



CHULA VISTA FIRE DEPARTMENT

FIRE PREVENTION DIVISION

EMERGENCY RESPONDER COMMUNICATION (RADIO) COVERAGE SYSTEM REQUIREMENTS

The purpose of this Construction Detail is to provide local requirements, and guidelines for compliance with the requirements in Section 510 of the California Fire Code (CFC) and Section 918 of the California Building Code (CBC) for emergency responder radio coverage systems (ERRCS). In addition, these systems shall be designed and installed per National Fire Protection Association (NFPA) 1221 and the California Electrical Code (CEC).

I. WHERE REQUIRED

A. New Buildings

All new buildings and structures are required to comply with this Construction Detail, and adopted corresponding code provisions, except for the following:

1. Group R-3 occupancies (single-family homes, duplexes and townhomes) as defined by the CBC.
2. Open parking garages with no subterranean portions.
3. Buildings or structures that are five (5) stories or less, with a floor area not exceeding 50,000 sq. ft. per floor, and that do not have subterranean levels.

4. Buildings or structures that are primarily constructed of wood and do not have subterranean storage or parking.

B. Fire Code Official Discretion

Notwithstanding the above requirements and exceptions for new buildings, the Fire Code Official shall have the discretion to require ERRCS.

C. Existing Buildings

Existing buildings are required to comply with the requirements of this Construction Detail if a previously required two-way wired fire department communication system is removed.

II. PERMIT SUBMITTAL

A. Architectural Drawings

The following notes must be added to the architectural drawings for buildings required to meet the requirements for ERRCS as listed above:

1. This project is required to meet the requirements in CFC Section 510 for ERRCS.
2. If this building does not meet the signal strength requirement in 95% of all areas on each floor of the building, then an approved ERRCS will be provided to achieve the required coverage.
3. At the time of fire final inspection, an ERRCS Final Report and proof of FCC registration shall be submitted to the Chula Vista Fire Department.

B. Construction Permit

1. Submit for and obtain a CVFD ERRCS Construction Permit.
2. Submit for and obtain a CVFD Fire Alarm System Construction Permit.

C. Emergency Communications Study

The CVFD ERRCS Construction Permit specified in Section II Part B (1) is an ERRCS study that shall be submitted to CVFD, as a Technical Report for review and approval.

D. Electrical Plans

The electrical plans must include an approved secondary source of power required for the ERRCS as specified below.

III. DESIGN RADIO COVERAGE SYSTEM

A. Signal Strength

Acceptable ERRCS coverage requires signal strength measurements in 95% of all areas and 99% of areas designated as critical areas by the fire code official on each floor of the building meeting the following:

1. 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 a minimum of -95dBm throughout the coverage area and 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.

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III. DESIGN RADIO COVERAGE SYSTEM (continued)

2. 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.
3. System performance. Signal strength shall meet the requirements of the applications being utilized by public safety for emergency operations through the coverage area.

B. Amplification Systems and Components

Buildings that cannot support the required level of radio coverage must be equipped with systems and components to enhance the public safety radio signals and achieve the required level of radio coverage in Section III Part A. Prior to installation, all RF-emitting devices shall have the Federal Communications Commission (FCC) certification and be suitable for public safety use.

C. Frequency Range and Donor Antennae Locations

See table to the right for frequency range(s) and donor antennae locations.

The ERRCS 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.

D. Primary Power

A dedicated branch circuit shall supply the primary power source. The location of the branch circuit disconnecting means shall be permanently identified at all equipment supplied by the dedicated branch circuit. The system circuit disconnecting means shall be permanently identified as "EMERGENCY COMMUNICATIONS" and have a red marking. Where a circuit breaker is the disconnecting means, an approved breaker locking device shall be installed.

E. Standby Power

ERRCS shall be provided with dedicated standby batteries or provided with 2-hour standby batteries and connected to the facility generator power system per CFC Section 1203. The standby power supply shall be capable of operating the ERRCS at 100% system capacity for a duration of not less than 12 hours.

F. Signal Booster Requirements

If used, signal boosters shall meet the following requirements:

1. All signal booster components must be contained within 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 before 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 ERRCSs 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 ERRC networks shall be coordinated and approved.

