# SAN DIEGO FIRE-RESCUE
## COMMUNITY RISK REDUCTION DIVISION

| STANDARD TITLE | | STANDARD NUMBER |
|---|---|---|
| **Emergency Responder Communication Enhancement Systems (ERCES)** | | **C-1** |
| EFFECTIVE DATE: **01/14/2025** | REVISION DATE: **01/08/2025** | |

## I. PURPOSE

The purpose of this standard is to establish requirements set forth by the San Diego Fire-Rescue Department (SDFD) and the Department of Information Technology / Wireless Services Division (SD DoIT/WSD) to ensure acceptable communication coverage for emergency responders and protect the City of San Diego public safety radio network. These requirements cover the testing of in-building emergency responder communication coverage, and the design and installation of Emergency Responder Communication Enhancement Systems (ERCES).

## II. SCOPE

The provisions of this standard shall apply to the following buildings within the jurisdiction of SDFD.

**A. New Buildings:** All new buildings must meet the minimum performance requirements of CFC section 510 for in-building, emergency responder communication coverage.

1. All new high-rise buildings MUST be provided with an ERCES. 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 ERCES.
2. Low-rise buildings meeting ANY of the following conditions shall either provide Proof of Acceptable coverage to SDFD or be provided with an ERCES:
   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.

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 ERCES shall be installed within three (3) years of the test date.

## III. REFERENCED CODES AND STANDARDS

Unless otherwise specified within this standard, ERCES shall comply with all the following, including references therein:

**A.** 2022 California Fire Code (CFC)

**B.** National Fire Protection Association (NFPA) 1225, 2022 Edition

**C.** Federal Communications Commission (FCC) 47 CFR Part 90.219

## IV. REQUIRED SIGNAL STRENGTH AND QUALITY

A building shall be considered to have acceptable in-building, two-way emergency responder communication coverage where radio signal strength measurements in 95% of all areas and 99% of critical area on each floor of the building meet the following requirements:

**Critical Areas**

Areas that are designated for the highest level of emergency responder radio coverage including but not limited to fire command centers, fire pump rooms, exit stairs, exit passageways, elevators, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations, and other areas deemed critical by SDFD.

### A. 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.

1. Downlink (DL) 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.

**B. 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.

1. Uplink (UL) DAQ shall be measured using SD DoIT/WSD issued radios, with the DAQ values assessed at the receiving radio outside the building as transmitted from each grid within the building. Vendors shall coordinate with SD DoIT/WSD to secure radios for testing.

## V. APPLY FOR PROOF OF ACCEPTABLE COVERAGE

Upon completion of building construction and once occupied (after issuance of Temporary Certificate of Occupancy (TCO)), testing for proof of acceptable coverage is required to ensure that two-way emergency responder communication coverage on each floor of the building meets required signal strength and quality.

**NOTE: It is the responsibility of building owners and/or the ERCES testing contractor to reach out to SDFD requesting release of a building for TCO. Buildings meeting criteria within the SCOPE of this standard typically require installation of an ERCES to meet requirements. It is strongly recommended that considerations be made to provide for cabling pathways and installation of conduit (as needed) during building construction to accommodate an ERCES installation if testing indicates a system is needed to provide acceptable coverage. SDFD will not release buildings for Certificate of Occupancy (CofO) until either Proof of Acceptable coverage is provided or an ERCES has been permitted, installed, and fully tested/inspected.**

Failure of proof of acceptable coverage will require the installation of a public safety dedicated ERCES and will be subject to the ERCES Permit processing and fees.

**A. Qualifications of Testing Personnel**

All testing shall be conducted by a licensed FCC General Radio Operator with an approved certificate of in-building system training.

**NOTE: Beginning July 1st, 2025, a NICET IB-PSC Level II certification shall be required for testing personnel.**

**B. Testing Specifications**

All tests shall be conducted utilizing the 20-grid format per CFC 510.5.4 with signal strength and DAQ (both UL and DL) measurements taken for each grid.

All measurements are to be taken using equipment with proof of current calibration, utilizing control channels ONLY on the 700 MHz band as identified in APPENDIX A.

**C. Testing Report and Application**

When applying for compliance WITHOUT installation of an ERCES, see APPENDIX B for Proof of Acceptable Coverage test report requirements. Submittals are processed through the SDFD Community Risk Reduction permit website, under New Construction > Emergency Responder Communication Enhancement System > Apply for Proof of Acceptable Coverage.

**D. SDFD Inspection and Enforcement**

An SDFD associated operational inspection may be required to verify the results of the test. SDFD may require future testing of the building to ensure adequate coverage remains as conditions change within the jurisdiction.

## VI. ERCES DESIGN

All ERCES shall be Public Safety dedicated and design of the system shall meet all the following specifications. See APPENDIX C for ERCES plan submittal requirements.

**A. Active Equipment**

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.*

**B. System Performance**

1. The ERCES installation and components shall comply with all applicable federal regulations including, but not limited to, Federal Communications Commission (FCC) 47 CFR Part 90.219. Proof of registration with the FCC shall be provided to the City.

2. ERCES shall meet the requirements of the applications being utilized by public safety for emergency operations throughout the coverage area and shall be designed to support two portable radios simultaneously transmitting on different talk paths or channels.

3. The maximum allowable ERCES 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.

**C. 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 on all equipment supplied by the circuit. Equipment shall be hard-wired to the dedicated branch circuit and the system circuit disconnecting means shall be permanently identified as "ERCES" with white lettering on red labeling. Where a circuit breaker is a disconnecting means, an approved red colored breaker locking device shall be installed.

