



# SAN DIEGO FIRE-RESCUE

## COMMUNITY RISK REDUCTION DIVISION

### Emergency Responder Radio Coverage Systems

#### I. PURPOSE

The purpose of this guideline is to clarify the requirements for emergency responder radio coverage systems (ERRCSs) and ensure that the design, installation and testing of these systems meets the requirements of the 2022 California Fire Code (CFC) and the following referenced standards: NFPA 1221 (2019 Edition), NFPA 72 (2022 Edition), NFPA 70 (2020 Edition).

#### II. WHERE REQUIRED

**A. New Buildings:** All new buildings must meet the minimum performance requirements for in-building, emergency responder communication system coverage. Upon completion of building construction, a radio coverage test shall be conducted per the specific requirements of CFC 510, and if the test fails, an Emergency Responder Radio Coverage System (ERRCS) shall be installed.

**Considerations should be made to install conduit during building construction to accommodate ERRCS coaxial cables if testing indicates a system is needed to provide acceptable coverage after building construction is completed.**

1. All new high-rise buildings must be provided with an Emergency Responder Radio Coverage System (ERRCS). A wired phone-jack two-way communication system shall not be permitted to be installed in new high-rise buildings in lieu of the required ERRCS.
2. Low-rise buildings meeting ANY of the following conditions:
  - a. Buildings 3 or more stories above grade plane.
  - b. Total building area exceeds 20,000 sq. ft.
  - c. Building contains multiple stories below grade or a basement exceeding 2,500 sq. ft.
  - d. Buildings determined by the fire code official as requiring evaluation based upon construction features or fire- and life-loss potential.

**Exceptions:** Group R-3 occupancies

**B. Existing Buildings:** Existing buildings must comply with these requirements under the following conditions.

1. Where a previously required two-way wired fire department communication system is removed.



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2. Where building permits are required for a change of use or occupancy in accordance with CFC 102.3. Radio coverage shall not be required if the building has an existing operational wired phone-jack system.
3. Existing high-rise buildings without an existing wired fire department communication system (phone-jack system) are required to conduct a radio test to verify acceptable radio coverage. If the radio test fails, an ERRCS shall be installed within three (3) years of the test date.

### III. **DESIGN OF RADIO COVERAGE SYSTEM**

Design of the radio coverage system shall meet all the following specifications. See APPENDIX B for ERRCS plan submittal requirements.

All repeaters, transmitters, receivers, signal-booster components, remote annunciators and operational consoles, power supplies, and battery charging system components shall be listed and labeled in accordance with UL 2524, *Standard for In-Building 2-Way Emergency Radio Communications Enhancement Systems*.

#### A. **Signal Strength**

The building shall be considered to have acceptable in-building, two-way emergency responder communication system coverage where signal strength measurements in 95% of all areas and 99% of areas designated as critical areas by the fire code official on each floor of the building meet the requirements in CFC [Sections 510.4.1.1](#) through [510.4.1.3](#):

#### **Critical Areas**

Areas that are designated for the highest level of emergency responder radio coverage including but not limited to areas such as exit stairs, exit passageways, elevator lobbies, fire protection equipment room and control valve locations, and fire command centers.

#### 1. **Minimum Signal Strength Into the Building**

The minimum inbound signal strength shall be sufficient to provide usable voice communications throughout the coverage area. The inbound signal level shall be a minimum of -95dBm throughout the coverage area and sufficient to provide not less than a Delivered Audio Quality (DAQ) of 3.4 or an equivalent Signal-to-Interference-Plus-Noise Ratio (SINR) applicable to the technology for either analog or digital signals.



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### 2. Minimum Signal Strength Out of the Building

The minimum outbound signal strength shall provide usable voice communications throughout the coverage area. Outbound signal level shall provide not less than a DAQ of 3.4 or an equivalent SINR applicable to the technology for either analog or digital signals.

### 3. System Performance

- a. Signal strength shall meet the requirements of the applications being utilized by public safety for emergency operations through the coverage area. Radio enhancement systems shall be designed to support two portable radios simultaneously transmitting on different talk paths or channels.
- b. The maximum allowable ERRCS propagation delay is 15 microseconds. Should this propagation delay be exceeded within the building, there shall be a minimum differential of 16 dB between the signal a portable radio receives from the signal booster and the signal a portable radio receives from the macrosystem.

### B. Power Sources

At least two independent and reliable power sources shall be provided for all active components; one primary and one standby power source.

#### 1. Primary Power Source

A dedicated branch circuit shall supply the primary power source. The location of the branch circuit disconnecting means shall be permanently identified at all equipment supplied by the dedicated branch circuit. The system circuit disconnecting means shall be permanently identified as "EMERGENCY COMMUNICATIONS" and have a red marking. Where a circuit breaker is a disconnecting means, an approved breaker locking device shall be installed.

#### 2. Standby Power

ERRCSs shall be provided with one of the following:

- a. A storage battery dedicated to the system with 12 hours of 100% system operation capacity.
- b. A 2-hour standby battery and connection to the facility generator power system, providing the facility generator power system can support the complete system load for 12 hours.
- c. An alternative power source of 12 hours at 100 percent system operation capacity where approved by SDFD.



