FIRE AND LIFE SAFETY STANDARD	
EMERGENCY RESPONDER COMMUNICATIONS ENHANCEMENT SYSTEM (ERCES)	
Effective Date: 8/27/26	**Revision Date: 1/1/20, 6/16/23, 8/27/26**

SECTION 1 – PURPOSE

The purpose of this standard is to provide clarification of the requirements of the California Fire Code (CFC), Chapter 5, Section 510; and establish minimum requirements for providing a reasonable level of life safety and property protection from the hazards of fire, explosion or dangerous conditions in new and existing buildings, structures, and premises and to provide safety to firefighters and emergency responders during emergency operations.

SECTION 2 – SCOPE

When a new or existing building is required to install an emergency responder communications enhancement system, it shall be authorized by the Fire Code Official, meet the minimum requirements of the California Fire Code (CFC), Chapter 5, Section 510, and this Standard.

SECTION 3 – DEFINITIONS

N/A

SECTION 4 – MINIMUM REQUIREMENTS

4.1 ERCES evaluation.

4.1.1 Evaluation. Buildings or structures with an area greater than 50,000 square feet or more than 3 stories in height shall require an ERCES evaluation to determine the need for installation of such system.

4.1.2 Minimum qualification of personnel. The minimum qualifications of ERRCS evaluation personnel shall be in accordance with CFC 510.5.2.

4.2 Permits required.

4.2.1 Construction permit. A permit for the installation of an ERCES shall be obtained from the Building Department.

4.2.2 Operational permit. A permit for the operation of an ERCES shall be obtained from the Fire Department.

4.2.3 Sacramento Regional Radio Communications System (SRRCS) registration. Prior to issuance of a construction permit, the ERCES shall be registered with SRRCS and proof of registration shall be included with the plan submittal. An application for SRRCS registration is included with this Standard.

4.3 Location. ERCES common equipment shall be installed and located in the Fire Control Room.

4.4 Signage. A sign stating “Emergency Responder Communications Enhancement System installed at this facility” shall be installed adjacent to the Knox Box outside of the Fire Control Room. The sign shall be in letters 1 inch high, a stroke not less than 1/8 inches, on a contrasting background.

4.5 Frequencies. See Attachment Appendix E.

Subject: BDA - Implementation Guidelines & Support **3/25/2021**

The County of Sacramento DTECH Radio Communications Division is responsible for the operation and maintenance of the Sacramento Regional Radio Communications System (SRRCS) 700/800MHz Simulcast P-25 trunked radio system and associated ARS sites. As the Frequency License Holder, the department issues authorization for all radio transmitters communicating through this system. This includes all In-Building Emergency Responder Radio Communications Systems (ERRCS).

As required by NFPA, CFC, County of Sacramento, and local City ordinances the owner of any building within the County is responsible for the installation and maintenance of an ERRCS system if radio coverage within their building is inadequate to support reliable two-way radio communications through SRRCS.

The intent of this document is to assist the building owner or their contracted system installation team in securing approval for construction, verification of operation and ultimately approval for continuing operation of the required ERRCS.

It is the responsibility of the contractor to execute all steps in proper order and secure all permissions and permits PRIOR TO construction or activation. Failure to do so may result in delays, penalties or denial of approval to operate a given system.

The system shall not be left in a powered-on state, with donor antenna connected, except for testing during regular business hours, until final inspection has been completed, and final approval has been issued by SRRCS (FCC License Holder).

This document is effective immediately for all submittals or projects within the County of Sacramento.

Any projects currently under construction will be subject to these guidelines.

Beginning immediately all email correspondence regarding ERRCS matters should be directed to the assigned Fire Marshall and email DTECH-BDA@Saccounty.net

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AHJ-Agency having Jurisdiction

ALC-Automatic Level Control

BBU- Battery Back-Up Unit

BDA -Bi-Directional Amplifier

SRRCS-Sacramento Regional Radio Communications System 700/ 800 Mhz

CFC-California Fire Code

CLASS "A"-A signal booster designed to retransmit channelized signals

CLASS "B"-A signal booster designed to retransmit any signals within a wide frequency band

DAQ-Delivered Audio Quality "A measure of audio quality over a transmission medium"

DAQ	Definition
1	Unusable. Speech present but not understandable.
2	Speech understandable with considerable effort. Requires frequent repetition due to noise or distortion.
3	Speech understandable with slight effort. Requires occasional repetition due to noise or distortion.
3.4	Speech understandable without repetition. Some noise or distortion present.
4	Speech easily understandable. Little noise or distortion.
4.5	Speed easily understandable. Rare noise or distortion.
5	Perfect. No distortion or noise discernible.

