



## **TECHNICAL SPECIFICATIONS RELATED TO ERRCS CITY OF PASADENA FIRE DEPARTMENT**

**Revised 03/01/2019**

### **EMERGENCY RESPONDER RADIO COVERAGE REQUIREMENTS**

These guidelines establish a framework to provide effective in-building radio coverage in communities served by the Pasadena Fire and Police Department using the Pasadena Cell of the Interagency Communications Interoperability System (ICI).

It is the responsibility of the organization installing any systems relating to the provisioning of radio coverage for emergency responders to conform to any and all applicable laws and regulations.

These guidelines shall apply to every building, structure, subterranean parking and storage except for the following.

1. Existing building or structures for which a building permit has already been issued.
2. Elevators
3. Buildings or Structures that have three (3) stories or less and that do not have subterranean storage and/or parking.
4. Any building or structure where coverage, that is consistent with the minimum levels of service as set forth in the specifications, is naturally provided.
5. Any existing building *unless* the building is undergoing extensive remodel and or expansion; and the building exceeds three (3) stories or contains subterranean parking and/or storage; and desired in-building coverage is compromised and no longer meets regulations.
6. Any structure or building where the installation of an in-building amplification system may present hazardous or imminent danger to occupants of such facility.

#### *Note:*

When these conditions exist, and prior to placing any requirement for the installation of any in-building emergency radio communications equipment, the owner of the building should consult with the Pasadena Planning Department, Fire Department staff and/or its authorized agents/vendors as early in the construction planning and approval process as practical, in order to:



1. Determine if the radio communications have historically been problematic for emergency response personnel (FIRE and POLICE Services) for the location, building or structure in question.
2. Determine if building or structure already meets or exceeds the established minimum coverage specifications.
3. Communicate and coordinate with the Building Official, and the Property Owner.

The owner of any building or structure to which this article applies shall be responsible for all cost's associated with compatibility with the Pasadena Cell of ICI.

All new buildings shall have approved radio coverage for emergency responders pursuant to California Fire Code (CFC) Section 510. The intent of these guideline's is to provide interpretation of the minimum standards necessary to meet the requirements for Emergency Responder Radio Coverage (ERRC) in accordance with the code.

The radio coverage system and all of its components shall be installed and maintained in accordance with the Pasadena Municipal Code (PMC), California Fire Code (CFC) Section 510, and with the applicable provisions of NFPA 72. – <http://www.bsc.ca.gov/pubs/codeson.aspx>

### **1. PERMITTEE**

That person or organization in control of a property or an activity, or acting under the authority of a principal; the holder of the permit.

### **2. OBSTRUCTION BY NEW BUILDING**

When, in the opinion of the fire code official, the construction of a new building obstructs the 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 CFC Section 510.

### **3. EMERGENCY RESPONDER RADIO COVERAGE IN EXISTING BUILDINGS**

Existing buildings shall provide approved radio coverage for emergency responders as required in Chapter 11 of the CFC and Pasadena Municipal Code.



#### **4. PERMIT REQUIRED**

A construction permit is required for installation of, or modification to an ERRC system and related equipment as specified in CFC Section 105.7.5. Maintenance performed in accordance with fire code is not considered to be a modification and does not require a construction permit.

#### **5. INSPECTION**

Inspection of the systems, validation of functional operability, and verification of compliance shall be conducted by the fire official or his/her designee *prior* to issuance of a Certificate of Occupancy or Temporary Certificate of Occupancy.

#### **6. SYSYEM DESIGN AND TECHNICAL REQUIREMENTS**

The design, specifications, installation, components, and equipment required to provide an ERRC system shall comply with CFC Section 510.4.1 through 510.4.2.5.

#### **7. CRITICAL AREA**

Critical areas such as the fire command center, the fire pump room, exit stairs, exit passageways, elevator lobbies, below grade parking facilities, standpipe cabinets, sprinkler valve locations, and other areas deemed critical by the fire official shall be provided with ninety-nine percent (99%) floor area radio coverage consistent with NFPA 72, Section 24.5.2.2.1

#### **8. DELIVERED AUDIO QUALITY**

The ERRC 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.

#### **9. BUILDING CONDUIT**

In accordance with the CFC and NFPA 72, all floors (including subterranean parking garages) in new buildings that require the installation of a ERRC system protected with a fire sprinkler system shall be constructed with not less than a two-inch (2") conduit having a minimum one-hour (1hr) fire resistive rating for the purpose of housing all radio equipment, cabling, antennas, and other infrastructure items appurtenant to the ERRC system. A two-hour fire resistive rating shall be required in buildings not protected with a fire sprinkler system.