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### 3. EPO Switch

Emergency Power-Off (EPO) means shall be provided for all ERRCS. The EPO shall be located in the Fire Command Center or adjacent to the Bi-Directional Amplifier in buildings without a Fire Command Center. The EPO shall be clearly labeled and have protection from accidental activation.

### C. Signal Booster Requirements

1. Signal boosters shall be Class A only and operate on the specific frequencies assigned in APPENDIX A and no other frequencies.
2. Signal boosters shall be located in the Fire Command Center or other area approved by the fire code official.
3. Before installation, all RF-emitting devices shall have FCC certification and be suitable for public safety use.
4. All signal booster components must be contained within a [National Electrical Manufacturer's Association](#) (NEMA) 4-type waterproof cabinet.
5. Battery systems used for the emergency power source shall be contained in a NEMA 3R or higher- rated cabinet.
6. Isolation shall be maintained between the donor antenna and all inside antennas to not less than 20 dB greater than the system gain under all operating conditions.
7. Active RF-emitting devices used for in-building, two-way emergency responder communication coverage systems shall have built-in oscillation detection and control circuitry.
8. Amplifier uplink gain shall be set to the minimum necessary to comply with the radio coverage requirements set forth herein, and not exceed 65 dB unless approved by the fire code official.
9. Bidirectional amplifiers shall not exceed -150 dBm uplink noise at the donor site, -43 dBm ERP uplink noise within the authorized passband, and -70 dBm ERP uplink noise at 1 MHz outside the authorized passband when in a quiescent state. A reduction in quiescent noise may be required dependent upon the distance of the bidirectional amplifier from the donor site.
10. The installation of amplification systems or systems that operate on or provide the means to cause interference on any in-building, two-way emergency responder communication coverage network shall be coordinated and approved by the fire code official.



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### D. System Monitoring

A listed fire alarm control unit must monitor the ERRCS, or where approved by the fire code official, shall sound an audible signal at a constantly attended on-site location. A dedicated annunciator shall be provided to annunciate the status of all RF-emitting devices and active system component locations within an area acceptable to the fire code official.

1. Monitoring for integrity of the system shall comply with Chapter 10 of NFPA 72.
2. Automatic supervisory signals shall include the following:
  - a. Loss of normal AC power supply.
  - b. System battery charger(s) failure.
  - c. Malfunction of the donor antenna(s).
  - d. Failure of active RF-emitting device(s).
  - e. Low-battery capacity at 70% reduction of operating capacity.
  - f. Failure of critical system components.
  - g. The communications link between the fire alarm system and the ERRCS.
  - h. Oscillation of active RF-emitting device(s).

### E. Operational Frequencies

1. The ERRCS 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.
2. The ERRCS must be operational on both 700 and 800 MHz Public Safety bands, and operate on all assigned frequencies as identified in APPENDIX A.
3. Intentional retransmission of any other frequencies must have approval from the [City of San Diego Department of Information Technology – Wireless Technology Services Division](#) (SD DoIT).

### F. Radio Communication Antenna Density

1. Systems shall be engineered to minimize the near-far effect. Radio enhancement system designs shall include sufficient antenna density to address reduced gain conditions.



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2. Antenna placement and downlink gains shall be designed to prevent RF leakage and to avoid downlink levels exceeding  $-75\text{dBm}$  at or near the building interior perimeter.
3. RF Leakage from the system shall not present a measured level in excess of  $15\text{dB}$  below the measured Donor signal at ground level in the immediate area (3-25') from the building perimeter.

### G. Protection of ERRCS

1. The backbone, antenna distribution, radiating, or any fiber-optic cables shall be rated as plenum cables.
2. The backbone cables shall be connected to the antenna distribution, radiating, or copper cables using hybrid coupler devices of a value determined by the overall design.
3. Backbone cables and active components shall be routed through an enclosure that matches the building's fire rating.
  - a. In buildings where the primary structural frame does not have a fire rating, but 1-or-2 HR rated enclosures such as stairways or vertical shafts are required, the backbone and active components shall be located within a rated enclosure or provided with a fire resistance rating of at least the same value.
4. Passage of the antenna distribution cable in and out of the enclosure shall be fire-stopped.
5. All cables shall be installed in accordance with Chapters 7 and 8 of *NFPA 70*.
6. Mechanical protection of work and raceways for coaxial cables shall comply with Article 820 of *NFPA 70*.
7. Cables that are susceptible to mechanical damage must be protected by electrical metallic tubing (EMT) or metal raceways.

### H. Lightning Protection

1. The donor antenna coaxial cable(s) shall be protected by antenna discharge units in accordance with Article 820 of *NFPA 70*.
2. The antenna discharge units shall be listed to UL 497C, *Standard for Protectors for Coaxial Communications Circuits*.
3. Each donor antenna coaxial cable(s) shall be provided with a listed antenna discharge unit in accordance with Article 820 of *NFPA 70*.





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4. The antenna, antenna mast, and antenna discharge unit(s) shall be grounded in accordance with Article 820 of *NFPA 70*.