DAS-Distributed Antenna System - Distributed antennas within the facility fed by the BDA

DONOR -Primary antenna providing the R.F. link between the BDA and the Local Cell signal

ERRCS-Emergency Responder Radio Communications System

FACP-Fire Alarm Control Panel

FCC-Federal Communications Commission

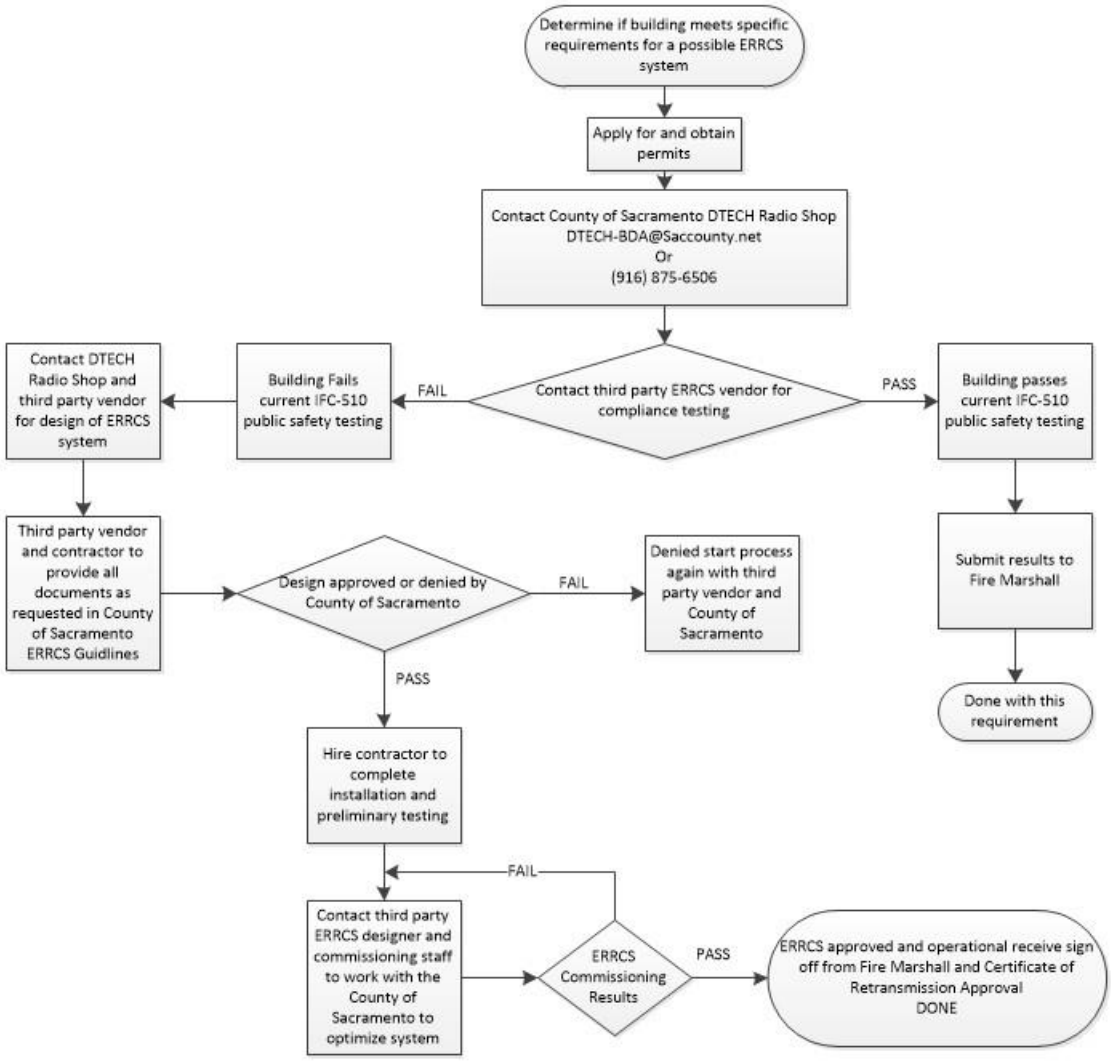
GROL-FCC Licensed General Radio Operator

