Date: August 7, 2018

FIRE PREVENTION & PUBLIC SAFETY BUREAU

REQUIREMENT #105

EMERGENCY RESPONDER RADIO SYSTEM (ERRS) COVERAGE

(Two-Way Radio Communications Enhancement Systems
Bi-Directional Amplifier System (BDA) Testing)

All testing procedures are performed in accordance with applicable portions of the 2016 California Fire Code Section / 2017 Los Angeles Fire Code, Section 510 (Emergency Responder Radio Coverage) and NFPA 72, 2016 Edition, Chapter 24, Section 24.5.2 Two-Way Radio Communications Enhancement Systems

GENERAL

Applicability – Section 510.1 of the 2016 California Fire Code / 2017 Los Angeles Fire Code shall be interpreted to mean any portion of a new building constructed where radio coverage signal strength levels are not consistent with Section 510.4.1 of the 2016 California Fire Code / 2017 Los Angeles Fire Code and meets any one of the following conditions:

1. There are more than 3-stories above grade plane.
2. The total building area is 50,000 square feet or more.
3. The total basement area is 10,000 square feet or more.
4. Any basement or level that extends 2 or more stories below grade plane.
5. Any building that is 20,000 square feet or greater and is equipped with a solar photovoltaic system.

Exception: R-3 Occupancy

Section 510.2 of the 2016 California Fire Code / 2017 Los Angeles Fire Code shall be interpreted to mean any existing building where the building's fire alarm system is replaced and the building meets any one of the conditions listed above for new buildings under Section 510.1 of the 2016 California Fire Code / 2017 Los Angeles Fire Code.

Non-Interference - No amplification system capable of operating on frequencies or causing interference on frequencies assigned to the Los Angeles Fire Department (LAFD) by the FCC shall be installed without prior coordination with and approval of the LAFD. The Building Manager/Owner shall suspend and immediately correct any other equipment installation(s) that degrade the performance of the public safety radio system or public safety radio enhancement system.

Cellular Distributed Antenna Systems – Cellular distributed antenna system amplifiers may share common passive devices as long as there is no compromise of the emergency responder radio system coverage. Engineering factors shall be considered in the design when using multi-band antennas and indicated on the as-built drawings.

Approval and Permit – LAFD plan review and approval is required for the installation or modification of ERRS.

Detailed as-built drawings including cable path(s), equipment location(s) and an 800 MHz Emergency Responder Radio System RF Test shall be submitted - prior to final inspection and acceptance test.

Technical Criteria

The following information is supplied in accordance with Section 510.4.2.2 of the 2016 California Fire Code / 2017 Los Angeles Fire Code for system planning purposes.

List of Assigned Frequencies – Any active amplification system installed to meet these requirements shall operate on the following LAFD frequencies in repeat analog conventional mode:

Uplink Frequency	Downlink Frequency		Uplink Frequency	Downlink Frequency
2 814.9375	859.9375		12 815.4375	860.4375
4 812.9375	857.9375		15 814.7625	859.7625
6 813.2375	858.2375		16 813.7625	858.7625
7 814.4375	859.4375		17 812.7625	857.7625

The list of assigned inbound/outbound frequency pairs is maintained by the LAFD for distribution to system designers and Regulation No. 4 certified testers and should be confirmed prior to final system design, installation and acceptance testing.

LAFD System Information – The following information is provided to building owners for planning purposes. The LAFD radio communications system is a City-wide, nine site simulcast system that operates in the analog mode. Primary transmitter locations are as follows:

	SITE NAME	ADDRESS	Latitude (WGS84)	Longitude (WGS84)	ELEV (ft)
1	100 Wilshire	100 Wilshire Blvd Santa Monica, 90401	34 01 00.60	-118 30 00.84	90
2	Baldwin Hills	4203 S. La Brea Ave, LA, 90008	34 00 24.07	-118 21 44.43	486

3	Beverly Glen	14240 Mulholland Dr, LA, 90077	34 07 44.94	-118 26 33.27	1380
4	City Hall	200 N. Spring St, LA, 90012	34° 3'12.99"N	118°14'33.25"W	287
5	KSKQ Radio Site	4600 Carter Dr, LA, 90032	34 04 43.29	-118 11 08.12	760
6	Mt. Washington	4000 N. Glenalbyn Dr, LA, 90065 721 Lark Court, LA, 90065	34 06 15.04	-118 12 53.92	930
7	Oat Mountain	Oat Mountain Way, Northridge, 91326	34 19 41.99	-118 35 53.26	3666
8	San Pedro Hill	3960 Crest Road Rancho Palos Verdes, 90275	33 44 47.03	118 20 08.27	1450
9	Verdugo Peak	Verdugo Mountain Way Glendale, 91208	34 13 11.29	-118 17 25.93	2960

The LAFD shall provide the maximum acceptable propagation delay standard.