2. **Standby Power**

   ERCES shall be provided with one of the following:

   a. A Battery Backup Unit (BBU) 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.

   Battery systems used for the standby power source shall be contained in a National Electrical Manufacturer's Association (NEMA) 3R or higher rated cabinet. Batteries that require venting shall be stored in NEMA 3R-type enclosures.

3. **Emergency Power-Off**

   Emergency Power-Off (EPO) means shall be provided for all ERCES. The EPO shall be located next to the Dedicated Annunciator for the system. If the approved location for the Dedicated Annunciator is accessible to the public or general occupants of the building, then the EPO shall be located at the Bi-Directional Amplifier (BDA). The EPO shall be clearly labeled as “ERCES” and have protection from accidental activation.

**D. 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 an area approved by SDFD.

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 NEMA 4-type waterproof cabinet.

5. Active RF-emitting devices shall have built-in oscillation detection and control circuitry.

6. 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 and SD DoIT/WSD.

7. The maximum uplink RF noise (noise crown) created by any signal booster or signal booster-based ERCES shall not raise the noise floor at the public safety communications site closest to the ERCES or any receiving site within the public safety communications network that the ERCES is intended to operate with.

8. 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.

9. 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.

**E. System Monitoring**

The system shall include automatic supervisory signals for malfunctions of the in-building emergency responder communications enhancement system that are annunciated by the building fire alarm system in accordance with *NFPA 72*.

The system shall comply with all the following:

1. Monitoring for integrity of the system shall comply with Chapter 10 of *NFPA 72*.

2. System supervisory signals shall include the following:

   a. Signal source malfunction

   b. Active RF-emitting device failure

   c. Low-battery capacity indication when 70 percent of the 12-hour operating capacity has been depleted

   d. Active system component failure

e. Oscillation of active RF-emitting device(s)

3. Power supply supervisory signals shall include the following for each RF-emitting device and active system components:

   a. Loss of normal ac power

   b. Failure of battery charger

4. The communications link between the fire alarm system and the in-building emergency responder communications enhancement system shall be monitored for integrity.

5. A single supervisory input to the fire alarm system to monitor all system supervisory signals shall be permitted.

**F. Dedicated Annunciation**

A dedicated annunciator shall be provided within the fire command center, or an approved location within the building, to annunciate the status of all RF-emitting devices and active system component locations. The typical location for approval is at the Fire Alarm Control Panel (FACP) for the building fire alarm system.

The annunciator shall provide visual and labeled indications of the following for each system component and RF-emitting device:

1. Normal AC power

2. Loss of normal AC power

3. Battery charger failure

4. Low-battery capacity

5. Signal source malfunction

6. Active RF-emitting device malfunction

7. Active system component malfunction

The communications link between this device and the in-building emergency responder communications enhancement system shall be monitored for integrity.

**G. Operational Frequencies**

1. The ERCES 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 ERCES must be operational on both 700 and 800 MHz Public Safety bands, and operate on all assigned frequencies as identified in APPENDIX A. NOTE: Testing of the system shall ONLY be required on the 700 MHz band.
3. Intentional retransmission of any other frequencies must have approval from SD DoIT/WSD.

**H. Radio Communication Antenna Density**

1. Systems shall be engineered to minimize the near-far effect.
2. Designs shall include a sufficient number of distribution antennas and density to address reduced gain conditions.
3. Antenna placement and downlink gains shall be designed to prevent RF leakage and to avoid downlink levels exceeding -75dBm at or near the building interior perimeter.
4. RF Leakage from the system shall not present a measured level in excess of 15dB below the measured donor signal at ground level in the immediate area (3-25') from the building perimeter.

**I. System Protection**

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. All cables shall be installed in accordance with Chapters 7 and 8 of *NFPA 70*.
4. Cables shall be supported by J-Hooks with a flat base of at least 1 ½" width, or in accordance with manufacturer's specifications. Cables shall be supported at least every 3-5' and at varying distance (no greater than 1' deviation) to avoid waveform.
5. Mechanical protection of work and raceways for coaxial cables shall comply with Article 820 of *NFPA 70*.

a. Cables susceptible to damage shall be enclosed in conduit. All utilized conduit pathways shall have plastic bushings installed.

6. Backbone cables and backbone cable components shall be protected from attack by fire. Cables shall be contained within an enclosure or protected area having a fire-resistance rating, or cables with a listed fire-resistance rating shall be utilized in accordance with the following:

   a. 2-HR: Where the primary structural frame of a building is required to have a fire-resistance rating of 2 hours or more (including heavy timber construction) OR the building contains 4 or more connected stories, the minimum fire-resistance rating shall be 2 hours.

   b. 1-HR: Where the primary structural frame of a building is not rated or is required to have a fire-resistance rating of less than 2 hours AND the building contains less than 4 connected stories, the minimum fire resistance rating shall be 1 hour.

   c. NR: Where the primary structural frame of a building does not require a fire-resistance rating, the building contains 2 stories or less AND is sprinklered throughout with an NFPA 13 automatic sprinkler system in accordance with CFC 903.3.1.1, a fire resistance rating shall not be required.

7. Where backbone cables and distribution antenna cables are run in a fire-resistant enclosure or protected area, both of the following shall apply:

   a. The connection between the backbone cable and the distribution antenna cables shall be made within the fire-resistant enclosure or equivalent rated protected area.

   b. Passage of the distribution antenna cable in and out of the enclosure or protected area shall be fire-stopped to an equivalent rating of the enclosure or protected area.