South Simulcast

Chan #	TX Freq	RX Freq
1	853.4125	808.4125
2	853.1375	808.1375
3	853.0750	808.0750
4	852.9125	807.9125
5	852.6375	807.6375
6	852.6125	807.6125
7	852.4125	807.4125
8	852.3875	807.3875
9	852.1375	807.1375
10	851.9125	806.9125
11	851.8875	806.8875
12	851.6375	806.6375
13	851.4125	806.4125
14	851.1375	806.1375
15	851.0375	806.0375
16	853.6000	808.6000
17	853.4375	808.4375
18	851.4375	806.4375
19	852.0625	807.0625
20	852.8875	807.8875

Broadband Class B System

21	806-809	851-854
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Donor Antennae Locations

Mt. San Miguel
32°41'48.78"N
116°56'11.27"W

San Ysidro
32°33'42.83"N
117° 2'6.81"W

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G. System Monitoring

A listed fire alarm control unit shall monitor the ERRCS. If no fire alarm system is provided in the building, the system shall sound an audible signal at a constantly attended on-site location approved by the fire code official.

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% reduction of operating capacity.
6. Failure of critical system components.
7. The communications link between the fire alarm system and the ERRCS.
8. Oscillation of active RF-emitting device(s).

H. Radio Communication 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.

I. Protection of ERRCS

Riser coaxial cables shall be rated as riser cables and routed through a two-hour rated enclosure. The connection between the riser and feeder coaxial cables shall be made within a fire-resistance-rated enclosure, and passage of the feeder cable in and out of the enclosure shall be fire stopped.

Where an ERRCS is used in lieu of a two-way wired fire department communication system (e.g., high-rise structures, zoned evacuation), then it shall have a pathway survivability of Level 1, Level 2 or Level 3 by meeting at least one of the following:

1. Buildings fully protected by an automatic sprinkler system per NFPA 13 with any interconnecting conductors, cables, or other physical pathways installed in metal raceways.
2. 2-hour fire-rated circuit integrity (CI) or fire-resistive cable.
3. 2-hour fire-rated cable system (electrical circuit protective system).
4. 2-hour fire-rated enclosure or protected area.

Where installed in buildings, conductors and fiber-optic cables shall be installed in accordance with the CEC in any one of the following wiring methods:

1. Electrical metallic tubing
2. Intermediate metal conduit
3. Rigid metal conduit
4. Surface metal raceways
5. Reinforced thermosetting resin conduit (RTRC)

IV. INSTALLATION**A. Approval Prior to Installation**

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.

B. Minimum Qualifications of Personnel

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

1. A valid FCC-issued general radio operators' license.
2. Certification of in-building system training issued by a nationally recognized organization, schools such as Associated Public Safety Communications Officials International (APCO), National Association of Business and Education Radio (NABER), Wireless Infrastructure Association (WIA) or the International Association for Radio, Telecommunications and Electromagnetics (iNARTE) or a certificate issued by the manufacturer of the equipment being installed; or an ERRCS certification by the National Institute for Certification in Engineering Technologies (NICET).

C. Contractor's Acceptance Test Procedures

Upon completion of the installation, the system is required to be tested by the contractor to verify that two-way coverage on each floor of the building is not less than 95%. This testing is not witnessed by CVFD. The results of the acceptance test shall be memorialized in a ERRCS Final Report per Section IV Part D. The test procedure shall be 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 in both receive and transmit modes.
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

INSTALLATION (continued)

- 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 must 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 is considered to be a failure of that test area. Additional test locations are not 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.
 7. As part of the installation, a spectrum analyzer or other suitable test equipment shall be utilized to ensure the subject signal booster is not generating spurious oscillations. This test shall be conducted at the time of installation.
 8. Systems 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 Section III Part A.

D. ERRCS Final Report

At the time of fire final inspection, an ERRCS Final Report (memorializing the results of the contractor's acceptance test performed in accordance with Section IV Part C) and proof of FCC registration shall be submitted to CVFD. The ERRCS Final Report shall contain a floor plan and the signal strengths at each location tested, and other relevant information stamped and signed by the FCC-certified technician or Engineer with a statement specifying that the building complies with all of the requirements of CFC Section 510 and the Chula Vista Fire Department's Emergency Responder Radio Coverage System Requirements.

V. MAINTENANCE

A. Testing

Testing is required both annually and whenever structural modifications are made that will impact the system. Such required testing shall be managed and reported through The Compliance Engine. See CFC Section 510.6.1 for testing requirements.

B. Additional Frequencies

The building owner is responsible for modifying or expanding the ERRCS at their expense if the FCC or other

radio licensing authority requires changes or if additional frequencies are made available by the FCC or other radio licensing authority.

C. Nonpublic Safety System

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

VI. RCS INQUIRIES

A. RCS Contact

For Regional Communications System (RCS) technical inquiries, please direct questions to:

San Diego County Sheriff | RCS

Website: rcs800mhz.org

Main Phone: 858-694-3663

Main Email: rcs800mhz@sdsheriff.org

Engineering Email: rcsengineering@sdsheriff.gov