FIRE PREVENTION DIVISION
1600 FIRST STREET, NAPA, CA 94559
707.257.9590

Emergency Responder Radio Coverage Guideline

Plan Submittal Requirements:

- ☐ Plans and attachments shall be clearly labeled, legible and dated.
- ☐ Plans shall include a title sheet, an equipment list, a written standard operating procedure, a floor plan, a system riser diagram, and secondary power calculations.
- ☐ Attachments shall include the manufacturer's specification sheets for all equipment and devices such as; cables, amplifiers, ups, batteries and antenna; indicating the FCC certification.
- ☐ Prior to installation, the developer shall notify the Fire Department to ensure that the required radio study is prepared to assess existing and proposed signal strength and clarity. The radio study shall provide specific recommendations to the developer to achieve compliance. The radio study shall be submitted along with the applicant's formal application and plans for permit. 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 and other supporting technical information.
- ☐ Submit (3) hard copies of plans, technical specifications, FCC-license & training certification to the Building Department for review.
- ☐ Submit (1) digital copy of plans, specifications, FCC-license & training certification to the following link for Fire and Telecommunication Department Reference. Napa, CA (cityofnapa.org)
- ☐ A copy of a valid FCC-issued general radio operators license.
- ☐ 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.
- ☐ 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 designed in accordance with all current & applicable codes, standards, laws, regulations and NFPA 1221.

☐ **The FRONT TITLE SHEET shall contain the following information:**

1) Project name and address of the project.
2) Scope of work.
3) The designer's full name, FCC License number and signature. The designer of record shall be responsible for the entire system being worked on.
4) Business name, address, and California Contractor's License number and FCC issued License of the installing contractor.
5) Occupancy group(s) of building or area as defined by the California Building Code.
6) Number of basements, number of stories above basement, building height, total building area, and building construction type.
7) Description of transmission zone assignments such as complex name, address, or campus and designation.
8) A note stating that the design and installation complies with the CFC (current edition), NFPA 72 & 1221 (current editions), the California Electrical Code (current edition), the California Building Code (current edition), and the Napa Fire Department ordinances, policies, and standards.
9) A key plan of the building and/or complex indicating the street location and the ERRC System Controls within the building shall be provided.
10) A clear site map and/or vicinity map and all other pertinent notes.

☐ **The EQUIPTMENT LIST shall contain the following information:**

1) Provide the model number, manufacturer's name, description, quantity, and symbols to be used (legend) for each device, equipment, and conductors proposed to be installed (Note: The Fire Department reserves the right to disallow any listed product due to past performance).
2) The symbols used on the plans shall match the legend. Strike out any "typical" symbols that do not pertain.

☐ **The RISER DIAGRAM shall contain the following information:**

1) Single-line wiring diagram (riser diagram) that shows the interconnection of equipment of the whole system.
2) Type and size of wire or conductor to be used.
3) Schematic drawing of electrical system and backup power.

☐ **The DETAIL DIAGRAM shall contain the following information:**

1) Show supervisory points from repeater.

☐ **The FLOOR PLAN shall contain the following information:**

1) Scale used and a graphical representation of the scale. The minimum scale for ERRC plans is 1/8" = 1'-0". Metric scale shall not be accepted.
2) Room and Room Names.
3) The locations of partitions, non-rated walls, and rated walls.
4) The location of all Emergency Responder equipment.
5) Power and Panel locations.
6) Raceway routing.
7) Conduit and conductor size.
8) Roof plan showing location(s) of antennae.
9) Location(s) of In Building Antennae.
10) Bandwidth

☐ **The CALCULATIONS shall contain the following information:**

1) Secondary power calculation.
2) Signal propagation Map – Provide a map indicating the signal strengths as designed and then as installed by As-Built. These maps are generally printed in color; however, they are scanned in Black and White (B&W). The map(s) must be graphically distinct such that having been scanned into B&W it/they will still demonstrate the system design.

☐ **The ATTACHMENTS shall contain the following information:**

1) Manufacturer's specification sheets for all devices, equipment, and materials to be used shall be submitted, including the cables, amplifiers, ups, batteries, antenna and transponder to the supervising station. Highlight on the cut sheet which device or equipment is being used, the listing information, and the application per listing.