8. If both the backbone cables and the backbone cable components are fire rated in accordance with the requirements herein, the connection of the distribution antenna cable shall not be required to be made within an enclosure or protected area.

9. Active system components shall be located within enclosures that meet or exceed the required fire resistance ratings of the backbone cables. Enclosures shall be sufficient in space to allow adequate cooling to keep equipment within operational rated temperature range, or enclosures shall be equipped with active climate control.

**J. Donor Antennas**

1. Antennas shall be permanently affixed to the building.

2. Donor antennas shall support: A horizontal beamwidth of 30 degrees or less, a vertical beamwidth of 30 degrees or less, and a front-to-back ratio of 27db or greater.

    a. Antennas that meet this requirement are listed below, alphabetically by manufacturer name and with no preference from SDFD. Other antennas that meet these requirements shall be considered for approval.

    ADRF: AD-PA-700-900-DIN-X, Comba: ODP-030V14MN, Gamma Nu: F16V28DHFB, Ventev: VHG-VL3015-ODNF

3. Isolation shall be maintained between the donor antenna and all inside antennas to a minimum of 20 dB above the system gain under all operating conditions.

4. The antenna installation shall be in accordance with the applicable requirements in the California Building Code for weather protection of the building envelope.

**K. 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*.

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

5. Lightning arrestors shall be installed on the donor cable as close as possible to the point of entry of the cable into the building where grounding is available.

**L. Network Connectivity**

A 50 Mbps or faster ethernet connection with active connection to the internet and a Dynamic Host Configuration Protocol (DHCP) assigned IP address shall be provided within 18 inches of the bi-directional amplifier.

**M. Signage**

Buildings equipped with an ERCES shall be identified with approved signage per the following specifications.

1. Signage shall be provided on the exterior of the building at each entrance, at 60"–70" elevation above ground level. Where a building KnoxBox is provided, the sign for this entrance shall be mounted adjacent to or above the KnoxBox.

2. Additional sign(s) shall be provided on the exterior side of door(s) leading to the enclosure(s) and on the door of enclosure(s) containing the BDA, head end, and/or remote units at 60" – 70" elevation above finished floor.

3. A sign shall be provided on the exterior door leading to the fire command center on each high-rise building equipped with an ERCES.

4. Signage shall be plastic or aluminum, 4" X 4" in size, with white "ERCES" letters and radio-tower symbol on red background. The "ERCES" letters shall be 1" in height as shown on the example below.


## VII. MULTI-BUILDING INSTALLATIONS

Where more than one building on any property (or in the same complex/campus) are controlled, managed, or owned by any individual, group, corporation, or partnership, a single Public Safety Dedicated active fiber DAS system shall be installed to provide coverage to all buildings. The DAS head end and donor antenna shall be located at the most appropriate building with clear line of sight to the selected communications tower. Other buildings currently erected, or when constructed in the future, shall be equipped with remote units interconnected by supervised fiber-optic cables to the head end. All other ERCES requirements herein shall apply to these installations.

### A. System Monitoring

Multi-building ERCES shall be monitored at the headend building Fire Alarm System.

**B. Dedicated Annunciation**

Dedicated annunciators shall be provided within each building at the fire command center or an approved location, providing indication of the functional status of the ERCES equipment contained within that building.

## VIII. INSTALLATION

**A. 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 SD DoIT/WSD. Any such system shall comply with any standards adopted by this agency.

**B. 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 ERCES certification by the National Institute for Certification in Engineering Technologies (NICET).

**NOTE: Beginning July 1st, 2025, SDFD will require National Institute for Certification in Engineering Technologies (NICET), In-Building Public Safety Communications (IB-PSC) certification for all personnel designing and installing ERCES. Personnel functioning in duplicate roles, with proof of appropriate qualification, shall be approved. In the event a sub-contractor is utilized for work of installation, such personnel shall be identified with proof of qualifications provided. At a minimum, identification and proof of qualifications shall be provided for the following personnel:**

1. RF Engineer: NICET IB-PSC Level III certification
2. System Designer: NICET IB-PSC Design certification
3. Installation Crew Supervisor: NICET IB-PSC Level II certification (or higher)

4. Installation Technician(s): NICET IB-PSC Level I, II, or III certifications (as appropriate based on work being conducted)
5. System Commissioning Technician: NICET IB-PSC Level II certification AND certification issued by the manufacturer for the model of equipment being installed.

NICET IB-PSC Level I certified personnel may: install cable, terminate cable, install passive equipment, install donor antenna, install active equipment, install dedicate annunciator, and install battery backup (BBU).

NICET IB-PSC Level II certified personnel may: perform any function of Level I and measure RF signal strength and quality, troubleshoot issues impacting RF performance, test cable, validate passive equipment installation, validate and verify electrical and grounding installation and requirements, interface with fire alarm systems, adjust headend and remote amplification equipment, test system alarms, and test battery backup (BBU).

**C. Commissioning**

ERCES shall be commissioned by the installing contractor and tested by a third-party.

**D. Third-Party Acceptance Test**

Upon completion of ERCES installation and once the building is occupied (after issuance of Temporary Certificate of Occupancy (TCO)), the system is required to be tested to ensure signal strength and quality, are adequate for two-way emergency responder communication. Testing shall be conducted in accordance with Section V of this document, along with additional acceptance test criteria and reporting requirements as identified in APPENDIX D.

