The Silicon Valley Regional Communication System is just that, a regional system, therefore there are many agencies that have local ordinances and guidelines that must be complied with. The purpose of this document is to provide guidance specific to the design of the SVRCS to aid in ensuring that the radio coverage is sufficient. It is not intended to replace any local rules or policies. The information contained in the protocol has been developed to assist architects, engineers, and contractors in obtaining compliance with the design, installation and maintenance requirements for emergency responder radio coverage.

Emergency responders need reliable communications wherever they work, including inside buildings. Section 510 of the California Fire Code, and Section 510 and 915 of the California Building Code requires that certain buildings be provided with radio enhancement systems designed to provide radio coverage in areas of the buildings where signal strength does not meet minimum criteria due to building construction features and/or location. These radio coverage enhancement systems are also referred to as BDA (bi-directional amplifier) and DAS (distributed antenna systems). In this Protocol, they are collectively referred to as BDA/DAS systems.

Additional information about radio coverage is available through the National Public Safety Telecommunications Council at: www.npstc.org/inBuilding.jsp

The SVRCS through the Silicon Valley Regional Interoperability Authority (SVRIA) in collaboration with each of the Member and Participant Agencies will keep track of every BDA/DAS system that is deployed.

**MINIMUM RADIO SIGNAL STRENGTH**

1. **Coverage**: The building shall be considered to have acceptable emergency responder radio coverage when signal strength measurements in 95 percent of all areas on each floor of the building meet the signal strength outlined below:

   a. **Minimum signal strength into the building**. Minimum signal strength of -95 dBm shall be receivable within the building.

   b. **Minimum signal strength out of the building**. Minimum signal strength of -95 dBm shall be received.

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QUALIFICATIONS OF CONTRACTORS

1. Minimum qualifications of personnel: The system designer, lead installation personnel and personnel conducting radio system tests shall include:

   a. A valid FCC-issued general radio operators license; and

   b. Certification of in–building system training issued by a nationally recognized organization, school such as Associated Public Safety Communications Officials International (APCO), National Association of Business and Education Radio (NABER), Personal Communications Industry Association (PCIA) or the International Association for Radio, Telecommunications and Electromagnetics, Inc. (iNARTE) or a certificate issued by the manufacturer of the equipment being installed.

PERMITS AND CONSTRUCTION DOCUMENTS MUST COMPLY WITH LOCAL BUILDING AND FIRE CODE ORDINANCES.

INITIAL TEST REPORT

1. Cover Sheet (i.e., contractor, lead technician, contact information, customer, address);

2. Project Information (i.e., customer, project name, address, tenant(s) if known);

3. Building Information (i.e., building name, address, construction type(s), number of floors, square footage);

4. Project Scope of Work;

5. Color Signal Strength/Quality Measurements by Floor & Grid (i.e., “red” for failed, “green” passed);

6. System Recommendations (i.e., met coverage requirements, requires radio enhancement system, or similar).

DESIGN AND INSTALLATION

1. General: Emergency Responder Radio Coverage Systems shall be designed, and installed in accordance with California Fire Code, Section 510, applicable provisions of the National Fire Alarm and Signaling Code (NFPA 72), and this standard.

2. Systems Allowed: Only dedicated emergency responder radio system will be allowed. A dedicated Public Safety Antenna System is preferred, A single set of antennas would
be acceptable so long as it is 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 (as noted above).

3. **Location**: For buildings without a fire command center the communications control equipment shall be located inside the building adjacent to the fire alarm control panel.

4. **Delivered audio quality (DAQ)**: The radio coverage system shall provide a minimum delivered audio quality of level 3.5 (DAQ “3.5”) on each floor of the building or structure. DAQ 3.5 constitutes audio quality that makes speech understandable with repetition only rarely required with some noise and distortion.

5. **Pathway survivability**: Pathway survivability shall comply with the following:
   
   a. Riser cable shall be protected by 2-hour-rated enclosure;
   
   b. All feeder cable pathways shall be protected by an automatic sprinkler system in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, or installed within approved metal raceway.  
   **Exception**: In non-high rise buildings, riser cable mechanically protected by conduit can be routed through a sprinkler protected 1-hour rated enclosure (including door).

6. **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 California Electrical Code. The secondary power supply shall be 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.

7. **Signal booster requirements**: Signal boosters shall meet all of the following requirements:
   
   a. Equipment shall be installed adjacent to the fire alarm control panel;
   
   b. Only channelized Class A amplifiers shall be permitted;
   
   c. All signal booster components shall be contained in a National Electrical Manufacturer’s Association (NEMA) 4-type waterproof cabinet;
   
   d. Battery systems used for the emergency power source shall be contained in a NEMA 4-type waterproof cabinet;
e. The signal booster system and power supply(s) shall be electrically supervised and monitored by a supervisory service in accordance with NFPA 72;

f. Equipment shall have FCC certification prior to installation.

8. Supervision/Monitoring: System(s) shall be electronically monitored by the buildings fire alarm control panel. At a minimum the following five points shall be monitored:

a. Loss of normal AC power;

b. Signal booster failure;

c. Antenna malfunction;

d. Failure of UPS;

e. Low-battery capacity.

9. Signage: Buildings equipped with an emergency responder radio coverage system shall be identified by an approved sign “Building is equipped with an Emergency Responder Radio Coverage System” located adjacent to the fire alarm control panel remote annunciator, or at the fire alarm control panel if no remote annunciator is installed.

ACCEPTANCE TESTING AND CERTIFICATION

1. Acceptance test procedure and system certification: The building owner shall have the radio system tested to ensure that two-way coverage on each floor of the building is a minimum of 95 percent. The test procedure shall be conducted as follows:

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

b. 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.

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

d. In the event that three 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 a maximum of fourth 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 90 percent coverage requirement;

e. 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.

f. Prior to issuance of the Certificate of Occupancy, the building owner or owner’s representative shall provide the Fire Prevention and Hazardous Materials Division with a certification letter, stating that the emergency responder radio coverage system has been installed and tested in accordance with California Fire Code, Section 510, and manufacturers installation instructions.

MAINTENANCE AND TESTING

1. General: Emergency Responder Radio Coverage Systems shall be maintained in accordance with California Fire Code, Section 510, applicable provisions of the National Fire Alarm and Signaling Code (NFPA 72), and this standard.

2. 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.

3. 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 an approved monitoring company. Systems that are out-of-service for more than 8 hours require notification to the local Public Safety Dispatch Center.

4. Testing: 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 designer and installer qualifications. Testing shall consist of the following:

   a. In-building coverage test.

   b. Signal boosters shall be tested to ensure that the gain/output level is the same as it was upon initial installation and acceptance.
c. 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.

d. All other active components shall be checked to verify operation within the manufacturer’s specifications

e. A the conclusion of the testing, a report shall be submitted to the local agency, copied to SVRIA and a copy maintained on the premises and made available upon request for inspection.

ADDITIONAL FREQUENCIES AND CHANGES IN 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 at the building owner’s expense.