## **10. POWER SUPPLY SOURCE**

ERRC systems shall be powered with at least two (one primary and one secondary) independent and reliable power sources that conform to NFPA 72 and the California Electrical Code. The secondary power supply shall be capable of operating the ERRC system for a period of at least 24-hours when the primary power source is inoperable. In the event of a failure of the primary power supply, the ERRC system shall automatically transfer to the secondary power supply without interruption. If a signal booster is used, it shall comply with the requirements of CFC Section 510.4.2.4, and shall be monitored by a supervisory service. It shall also provide automatic supervisory and trouble signals for a failed primary or secondary system, and have a backup capacity of 75% that is annunciated by the fire alarm system in accordance with NFPA 72.

## **11. ACCEPTANCE TEST PROCEDURE AND SYSTEM CERTIFICATION**

A system acceptance test report shall be submitted to the fire code official by a person or entity that meets the minimum standards established in CFC Section 510.5.2, maintained on the premises and be made available to the City of Pasadena upon request. The report shall verify compliance with CFC Section 510.5.4 and include the ERRC system equipment data sheet, diagram showing device locations, wiring schematic, GRID testing results and a copy of the original permit, and a system certification letter. The building owner shall have the radio system tested utilizing a GRID test to ensure that two-way coverage on each floor of the building complies with the requirements of CFC Section 510.4.1 and 510.5.3. The fire official or his/her designee shall conduct a final field test to verify the required level of radio coverage and operational efficacy on each floor of the building before the issuance of the Certification of Occupancy or Temporary Certificate of Occupancy.

## **12. LOCATION OF EQUIPMENT**

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

## **13. SIGNAGE**

Buildings equipped with an ERRC system shall be identified by an approved sign located in a conspicuous location as determined by the fire official, stating: "Radio System Installed". Sign dimensions shall be 6" x 8" with ¼" lettering and a 2" x 4" graphic. The metal backed sign shall have a red background with white lettering and graphic.





**14. MAINTENANCE**

The ERRC system shall be maintained operational at all times in accordance with CFC Section 510.6 through 510.6.3.

**15. CONTINUING OPERATION/SUPERVISION**

The occurrence of any fault in an ERRC system, or when the system function is compromised, a signal to the supervisory service shall be transmitted. If a system is out of service for more than 8 (eight) hours, the fire code official shall be notified.

**16. SUPPORTED FREQUENCIES**

ERRC in Pasadena must be compatible with trunked, digital systems combined with conventional and analog systems. A failure to properly pass even a single listed frequency pair will result in the failure of the entire system

**17. PASADENA RADIO FREQUENCIES**

Any building providing an ERRC system shall provide simultaneous coverage for all the following frequency pairs capable of P25 Phase 1 and 2.

	<b>Repeater Output (Downlink)</b>	<b>Repeater Input (Uplink)</b>		<b>Repeater Output (Downlink)</b>	<b>Repeater Input (Uplink)</b>		<b>Repeater Output (Downlink)</b>	<b>Repeater Input (Uplink)</b>
1	<b>*453.9500</b>	<b>*458.9500</b>	8	482.1375	485.1375	15	482.4875	485.4875
2	470.0875	473.0875	9	482.1875	485.1875	16	482.5375	485.5375
3	470.1375	473.1375	10	482.2375	485.2375	17	482.5875	485.5875
4	470.2125	473.2125	11	482.2875	485.2875	18	482.6375	485.6375
5	470.2625	473.2625	12	482.3375	485.3375	19	484.1875	487.1875
6	<b>**470.3625</b>	<b>**473.3625</b>	13	482.3875	485.3875	20	484.2625	487.2625
7	482.0875	485.0875	14	482.4375	485.4375	21	<b>*506.2000</b>	<b>*509.2000</b>

**\*Channel Pairs 1, and 21 are conventional analog and not part of the trunked system.**  
**\*\* Channel Pair 5 is conventional, analog simulcast and not part of the trunked system.**



**18. RADIO SYSTEM SITES:**

Radio coverage for the ERRC system shall consider the location and performance of the following radio system site:

<u>Address</u>	<u>LAT / LONG</u>	<u>Radiated Power</u>
1 2000 Glen Oaks Blvd, Pasadena 2	Lat:34-09-35.0N Long:118-11-02.2W (NAD83)	50 W

