

SECTION 510 - EMERGENCY RESPONDER RADIO COVERAGE SYSTEMS

510.1 Emergency responder radio coverage in new buildings. Approved radio coverage for emergency responders shall be provided within all buildings meeting any one of the following conditions:

1. There are more than 3 stories above grade plane (as defined by the Building Code Section 202);
2. The total building area is 30,000 square feet or more;
3. The total basement area is 5,000 square feet or more;
4. Where required by the fire code official and radio coverage signal strength levels are not consistent with the minimum levels set forth in Section 510.4.1

Exceptions:

1. Where *approved by the fire code official*, a wired communication system in accordance with Section 907.2.13.2 shall be permitted to be installed or maintained in lieu of an *approved* radio coverage system.
2. Where it is determined by the fire code official that the radio coverage system is not needed.
3. In facilities where emergency responder radio coverage is required and such systems, components or equipment required could have a negative impact on the normal operations of that facility, the *fire code official* shall have the authority to accept an automatically activated emergency responder radio coverage system.
4. Buildings and areas of buildings that have minimum radio coverage signal strength levels of the Silicon Valley Regional Interoperability Authority (SVRIA) P25 Phase 2 700 MHz Digital Trunked Radio System within the building in accordance with Section 510.4.1 without the use of an indoor radio coverage system.

The radio coverage system shall be installed and maintained in accordance with Sections 510.4 through 510.7 of this code and with the applicable provisions of NFPA 1221, Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems..

The coverage shall be based upon the existing coverage levels of the public safety communication systems of the jurisdiction at the exterior of the building. This section shall not require improvement of the existing public safety communication systems.

510.1.1 Obstruction by new buildings. No obstruction of the public safety system backhaul shall be allowed without an *approved* mitigating plan.

510.2 Emergency responder radio coverage in existing buildings. Existing buildings shall be provided with approved radio coverage for emergency responders as required in Chapter 11.

510.3 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 Section 105.7.5. Maintenance performed in accordance with this code is not considered a modification and does not require a permit. A frequency change made to an existing system is considered to be new construction and will require a construction permit.

An operational permit may be required by the authority having jurisdiction to maintain an emergency responder radio coverage system.

510.3.1 SVRIA system registration. Prior to issuance of a construction permit, systems must be registered with the SVRIA at <http://svria.org/resources/> and proof of registration shall be submitted to the *fire code official* upon plan submittal.

SECTION 510 - EMERGENCY RESPONDER RADIO COVERAGE SYSTEMS

510.4 Technical requirements. Systems, components, and equipment required to provide emergency responder radio coverage systems shall comply with Section 510.4.1 through 510.4.2.5.

510.4.1 Radio signal strength. The building shall be considered to have acceptable emergency responder radio coverage when signal strength measurements in 90% of all areas on each floor of the building meet the signal strength requirements in Sections 510.4.1.1 and 510.4.1.2.

Exception: Critical areas, such as the fire command center(s), the fire pump room(s), interior exit stairways, exit passageways, elevator lobbies, standpipe cabinets, rescue air filling stations, sprinkler sectional valve locations, and other areas required by the fire code official, shall be provided with 99% floor area radio coverage.

510.4.1.1 Minimum signal strength into the building. A minimum signal strength of -95 dBm shall be receivable in 90% of the area of each floor within the building when transmitted from the Silicon Valley Regional Interoperability Authority (SVRIA) P25 Phase 2 700 MHz Digital Trunked Radio System.

510.4.1.2 Maximum signal strength out of the building. A maximum signal strength of -95 dBm shall be received by the Silicon Valley Regional Interoperability Authority (SVRIA) P25 Phase 2 700 MHz Digital Trunked Radio System at the donor site when transmitted from 90% of the area of each floor within the building.

510.4.1.3 Signal strength differential. The system shall be designed to ensure that there is a minimum 15 dBm difference between the interior and exterior signal strength.

510.4.1.4 Delivered audio quality. The radio coverage system shall provide a minimum delivered audio quality of level 3.4 (DAQ "3.4") on each floor of the building or structure. DAQ 3.4 constitutes audio quality that makes speech understandable with repetition only rarely required with some noise and distortion.

510.4.1.5 Building conduit and pathway survivability. All new buildings shall be constructed with not less than a two-inch (2") conduit having a minimum two-hour fire resistive rating installed between the first floor or the bottom subterranean floor to the roof. Installed riser cable shall be protected by a 2-hour-rated enclosure.