**NOTE: Acceptance testing is required to be performed by a third-party qualified testing entity, not employed by or related to the ERCES installation contractor. It is the responsibility of building owners and/or the ERCES installation contractor to reach out to SDFD requesting release of a building for TCO prior to testing of the ERCES. SDFD will not release buildings for Certificate of Occupancy (CofO) until the ERCES has been permitted, installed, and fully tested/inspected.**

**E. Final Report**

Before issuance of Certificate of Occupancy (CofO) for the building, a final acceptance test report and as-built plans (as applicable) shall be submitted to SDFD. SDFD and SD DoIT/WSD will review the documents, and when approved, return an SDFD Approved/Stamped version of the testing report to the third-party tester and installing contractor. This stamped version of the acceptance test report is then required to be uploaded to The Compliance Engine (TCE) website initiating the timeline for annual inspection, testing, and maintenance of the system thereafter.

**F. SDFD Inspection**

An SDFD associated inspection shall be required to verify the installation and results of the acceptance test report. After successfully passing inspection, SDFD will release any holds related to issuance of CofO for the building.

## IX. MAINTENANCE

**A. Periodic Inspection/Testing**

1. Semiannual Inspection

The owner of the building or owner's authorized agent shall have all ERCES that are connected to fire alarm systems that are monitored for alarm, supervisory, and trouble conditions off site as defined by NFPA 72 shall be visually inspected semiannually for the following conditions:

a. Normal ac power

b. Loss of normal ac power

c. Battery charger failure

d. Low battery capacity

e. Signal source malfunction

f. Active RF-emitting device malfunction

g. Active system component malfunction

h. Loss of communication with the fire alarm control panel

i. Signs of physical damage to components that could affect proper system operation

**NOTE: Semiannual inspections shall be documented on the Maintenance Log of the system.**

2. Annual Testing, Inspection, and Maintenance (ITM)

The owner of the building or owner's authorized agent shall have the ERCES inspected and tested annually or where structural changes occur, including additions or remodels that could materially change the original field performance tests. Testing shall consist of the following:

a. In-building coverage test as described in CFC 510.5.4

b. Signal boosters shall be tested to verify that the gain is the same as it was upon initial installation and acceptance or set to optimize the performance of the system.

c. Backup batteries and power supplies shall be tested under load of a period of 1 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 active components shall be checked to verify operation within the manufacturer's specifications.

**NOTE: Any failures or deficiencies of the system shall be corrected, and re-testing shall be conducted (as applicable) thereafter.**

Annual testing may be performed by the installing contractor's qualified testing agent or employee, or by a qualified third-party contractor. See APPENDIX E for ERCES annual testing report requirements. Annual testing reports, with passing results, shall be submitted to SDFD via The Compliance Engine (TCE) website by the testing contractor (WITHOUT prior review by SDFD personnel).

**B. Additional Frequencies**

The building owner is responsible for modifying or expanding the ERCES 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 ERCES, the nonpublic safety amplification system shall be corrected or removed.

## X. FIELD TESTING

SDFD and/or SD DoIT/WSD personnel shall have the right to enter a property at any reasonable time to conduct independent field testing to verify the requirements of emergency responder communications coverage and verify proper operation of all ERCES installations. Unimpeded access shall be provided at any time (24 hours a day, 365 days a year) to investigate a case of interference with the City of San Diego public safety network and communications systems.

## XI. ON-SITE DOCUMENTATION

### A. Location

1. Documentation shall 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. Required Documents (Original documents shall be maintained by the property owner):

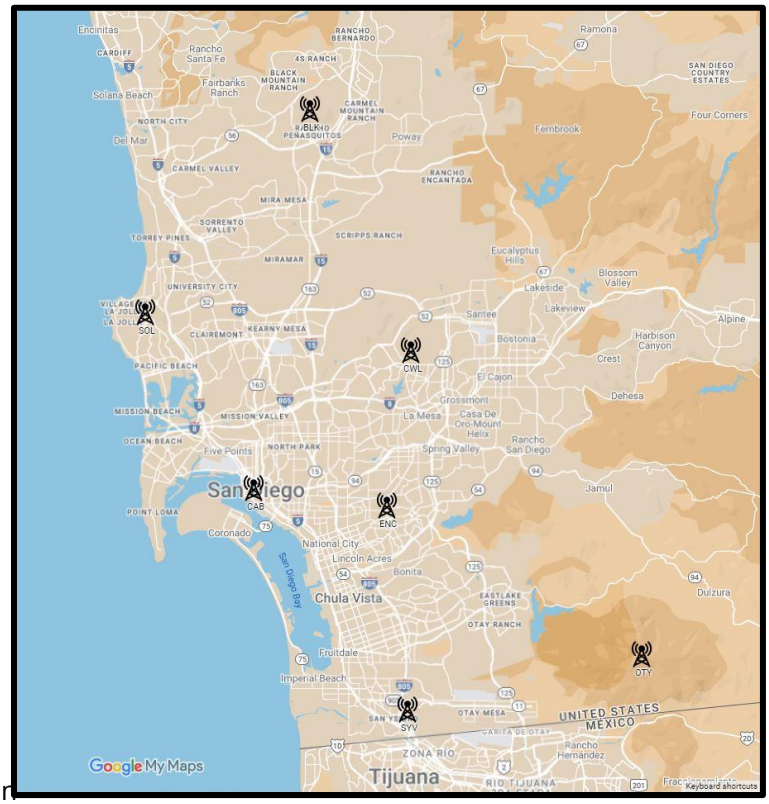
1. Approved/Permitted System Plans
2. Most recent Annual Testing Report (Not applicable until 1st ITM)
3. Current SD DoIT/WSD ERCES Authorization to Operate Form
4. Maintenance Log

# 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 |



| 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 |

# APPENDIX B

**PROOF OF ACCEPTABLE COVERAGE TEST REPORT REQUIREMENTS**

Testing shall be conducted in accordance with CFC 510.5.4. All measurements are to be taken using equipment with proof of current calibration, utilizing control channels ONLY on the 700 MHz band as identified in APPENDIX A. Passing results shall detail compliance with Required Signal Strength and Quality as previously identified herein.