#### IV. INSTALLATION

##### A. Donor Antennas

To maintain proper alignment with the system designed donor site, donor antennas shall be:

1. Highly directional
2. Secured to a structure strong enough to carry the weight of the installation with necessary allowances for wind and vibration and shall be permanently affixed to the building.
3. Antennas shall not be attached to or supported by vent pipes.
4. The antenna installation shall be in accordance with the applicable requirements in the California Building Code for weather protection of the building envelope.

##### B. Approval Prior to Installation

No amplification system capable of operating on frequencies used by the City Public Safety 700/800 MHz Radio Systems may be installed without prior coordination and written Authorization to Operate from the [City of San Diego Department of Information Technology – Wireless Technology Services Division](#). Any such system shall comply with any standards adopted by this agency.

##### C. Qualifications of Personnel

The system designer and lead installation personnel must meet the following qualifications:

1. A valid FCC–issued General Radio Operators License (GROL); and
2. Certification of in–building system training issued by a nationally recognized organization, schools such as [Associated Public Safety Communications Officials International](#) (APCO), National Association of Business and Education Radio (NABER), Wireless Infrastructure Association (WIA) or the [International Association for Radio, Telecommunications and Electromagnetics](#) (iNARTE) or a certificate issued by the manufacturer of the equipment being installed; or an ERRCS certification by the [National Institute for Certification in Engineering Technologies](#) (NICET).



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### D. Acceptance Test

Upon completion of both building construction and ERRCS installation, the system is required to be tested to ensure that the two-way coverage on each floor of the building is not less than 95% and 99% of critical areas. Coverage shall be based on operation with fire door(s) closed. The test procedure shall follow the requirements of CFC 510.5.4.

- a. **NOTE:** Acceptance testing is required to be performed by a third-party qualified testing entity, not employed by or related to the ERRCS installation contractor. DAQ shall be measured using an instrument which decodes the APCO Project-25 bitstream and provides a SINR or SNR measurement. A passing SNR or SINR is 20 dB or greater, and a passing BER is no greater than two percent.

### E. Final Report

Before issuance of a certificate of occupancy, a final acceptance testing report and as-built plans shall be submitted to SDFD. SDFD personnel will review the documents and schedule an on-site inspection and operational test with the third-party contractor. See APPENDIX C for ERRCS acceptance testing report requirements.

### F. Inspection

An SDFD associated inspection shall be required to verify the installation and results of the acceptance testing report. After SDFD's inspection of the ERRCS installation, a stamped/approved version of the acceptance report will be returned to the testing contractor. This report shall then be uploaded to [The Compliance Engine](#) by that contractor.

### G. FCC Compliance

The ERRCS installation and components shall comply with all applicable federal regulations including, but not limited to, FCC 47 CFR Part 90.219. Proof of registration with the FCC shall be provided to the City.

## V. MAINTENANCE

### A. Annual Testing

The owner of the building or the owner's authorized agent shall have the ERRCS inspected and tested annually and whenever structural modifications are made that will impact the system. Annual testing may be performed by the installation contractor's qualified testing agent or employee, or by a third-party contractor. The test procedure shall follow the requirements of CFC 510.6.1.





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See APPENDIX C for ERRCS annual testing report requirements. Annual testing reports shall be submitted to the fire code official via [The Compliance Engine](#) by the testing contractor, WITHOUT prior review by SDFD personnel.

### **B. Additional Frequencies**

The building owner is responsible for modifying or expanding the ERRCS at their expense if the FCC requires changes or if additional frequencies are made available by the FCC.

### **C. System Interference**

Where other nonpublic safety amplification systems installed in buildings reduce the performance or cause interference with the ERRCS, the nonpublic safety amplification system shall be corrected or removed.

## **VI. FIELD TESTING**

SDFD and/or SD DoIT 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.

## **VII. ON-SITE DOCUMENTATION**

### **A. System documentation shall be located with the head end amplifier.**

1. Documentation may be in a sealed container within the BDA or BBU enclosure if a document pocket of sufficient size is provided.
2. If stored externally to equipment, the installer must provide an appropriate metallic or rigid plastic document holder.

### **B. Documentation shall contain copies of:**

1. Approved/Permitted system plans
2. Acceptance test report
3. Most recent annual testing report
4. Current SD DoIT ERRCS Authorization to Operate form
5. Manufacturer's manuals for all active components of the system:
6. Maintenance log

### **C. Original documents should be maintained by the property owner.**



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### **VIII. PROOF OF ACCEPTABLE COVERAGE**

If applying for compliance WITHOUT installation of an ERRCS, See APPENDIX D for testing and Proof of Acceptable Coverage report requirements.



