Sunnyvale Department of Public Safety

Emergency Responder Radio Coverage Systems

Radio System Installed

Code and Policy Requirements

Updated: November 30, 2017

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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 ~~building official and 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 ~~All new buildings shall have approved radio coverage for emergency responders within the building~~ 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. When in the opinion of the *fire code official*, the construction of a new building obstructs line of sight emergency radio communications to existing buildings or other locations, the developer of the new building shall correct the degraded radio coverage as necessary to restore communications capabilities in accordance with Section 510 of this code.

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 is required to maintain an emergency responder radio coverage system as specified in Section 105.6.

510.3.1 SVRIA system registration. Prior to issuance of a construction permit, systems must be registered with the SVRIA and proof of registration shall be submitted to the *fire code official* upon plan submittal.

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~~95~~ percent 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 percent 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 ~~Minimum~~ Maximum signal strength out of the building. A ~~minimum~~ maximum signal strength of -95 dBm shall be received by the ~~agency's radio system~~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 or other approved 2-hour fire-resistive rated enclosure.

Installed riser cable shall be protected by a 2-hour fire-resistive rated enclosure.

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

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 which 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 bands and frequencies specified by the *fire code official*, or other system allowed 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 ~~maintain a document providing the specific technical information and requirements for the emergency responder radio coverage system. This document shall contain, but not be limited to,~~ 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.

510.4.2.3 Power supply sources.~~Standby power.~~ Emergency responder radio coverage systems shall be provided with ~~standby power in accordance with Section 604~~ 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 period of at least 24 hours. When primary power is lost, the power supply to the emergency responder radio coverage system shall automatically transfer to the secondary power supply.

510.4.2.3.1 Emergency power off. 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:

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 4-type waterproof cabinet.
3. The signal booster system and ~~battery system~~ power supply(ies) shall be electrically supervised in accordance with NFPA 1221. ~~and monitored by a supervisory service or when approved by the fire code official, shall sound an audible signal at a constantly attended location.~~
   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.
4. Equipment shall have FCC certification prior to installation.

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, ~~and~~ lead installation personnel and personnel conducting radio system tests shall include possession of:

1. A valid FCC-issued general radio operators license; and
2. Certification of in-building system training issued by ~~a nationally recognized organization, school or a certificate issued by~~
   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.
~~These qualifications shall not be required where demonstration of adequate skills and experience satisfactory to the fire code official is provided~~.

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 ensure that two-way coverage on each floor of the building is ~~a minimum or 90 percent~~ in accordance with Section 510.4.1. The test procedure shall be conducted as follows:

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 Sunnyvale Department of Public Safety radio(s) on the designated control channel (Channel 2) and may be witnessed by a representative of the Sunnyvale Department of Public Safety.

((~~1.~~))2. Each floor of the building shall be divided into a grid of 20 approximately equal test areas.

~~2.~~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.

~~3. Failure of a maximum of two nonadjacent test areas shall not result in failure of the test.~~

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. ~~Failure of a maximum of four nonadjacent test areas shall not result in failure of the test.~~ 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 percent coverage requirement.

Exception: Critical areas shall be provided with 99 percent 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 ~~public agency's radio communication system~~ 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. ~~Additional test locations shall not be permitted~~

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 percent floor area radio coverage.

7.~~6.~~ 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.((~~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 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.

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 and portable handsets 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".

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.~~3~~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 tests shall 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 ensure 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 one 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 Public Safety Department personnel 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~~ Sunnyvale Department of Public Safety 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 in possession of a current FCC General Radiotelephone Operator license, or a current technician certification issued by a nationally recognized organization, school or a certificate issued by the manufacturer of the equipment being installed.

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 Building Signage Required in Section 510.5.6:

6” x 8” Sign
½” Lettering
2” x 4” Graphic
Red Background with
White Letters and Graphic

Radio System Installed

ERRCS - PERMITTING & PLAN SUBMITAL GUIDELINES

GENERAL

The contractor shall apply for permits to install a new Emergency Responder Radio Coverage System (ERRCS) or to modifying an existing system. The contractor shall submit plans for the ERRCS that provide sufficient information for the City of Sunnyvale to determine appropriate equipment and materials are being utilized; the survivability of the cable pathway; and that the system meets the requirements specified in the fire code including backup power, alarms and appropriate RF signal levels.

PERMITS REQUIRED

1. A fire construction permit is required to install or modify emergency responder radio coverage systems. (2016 CFC 105.7.5, 510.3; 2016 NFPA 72 §24.9.1.2)
2. A City of Sunnyvale Building Inspection or City of Sunnyvale Building Department electrical permit for compliance with 2016 CEC is required when changes to the electrical system or panels are needed.
3. A City of Sunnyvale Fire Alarm permit is required when changes to the fire alarm panels are needed.