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

**I. GENERAL INFORMATION**

- **A.** Site name and address
- **B.** Building owner name, mailing address, phone number and email address
- **C.** On-site contact name, mailing address, phone number, and email address (typically property management)
- **D.** Testing company's name and mailing address
- **E.** Testing inspector's name, phone number, and email address
- **F.** Date(s) of testing

**II. TESTING INSPECTOR'S PROOF OF QUALIFICATIONS**

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

**NOTE: Beginning July 1st, 2025, a NICET IB-PSC Level II certification shall be required for testing personnel.**

**III. TEST DESCRIPTION**

- **A.** Test requirements per CFC and SDFD ERCES Standard
- **B.** Test methodology
- **C.** Model, serial number and calibration date for all test equipment

**IV. TESTING RESULTS SUMMARY PAGE (PASS/FAIL)**

- **A.** Overall building signal strength and quality

## V. DETAILED TEST RESULTS

**A.** Signal Strength and Quality

1. Building level (floor by floor) summary:
   a. Building level identifier
   b. General area grids with passing measurements relative to total (e.g., 19/20)
   c. Critical area(s) (as applicable) with passing measurements relative to total (e.g., 4/4)
   d. Building level Pass/Fail identification.
2. Graphic and tabular data for all building levels:
   a. Floor plan view displaying:
      i. Numbered and approximately equal 20-grid test areas
      ii. Critical areas (identified within applicable grids)
      iii. Interior Signal Strength (Downlink) per grid (utilizing green colored lettering or shading for passing results, and red colored lettering or shading for failing results).
   b. Tabular data displaying:
      i. Grid number
      ii. Critical areas (identified for applicable grids)
      iii. Interior Signal Strength per grid
      iv. Downlink DAQ (provide SINR/BER) per grid
      v. Uplink DAQ per grid
      vi. Pass/Fail identification per grid

# APPENDIX C

**DESIGN SUBMITTAL**

A fire permit is required for the installation of all ERCES to verify compliance with SDFD standards in safeguarding the City of San Diego public safety radio network. In addition, a fire permit is required prior to modification of (altering, adding, or replacing) any components of an existing ERCES.

Submittals are processed through the SDFD Community Risk Reduction permit website, under New Construction > Emergency Responder Communication Enhancement System > Apply for an ERCES Permit.

Initial system design proposals and as-built submittals shall be formatted as described and include the following data:

**I. FORMAT:**

**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.** Architectural D (24" x 36"), landscape orientation

**D.** All pages must be of the same dimension.

**NOTE: 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. ALL other submission requirements shall be detailed in the Plan Set submittal. If submitted separate from the Plan Set, file names must indicate the content.**

**E.** Pages shall each contain:

1. Project name
2. Revision number
3. Page identifier
4. Page description

**F.** Floor plans, exterior elevations and area drawings shall contain:

1. Legend
2. Scale/dimensions (graduated ruler)
3. Compass orientation

4. Unique identifier of all components shown including major cable segments

**II. CONTENT:**

**A.** Cover page/title sheet showing:

1. Project name and address
2. Building description including:
   a. Construction type (per floor)
   b. Number of floors above and below grade
   c. Square footage
   d. Occupancy classification
   e. Sprinkler Information
      i. Standard for system (e.g., NFPA 13, 13R, 13D)
      ii. Building fully protected: Yes or No
3. Property Owner contact information
4. System Designer's and Lead Installer's name(s) and contact information
5. Vicinity map showing property location

   **NOTE: Multi-building systems shall provide a site map with building identifiers**
6. Scope of work
7. Proposed start and finish dates of project
8. Full description of concept including any phases represented or connection to existing or future elements
9. Statement of compliance, at a minimum, identify current editions of CFC, NFPA 1225, FCC 47 CFR 90.219, and SDFD ERCES Standards
10. Sheet index

**B.** Additional pages sufficient to identify/provide (in the following order):

1. Frequencies and communications site (See Appendix A for SDFD requirements):
   a. System supported frequencies, specifically listed, and organized per Appendix A
   b. Selected communications site:
      i. Identifier and location
      ii. Donor path overhead view with distance identified
      iii. Donor path elevation (topography) view

   **NOTE: Issuance of an SDFD ERCES construction permit and Authorization to Operate documentation as provided by SD DoIT/WSD ONLY authorizes use of City of San Diego frequencies and communications sites. It is the permit applicant's responsibility to ensure that ALL public safety communications within a building are supported, which MAY be in addition to those required by SDFD (e.g., County, Port Authority, Airport Authority, UCSD facilities, etc.). See Appendix A for City of San Diego communications sites co-located with San Diego County. All system supported frequencies and communications sites utilized shall be identified on plan set submittals. It is the permit applicant's responsibility to receive approval for use of frequencies and communications sites (other than those of the City of San Diego) from the appropriate authority/license holder.**

2. Design and installation personnel qualifications, to include:
   a. FCC GROL
   b. SDFD approved certification of in-building system training (as previously identified herein)

   **NOTE: Beginning July 1st, 2025, a NICET IB-PSC certifications as previously identified herein shall be required for all personnel.**

3. Materials list (all active and passive components excluding small hardware):
   a. Manufacturer
   b. Full model or part number
   c. Manufacturer's description
   d. Quantities for each device

e. BDA: class, model number, and serial number (if available)

f. BDA FCC ID number

g. Unique identifiers provided for all major components (e.g., BDA, BBU, ANN, EPO, etc.)