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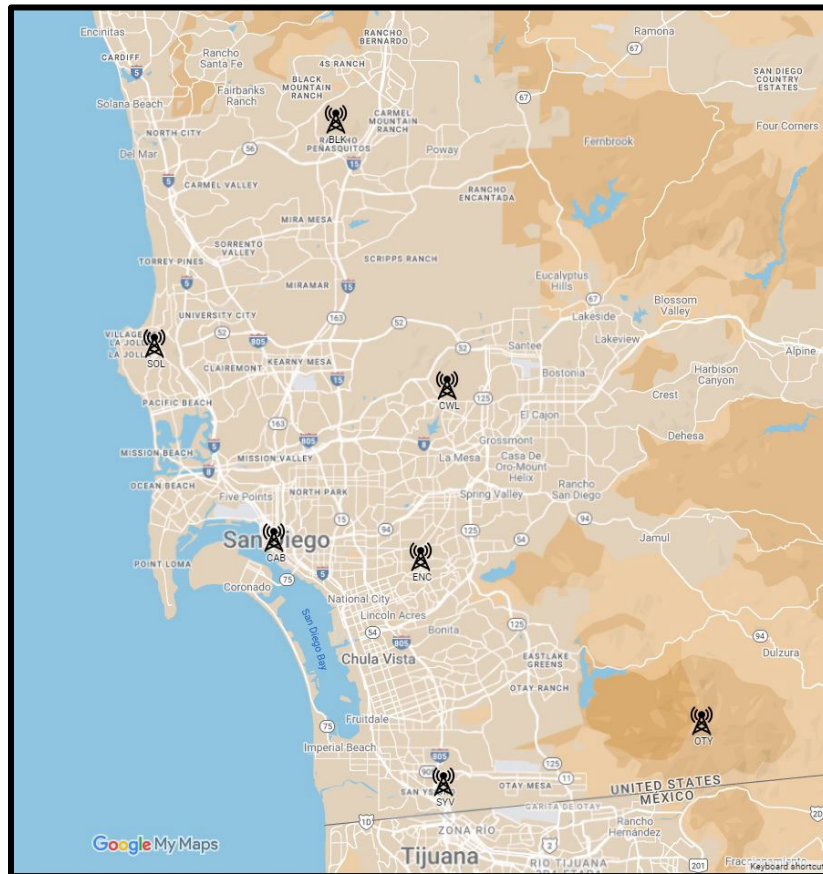
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### APPENDIX A

#### CITY OF SAN DIEGO COMMUNICATIONS SITES

\*Collocated with San Diego County

SITE	AKA	ADDRESS	LATITUDE	LONGITUDE	ELEVATION (ft/met)	NETWORK	TX ERP (dbm)
City Admin Bldg	CAB	202 C Street	32-43-01.36	117-09-45.64	42 / 12.8	800/700 P25	47.8
Mt Soledad*	SOL	2110 Via Casa Alta	32-50-23.09	117-15-10.15	822 / 250.5	800/700 P25	47.8
San Ysidro View*	SYV	4350 Otay Mesa Rd	32-33-42.75	117-02-06.78	480 / 146.3	800/700 P25	50
Cowles Mountain*	CWL	6902 Barker Way	32-48-49.0	117-01-56.2	1518 / 462.6	800/700 P25	45.13
Black Mountain*	BLK	9700 Laurentain Drive	32-58-53.28	117-06-59.88	1540 / 469.4	800/700 P25	49
Encanto	ENC	6770 Aviation Drive	32-42-16.84	117-03-09.14	482 / 146.9	800/700 P25	45.8
Otay Mt.	OTY	Otay Mountain Truck Trail	32-36-02.3 N	116-50-27.9	3355 / 1022.9	700 P25	42.14





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### CITY FREQUENCY USE – 700 MHz CHANNELS

PRIMARY USE	FREQUENCY out/in	PRIMARY USE	FREQUENCY out/in
TRUNK CH. 1 (control)	771/801.48125	TRUNK CH. 11	769/799.81875
TRUNK CH. 2 (control)	770/800.80625	TRUNK CH. 12	769/799.50625
TRUNK CH. 3 (control)	770/800.30625	TRUNK CH. 13	770/800.76875
TRUNK CH. 4 (control)	769/799.80625	TRUNK CH. 14	770/800.26875
TRUNK CH. 5 (BSI)	769/799.30625	TRUNK CH. 15	769/799.75625
TRUNK CH. 6	771/801.05625	TRUNK CH. 16	769/799.31875
TRUNK CH. 7	771/801.49375	TRUNK CH. 17	771/801.26875
TRUNK CH. 8	771/801.06875	TRUNK CH. 18	770/800.01875
TRUNK CH. 9	770/800.75625	TRUNK CH. 19	769/799.55625
TRUNK CH. 10	770/800.25625	TRUNK CH. 20	770/800.51875

### CITY FREQUENCY USE – 800 MHz CHANNELS

PRIMARY USE	FREQUENCY out/in	PRIMARY USE	FREQUENCY out/in
TRUNK CH. 1 (control)	855/810.6875	TRUNK CH. 11	856/811.8875
TRUNK CH. 2 (control)	856/811.1875	TRUNK CH. 12	857/812.0875
TRUNK CH. 3 (control)	856/811.3125	TRUNK CH. 13	854/809.6375
TRUNK CH. 4 (control)	854/809.1125	TRUNK CH. 14 (BSI)	854/809.0125
TRUNK CH. 5	857/812.1375	TRUNK CH. 15	854/809.7375
TRUNK CH. 6	855/810.2625	TRUNK CH. 16	854/809.9625
TRUNK CH. 7	856/811.8375	TRUNK CH. 17	854/809.6625
TRUNK CH. 8	855/810.5875	TRUNK CH. 18	855/810.0875
TRUNK CH. 9	855/810.0625	TRUNK CH. 19	854/809.3625
TRUNK CH. 10	855/810.9125	TRUNK CH. 20	854/809.2375



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### APPENDIX B

#### **DESIGN SUBMITTAL**

A fire permit is required for the installation of all ERRCS to comply with the minimum standards necessary to safeguard public health, safety, and welfare. In addition, a fire permit is required prior to modification of (altering, adding, or replacing) any components of an ERRCS.

