

## **PURPOSE**

The purpose of this publication is to provide a guideline for the purpose of providing effective “in building” 700 MHz and 800 MHz City of Berkeley Public Safety Communication System (BPPSCS) and East Bay Regional Communications System (EBRCS) radio coverage throughout the City of Berkeley for police and fire emergency services.

## **SCOPE**

The regulatory authority for the provisions contained within this Guideline are found in Section 510 of the 2013 California Fire Code.

## **DEFINITIONS/ACRONYMS**

*Bi-directional Amplification System (BDA)* – An in-building public safety radio amplification system composed of FCC certified bi-directional 700 MHz and 800 MHz amplifier(s), associated distribution system, and subcomponents.

*BPPSCS* – City of Berkeley Public Safety Communication System

*City of Berkeley (COB)* – City of Berkeley, California

*California Fire Code (CFC)* – 2013 Edition of the California Fire Code

*EBRCS* – East Bay Regional Communications System

*ERRC* – Emergency Responder Radio Coverage

*FCC* – Federal Communications Commission

*FCC Certified Technician* – An individual who is qualified with a General Radiotelephone Operator License (GROL/PG), or equivalent, to review design plans and perform tests in affected structures to measure compliance with the specifications set forth in this guide.

## **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 California Building Code Section 202);
2. The total building area is 30,000 square feet or more;
3. The total basement or subterranean area is 5,000 square feet or more;
4. The building is equipped with a solar photovoltaic system; or
5. Radio coverage signal strength levels are not consistent with the minimum levels set forth in CFC Section 510.4.1.

Exception: Critical areas such as fire command centers, fire pump rooms, emergency generator rooms, electrical rooms, electrical switch gear rooms, interior exit stairways, exit passageways, elevator lobbies, standpipe locations, sprinkler sectional valve locations, and other areas required by the fire code official shall be provided with 99% floor area radio coverage.

The radio coverage system shall be installed and maintained in accordance with CFC Sections 510.4 through 510.6 and with the applicable provisions of NFPA 72 – National Fire Alarm and Signaling Code and NFPA 1221 – Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems. Use the latest editions as adopted by the State of California.

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

**Exceptions:**

1. When approved by the fire code official, a wired communication system in accordance with CFC 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. (i.e. one and two family dwellings and townhouses)
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 radio coverage system.

**EMERGENCY RESPONDER RADIO COVERAGE IN EXISTING BUILDINGS**

Existing buildings shall be provided with approved radio coverage for emergency responders as required in Chapter 11, Section 1103.2 of the CFC.

**CONSTRUCTION PERMITS**

Permits are required for any of the following:

- Installation of a new ERRC system
- Any alteration to an existing ERRC system
- Addition to an existing ERRC system
- Demolition of a part or whole ERRC system

Maintenance performed in accordance with this guideline is not considered a modification and does not require a permit.

**CONSTRUCTION DOCUMENTS**

Utilize the City of Berkeley Building Permit Detailed Checklist when submitting plans for an ERRC System.

[http://www.ci.berkeley.ca.us/uploadedFiles/Online\\_Service\\_Center/Planning/BuildingPermitDetailedChecklist.pdf](http://www.ci.berkeley.ca.us/uploadedFiles/Online_Service_Center/Planning/BuildingPermitDetailedChecklist.pdf)

In addition, include the following information:

- Installing contractor's name, address, and California license number
- Equipment legend
- Location of the amplifier modules, relays, and all other associated equipment
- Depiction of areas of coverage
- Size, type, and protection method of cable to be utilized
- Type of supervising station service as per NFPA 72 – National Fire Alarm and Signaling Code, Chapter 26
- A note stating that the design and installation complies with NFPA 72 (2013 Edition), California Building Code (2013 Edition), California Electrical Code (2013 Edition), and California Fire Code (2013 Edition)

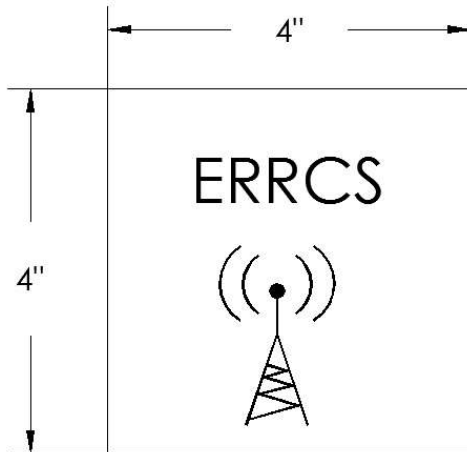
## REQUIRED SPECIFICATIONS

The following levels of coverage are required for public safety radio communication on the Berkeley Public Safety Communication System:

- A. A minimum delivered audio quality of level 3.0 (DAQ 3.0) 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.
- B. A minimum signal strength of (-95dBm) in 95% of the area of each floor of the building or structure from both BPSCS, EBRCS, and from within the building or structure.
- C. A frequency range supported to and from EBRCS of 769.09375 to 853.93750 MHZ (base and radio field transmitter frequencies) on each floor of the building or structure.
- D. Wiring/cable installation shall be in accordance with NFPA 72, Section 27.7. All new buildings or structures shall be constructed with a two-inch (2") conduit installed with Hoffman, or equivalent, pull box on each floor that is accessible above the ceiling tiles, along the hallway or through firewalls. All floors of subterranean parking garages shall have a similar conduit installation.
- E. Pathway survivability shall be a minimum of Level 1 in accordance with NFPA 72, Section 12.4.2. If the building is not or cannot be sprinklered, the riser coaxial cables shall be rated as riser cables and routed through a 2-hour rated enclosure. Exception: If the building corridors and shafts have a required fire resistance rating of less than 2 hours, then the riser coaxial cable may be placed in less than a 2-hour rated enclosure. The minimum rating shall be 1 hour. The connection between the riser and feeder coaxial cables shall be made within the 2-hour rated enclosure, and the passage of the feeder cable in and out of the 2-hour rated enclosure shall be re-stopped to 2-hour ratings.
- F. If used, signal boosters shall meet requirements as set forth in CFC Section 510.4.2.3 and be an FCC Class A channelized signal booster.
  - 1) All signal booster components shall be contained in a National Electric 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 shall be electrically supervised and monitored by a supervisory service, or when approved by the fire code official, shall sound an audible signal at a constantly attended location.
  - 4) Equipment shall have FCC certification prior to installation.

- G. The ERRC system shall be monitored by a separate dedicated monitoring panel located near the building's fire alarm control panel. Using the dedicated phone lines of an existing fire alarm control panel shall not be prohibited. The ERRC system shall not be required to be monitored by the fire alarm control panel. Systems that are out-of-service for more than 1 hour shall require notification to the BPCS (510-981-5900). At a minimum, the system shall monitor:
- 1) Normal AC power
  - 2) Loss of normal AC power
  - 3) UPS/battery charger failure
  - 4) Low-battery capacity (to 70% depletion)
  - 5) Donor antennae malfunction
  - 6) Active RF emitting device malfunction
  - 7) System component malfunction
- H. All amplification system components must be FCC P25 Phase 2 compliant after installation without additional adjustments or modifications. The system must be capable of encompassing the frequencies stated above and capable of future modifications to a frequency range subsequently established by the City of Berkeley (COB). If the system is not capable of modification to future frequencies, then a new system must be installed to accommodate the new frequency band. Amplifiers must be a variable gain amplifiers.
- I. All electrical components must be equipped with independent primary power and secondary power. The secondary power supply shall be capable of operating the emergency responder radio coverage system at full capacity for a period of at least twenty-four (24) hours. Batteries shall be maintained and replaced per manufacturer's specifications. Generators shall be maintained per manufacturer's specifications. When primary power is lost, the power supply to the emergency responder radio coverage system shall automatically transfer to the secondary power supply.
- J. All system components shall be designed, installed, tested, inspected, and maintained in accordance with the manufacturers' published instructions.
- K. The system designer and lead installation personal shall minimally have a valid FCC-issued general radiotelephone operator license and certification of in-building system training issued by a nationally recognized organization, school or a certificate issued by the manufacturer of the equipment being installed.
- L. It is the responsibility of the building owner to have supervisory/fault alarms investigated within 48 hours by a technician. Corrections of the fault, repair of equipment, or any other actions needed to provide for operability of the BDA shall be completed within 14 days of the failure.

M. Buildings equipped with an ERRC system shall be identified by an approved sign located above or near the building Knox Box stating: "ERRCS" along with the antennae logo. The sign shall be a minimum of 4" x 4". The letters shall be in white and be a minimum of 1" in height. The background shall be red.



THE EMERGENCY RESPONDER RADIO  
COVERAGE SYSTEM SIGNAGE TO BE  
LOCATED ABOVE OR NEAR BUILDING  
KNOX BOX.