4. Battery back-up calculations
5. System elevation schematic per building for all levels (including those not covered by the system, starting from roof level to ground/sub levels), identifying:
   a. Donor antenna
   b. Lightning arrestor
   c. Active devices: BDA, BBU, ANN, etc.
   d. Antennas
   e. Splitters, taps, etc.
   f. Cable segments
   g. EPO
   h. Anticipated attenuation for each cable segment and device port
   i. Fire-rated protection callouts (as applicable) for equipment enclosures, shafts, cabling, etc.
6. Floor plans per building for all levels (including those not covered by the system, starting from roof level to ground/sub levels), identifying:
   a. All components as identified in system elevation schematic
   b. Fire-rated protection callouts (as applicable) for equipment enclosures, shafts, cabling, etc.
7. Physical installation details/typicals:
   a. Donor antenna

b. Equipment mounting

c. Wall and floor penetration:

i. Fireproofing/stopping requirements

d. Wiring:

i. Electrical - dedicated branch, hardwired

ii. Lightning protection and system grounding

iii. System monitoring and alarming supervisory signal callouts with wiring

8. Fiber optics layout, interconnect, and protection (if applicable)

**NOTE: Multi-building systems shall identify and callout fiber pathways and protection on site map.**

9. Link budgets detailing uplink at donor and downlink power at each das antenna (for both 700 and 800 MHz bands).

a. Full calculations for each segment or point in tabular format

b. Schematic representation showing power projections at each junction or connection point (typically provided in system elevation schematic)

**NOTE: Uplink budget shall identify gain set to maximum of 65 dB.**

10. Heat map predictive modeling (iBwave or Ranplan) for every floor AND exterior leakage

a. Predictive modeling shall account for building construction design and materials

11. Manufacturer's Data Sheet for all:

a. Active components (identifying UL 2524 listing)

b. Antennas (donor and interior)

c. EPO

d. Passive coupling devices (taps, power dividers, etc.)

e. Coaxial cable

f. Coaxial connectors

g. Fiber cable (if used)

h. Fiber connections (if used)

i. Enclosures to be provided by contractor (if applicable)

# APPENDIX D

**THIRD-PARTY ACCEPTANCE TEST REPORT REQUIREMENTS**

Testing shall be conducted in accordance with CFC 510.5.4. All measurements are to be taken using equipment with proof of current calibration, utilizing control channels ONLY on the 700 MHz band as identified in APPENDIX A. Passing results shall detail compliance with Required Signal Strength and Quality as previously identified herein, along with additional requirements identified in this Appendix.

Third-party acceptance testing reports shall be submitted via email to SDFD personnel that issued the ERCES construction permit.

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

**I. GENERAL INFORMATION**

- **A.** Site name and address
- **B.** Building owner name, mailing address, phone number and email address
- **C.** On-site contact name, mailing address, phone number, and email address (typically property management)
- **D.** Testing company's name and mailing address
- **E.** Testing inspector's name, phone number, and email address
- **F.** Date(s) of testing

**II. TESTING INSPECTOR'S PROOF OF QUALIFICATIONS**

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

**NOTE: Beginning July 1st, 2025, a NICET IB-PSC Level II certification shall be required for testing personnel.**

**III. TEST DESCRIPTION**

- **A.** Test requirements per CFC and SDFD ERCES Standard
- **B.** Test methodology
- **C.** Model, serial number, and calibration date for all test equipment