*1-Radiated Power is provided for planning purposes only. Prior to formal design, the permittee shall verify onsite conditions, including relevant signal strengths.*

*2-Designs should use Site 1 as the donor site when possible for channel pairs. Designs using other sites as the donor should be discussed and pre-approved prior to final design and formal submittal.*

*The following serves to add clarification and augment the existing regulation found in section 510.1 to 510.6 of the 2013 Calif. Building Code as it is be applicable to the City of Pasadena Emergency Responder Radio Communications System (ERRCS).*

**19. TESTING METHODOLOGY**

As the Pasadena RF system is a simulcast network with multiple transmitter sites, testing shall occur on a channel specifically reserved for in-building coverage. The tester shall request from the Fire Inspector that the IT/Infrastructure/Radio group schedule a date and time during which one channel will be reserved from the radio system and set to output a signal from the Prime Site at Mirador Reservoir, which will be used for measurement by the contractor. No other frequency used for testing will be accepted.



## **20. REQUIRED SPECIFICATIONS**

The following specifications are required for in building public safety radio communication equipment that is to be operated on or with the Pasadena subsystem of the Interagency Communications Interoperability System:

- a. Signal Boosters shall have FCC current part 90 certification prior to the installation. This certification must be in writing on either supporting documentation and/or the active amplification equipment
- b. Signal Booster/Amplification system shall be compatible with both analog and digital communications networks. The signal booster/amplification device shall provide a delivered audio quality of level 3 (for digital operations) and/or 3.4 (for analog operations) on each floor of the building or structure, which constitutes audio quality that makes speech understandable with slight effort with occasional repetition required due to noise or distortion.
- c. Signal Booster/Amplification system shall be compatible with APCO Project 25 Phase 1 and Phase 2 modulation formats.
- d. All amplification system components must be 100% compatible with simultaneous analog and/or digital modulations schemes after installation without additional adjustments or modifications. The system must be capable of encompassing the frequencies stated in the Technical Criteria section and capable of future modifications to a frequency range subsequently established by the City of Pasadena. If the system is not capable of modification to future frequencies, then a new system must be installed to accommodate the new frequency band.
- e. A minimum signal strength of (-95dBm) in 90% of the area of each floor of the building or structure from both the Pasadena subsystem of the Interagency Communications Interoperability System and from within the building or structure.



## **REQUIRED SPECIFICATIONS - CONTINUED**

- f. A frequency range supported for the Pasadena subsystem of the Interagency Communications Interoperability System as detailed in the Technical Specifications section. Uplink and Downlink filtering shall be employed on all active devices for the in-building system.
- g. Non-Interference - No amplification system installed shall be the source of interface to the Pasadena subsystem of the Interagency Communications Interoperability System.
- h. Appropriate internal circuitry shall be incorporated that shall prevent and/or shut down the uplink and downlink amplifiers whenever an undesirable oscillation condition is detected.
- i. In-building systems donor antenna shall only be a directional device that is orientated toward Pasadena Primary site at the Glen Oaks Ave. location. The use of Omni-directional donor antennas for this application is strictly prohibited.
- j. Minimum isolation between the outside donor antenna and the internal distributed antenna system (DAS) shall be at least 15 dB plus the maximum gain of the amplifier; (i.e. if amplifier has 60 dB of gain, the accepted minimum isolation factor will be -75 dB).
- k. Donor Antenna Cable Conduit- All new buildings or structures shall be constructed with a two-inch (2") conduit installed between the first floor and/or the lowest subterranean floor, as applicable, and said conduit shall extend along the center of the building to the roof. All ends of the conduit shall be fire blocked using the appropriate material.
  - 1. The use of plenum rated or fire rated RF cabling shall be explicitly used within all the internal confines of any structure where the RF cabling is to be installed.
  - 2. In those areas where the RF cabling may be exposed; i.e. roof of subterranean parking structure, floor to floor riser's pathways open to the public, or other exposed areas that are open to the public where the RF cable is installed, the RF cable shall be placed in conduit.
  - 3. Exception to section ii above is if the RF cabling employed is a radiating type cable assembly.