Additional Frequencies – Frequencies used by the LAFD may change as a result of FCC order or other operational requirements of the LAFD. In the event of such frequency change, and upon notification by the LAFD, the building owner shall modify or expand the emergency responder radio system coverage at their expense. The Authority Having Jurisdiction (AHJ) may require coverage in the future for FirstNet Broadband Services as NFPA 72, NFPA 1221 and Fire Code 510 are amended.

Labeling

1. Provide sign on all doors providing access to ERRS stating: "EMERGENCY RESPONDER RADIO SYSTEM EQUIPMENT INSIDE."

2. Provide sign on donor antennas stating: "EMERGENCY RESPONDER RADIO SYSTEM."

System Components

Section 510.4.2.4, Items 1 through 4 of the 2016 California Fire Code / 2017 Los Angeles Fire Code shall be enforced with the following additional clarifications:

Equipment
All equipment shall be listed by nationally recognized testing laboratory for its intended use.

External Filters – Permanent external filters and attachments shall not be permitted.

Signal Booster Components - If used, signal boosters shall meet the following requirements:

1. Signal boosters shall have FCC certification prior to installation and shall be NFPA 72 and/or IFC510.1 compliant.

2. All signal boosters shall be compatible with both analog and digital communications simultaneously at the time of installation.

Power Sources –At least two independent and reliable power sources shall be provided for all repeater, transmitter, receiver, and signal booster components, one primary and one secondary.

1. All repeater, transmitter, receiver, signal booster components, external filters and battery system components shall be contained in UL approved type 4 or 4X enclosure.

2. Donor antenna cabling and connections shall be weatherproof, protected from physically damage and properly supported.

Pathway Survivability – All system riser cables shall be in conduits and shall consist of one or more of the following:

1. Buildings where interior exit stairway and ramp enclosure are required to have fire-resistance rating of no less than two hours:

   - 2-hour fire-rated circuit integrity (CI) cable.
   - 2-hour fire rated-cable system.
   - 2-hour fire-rated enclosure or protected area.
   - 2-hour performance alternative approved by the AHJ.

2. Buildings where interior exit stairway and ramp enclosure are required to have fire-resistance rating of no less than one hour.

   - 1-hour fire-rated CI cable.
   - 1-hour fire rated-cable system.
   - 1-hour fire-rated enclosure or protected area.
   - 1-hour performance alternative approved by the AHJ.

Power Sources

a) **Primary Power Source** – The primary power source shall be supplied from a dedicated branch circuit and comply with NFPA 72, 2016 Edition, Section 10.6.5.1.

b) **Secondary Power source** – In the event of a fault or failure of the primary power supply, ERRS system shall automatically and immediately transfer to a secondary power source; while constantly maintaining all ERRS required functions and operation available without restarting the system. One the following secondary power sources can be used:

1. A storage battery dedicated to the system with at least 24-hours at 100% system operation capacity and arranged in accordance with NFPA 72, 2016 Edition, Section 10.6.10.

2. An automatic –starting engine driven emergency generator serving the dedicated branch circuit or the system with at least 24-hours of 100% system operation capacity and arranged in accordance with NFPA 72, 2016 Edition, Section 10.6.11.3. In addition to the generator, the ERRS shall be provided with a primary battery backup unit of no less than two hours of full system run-time, which shall ensure continuous coverage until the engine driven emergency generator starts.

c) All electrical breakers for ERRS shall be properly labeled and shall be provided with an approved breaker locking device.

System Monitoring – The public safety radio communications enhancement system shall include automatic supervisory and trouble reporting for malfunctions of the signal booster and power supplies that are annunciated by the fire alarm system and UL listed supervising station monitoring company or shall be monitored at a constantly attended location at the building and comply with the following:

1. The integrity of circuit monitoring signal boosters and power supplies shall comply with NFPA 72, 2016 Edition, Sections 10.6.9 and 12.6.

2. System and signal booster supervisory signals shall include the following:

   - Antenna malfunction
   - Signal booster failure
   - Low battery indication when 70% of the 24-hour operation capacity has been depleted

3. Power supply signals shall include the following for each signal booster:

   - Loss of normal power
   - Failure of battery charger

ERRS signals on fire alarm annunciator panel shall be labeled "EMERGENCY RESPONDER RADIO SYSTEM." There shall be one green LED signal indicating ERRS in normal mode and one yellow LED indicating system is in trouble.

Automatic smoke detection – Smoke detector shall be provided at the location of each ERRS control unit(s), storage battery unit(s) and monitoring panel.