Inspection Requirements:

- ☐ Allow (1) week notice prior to scheduling the inspection.
- ☐ An approved set of plans, specification sheets and installing contractor shall be onsite for the entirety of the inspection.
- ☐ Inspections are to be scheduled online through the following link. Construction Inspection Resources | Napa, CA (cityofnapa.org)
- ☐ Contractors shall provide their own radios. The Telecommunication Department will not program the contractor's radios.
- ☐ If PL Tone information is needed contact the Telecommunication Department at (707) 258-7863 or Max Hitzler at mhitzler@cityofnapa.org
- ☐ The testing channels typically are "Blue", but this could vary depending on the day of testing. (contact the Telecommunication Department if clarification is needed)
- ☐ It is the responsibility of the testing contractor, not the Telecommunication Department to troubleshoot and make needed corrections to the system on the initial inspection. If the needed corrections cannot be resolved in a reasonable amount of time an additional inspection will be required.
- ☐ Additional fees will be applied for any further inspections required after the initial on-site inspection.
- ☐ 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 in accordance with CFC and NFPA "acceptance test procedure".
- ☐ At the conclusion of the testing, a report, which shall verify compliance with all current & applicable codes, standards, laws and regulations, shall be submitted to the fire code official.

Emergency Responder Radio Coverage Guideline

New buildings shall have approved radio coverage for emergency responders within the building 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.

Permit Required

A construction permit for the installation of or modification to emergency responder radio coverage systems and related equipment is required as specified in all current & applicable codes, standards, laws and regulations. Maintenance performed in accordance with this code is not considered a modification and does not require a permit.

Technical Requirements

Systems, components and equipment required to provide the emergency responder radio coverage system shall comply with all current & applicable codes, standards, laws and regulations.

Emergency Responder Communication Enhancement System Signal Strength

The building shall be considered to have acceptable emergency responder communications enhancement system coverage when signal strength measurements in 95 percent of all areas on each floor of the building meet the signal strength requirements set forth by all current & applicable codes, standards, laws and regulations.

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 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.

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.

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 all current & applicable codes, standards, laws and regulations.

System Design

The emergency responder radio coverage system shall be designed in accordance with all current & applicable codes, standards, laws, regulations and NFPA 1221.

Amplification Systems and Components

Buildings and structures that cannot support the required level of radio coverage shall be equipped with systems and components to enhance the public safety radio signals and achieve the required level of radio coverage specified in in all current & applicable codes, standards, laws and regulations. Public safety 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 safety use.

Standby Power

Emergency responder radio coverage 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 all current & applicable codes, standards, laws and regulations.

The standby power supply shall be capable of operating the emergency responder radio coverage system at 100-percent system capacity for a duration of not less than 12 hours.

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. Bi-Directional Amplifiers (BDAs) used in emergency responder radio coverage systems shall have oscillation prevention circuitry.
6. The installation of amplification systems or systems that operate on or provide the means to cause interference on any emergency responder radio coverage networks shall be coordinated and approved by the fire code official.

SYSTEM MONITORING

The emergency responder radio 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:

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 emergency responder radio enhancement system.

ADDITIONAL FREQUENCIES AND CHANGE OF FREQUENCIES

The emergency responder radio 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.

DESIGN DOCUMENTS

The fire code official shall have the authority to require "as-built" design documents and specifications for emergency responder communications coverage systems. The documents shall be in a format acceptable to the fire code official.

RADIO COMMUNICATIONS ANTENNA DENSITY

Systems shall be engineered to minimize the near-far effect. Radio enhancement system designs shall include sufficient antenna density to address reduced gain conditions.

Exceptions:

1. Class A narrow band signal booster devices with independent AGC/ALC circuits per channel.
2. Systems where all portable devices within the same band use active power control features.

INSTALLATION REQUIREMENTS

The installation of the public safety radio coverage system shall be in accordance with NFPA 1221 and all current & applicable codes, standards, laws and regulations.

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.

MINUMUM 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 operators 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.

ACCEPTANCE TEST PROCEDURE

Where an emergency responder radio 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.
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 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 (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 all current & applicable codes, standards, laws and regulations.

FCC Compliance

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.

Maintenance

The emergency responder radio coverage system shall be maintained operational at all times in accordance with all current & applicable codes, standards, laws and regulations.

TESTING AND PROOF OF COMPLIANCE

The owner of the building or owner's authorized agent shall have the emergency responder radio coverage system 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 all current & applicable codes, standards, laws and regulations.
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. 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 **with** all current & applicable codes, standards, laws and regulations, shall be submitted to the fire code official.

ADDITIONAL FREQUENCIES

The building owner shall modify or expand the emergency responder radio 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 a public safety radio coverage system on previous frequencies does not exempt this section.

NONPUBLIC SAFTEY SYSTEM

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

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.