## **REQUIRED SPECIFICATIONS - CONTINUED**

- l. At each floor and the roof, an opening shall be made to afford easy access to the conduit from the ceiling. Access in either form; drop ceiling or conduit, shall be made available along hallways and through firewalls. All floors of subterranean parking garages shall have a similar conduit installation.
- m. Alarms - The in-building amplifier system shall be capable of activating alarms under the following circumstances: Loss of Primary Power (typically the main AC power feed), Loss of Secondary Power/Low Battery Condition, Outdoor Antenna Malfunction Alarm, Oscillation Activation Alarm and Charger Fail (if secondary power is employing a battery system). At minimum these alarms should be routed to a Supervisory Alarm Control Panel.
- n. Amplification equipment must have adequate environmental controls to meet the heating, ventilation, cooling, and humidity requirements of the equipment that will be utilized to meet the requirements of this Code. The area where the amplification equipment is located also shall be free of hazardous materials. The location of the amplification equipment must be in an area that has twenty-four-hour, seven days a week access for the City's authorized communications personnel without prior notice. All communications equipment including amplification systems, cable, and antenna systems shall be grounded with a single point ground system of five (5) ohms or less.
- o. The amplification system shall be installed by a City approved, manufacturer-trained and FCC certified installer possessing a FCC GROL license at a minimum.
- p. System optimization, adjustments, test data collection and results shall be made by a person who holds a current valid FCC General Radiotelephone Operators License. Collection of the technical data will be made with calibrated equipment. Calibration documentation should be provided in the application and planning process. Should a subscriber unit be employed for the basis of coverage testing it shall meet or exceed the manufactures nominal technical specifications and a test report depicting the performance of such device will be required. In addition, any and all recent certification of completion in the manufactures amplifier or signal booster training classes shall be made available upon request.



## **21. GUIDELINES FOR MAKING MEASUREMENTS**

- a. Measurements shall be made with the antenna held in a vertical position within a distance of three (3) to four (4) feet above the floor;
- b. A calibrated service monitor or RF spectrum analyzer (with a factory calibration dated within twenty-four (24) months) may be used to do the test. Calibration within twelve months is preferred however;
- c. Automated test equipment and data collection equipment may be utilized providing the operator is competent in their knowledge and skills sets in configuration and operation along with past experience of such equipment;
- d. A Public-Safety Communications representative for the City or other authorized person may also make simultaneous measurements to verify that the equipment is making accurate measurements. A variance of 3dB between the instruments will be allowed;
- e. If measurements in one location are varying, then average measurements may be used. Uplink measurements at the primary Donor facility or affiliated voting facility shall be noted.

## **22. REPORTING**

Upon installation the installer shall provide all test documentation to the City depicting the results. The building owner or authorized representative shall notify the FCC of the installation of a Signal Booster that is operating on the City's licensed system and register it accordingly with the FCC. Evidence of registration shall be provided to the City of Pasadena's Information Technology, Infrastructure Group, Radio Communications section within 14 days of registration. The information provided to the FCC shall reference the following:

- a. Frequencies Impacted: 450-512, 470-512
- b. Call Signs: WQOF435, WIJ442, WPZU953, WPZK581