IBWAVE-Telecom Radio Planning software

LOS-Line of Sight

NFPA-National Fire Prevention Association

UPS-Uninterruptable Power Supply


Determine if building meets specific requirements for a possible ERRCS system
Apply for and obtain permits
Contact County of Sacramento DTECH Radio Shop
DTECH-BDA@Saccounty.net
Or
(916) 875-6506
Contact third party ERRCS vendor for compliance testing
FAIL
PASS
Building Fails current IFC-510 public safety testing
Building passes current IFC-510 public safety testing
Contact DTECH Radio Shop and third party vendor for design of ERRCS system
Third party vendor and contractor to provide all documents as requested in County of Sacramento ERRCS Guidlines
Design approved or denied by County of Sacramento
FAIL
Denied start process again with third party vendor and County of Sacramento
PASS
Submit results to Fire Marshall
Done with this requirement
Hire contractor to complete installation and preliminary testing
FAIL
Contact third party ERRCS designer and commissioning staff to work with the County of Sacramento to optimize system
ERRCS Commissioning Results
PASS
ERRCS approved and operational receive sign off from Fire Marshall and Certificate of Retransmission Approval
DONE

Application and Approval Process

1) For initial submittal, SRRCS requires the ERRCS/BDA/DAS system designer to provide the following for pre-evaluation:
    a. Project Name
    b. Site address
    c. Project description
    d. Contractor contact information
    e. Solution proposed
    f. If proposed solution is a signal booster what class of operation will be used (Class A/B?)
    g. Proposed project timeline

    This information is to be submitted via email to DTECH-BDA@SacCounty.net.

2) SRRCS will respond with all of the technical criteria necessary to enhance the area in question. Management forms will be supplied.

3) Designer will then complete the design and submit plan set for approval and construction permits.
    a. See APPENDIX A for minimum design requirements.
    b. See APPENDIX B for submittal format requirements.
    c. NOTE: SRRCS will receive a copy of all contractor submittals.
    d. Submittal must be compliant with the local Fire Jurisdiction and planning department's requirements and at minimum shall be based on Architectural size D (36" x 24") building prints (in PDF) and must include:
        I. Site Address:
        II. Building number assigned to project (if available)
        III. Solution location within structure:
        IV. Equipment model and Serial number
        V. FCC ID# (Type Acceptancy Approval for the device)
        VI. Customer contact (name, tel., address):
        VII. Contractor contact (name, tel., address):
        VIII. Proposed operational configuration (Class A or B).
        IX. Full materials list
        X. Schematic drawing of system, including both **uplink and downlink** power projections.
        XI. Floor plans for all floors (including those without Signal Booster components)
        XII. Exterior elevations for all exposures
        XIII. Proposed heat maps (typ. IBWAVE or RANPLAN) for all floors
        XIV. Manufacturer's data sheets for all components except small hardware
        XV. Proposed project timeline

4) SRRCS or designated representative will review design to determine acceptability for operation with the SRRCS system and any requirements for modification or correction. Contractor will then provide hard copy plan sets to SRRCS for formal approval.

5) Submit as multiple hard copies (per local planning department requirements) and accompanying digital copy (for SRRCS records). This step may have been required in item 3 by local ordinance.

6) SRRCS will then provide documented approval for construction. The contractor is to present this approval to the appropriate plans approval agency for permit to construct.

7) On completion of construction, the contractor is to request via e-mail to SRRCS for a unique Site ID. This submittal shall contain the following as-built details:
   a. Site Address.
   b. Equipment location within building (Floor & Room #).
   c. Equipment type, model# and Serial Number.
   d. On-site customer contact (name, tel., address, email).
   e. Contractor contact (name, tel., address, email).
   f. Actual operational configuration (Class A or B).
   g. Digital images of system installation showing equipment, Power Supply, Power Disconnect, Donor Antenna(s).

   (*Note: please allow 3-5 days for grant SiteID.*)

   NOTE: New systems shall not be enabled without prior coordination with SRRCS System administration 916-875-6506. No EXCEPTIONS!