PLAN REVIEW SUBMITTAL DOCUMENTS

- The City of Sunnyvale permit application and permit fees.
- A copy of the SVRIA System Registration document and proof of registration.
- A copy of Contractors license and or system designer qualifications in accordance with 2016 NFPA 72 §10.5.1-3. The supplier and installation contractor must be qualified for the selected products and have manufacturer's certification.
- Identify the Benchmark Test Report Number on the construction permit application. The Benchmark Test Report must confirm that the ERRCS is necessary to improve radio coverage.
- Prior to submitting your Plan Review Documents to the City of Sunnyvale for the ERRCS permit, the contractor shall submit an electronic copy of the ERRCS Construction and Design plans in .PDF format for review and approval (NFPA 1221 §9.6.2.1.2; NFPA 72 §24.3.13.8.2) to the Sunnyvale Department of Public Safety approved third party company (RFSignalman).

Please set up an account and upload your plan sets at www.planchecker.rfsignalman.com. You may contact RFSignalman at PlanChecker@RFSignalman.com to coordinate submittal of your electronic plan sets.

Allow 15 business days for plan review. Please allow 10 business days to review plans that have been resubmitted to address the reviewer's comments. After the ERRCS Construction and Design Plans have been reviewed and accepted, three sets of scaled ERRCS Construction / Design Plans shall be submitted to the City of Sunnyvale to receive the fire construction permit for the ERRCS (2016 NFPA 1221 §9.6.6). The ERRCS Construction and Design plans will include the following at a minimum:

- Title Page with:
  - Project name, address, and location map.
  - Designer name, Contractor name and contact information.
  - Designers FCC License number, Contractors License Number,
  - Project notes
  - Statement of Compliant Installation - compliance to CA fire code, NFPA and City of Sunnyvale Code and Policy
- Site plan with north arrow, scaled or dimensioned showing the subject building and surrounding property. Site plan will include a table documenting the SVRIA Registration Number, Equipment Room ID, outdoor antenna model number, antenna gain, azimuth, ERP and distance to the donor site.

- System Diagram showing the interconnection of the whole system. Include a numbered cable list and symbol chart.
- Floor plan for each level of the building showing equipment, power, and antenna locations, coax routes, conduit size, and locations of any miscellaneous system components, including splitters, couplers, filters, inline amplifiers and alarm/protection equipment. All components shall be named or labeled and referenced in the contactors materials lists and power budget calculation tables.
- A Radio coverage diagram for each level of the building showing where the signal level reaches -95dBm from each indoor antenna.
- Elevation and roof plans indicating the location, orientation and height above roof level of donor antenna mounts and the location of cable routes and entries. Include Detail Diagrams indicating grounding (NFPA 70; NFPA 1221 §5.8), surge protection (2016 NFPA 1221 §5.6), anchoring and cable entries in compliance with 2016 CFC Section 504.4.
- Construction details including the power budget calculations, the location of the 24-hour secondary power source and an Electrical one-line diagram showing primary power, backup power and emergency power off connections. (2016 CFC 510.4.2.3; NFPA 1221 §5.5-5.10, 9.6.12).
- Grounding and lightning protection diagram showing the antenna mount, cable, cabinet and electrical ground connections to the building ground system (2016 NFPA 1221 §5.8, 9.6.3).
- Construction details indicating how the ERRCS system is connected to the building fire alarm or monitoring system including a description of sequence of events associated with testing the alarms. (2016 CFC 510.4.2.4; NFPA 1221 §9.6.13). Include a Schematic drawing of alarm interconnection.
- Construction details for the 2-hour rated riser for the coaxial cables between the amplifier and antennas on each floor. (2016 NFPA 1221 §9.6.2.1.3; NFPA 72 § 24.3.6.8 – 24.3.6.8.4.)
- Construction details for pathway survivability meeting Level 1, 2 or 3 on each of the cable extensions to the indoor mounted antennas. Plenum rated coaxial cables will be used inside buildings. Cables that are exposed to sunlight shall be UV rated and suitable for outdoor use (2016 NFPA 1221 §5.10, 9.6.2).
- Construction details indicating how the cable is protected against physical damage in areas that have public access and on roof tops.
- Construction details and or notes showing physical installation of equipment and panels, climate control, fire protection, security, power and lightning protection (2016 NFPA 1221; 4.10). Indicate how signal booster components and battery systems are mounted in NEMA 4-type waterproof cabinets. (2016 CFC 510.4.2.4; 2016 NFPA 1221 §4.10)