## **23. AS-BUILT DIAGRAMS**

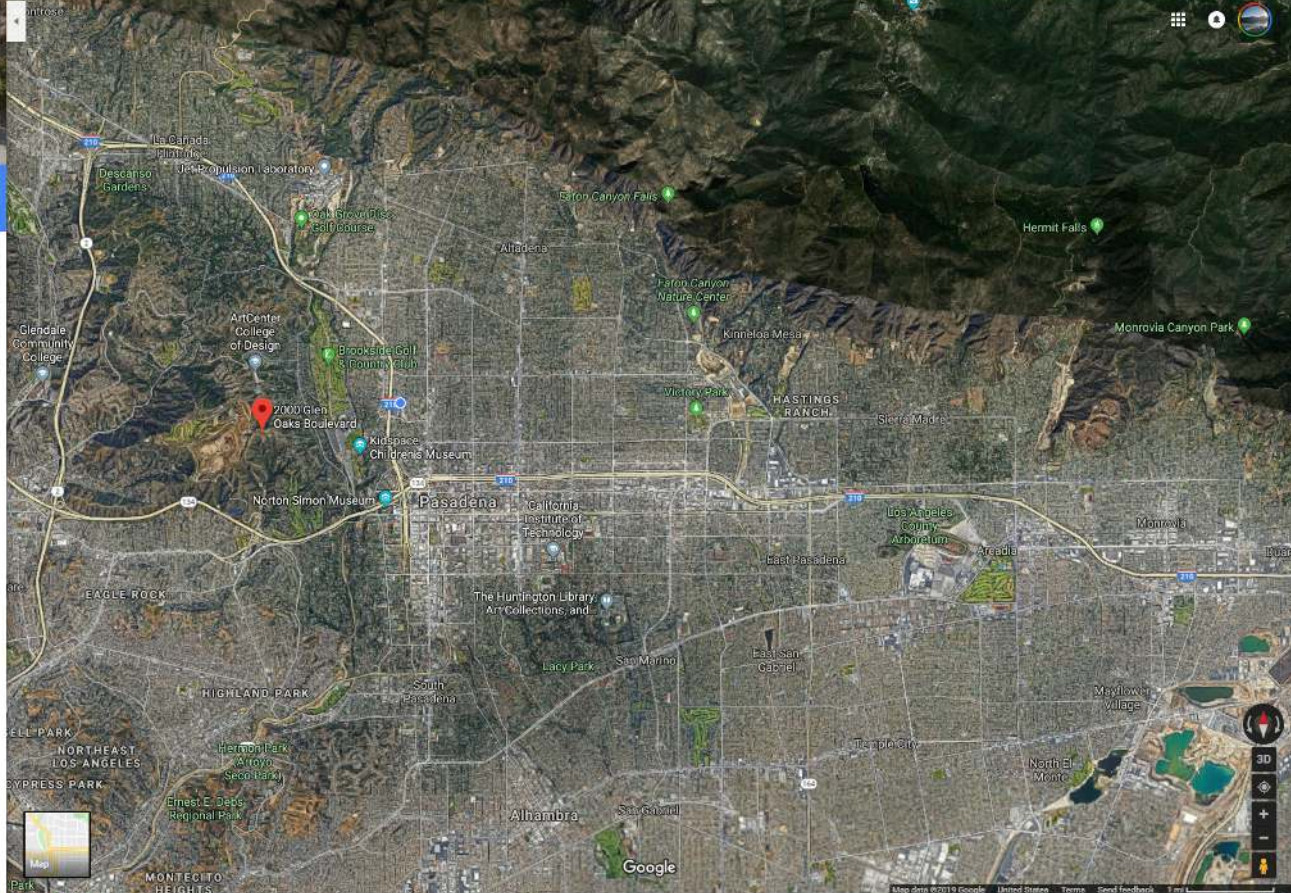
As-Built Diagrams shall be provided by the installer to the City of Pasadena's Infrastructure/Radio section that depict all the antenna locations, cable pathways, BOA location(s), Alarm panel location, and Alarm interface points. The as-built diagrams shall be in Adobe Acrobat PDF format.



### Note:

The radio system described herein was designed and is operated solely for the safety of the emergency responders and ***will not*** be modified to suit permittees. Request for alternatives may be granted, at the sole discretion of the City of Pasadena, to resolve extreme technological or engineering impediments, but not to merely mitigate implementation cost.

The design and installation of any system providing radio coverage for emergency responders is ***inherently technical and challenging***. The success or failure of a project will be largely dependent upon the experience and qualifications of the individual(s) selecting the system and designing the installation. The City of Pasadena highly recommends that you thoroughly research your possible consultants and contractors. Additionally, ***it is the responsibility of the individuals involved to ensure that all necessary information needed to properly design and install a system will work with the Pasadena emergency response radio infrastructure***. Ultimately, if the system fails to ensure proper radio coverage, or causes any type of interference with the City of Pasadena System, the building owner will be responsible to make whatever modifications are necessary to ensure proper performance.



La Canada Flintridge  
Descanso Gardens  
Jet Propulsion Laboratory  
Oak Grove Pines Golf course  
Pasadena Canyon Falls  
Hermit Falls  
Altadena  
Pasadena Canyon Nature Center  
Kinneloa Mesa  
Monrovia Canyon Park  
Glendale Community College  
ArtCenter College of Design  
Brookside Golf & Country Club  
2000 Glen Oaks Boulevard  
Kidspace Children's Museum  
Norton Simon Museum  
Pasadena  
California Institute of Technology  
HASTINGS RANCH  
Sierra Madre  
Los Angeles County Arboretum  
Arcadia  
Monrovia  
East Pasadena  
The Huntington Library, Art Collections, and Botanical Gardens  
Lacy Park  
San Marino  
East San Gabriel  
Mayflower Village  
North El Monte  
Alhambra  
San Gabriel  
Ernest E. Debs Regional Park  
HIGHLAND PARK  
SOUTH PASADENA  
EAGLE ROCK  
NORTHEAST LOS ANGELES  
CYPRESS PARK  
MONTICITO HEIGHTS