Exception: In existing buildings, riser cable mechanically protected by metal conduit can be routed through a sprinkler-protected, 1-hour rated enclosure, including the door.

All feeder cable shall be either protected by an automatic sprinkler system in accordance with NFPA 13 or installed within approved metal raceway.

All radio cable (riser and feeder) is required to be plenum-rated. Cable other than radio cable is allowed to comingle with the radio cable in the conduit provided it is listed, shielded cable that will not interfere with the radio cable.

At each floor and the roof, an opening shall be made to allow easy access to the conduit from the ceiling.

SECTION 510 - EMERGENCY RESPONDER RADIO COVERAGE SYSTEMS

Access in either the form of a drop ceiling or access panel shall be made along hallways and through firewalls.

All floors of the subterranean parking garages shall have a similar conduit installation and access.

510.4.2 System design. The emergency responder radio coverage system shall be designed in accordance with Sections 510.4.2.1 through 510.4.2.5.

510.4.2.1 Amplification systems allowed.

Buildings and structures that cannot support the required level of radio coverage shall be equipped with a radiating cable system, a distributed antenna system with Federal Communications Commission (FCC)-certified, Class A channelized (spectrum agile) public safety grade signal boosters (amplifiers) designed for the frequencies specified by the fire code official, in order to achieve the required adequate radio coverage.

510.4.2.2 Technical criteria. The *fire code official* shall provide the various frequencies required, the location of radio sites, effective radiated power of radio sites, and other supporting technical information upon request by the building owner or owner's representative. **The City of Palo Alto will utilize the frequencies necessary to complete the West simulcast cell. These frequencies and other technical information will be provided by the SVRIA upon registration.**

510.4.2.2.1 The Public Safety radio system, extending from the head-end amplifier to the distributed antennas shall not be combined with other DAS systems installed in the building.

510.4.2.2.2 A single antenna system is allowed provided the antennas are capable of passively distributing all frequencies between 698MHz and 2.7GHz and the hardware for both Public Safety and wireless carrier frequencies are completely separate with necessary filters. The single antenna system must also be tested and certified by a qualified contractor.

510.4.2.2.3 Where fiber distribution systems are used to extend the Public Safety radio system throughout the building or to other buildings, the horizontal fiber runs shall be enclosed in conduit meeting at least the building conduit requirements in Section 510.4.1.5.

510.4.2.3 Power supply sources. Emergency responder radio coverage systems shall be provided with at least two independent and reliable power supply sources conforming to NFPA 72 and the Electrical Code, one primary and one secondary. The standby power supply shall be an approved UPS system capable of operating the emergency responder radio coverage system for a duration of not less than 24 hours. When primary power is lost, the power supply to the emergency responder radio coverage system shall automatically transfer to the standby power supply.

510.4.2.3.1 Emergency Power Off (EPO). The UPS system shall be equipped with an emergency power off (EPO) switch in a location approved by the fire code official. The EPO shall disconnect both the circuit breaker and secondary power supply simultaneously.

510.4.2.4 Signal booster requirements. If used, signal boosters shall meet the following requirements:

SECTION 510 - EMERGENCY RESPONDER RADIO COVERAGE SYSTEMS

- a. All signal booster components shall be contained in a National Electrical Manufacturer's Association (NEMA) 4-type waterproof cabinet.
- b. Battery systems used for the emergency power source shall be contained in a NEMA 4-type waterproof cabinet.
- c. The signal booster system and power supply(ies) shall be electrically supervised and monitored in accordance with NFPA 1221.
 - i. For buildings without a fire alarm system, a dedicated monitoring panel in accordance with NFPA 72 shall be provided to annunciate automatic supervisory and trouble signals for the signal booster system and power supply(ies) and sound an audible signal at a constantly attended location.
- d. Equipment shall have FCC certification prior to installation.

510.4.2.5 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 additional frequencies are made available by the FCC.

510.5 Installation requirements. The installation of the public safety radio coverage system shall be in accordance with Sections 510.5.1 through 510.5.6.

510.5.1 Approval prior to installation. Amplification systems capable of operating on frequencies licensed to any public safety agency by the FCC shall not be installed without prior coordination and approval of the *fire code official*.

510.5.2 Minimum qualifications of personnel. The minimum qualifications of the system designer, lead installation personnel and personnel conducting radio system testing shall include possession of both of the following:

1. A valid FCC-issued general radio operators license; and
2. Certification of in-building system training issued by one of the following:
 - a. Associated Public Safety Communications Officials (APCO),
 - b. National Association of Business Education Radio (NABER),
 - c. Personal Communications Industry Association (PCIA) or,
 - d. The manufacturer of the equipment being installed.