Submittals are processed through the [SDFD Community Risk Reduction](#) permit website, under New Construction > Emergency Responder Radio Coverage System > Apply for an ERRCS Permit.

System Design and As-Built submittals shall be formatted as described below and include the following data:

#### **I. FORMAT – CONSTRUCTION (ENGINEERING) PRINT:**

- A. All submittals shall be in PDF format.
- B. File names shall contain the project name, revision number (if applicable), and date of filing.
- C. If submitted as separate Plans and Materials Files, the file name must indicate the content.
- D. Minimum Architectural D (36" x 24")
- E. All pages must be of the same dimension.
- F. Material data sheets may be submitted as a separate document in booklet format, 8.5" x 11" with cover sheet and full materials list included.

#### **II. COVER PAGE/TITLE SHEET SHOWING:**

- A. Project name and address
- B. Building description including:
  - 1. Usage
  - 2. Construction type
  - 3. Number of floors above and below grade
  - 4. Proposed square footage
  - 5. Occupancy classification
  - 6. Fully sprinklered: Yes or No



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- C. Property Owner contact information
- D. System Designer's and Lead Installer's contact information
- E. Vicinity map showing property location
- F. Scope of work
- G. Proposed start and finish dates of project
- H. Full description of concept including any phases represented or connection to existing or future elements
- I. Document index

### III. SUBSEQUENT PAGES SHALL EACH CONTAIN:

- A. Project name
- B. Revision
- C. Page identifier
- D. Page description

### IV. FLOOR PLANS, EXTERIOR ELEVATIONS AND AREA DRAWINGS SHALL CONTAIN:

- A. Legend
- B. Scale/dimensions (graduated ruler)
- C. Compass orientation
- D. Unique identifier of all components shown including major cable segments

### V. DOCUMENT CONTENT PAGES SUFFICIENT TO PROVIDE:

- A. Compliance statement(s) to ALL applicable and currently adopted editions of codes/standards, including but not limited to CFC, CBC, CEC, NFPA Standards, and SDFD ERRCS Guidelines.
- B. Minimum Designer & Lead Installer qualifications to include:
  - 1. FCC GROU License verification
  - 2. Certification of in-building system training (as previously identified)
- C. Materials list (all active and passive components excluding small hardware)
  - 1. Manufacturer
  - 2. Full model or part number





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3. Manufacturer's description
4. Quantities for each device
5. BDA type, model number, and serial number (if available)
6. BDA FCC ID number

### **VI. PHYSICAL INSTALLATION DETAILS AND REQUIREMENTS:**

- A. Wall and floor penetration details
- B. Equipment mounting details and construction standards
- C. Electrical, dedicated branch, lightning protection, ground, and alarm cabling details
- D. Fireproofing requirements

### **VII. LIST OF UNIQUE IDENTIFIERS FOR ALL COMPONENTS AND MAJOR CABLE SEGMENTS.**

### **VIII. SCHEMATIC DIAGRAM OF THE PROPOSED SYSTEM SHOWING UNIQUE IDENTIFIER OF ALL COMPONENTS WITH:**

- A. Active devices
- B. Antennas
- C. Splitters, taps, etc.
- D. Cable segments

NOTE: Unique identifiers MUST be represented on all line drawings and floor plans.

### **IX. SYSTEM MONITORING INFORMATION IDENTIFYING ALL SUPERVISORY SIGNALS AS REQUIRED BY CFC.**

### **X. LINK BUDGET ANALYSIS DESCRIBING UPLINK AT DONOR AND DOWNLINK POWER AT EACH DAS ANTENNA.**

- A. Provide full calculations for each segment or point in tabular format.
- B. Provide schematic representation showing power projections at each junction or connection point.

### **XI. ANTICIPATED ATTENUATION FOR EACH CABLE SEGMENT AND DEVICE PORT.**

### **XII. DONOR SITE SIGNAL PATH(S)**

- A. List of all frequencies to be amplified by system.