**IV. ERCES EQUIPMENT IDENTIFICATION**

**A.** Model, serial number and FCC certification number of all active RF components including:

1. BDA
2. Fiber DAS headend (if applicable)
3. Remote units (if applicable)

**B.** Identification of BDA operating Class (Class A required)

**C.** Model and serial number of remaining powered components:

1. Battery backup units

**V. INSPECTION/TESTING RESULTS SUMMARY PAGE (PASS/FAIL)**

**A.** Overall building signal strength and quality

**B.** RF leakage 15dB below the measured donor signal at ground level (3-25') from the building perimeter

**A.** Correct frequency filtering

**B.** Uplink muting enabled

**C.** Spurious uplink emissions measurement

**D.** Quiescent noise measurement

**E.** Donor pathway as permitted and approved

**F.** Donor to serving antenna isolation less maximum BDA > 20 dB

**G.** System monitoring supervisory signals at fire alarm system control panel functionality

**H.** System monitoring signals at dedicate remote annunciator functionality

**I.** Primary power provided by dedicated branch circuit (hardwired)

**J.** Backup power supply provides power for all active components

**K.** Backup power supply battery condition

**L.** Backup power supply calculated runtime

**M.** Backup power load test

**N.** Physical condition of installation

**O.** AC power termination (proper circuit breaker labeled/locked)

**P.** Emergency Power-Off device functionality (both AC and DC deactivated)

**Q.** Grounding and lightning protection

**R.** Amplifier gain measurements:

1. Uplink (65 dB maximum)
2. Downlink

**S.** NEMA 4/3R compliance of equipment enclosures inter-cabinet cabling

**T.** Active components UL2524 listed

**U.** Active RF equipment FCC certification

## VI. DETAILED TESTING RESULTS

**A.** Signal Strength and Quality

1. Building level (floor by floor) summary:
   a. Building level identifier
   b. General area grids with passing measurements relative to total (e.g., 19/20)
   c. Critical area(s) (as applicable) with passing measurements relative to total (e.g., 4/4)
   d. Building level Pass/Fail identification.
2. Graphic and tabular data for all building levels:
   a. Floor plan view displaying:
      i. Numbered and approximately equal 20-grid test areas
      ii. Critical areas (identified within applicable grids)
      iii. Interior Signal Strength (Downlink) per grid (utilizing green colored lettering or shading for passing results, and red colored lettering or shading for failing results).
   b. Tabular data displaying:
      i. Grid number

ii. Critical areas (identified for applicable grids)

iii. Interior Signal Strength per grid

iv. Downlink DAQ (provide SINR/BER) per grid

v. Uplink DAQ per grid

vi. Pass/Fail identification per grid

**B.** System primary and backup power:

1. One-hour load test or pulse-load battery capacity test

**C.** System gain and measured RF power:

1. Uplink and downlink
2. Single channel
3. Near-far (uplink only)

**D.** Ambient noise floor:

1. Measured at BDA Donor antenna feed point and BDA service antenna feed point
2. Amplifier powered off
3. Active DAS, if used, powered on
4. Show span of 15-20MHZ centered at 800.30625 MHz (Downlink) and 770.30625 MHz (Uplink)
5. Provide a screenshot displaying noise entering BDA from donor antenna at both frequencies as described in item 3d (above)
6. Provide a screenshot displaying noise entering BDA from service antennas at both frequencies as described in item 3d (above)
7. If an active DAS is used, provide a screenshot of the noise entering the BDA from the active DAS

**E.** Active noise floor:

1. Repeat item 3 with power applied to BDA, with all antennas connected.

**F.** Quiescent noise:

1. BDAs 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.

**G.** Antenna systems isolation:

1. Inject reference signal to DAS antenna system at 770.30625 MHz
2. Show injected power level
3. Show measured signal from donor antenna system

## VII. INSPECTION DETAILS

**A.** Provide images of:

1. BDA, fiber DAS headend and remote equipment
    a. Additional detail image(s) showing required labeling (model/serial numbers and FCC certificate)
2. BDA, fiber DAS headend, and remote cabling
3. Donor lightning arrestor
4. Donor antenna and supporting structure
5. Interior of BBU cabinet
6. Typical DAS antenna

# APPENDIX E

**ANNUAL TEST REPORT REQUIREMENTS**

Testing shall be conducted in accordance with CFC 510.5.4. All measurements are to be taken using equipment with proof of current calibration, utilizing control channels ONLY on the 700 MHz band as identified in APPENDIX A. Passing results shall detail compliance with Required Signal Strength and Quality as previously identified herein, along with additional requirements identified in this Appendix.

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

**I. GENERAL INFORMATION**

- **A.** Site name and address
- **B.** Building owner name, mailing address, phone number and email address
- **C.** On-site contact name, mailing address, phone number, and email address (typically property management)
- **D.** Testing company's name and mailing address
- **E.** Testing inspector's name, phone number, and email address
- **F.** Date(s) of testing

**II. TESTING INSPECTOR'S PROOF OF QUALIFICATIONS**

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

**NOTE: Beginning July 1st, 2025, a NICET IB-PSC Level II certification shall be required for testing personnel.**

**III. TEST DESCRIPTION**

- **A.** Test requirements per CFC and SDFD ERCES Standard
- **B.** Test methodology
- **C.** Model, serial number, and calibration date for all test equipment

**IV. ERCES EQUIPMENT IDENTIFICATION**

- **A.** Model, serial number and FCC certification number of all active RF components including:
  1. BDA

2. Fiber DAS headend (if applicable)
3. Remote units (if applicable)

**B.** Identification of BDA operating Class (Class A required)

**C.** Model and serial number of remaining powered components:

1. Battery backup units

## VI. INSPECTION/TESTING RESULTS SUMMARY PAGE (PASS/FAIL)

**A.** Overall building signal strength and quality

**B.** Amplifier gain measurements:

1. Uplink (65 dB maximum)
2. Downlink

**C.** System monitoring supervisory signals at fire alarm system control panel functionality

**D.** System monitoring signals at dedicate remote annunciator functionality

**E.** Backup power load test

**F.** Active components operational within manufacturer's specifications

## VII. DETAILED TEST RESULTS

**A.** Signal Strength and Quality

1. Building level (floor by floor) summary:
   a. Building level identifier
   b. General area grids with passing measurements relative to total (e.g., 19/20)
   c. Critical area(s) (as applicable) with passing measurements relative to total (e.g., 4/4)
   d. Building level Pass/Fail identification.
2. Graphic and tabular data for all building levels:
   a. Floor plan view displaying:
      i. Numbered and approximately equal 20-grid test areas
      ii. Critical areas (identified within applicable grids)

iii. Interior Signal Strength (Downlink) per grid (utilizing green colored lettering or shading for passing results, and red colored lettering or shading for failing results).