8) For final approval a third-party evaluation and report must be submitted to SRRCS and the Fire Agency having jurisdiction.

   a. Test and report requirements are described in APPENDIX D
   b. Test date is to be coordinated in advance with both the Fire Agency having jurisdiction and SRRCS, NO EXCEPTIONS.

The Third party test is to be performed by an FCC licensed General Radio Telephone Operator (GROL) who is qualified and certified to inspect ERRCS installations to insure compliance with operational specifications as called out in CFR 47, Part 90 §90.219 and has been approved by SRRCS to conduct Third-Party testing. No party shall perform inspections or testing unless that party has been approved by SRRCS.

1. At present, SRRCS does not perform the third party testing.

2. Submit the electronic PDF of the As-Built documentation, along with the third party test report to SRRCS for review. Once, approved SRRCS will request a hard copy for final sign-off.

3. Contractor is to include permit forms provided by the appropriate County and City agency, with design and completed sections executed for final signature by SRRCS.

4. SRRCS will provide written confirmation of approval to operate the ERRCS system. This approval is valid for one year from grant date and is automatically extended upon receipt of a compliant annual review from a recognized Third-Party testing agent.

Please contact this office if you have any questions.
Thank you,

Nathaniel Hinkle,
Telecommunications Systems
Supervisor
County of Sacramento DTECH
Radio Communications
3700 Branch Center Rd. Suite D.
Sacramento, CA 95827
Hinklen@SacCounty.net

APPENDIX A

ERRCS Solution System Design Requirements:

1. Designs shall be submitted in plan set format, minimum dimension is Architectural Size D (36" x 24"). Materials data sheets may be submitted in booklet format, 8.5" x 11.5" with cover sheet and full materials list included.
   a. Refer to APPENDIX B for detailed formatting requirements.

2. Contractor is fully responsible for the 700/800MHz BDA system design and compliance with the requirements set forth in CFC 510 and CFR 47, FCC Part 90, §90.219

3. ERRCS Solution coverage shall be based on operation with fire door(s) closed.

4. ERRCS system shall be fully compatible with current operational frequencies of the SRRCS.

5. Shall be capable of supporting both analog and digital modulation.

6. Any signal boosters placed within a quarter mile of an existing signal booster will warrant special consideration and engineering as not to interfere with existing systems. The use of fiber to connect multiple signal boosters will be highly encouraged and in some situations the only acceptable option for the addition of a new ERRCS system.

7. All 800 MHz Signal booster devices must support two (2) sub band windows(uplink and downlink) one uplink passband window covering frequencies between 806-809 MHz and one downlink passband window covering frequencies between 851-854MHz. All noise emission 1 MHz beyond these passbands must not exceed -70 dBm/10KHz RBW per FCC rule section 90.219. All 700/800 MHz Signal booster devices must support a minimum of three (3) sub band windows. One uplink window covering frequencies between 799 – 809 MHz and 2 down link windows, one covering frequencies between 769 and 775 MHz and one covering 851 – 854 MHz. All noise emissions 1 MHz or more above or below these windows shall not exceed -70 dBm/10KHz RBW per FCC rules section 90.219. All noise values will be calculated based on the output noise power of the signal booster device plus the gain of the donor antenna system. . Devices with uplink gating (Uplink squelch or muting) are preferred.

8. Operational Frequencies:
   a. Must be operational on both 700MHz and 800MHz Public Safety bands.
   b. Operate on assigned SRRCS 700/800MHz frequencies and sites as determined in design approval.

c. Shall include all Countywide Radio Cell frequencies.
d. Shall include all assigned primary Radio Cell frequencies as specified by SRRCS.

9. System Gain
   a. System shall be designed to minimize amplifier uplink and downlink gain required to achieve required signal strength in all areas.
   b. Total uplink gain is not to exceed 75dB without prior approval. Idle uplink gain shall not exceed the values outlined in the table below. This will be based on the signal booster proximity to a SRRCS donor site. Any donor antenna system gain will be considered as part of maximum the gain level.

Distance to Donor Site in miles	maximum uplink gain	Donor Gain	NP ERP
> = 8	81	0	-44
> 4 and < 8	75	0	-50
>2 and < 4	69	0	-56
>1 and < 2	63	0	-62
>.5 and < 1	57	0	-68
>.25 and <.5	51	0	-74

10. ERRCS system shall be new product and we would like to see that it is projected to be supported by the manufacturer for seven years after installation if this information is available.