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- B. Area map showing donor site location and path to designated donor site
  - 1. Show both vertical and horizontal path views
- XIII. FLOOR PLANS FOR ALL LEVELS (INCLUDING THOSE NOT COVERED BY SYSTEM).**
  - A. Showing all components with identifiers
  - B. Cable routes and identifiers
  - C. Identifying BDA and backbone enclosure or shaft location, and fire rating via wall legend
- XIV. RACK OR WALL MOUNT ELEVATIONS INCLUDING ATTACHMENT METHOD AND GROUNDING DETAILS (GRAPHIC WITH NOTES).**
- XV. FIBER OPTICS LAYOUT, AND INTERCONNECT (IF APPLICABLE).**
- XVI. HEAT MAPS (TYPICALLY IBWAVE OR RANPLAN) FOR EVERY FLOOR.**
  - A. Divide each floor into 20 approximately equal sized grids.
    - 1. Assign a unique ID to each grid. This grid system shall be used for initial coverage calculations and all future test documentation.
- XVII. Battery back-up calculations for the system.**
- XVIII. Manufacturer's Data Sheet for all:**
  - A. Active components (displaying UL 2524 listing)
  - B. Antennas
  - C. Passive coupling devices (taps, power dividers, etc.)
  - D. Coaxial cable
  - E. Coaxial connectors
  - F. Fiber cable (if used)
  - G. Fiber connections (if used)
  - H. Enclosures to be provided by contractor



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### APPENDIX C

#### **ACCEPTANCE AND ANNUAL TESTING REPORT REQUIREMENTS**

All testing shall be conducted by a licensed FCC General Radio Operator with an approved certificate of in-building system training. All RF measurements are to be made using equipment with proof of current calibration. Downlink RF measurements are to be taken using control channels. DAQ shall be measured using an instrument which decodes the APCO Project-25 bitstream and provides a SINR or SNR measurement. A passing SNR or SINR is 20 dB or greater, and a passing BER is no greater than two percent.

It is the responsibility of the building owner to acquire and have available for inspection: copies of the acceptance report, the annual testing report conducted within the previous 12 calendar months, and the SD DoIT written Authorization to Operate. Specific documents are to be stored with the head end equipment as identified in Section VII of SDFD ERRCS Guidelines.

Annual testing should be conducted in preparation for the building's annual fire inspection unless the previous inspection or acceptance test was conducted within the previous 9 calendar months.

Acceptance testing reports shall be submitted to [SDFD Fire Plans Review](#) personnel. SDFD personnel will review the report and schedule an on-site inspection and operational test with the testing contractor. After SDFD's inspection of the ERRCS installation, a stamped/approved version of the acceptance report will be returned to the testing contractor. This report shall then be uploaded to [The Compliance Engine](#) by that contractor. NOTE: Acceptance testing is required to be performed by a third-party qualified testing entity, not employed by or related to the ERRCS installation contractor. Subsequent annual testing may be performed by the installation contractor's qualified testing agent or employee.

Annual testing reports shall be submitted to the fire code official via [The Compliance Engine](#) by the testing contractor, WITHOUT prior review by SDFD personnel.

Reports shall be submitted as 8.5 x 11" PDF documents and shall contain the following:

**I. COVER PAGE SHOWING:**

- A. Site name and address
- B. Date(s) of inspection
- C. Site Owner name address, phone number and email address
- D. On site (24/7) contact, full name, address, phone number & email address
- E. Testing company's contact information
- F. Inspector's name, contact address, phone number and email address



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### **II. INSPECTOR'S PROOF OF QUALIFICATIONS (MINIMUM 2 ITEMS)**

- A. FCC GROL
- B. Certification of in-building system training (as previously identified).

### **III. TEST DESCRIPTION**

- A. Test requirements per CFC and SDFD Guidelines
- B. Test methodology
- C. Model, serial number and calibration date of all testing equipment

### **IV. SITE DESCRIPTION**

- A. Site address
- B. Site donor antenna
- C. BDA FCC registration number
- D. Location of primary components within the property
- E. Model, serial number and FCC certification number of all active RF components including:
  - 1. Amplifier or Master Unit
  - 2. Remote Amplifiers
- F. Amplifier operating Class (Class A required).
- G. Model and serial number of remaining powered components.
  - 1. Battery Backup Units (BBU)
  - 2. Remote Alarm Reporting Devices

### **V. INSPECTION RESULT SUMMARY PAGE**

- A. List requirements and Pass/Fail Result
  - 1. Interior Signal Strength (Downlink)
  - 2. Exterior Signal Strength (Uplink)
  - 3. General Areas – 95% Coverage Test
  - 4. Critical Areas – 99% Coverage Test
  - 5. DAQ test (Uplink & Downlink)



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6. Correct Frequency Filtering
7. Uplink Muting Enabled
8. Spurious Uplink Emissions Measurement
9. Quiescent Noise Measurement
10. Donor Antenna Azimuth (specify degrees True or Magnetic)
11. Donor to Serving Antenna Isolation Less Maximum BDA > 20 dB
12. Primary Power Provided by Dedicated Branch Circuit
13. Backup Power Supply Provides Power for All Active Components
14. Backup Power Supply Battery Condition
15. Backup Power Supply Calculated Runtime
16. Backup Power Load Test
17. Physical Condition of Installation
18. NEMA 4/3R compliance of Equipment Enclosures Inter-cabinet cabling
19. AC Power Termination
20. Emergency Power-Off device
21. Grounding and Lightning Protection
22. Interference Test
23. Isolation Tests
24. Amplifier Gain Measurements
  - a. Uplink
  - b. Downlink
25. Active Components are UL2524 Listed
26. BDA FCC Certification
27. Any other applicable test results

