

**MCKINNEY FIRE DEPARTMENT  
FIRE MARSHAL'S OFFICE**

# **EMERGENCY RESPONDER RADIO BDA COVERAGE SYSTEMS**

## **OPERATIONAL REQUIREMENTS FOR INSTALLATION, MAINTENANCE, AND MONITORING**

These guidelines are to be followed when a building, or facility, within the City of McKinney, does not meet the signal level requirement and is required to have an approved Two-Way Radio Communications Enhancement System. All Two-Way Radio Communications Enhancement Systems for the purposes of this guideline and any other guidelines or requirements of the Fire Department shall conform to 2016 NFPA 72, 2016 NFPA 1221, 2015 International Fire Code, and FCC 47 CFR Part 90.219.

### **APPLICABILITY**

All new and existing buildings shall have approved radio coverage for emergency responders within the building based upon the existing coverage levels of the McKinney Public Safety Communications System at the exterior of the building if the following minimum conditions fail to meet compliance of IFC-2015, Section 510.4.1.1 and 510.4.1.2, NFPA 72 2013, Section 24.5.2.2.1 and 24.5.2.2.2 than an enhancement system is needed:

A minimum signal strength of -95dBm shall be provided in

1. Critical areas, such as fire command center(s), fire pump room(s), exit stairs, exit passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations, and other areas deemed critical shall be provided with 99 percent floor area radio coverage.
2. General areas, shall be provided with 90 percent floor area radio coverage.

**Contact the Fire Marshal's Office for technical information related to radio frequencies, radio system and antenna site locations.**

### **TWO-WAY RADIO COMMUNICATIONS ENHANCEMENT SYSTEM PROJECT REQUIREMENTS**

1. Permit is required before every project. In order to acquire a permit, a design package is required. Design package should include:
  - A) Submittal Document: This document must include the material list, data sheets of the materials, snapshots of the overall design plan and floor plans.
  - B) Overall design plan, Floor plans with the design, prediction propagation heat maps on PDF format with proper labeling for each component on a 24"x36" scale. Design plan will also include projected emission limits to reduce the interference potential that would cause adverse effects of increased noise floor at the donor site.
  - C) Benchmark test is required for each floor to make sure the amount of coverage is needed (whole floor, partial floor or none needed). The results of this test must include the make/model and calibration certificate of the measurement device used.
2. Plenum cable and connectors required for all interior horizontal and vertical runs.
3. Outdoor rated coax cable and connectors required for exterior runs.

# EMERGENCY RESPONDER RADIO BDA COVERAGE SYSTEMS

---

4. Passive components and antennas must be easily purchasable/replaceable. Examples of brands to be used: microlab, commscope, westell, clearlink, terrawave, galtronics, or equivalent.
5. All active components must be in a NEMA 4/NEMA 4X enclosure. This includes Repeater, Remote Units, and DAS Head End Units. Repeater and Active DAS equipment must be Cobham, ADRF, Comba, G-Wave, or equivalent.
6. Active components shall be located in an approved accessible conditioned space or room, such as an IT closet, lobby office space or similar.
7. There must be sufficient isolation between the donor and service antennas, the minimum isolation required is 15dB greater than the repeater gain.
8. Battery backup must be provided in a NEMA 4/NEMA 4X Enclosure and a calculated runtime of the 24 hour battery backup must be provided.
9. All interior vertical runs must be protected in a 2 hour Fire rated raceway or enclosure. If the interior vertical runs are in a stacked 2 hour rated room and the sealed with proper fire caulking, this meets the requirement.

The Two-Way Radio Communications Enhancement System installation and components shall also comply with all applicable federal regulations including but not limited to, FCC 47 CFR Part 90.219.

Installations must be registered in the FCC signal booster database that can be accessed at <https://signalboosters.fcc.gov/signal-boosters/>.

## ORGANIZATIONAL AND EQUIPMENT REQUIREMENTS

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

1. A valid FCC-issued General Radio Operators License.
2. Certification of in-building system training issued by a nationally recognized organization, school, or a certificate issued by the manufacturer of the equipment being installed.

In lieu of the above qualification requirements a demonstration of adequate skills, knowledge, and experience will need to be provided.

System design software with prediction tools are to be used in the design plan to give an accurate display of the overall design and RF propagation, e.g., IBwave, Ranplan. Design process shall include site surveys to collect pre and post installation data to validate predictions and ensure proper loss, gain, and power levels.

A calibrated spectrum analyzer will be used to validate pre and post installation signal levels in dBm. Validations and loss, gain, power levels will be included in the completed As-Built documentation.

A calibrated coax cable sweep test device will be used to capture accurate losses to validate design loss predictions and ensure proper installation of connectors. All measured cable losses will be included in the completed As-Built documentation.

## ACCEPTANCE TEST REQUIREMENT

Each Floor must be divided into a minimum of 20 grids and one sample must be taken from the center of each grid. A calibrated spectrum analyzer will be used to ensure a signal level of -95dBm or greater is recorded in each grid. Critical areas will have 99 percent coverage and General areas will have 90 percent coverage. Critical areas must have their own grid in addition to 20 grids. (Elevator lobby, stair case, mechanical rooms). Test will be deemed failed if two or more adjacent grids do not meet the required signal level.

# EMERGENCY RESPONDER RADIO BDA COVERAGE SYSTEMS

---

Additionally, Delivered Audio Quality (DAQ) testing will be performed with the same model/manufactures radio as used by the City of McKinney's Fire Department. A DAQ of 3.4, speech understandable with repetition only rarely required, will be required in the same critical and general test grid locations.

AS-Built Design documents, cable sweep test documentation, and acceptance test results will be kept onsite for reference.

## MONITORING AND MAINTENANCE

The Two-Way Radio Communications Enhancement System shall include automatic supervisory and trouble signals for malfunctions of the signal booster(s) and power supply(ies) that are annunciated by the fire alarm system and comply with the following:

1. System and signal booster supervisory signals shall include the following:
  - a. Antenna malfunction
  - b. Signal booster failure
2. Power supply/Battery backup signals shall include the following for each signal booster:
  - a. Loss of normal ac power
  - b. Failure of battery charger
  - c. Low-battery capacity indication

The Two-Way Radio Communications Enhancement 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.
2. Signal boosters shall be tested to verify that the output power 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 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. 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 will be submitted to the Fire Marshal's Office.