. Any resulting trouble alarm shall be automatically transmitted to an approved central station or proprietary supervising station as defined in NFPA 72 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.
5. Signal boosters must be equipped with filters that reject adjacent frequencies in addition to the multi-band pass filters.

## Additional Frequencies And Change of Frequencies

The building owner shall modify or expand the frequency range at his or her expense in the event frequency changes are required by the FCC or additional frequencies are made available by the FCC. Prior approval of a public safety radio coverage system on previous frequencies does not exempt this requirement.

### Point of Information

System designers should be aware that re-banding (Nextel) is currently well along making available the entire 800 MHz spectrum as well as portions of the 700 MHz band for public safety and equipment must be capable of supporting these and other spectrum bands. See [www.FCC.gov](http://www.FCC.gov) for additional information.

## Approval Prior to Installation

No amplification system capable of operating on frequencies used by the Regional 800 MHz Radio System shall be installed without prior coordination and approval of the radio system licensee (The Eastside Public Safety Communications Agency – [www.epsca.com](http://www.epsca.com) – (425) 556-2515) and any such system must comply with any standards adopted by the King County Regional Communications Board.

## Minimum Qualifications of Personnel

The system designer, lead installation personnel and personnel conducting radio system tests shall be qualified to perform the work. Design documents and all tests shall be documented and signed by a person in possession of a current FCC General Radiotelephone Operator License (GROL) and a certificate or certification issued by the manufacturer of the equipment being installed.

## Acceptance Test Procedure

Acceptance testing for Emergency responder radio amplification system is required upon completion of installation. It is the building owner's responsibility to have the radio system tested by qualified personnel to ensure a minimum of 95% two-way coverage on each floor of the building.

### Point of Information

A Certificate of Occupancy will not be issued to any structure if the building fails to comply with these provisions.

A report shall be submitted to the Bellevue Fire Department at the conclusion of acceptance testing containing a floor plan and the signal strengths at each location tested and other relevant information.

A representative of the Bellevue Fire Department may oversee the acceptance test. Acceptance testing is also required whenever changes occur to the building that would materially change the original field performance test. The test procedure shall be conducted as follows:

1. Each floor of the building shall be divided into a grid of approximately forty (40) equal areas.
2. Testing shall use a two (2) watt, portable transceiver with speaker/microphone and flexible antenna (or any calibrated device which will produce signal levels useable by the prescribed portable radio). Field strength testing instruments must have been calibrated within one (1) year of the date of the acceptance test. Field strength testing instruments must be of the frequency selective type incorporating a flexible antenna similar to the ones used on the hand held transceivers. City Radio System Manager may designate alternate methods of measuring the signal level, which satisfy appropriate levels of public safety coverage.
3. A maximum of two (2) nonadjacent areas will be allowed to fail the test.
4. In the event that three (3) of the areas fail the test, the floor may be divided into eighty (80) equal areas in order to be more statistically accurate. In such event, a maximum of four (4) nonadjacent areas will be allowed to fail the test. After the eighty (80) area tests, if the system continues to fail, the building owner shall have the system altered to meet the 95% coverage requirement.

5. A spot located approximately in the center of a grid area will be selected for the test, then the radio will be keyed to verify two-way communication to and from the outside of the building through the Regional 800 MHz Radio System. Once the spot has been selected, prospecting for a better spot within the grid area is not permitted. The gain values of all amplifiers shall be measured and the results kept on file with the building owner so that the measurements can be verified each year during the annual tests. In the event that the measurement results become lost, the building owner will be required to rerun the acceptance test to reestablish the gain values.
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 installation and subsequent annual inspections.

#### Point of Information

While the foregoing implies manual measurement and recording, automated testing and recording is certainly permitted so long as a report can be produced documenting the signal strength (or average) in each test square.

### FCC Compliance

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

### Maintenance

The emergency responder radio coverage system shall be maintained operational at all times.

### Testing And Proof Of Compliance

The emergency responder radio coverage system shall be inspected and tested annually, or whenever structural changes occur to the building that would materially change the original field performance tests by a consultant approved by the Fire Code Official. The performance test shall include at minimum a floor plan and the signal strength in various locations of the building.

Testing shall consist of the following:

1. In-building coverage test as described in the Acceptance Test 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 [TheComplianceEngine.com](https://www.TheComplianceEngine.com).

### **Identification**

Buildings equipped with an Emergency Responder Radio Coverage system shall be identified by a sign located on or near the Fire Alarm Control Panel stating: "This building is equipped with an Emergency Responder Radio Coverage System." As a general rule, fire protection and related equipment are identified by a red sign with minimum one-inch white letters as shown below.

Example:



This building is equipped with  
an Emergency Responder  
Radio Coverage System

### **Field Testing**

Police and Fire Personnel shall at any time have the right to enter onto the property to conduct its own field-testing to be certain that the required level of radio coverage is present.