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General Requirements for Emergency Responder Communications Enhancement Systems

- The emergency responder communication enhancement systems shall conform to the requirements of the International Fire Code (IFC, 2024 Edition).

- The building shall be considered to have an acceptable in-building emergency responder communications enhancement system where signal strength measurements in 95 percent of all areas and 99 percent of areas designated as critical on each floor of the building meet the signal strength requirements.

    - The downlink signal level shall be sufficient to provide not less than a Delivered Auto Quality (DAQ) of 3.0 throughout the coverage area using either narrowband analog, digital or wideband LTE signals or an equivalent Signal-to-Interference-Plus-Noise Ratio (SINR) applicable to the technology for either analog or digital signals.

    - The uplink signal level shall be sufficient to provide not less than a delivered auto quality (DAQ) of 3.0 using either narrowband analog, digital or wideband LTE signals or an equivalent digital signals or an equivalent bit error rate (BER), or an equivalent SINR applicable to the technology for either analog or digital signals.

- Buildings and structures that cannot support the required level of in-building emergency responder communications enhancement system shall be equipped with systems and components to enhance the radio signals and achieve the required level of in-building emergency communication enhancement system specified in Sections 510.4.1 through 510.4.1.3. IN-building, emergency responder communications enhancement 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 use.

- Emergency responder communications enhancement 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, *Emergency and Standby Power* Systems. The standby power supply shall be capable of operating the emergency responder communications enhancement system at 100-percent system capacity for a duration of not less than 12 hours.

- 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 gains under all operating conditions.

- Bi-Directional Amplifiers (BDA) used in emergency responder communication enhancement systems shall have oscillation prevention circuitry.

- The installation of amplification systems or systems that operate on or provide the means to cause interference on any in-building emergency responder communications enhancement networks shall be coordinated and approved by the fire code official and the frequency license holder(s)..

- The emergency responder communication enhancement 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.

    - Signal source malfunction

    - Failure of the RF-emitting device(s)

    - Low-battery capacity at 70-percent reduction of the 12 hours operating capacity has been depleted.

    - Failure of critical system components.

    - The communications link between the fire alarm system and the emergency responder communications enhanced system.

- The emergency responder communication enhancement system shall be capable of modification or expansion in the event frequency changes are required by the FCC or other frequency licensing authorities, or additional frequencies are made available by the FCC or other frequency licensing authorities.

- 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.

- 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, approved school or a certificate issued by the manufacturer of the equipment being installed.

- Where an emergency responder communication enhancement system is required, and upon completion of installation, the building owner shall have the enhancement communication 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 communication 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 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. The test shall be conducted at the time of installation and subsequent annual inspections.

- Systems incorporating Class B signal-booster devices or Class B broadband fiber remote devices shall be tested using two portable radios simultaneously conducting subjective voice quality checks. One portable radio shall be positioned not greater than 10 feet 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 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

- The emergency responder radio coverage system shall be maintained operational at all times in accordance with Sections 510.6.1. through 510.6.4. The emergency responder 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:

    - In-building coverage test per Section 510.5.4.

    - Signal booster tests to verify the gain is the same as at initial installation and set to optimize system performance.

    - Backup batteries and power supplies shall be tested per 510.6.1.3

    - Active components shall be checked to verify operation within manufacturer's specifications.

    - At the conclusion of the testing, a report, which shall verify compliance with Section 510.5.3.

- In the event frequency changes are required by the FCC or other radio licensing authority the building owner shall modify or expand the responder communication enhancement system in accordance with 510.6.2.

- Where other nonpublic safety amplification systems installed in buildings reduce the performance or cause interference with the emergency responder communications enhancement system the nonpublic safety amplification system shall or corrected or removed.

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

All service providers who inspect, test and repair fire protection systems within Thornton's jurisdiction are required to register and submit all test, inspection, and service reports via The Compliance Engine. All reports must be submitted in accordance with the testing schedule and requirements outlined in our adopted fire code.