- Equipment list including manufacturer part number, description, quantity and symbol to be used on plans. Include a matrix showing FCC issued certification numbers for all electronic equipment. (2016 NFPA 1221 §9.6.11) The equipment list may be a separate document to the drawing set. Include specification sheets for:
  - Amplifiers
  - Antennas
  - Coaxial cables and connectors
  - Splitters, combiners, couplers or any other passive components proposed.
  - NEMA 4-type waterproof enclosure for repeaters, transmitters, receivers, signal booster components and battery system components.
  - Any equipment requiring FCC certification. (2013 CFC 510.4.2.4)
  - Backup battery and charging system or if used, generator specifications and plans.
  - Signage “ERRCS Installed”

ERRCS - PERMITTING & PLAN SUBMITAL GUIDELINES

INSPECTION DOCUMENTATION

The ERRCS shall not be placed on the air until final inspection by the fire code official. The contractor will request physical inspection of cable installation prior to closing ceilings and walls. A test certificate/report is required from Sunnyvale's approved third party testing company (RFSignalman) to document the operation of the ERRCS and indoor radio coverage. (2016 NFPA 72 §7.5.8.1). Prior to requesting formal Acceptance or Annual tests the contractor will have submitted to the City of Sunnyvale fire code official and will have on-site and available for the inspector to review:

- A written statement by the installing contractor that the system has been installed in accordance with the approved plans and tested in accordance with the manufactures published instructions and regulating requirements. (2016 NFPA 72 §7.5.2)
- A written statement by the fire alarm service provider / contractor that the system has been installed in accordance with the approved plans and tested in accordance with the manufacturers published instructions, 2016 NFPA 72 and other regulating requirements. (2016 NFPA 72 §7.5.2)
- A record of completion form (2016 NFPA 72 §7.8.2, Figure 7.8.2(b))
- A supplementary record of completion form (2016 NFPA 72 Figure 7.8.2(j))
- As-built construction drawings.
- Equipment and software manuals.

INSPECTION PROCEDURES

1. Coordinate the physical inspection of the 2-hour riser and conduit installation with the Building Department prior to closing walls or ceilings.
2. **Call the Sunnyvale approved 3rd party testing company (RFSignalman) at (916) 686-1776 to schedule Acceptance and Annual Tests. Allow 10 days to schedule the inspection service.**
3. Supply the required inspection documentation prior to requesting a formal Acceptance Test of the ERRCS. The City's third party testing company (RFSignalman) will schedule an Acceptance Test within 10 days after receiving the request from the Owner/Contractor.
4. Failure of the Acceptance Test will require that the contractor resubmit the Inspection Documentation. The retest of the ERRCS will be scheduled within 10 days after receipt of the Inspection Documentation.
5. The City of Sunnyvale reserves the right to inspect radio coverage at any time with reasonable notice.

ACCEPTANCE TESTING (2016 CFC 510.5.3; NFPA 1221 §11.3.9)

Acceptance testing is required to demonstrate compliance to the provisions of CFC Section 510. The Inspection/Test fees are paid to the City of Sunnyvale with the permit application and will be performed to the published Acceptance Test Procedure for SVRIA System Certification.

The two primary considerations for the Acceptance Tests are Equipment Validation (before it is placed on the air) and Coverage Validation (to document the improved coverage). The contractor will not place an amplifier on air before it is verified.

Equipment Validation will be performed with the contractor and Sunnyvale Department of Public Safety's third party testing company (RFSignalman) present to demonstrate operation of the system including; frequency settings, signal levels, gain settings, antenna isolation, alarm operation and backup power operation. The goal is to achieve the minimum power required to carry out the desired operation. 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 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. This test shall be conducted at time of installation and subsequent annual inspections.

Coverage Validation will be performed by the Sunnyvale Department of Public Safety's third party testing company (RFSignalman) to document radio coverage in the general floor area and critical locations of the building. The coverage measurements will verify that the contractor's system meets the minimum signal level and audio quality requirements specified in the fire code. This can be either "native" or "amplified" radio coverage. It is not uncommon for a building to have acceptable radio coverage without a signal booster. Coverage validation is performed as follows:

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 Sunnyvale Department of Public Safety radio(s) on the designated control channel (Channel 2) and may be witnessed by a representative of the Sunnyvale Department of Public Safety.
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 three of the test areas on a floor fail the talk back test, 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 percent coverage requirement.
   Exception: Critical areas shall be provided with 99 percent 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 pass two-way communications to and from the outside of the building.
   Exception: Critical areas shall be provided with 99 percent 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 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.

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 fire code official upon request. The report shall verify compliance with Section 510.5.4. The contractor will ensure that the "as-built" system records includes equipment data sheets, diagram showing device locations and wiring schematic, test reports, a copy of the system SVRIA Registration and the renewable operating permit issued by the City of Sunnyvale Fire Prevention Unit.

After completion of the Acceptance Tests, Sunnyvale Department of Public Safety – Fire Prevention Unit will schedule a walk through to survey the building and verify Fire Command and Dispatch radio operation. Failure of the operational check will require that the owner correct deficiencies and re-schedule Acceptance Testing.