### **VI. DETAILED TEST RESULTS**

- A. Donor Site Path Profile
  1. Local Site coordinates



# SAN DIEGO FIRE-RESCUE

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2. Donor Site(s) coordinates
  3. Graphic representation of horizontal and vertical paths showing:
    - a. Donor Site(s) Name
    - b. Azimuth (degrees Magnetic) to Donor Site(s)
    - c. Path Length to Donor Site(s) (Miles)
    - d. Calculated Path Loss to each donor site
- B. Graphic or tabular verification for all required tests (following)**
1. System primary and backup power
    - a. One-hour load test or pulse-load battery capacity test.
    - b. Verify ALL active components operating on backup power
      - i. Amplifier/Master (Headend)
      - ii. Remote amplifiers
      - iii. Fault display
  2. System gain and measured RF power
    - a. Uplink and downlink
    - b. Single channel
    - c. Near-far (uplink only)
  3. Ambient noise floor
    - a. Measured at BDA Donor antenna feed point and BDA service antenna feed point
    - b. Amplifier powered off
    - c. Active DAS, if used, powered on
    - d. Show span of 15-20MHZ centered at 800.30625 MHz (Downlink) and 770.30625 MHz (Uplink)
    - e. Provide a screenshot displaying noise entering BDA from donor antenna at both frequencies as described in item 3d (above)
    - f. Provide a screenshot displaying noise entering BDA from service antennas at both frequencies as described in item 3d (above)







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- c. Donor Surge Protector
- d. Donor antenna and supporting structure
- e. Donor antenna alignment and path to Donor site(s)
- f. Interior of BBU cabinet
- g. Typical DAS antenna
- h. Any items requiring repair or support

**NOTE:** Digital images of physical condition of equipment and installation are not required for Annual testing reports.

The Fire Marshal and/or the Fire Marshal's designee, or SD DoIT personnel may, at any time during routine business hours, conduct independent testing of the in- building system to verify proper operation and shall be provided unimpeded access at any time 24 hours a day, 365 days a year, to investigate a case of interference with public safety communications systems.

Annual testing will be done at no expense to the City of San Diego.



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### APPENDIX D

#### **PROOF OF ACCEPTABLE COVERAGE REPORT REQUIREMENTS**

Upon **completion of building construction**, testing for proof of acceptable coverage is required to ensure that the two-way coverage on each floor of the building is not less than 95% or 99% for critical areas.

All testing shall be conducted by a licensed FCC General Radio Operator with an approved certificate of in-building system training. All RF measurements are to be made using equipment with proof of current calibration. Downlink RF measurements are to be taken using control channels. DAQ shall be measured using an instrument which decodes the APCO Project-25 bitstream and provides a SINR or SNR measurement. A passing SNR or SINR is 20 dB or greater, and a passing BER is no greater than two percent.

All radio tests shall include a grid test per [CFC 510.5.4](#) with both signal strength and DAQ indications in each test grid per [CFC 510.4.1](#).

An SDFD associated operational inspection may be required to verify the results of the test.

Failure of proof of acceptable coverage will require the installation of an ERRCS.

It is strongly recommended that considerations be made to install conduit during building construction to accommodate ERRCS cables if testing indicates a system is needed to provide acceptable coverage.

Installation of an ERRCS after failure of proof of acceptable coverage will be subject to ERRCS Permit fees.

Submittals are processed through the [SDFD Community Risk Reduction](#) permit website, under New Construction > Emergency Responder Radio Coverage System > Apply for Proof of Acceptable Coverage.

Reports shall be submitted as 8.5 x 11" PDF documents and shall contain the following:

#### **I. COVER PAGE SHOWING**

- A. Site name and address
- B. Date(s) of Inspection
- C. Site Owner name address, phone number and email address
- D. On site (24/7) contact, Full Name, Address, Phone number & email address
- E. Testing company's contact information
- F. Inspector's name, contact address, phone number and email address.



# **SAN DIEGO FIRE-RESCUE**

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### **II. INSPECTOR'S PROOF OF QUALIFICATION (MINIMUM 2 ITEMS)**

- A. FCC GROL
- B. Certification of in-building system training (as previously identified).

### **III. TEST DESCRIPTION**

- A. Test requirements per CFC and SDFD Guidelines
- B. Test methodology
- C. Model, Serial Number and Calibration date for all test equipment