All design documents and all tests shall be documented and signed by a person meeting the minimum qualification noted in this section.

510.5.3 Acceptance test procedure and system certification. When 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 in accordance with Section 510.4.1. The test procedure shall be conducted as follows:

SECTION 510 - EMERGENCY RESPONDER RADIO COVERAGE SYSTEMS

1. Talk-back testing from a site to the Silicon Valley Regional Interoperability Authority (SVRIA) P25 Phase 2 700 MHz Digital Trunked Radio System shall use City of Palo Alto radio(s) on the designated control channel (Channel 2) and may be witnessed by a representative of the City of Palo Alto Fire Department.

2. Each floor of the building shall be divided into a grid of 20 approximately equal test areas.

3. 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.

4. In the event that three of the test areas on a floor fail the talk back test, in order to be more statistically accurate, the floor shall be permitted to be divided into 40 equal test areas. If the system fails the 90% coverage requirement for the 40-area test, the emergency responder radio_system shall be altered to meet the 90% coverage requirement.

Exception: Critical areas shall be provided with 99% floor area coverage.

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 Silicon Valley Regional Interoperability Authority (SVRIA) P25 Phase 2 700 MHz Digital Trunked Radio 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.

6. The test for emergency responder radio coverage will be considered passed when 90% of the test locations on each floor are able to pass two-way communications to and from the outside of the building.

Exception: Critical areas shall be provided with 99% floor area radio coverage.

7. The gain values/output levels 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.

8. 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.

9. Individuals conducting initial benchmark and system acceptance tests shall meet the minimum qualifications in accordance with Section 510.5.2. All test results are required to be validated by an *approved* third party, independent of the system designer and installer.

Prior to issuance of the building Certificate of Occupancy, a system acceptance test report shall be submitted to the *fire code official*, maintained on the premises and be made available to the public safety department upon request. The report shall verify compliance with Section 510.5.4, and include the emergency responder radio coverage system equipment data sheets, diagram showing device locations and wiring schematic, and a copy of the electrical permit and system certification letter.

SECTION 510 - EMERGENCY RESPONDER RADIO COVERAGE SYSTEMS

510.5.4 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 CFR Part 90.219.

510.5.5 Location of equipment. For buildings without a *fire command center* the communications control equipment shall be located inside the building near the fire alarm control panel, or other *approved* location.

510.5.6 Signage. Buildings equipped with an emergency responder radio coverage system shall be identified by an *approved* sign located above or near the building key box stating: "Radio System Installed". A sign stating "Radio System Equipment" will be placed on or adjacent to the door of the room containing the main system components. These signs shall meet the City of Palo Alto's current ERRCS sign standard. Metal backed, red background, with blue reflective lettering.

510.6 Maintenance. The emergency responder radio coverage system shall be maintained operational at all times in accordance with Sections 510.6.1 through 510.6.5

510.6.1 Testing and proof of compliance. The emergency responder radio coverage system shall be inspected and tested annually or whenever structural changes occur including additions or remodels that could materially change the original field performance tests. Individuals conducting the tests shall meet the minimum qualifications in accordance with Section 510.5.2. All test results are required to be validated by an *approved* third party, independent of the system designer and installer.

Testing shall consist of the following:

1. In-building coverage test as described in Section 510.5.3.
2. Signal boosters shall be tested to verify that the gain/output level 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. 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 with Sections 510.5.3 and 510.6 shall be submitted to the *fire code official* and a copy maintained on the premises and made available to the *authority having jurisdiction* upon request.

510.6.2 Additional frequencies. The building *owner* shall modify or expand the emergency responder radio coverage system at their 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 section.

510.6.3 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.

510.6.4 Qualifications of testing personnel. All tests shall be documented and signed by a person meeting the minimum qualifications set forth in Section 510.5.2.

SECTION 510 - EMERGENCY RESPONDER RADIO COVERAGE SYSTEMS

510.6.5 Continuing operation/supervision. The occurrence of any fault in an emergency responder radio coverage system where the system function is decreased shall result in the transmission of a supervisory signal to a supervisory service. Systems that are out-of-service for more than 8 hours require notification to the *fire code official*.

Design Details for Approved Building Signage Required in Section 510.5.6:

**6" x 8" Metal backed Sign
½" Lettering
2" x 4" Graphic
Red Background with Blue
Reflective Letters and
Graphic**



Radio System Installed