b. Tabular data displaying:

i. Grid number

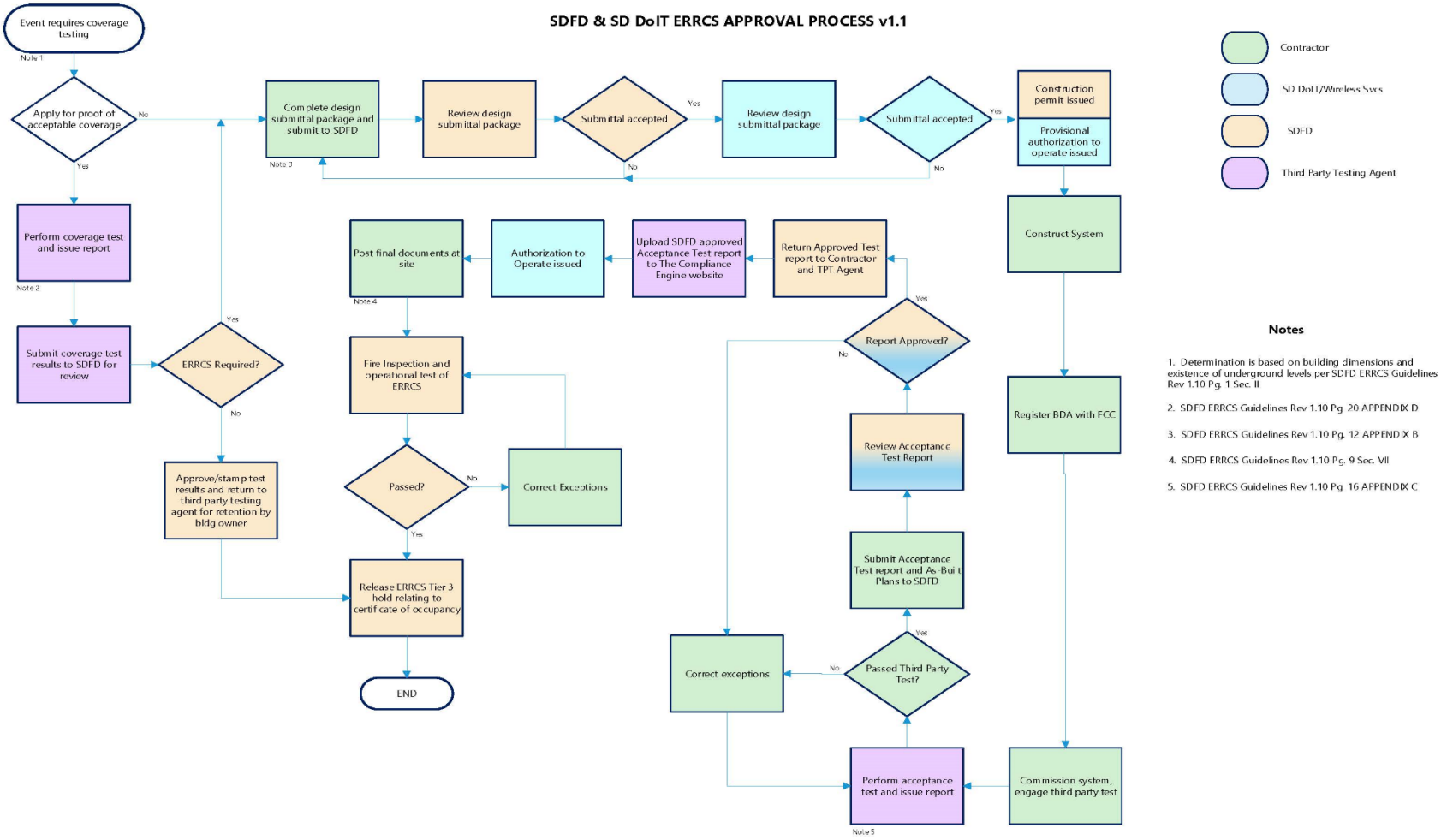
ii. Critical areas (identified for applicable grids)

iii. Interior Signal Strength per grid

iv. Downlink DAQ (provide SINR/BER) per grid

v. Uplink DAQ per grid

vi. Pass/Fail identification per grid


SDFD & SD DoIT ERRCS APPROVAL PROCESS v1.1
Event requires coverage testing
Note 1
Apply for proof of acceptable coverage
No
Yes
Perform coverage test and issue report
Note 2
Submit coverage test results to SDFD for review
ERRCS Required?
Yes
No
Approve/stamp test results and return to third party testing agent for retention by bldg owner
Complete design submittal package and submit to SDFD
Note 3
Review design submittal package
Submittal accepted
Yes
No
Review design submittal package
Submittal accepted
Yes
No
Construction permit issued
Provisional authorization to operate issued
Construct System
Post final documents at site
Note 4
Authorization to Operate issued
Upload SDFD approved Acceptance Test report to The Compliance Engine website
Return Approved Test report to Contractor and TPT Agent
Report Approved?
Yes
No
Fire Inspection and operational test of ERRCS
Passed?
No
Yes
Correct Exceptions
Release ERRCS Tier 3 hold relating to certificate of occupancy
END
Review Acceptance Test Report
Submit Acceptance Test report and As-Built Plans to SDFD
Passed Third Party Test?
Yes
No
Correct exceptions
Perform acceptance test and issue report
Note 5
Register BDA with FCC
Commission system, engage third party test
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