SIGN TO BE:

4" X 4" MINIMUM

RED BACKGROUND

LETTERS TO BE WHITE AT A MINIMUM  
OF 1" IN HEIGHT.

DRAFT

N. EBRCS 700/800 MHz Frequencies

Frequency	Power Output (watts)	Frequency	Power Output (watts)
769.09375	100	799.09375	30
769.76875	100	799.76875	30
770.29375	100	800.29375	30
770.56875	100	800.56875	30
770.84375	100	800.84375	30
771.19375	100	801.19375	30
771.49375	100	801.49375	30
771.79375	100	801.79375	30
772.09375	100	802.09375	30
772.39375	100	802.39375	30
772.69375	100	802.69375	30
772.99375	100	802.99375	30
773.46875 aC	100	803.46875	30
773.74375 C	100	803.74375	30
774.21875 C	100	804.21875	30
774.49375 C	100	804.49375	30
SPARE		SPARE	
SPARE		SPARE	
SPARE		SPARE	
SPARE		SPARE	
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Control Frequencies are: 773.74375, 774.21875, 774.49375  
 An Alternate Control Frequency is: 773.46875

O. EBRCS Transmitter Locations

37-38-00.0	N	122-16-37.2	W	550 6th Street, Oakland, CA
37-45-21.9	N	122-09-25.9	W	9333 Seneca Street, Oakland, CA
37-49-13.1	N	122-11-05.1	W	9700 Skyline Boulevard, Oakland, CA
37-52-39.6	N	122-14-48.4	W	KALX Site, Oakland, CA
37-87-76.6	N	122-24-67.7	W	LBNL Lab, Berkeley, CA ( <i>preferred site</i> )

## TESTING AND SYSTEM DESIGN PROCEDURE

### A. Initial Tests

1. Prior to issuance of a building permit for a building or structure to which these specifications apply, the applicant shall:
  - a. Retain an FCC-certified technician to review, sign, and stamp construction plans in order to ensure that such plans satisfy these specifications for reliable radio communication.
  - b. Submit copies of plans certified by an FCC-certified technician to the COB's Fire Department, Police Department, and Building & Safety Department.
2. Prior to the issuance of a certificate of occupancy for any building or structure to which these specifications apply, the applicant shall:
  - a. Retain an FCC-certified technician to test all areas of the building or structure. At the conclusion of testing, a report, which shall verify compliance with CFC Section 510.5.3, shall be submitted to the fire code official.
  - b. The building owner shall have the radio system tested to ensure that 2-way coverage on each floor of the building is a minimum of 95%. Acceptance test procedures shall be in accordance with CFC Section 510.5.3 or a more stringent test procedure. If the floor area is more than 128,000 ft<sup>2</sup> per floor (maximum of 80' x 80' grid dimension with 20 grids), then the floor area shall be subdivided into sectors each having an area less than or equal to 128,000 ft<sup>2</sup>? Testing equipment is the responsibility of the owner or ERRC system installer.
  - c. All secondary power systems shall be tested under load for a period of 1-hour to verify that the system will operate properly in the event of a 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. The testing technician reserves the discretion to determine whether or not the battery exhibits symptoms of failure. The FCC-certified technician will ultimately decide if the auxiliary system needs to be replaced or upgraded.
3. DAQ testing shall be the responsibility of the ERRCS installer. Before the system is turned on for the test, notify the BPCSCS at 510-981-5900. Also, notify the BPCSCS after the conclusion of the test.
4. After successful initial testing of the ERRC System, the building owner or ERRC System installer shall complete the BDA Management Form and provide a copy to FP and the City of Berkeley Radio Shop. It is the responsibility of the building owner to inform FP or the Radio Shop of any change in information on the form.

## B. Annual Tests

It shall be the building owner's responsibility to have all active components of the system such as signal boosters, power supplies and backup batteries tested at a minimum of once every 12 months. All tests shall be conducted, documented, and signed by a person in possession of a current FCC General Radiotelephone Operator License (GROL/PG) or equivalent.

## C. Field Tests

City of Berkeley Fire Department and Radio Shop 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 or to determine the source of radio system interference.

## D. Record Retention

The owner of any building or structure to which these specifications apply shall retain all records of initial and annual tests and maintenance performed pursuant to this section and shall submit copies to the COB's Fire Department as requested.

## **OBSTRUCTIONS BY NEW BUILDINGS**

When determined that 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 of the BPPSCS at no cost to the authority having jurisdiction.