### **IV. INSPECTION RESULT SUMMARY PAGE**

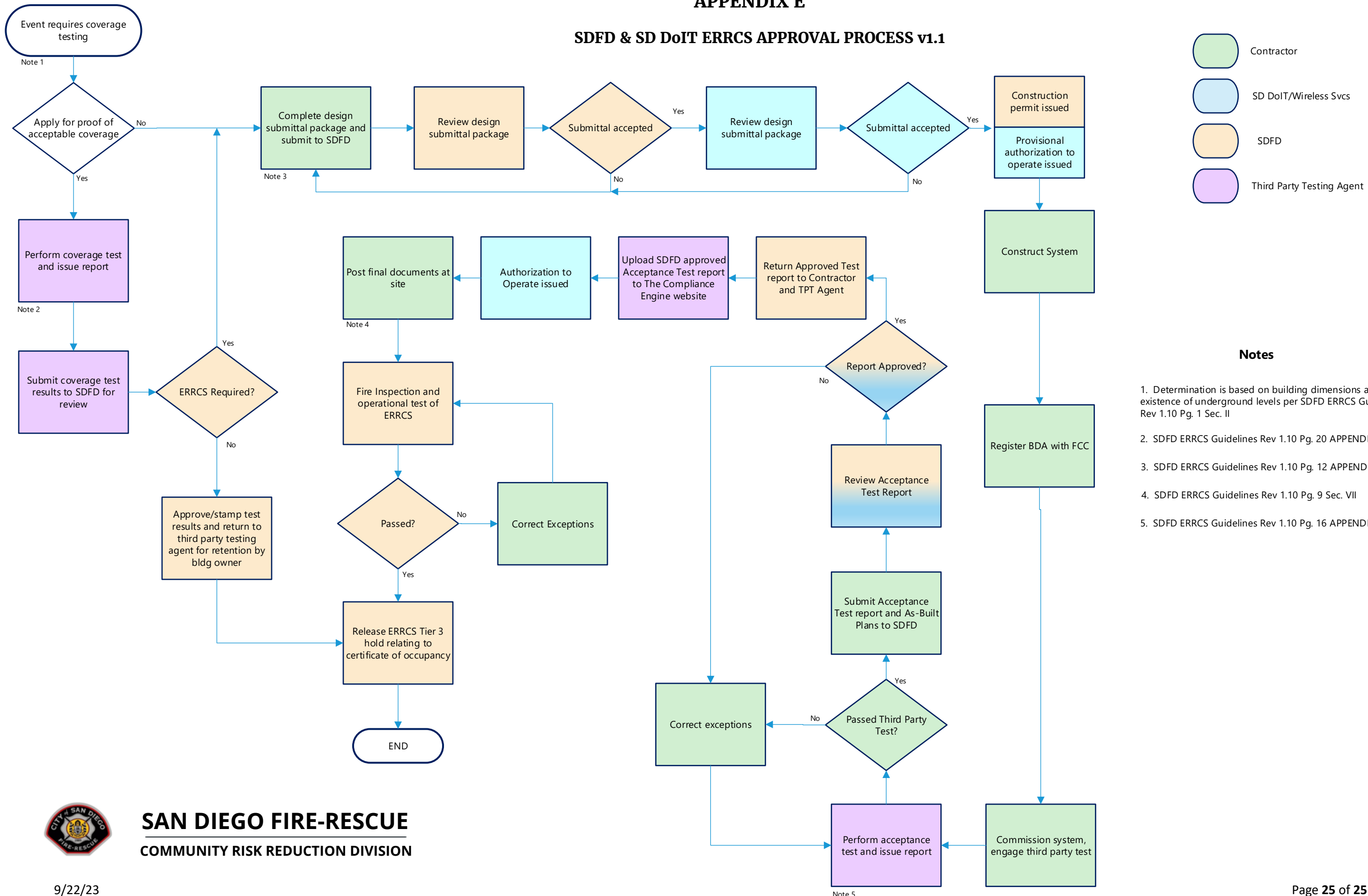
- A. List requirements and Pass/Fail Result
  - 1. Interior Signal Strength (Downlink)
  - 2. Exterior Signal Strength (Uplink)
  - 3. DAQ test (Uplink & Downlink)

### **V. DETAILED TEST RESULTS**

- A. Graphic or tabular verification for all the following required tests
  - 1. Coverage measurement
    - a. Coverage shall be based on operation with fire door(s) closed.
    - b. Using 20-grid method created in the original plan set, conduct measurements on each floor. Minimum acceptable is -95 dBm in 95% of the test grid and 99% of critical areas.
    - c. Determine and document uplink and downlink DAQ for all grids. Minimum acceptable is DAQ 3.4 in 95% of test grid areas on every floor and 99% critical areas.
    - d. DAQ shall be measured using an instrument which decodes the APCO Project-25 bitstream and provides a SINR or SNR measurement. A passing SNR or SINR is 20 dB or greater, and a passing BER is no greater than two percent.

# APPENDIX E

## SDFD & SD DoIT ERRCS APPROVAL PROCESS v1.1



Contractor  
 SD DoIT/Wireless Svcs  
 SDFD  
 Third Party Testing Agent

- Notes**
1. Determination is based on building dimensions and existence of underground levels per SDFD ERRCS Guidelines Rev 1.10 Pg. 1 Sec. II
  2. SDFD ERRCS Guidelines Rev 1.10 Pg. 20 APPENDIX D
  3. SDFD ERRCS Guidelines Rev 1.10 Pg. 12 APPENDIX B
  4. SDFD ERRCS Guidelines Rev 1.10 Pg. 9 Sec. VII
  5. SDFD ERRCS Guidelines Rev 1.10 Pg. 16 APPENDIX C