Dedicated Panel – A dedicated monitoring panel shall be provided in an area acceptable and approved by the LAFD to annunciate the status of all signal booster locations. In buildings with fire alarm systems, a smoke detector shall be provided above monitoring panel. The monitoring panel shall provide visual and labeled indication of the following for each signal booster:

- Normal 120VAC power
- Signal booster trouble
- Loss of normal 120VAC power
- Failure of battery power
- Low battery capacity

In special circumstances where a dedicated panel cannot be installed, a request for modification must be submitted and approved to annunciate on FACP.

Installation Requirement – Hardware and cabling installation shall be in accordance with the applicable portions of NFPA 72, 2016 Edition, Section 10.4, Sections 510.5 thorough 510.5.4 of the 2016 California Fire Code / 2017 Los Angeles Fire Code and 2017 Los Angeles Electrical Code.

1. **Radio Coverage** – Radio coverage shall be provided throughout the building as a percentage of floor area as follows and shall be tested in accordance with Section 510.5.3 (1) through (7) with the following additional conditions:

    a. Critical Areas – Critical areas such as the fire command center(s), the fire pump room(s), exit stairs, exit passageways, elevator lobbies, standpipe cabinets, sprinkler valve locations and other areas deemed critical by the LAFD shall be provided with 99% floor area radio coverage.

    b. General Building Areas – General building areas shall be provided with 90% floor area radio coverage.

2. **Minimum Qualifications of Personnel -** The minimum qualifications of the system designer and lead installation personnel shall be in compliance with Section 510.5.2 of the 2016 California / 2017 Los Angeles Fire Code.

Acceptance Test - Acceptance and Operational testing shall be in accordance with Section 510.5.3 of the 2016 California Fire Code / 2017 Los Angeles Fire Code with the following clarifications:

1. The Fire Development Services Inspector(s) shall review the as-built drawings and link budget to ensure the physical installation is the same as the as-built drawings during the final system acceptance test.

2. ERRS shall be inspected, approved and pre-test sheet signed by LADBS Electrical Inspection prior to requesting an acceptance inspection from LAFD.

3. The final system acceptance test shall be witnessed by a Fire Development Services Inspector(s) or specific designee and shall include a visual inspection of the physical installation of the emergency responder radio system. Two Fire Development Services Inspectors shall conduct an on air test of the subject radio channels in all critical areas and spot tests in non-critical areas. A qualified Engineer or Technician from the designing or installing company shall be present with appropriate test equipment to verify all measurements are in compliance with Section 510.5.3 (1) through (5).

4. As part of the acceptance test, backup batteries and power supplies shall be tested in accordance with Section 510.6.1(3) of the 2016 California Fire Code / 2017 Los Angeles Fire Code.

5. 510.5.3(7) - As part of the installation a spectrum analyzer or other suitable test equipment shall be utilized to evaluate the system for the entire spectrum range of frequencies used by the LAFD (856.2375MHz – 860.9375MHz and 811.2375MHz – 815.9375MHz, inclusive) to ensure spurious oscillations are not being generated or received by the building signal booster(s). This test shall be conducted at time of installation and subsequent annual inspections.

Maintenance - The emergency responder radio system coverage shall be maintained operational at all times in accordance with Section 510.6.1 through 510.6.3 of the 2016 California Fire Code / 2017 Los Angeles Fire Code.

1. In the event of a service affecting failure of any portion of the emergency responder radio system, an initial evaluation shall be made by a qualified technician within 24 hours and repairs shall be complete within five working days. Building owner or designee shall notify LAFD forthwith of any service affecting outage.

2. In the event of a non-service affecting failure of any portion of the emergency responder radio system, an initial evaluation shall be completed by a qualified technician on the next business day and repairs shall be complete within 15-business days.

Annual Testing and Proof of Compliance – Annual testing and proof of compliance shall be in accordance with Section 510.6.1 of the 2016 California Fire Code / 2017 Los Angeles Fire Code with the following clarifications:

1. A Regulation No. 4 test shall be conducted by a person holding a valid Regulation No. 4 Certificate of Fitness in accordance with Section 117 of the Los Angeles Fire Code in the category of two-way radio communications enhancement systems bi-directional amplifier systems for the specific manufacturer and type of system being tested.

2. At the conclusion of the testing, a report, which shall verify compliance shall be submitted on an LAFD approved F-340R Fire Protection System Performance Report.

3. Information on obtaining a Regulation No. 4 Certificate of Fitness can be obtained from the "prospective applicant letter" link which is found on the LAFD Fire Prevention Regulation No. 4 website at: http://lafd.com/fire_prevention/chiefs-regulation-4.

APPROVED BY:

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8/7/18
Date