11. Donor antenna(s) to be minimum 10dBd gain directional and must meet the following:

    a. Welded construction Yagi with anodized finish (gold preferred).
    b. Exterior rated enclosed panel.
    c. Corner reflector with anodized finish.
    d. Must provide at least 20dB front to back ratio.

12. Indoor antennas shall be at the minimum, 700 / 800 MHz compliant.
    a. Indoor multi-band antennas for BDA/DAS and cell phone coverage may be approved based on the building owner requirement and overall system design.

13. BDA system design shall not utilize "Tee" type connectors for power division. Hybrid or Wilkinson couplers shall be used.

14. Power dividers must be rated for maximum possible system power.
    a. Wilkinson type not recommended for dual donor or use in high power segments of DAS.

    Note the FCC does not allow DAS power to be such that a Wilkinson cannot be used.

15. All antennas shall be assigned unique alpha-numeric identifiers which shall be shown in all line drawings, documentation and floor plans.

16. All antenna feed line segments, fiber optic cables and signal jumpers shall be assigned unique alpha-numeric identifiers which shall be shown in line drawings, documents and floor plans.

17. Systems shall be capable of supporting the maximum number of 700 / 800 MHz downlink channels transmitted from the donor site that fall within the RF bandwidth if a Signal Booster is used.

18. Signal Booster system shall include anti-oscillation circuitry and be designed with adequate isolation to preclude signal booster oscillations that impair / degrade the donor public safety 700 / 800 MHz systems.

19. Any signal booster system shall include ALC circuitry on the uplink, as a minimum, to ensure that intermodulation and other spurious products are not generated and transmitted to the donor site.

20. **Any signal booster system shall be designed and tested to ensure that noise and spurious emissions do not degrade the performance of the donor site or any other FCC licensed system per FCC part 90.219.**

21. The transmitted noise and spurious interference, measured within a 10 kHz bandwidth at the donor antenna shall not exceed -43dBm ERP and in no case shall result in a calculated noise level at the donor site greater than -150dBm

22. Maximum Time Delay of 25μS total for all ERRCS systems and must be compliant with both Phase I and Phase 2 P25 systems.

23. The designer of the ERRCS system shall engineer the system to be capable of -75dBm to -95dBm signal level to be received at the nearest LOS SRRCS Radio site or best LOS signal as received by the donor antenna. However, **SRRCS will only accept -90dBm to -110dBm signal levels into our site receivers.** (Note: If the installation for some reason needs additional power or future needs the change at the ERRCS site has been factored into the design to increase power if needed.)

24. A maximum of 20dB of swing between the near and far antenna testing will be allowed for all installations, no exceptions. In general, no more than 60 feet will be allowed between in building antennas depending on building design unless it can be clearly demonstrated using RF propagation software that this requirement is unrealistic. (ie. very large open spaces)

25. No AGC will be used on the ERRCS system from 10Ft or greater distance from any in building antenna (DAS) using a portable radio on the hip at approximately 3Ft. elevation.

26. The BDA's AGC system shall be able to provide a minimum of 30dB of AGC from the system idle gain. The BDA shall be able to operate under full AGC for more than 30 minutes without shutting down. The BDA shall be able to gracefully handle a -10dBm signal presented at its uplink input port without shutting down.

27. Downlink gain and power should be limited to the amount necessary to deliver downlink signals within the structure that do not exceed -65dBm/channel with all channels active. Every attempt shall be made to keep RF from leaking onto the street. Measurements around the perimeter of the building will always be a minimum of 15dBm less than the signal provided by the donor system in all cases. Downlink signal booster design will be modified to eliminate any overlapping interference issues.

APPENDIX B

Minimum Submittal Requirements

The County of Sacramento DTECH Radio Communications Division is responsible for the operation and maintenance of the Sacramento Regional Radio Communications System (SRRCS) 800MHz Simulcast P-25 trunked radio system. As the Frequency License Holder, the department is responsible to issue authorization for all radio transmitters not requiring individual FCC licensing for operation within this system. This includes all In-Building Emergency Responder Radio Communications Systems (ERRCS) (BDA systems).

As required by NFPA, CFC and Sacramento County ordinances the owner of any building within the county is responsible to install an ERRCS system if radio coverage within their building is inadequate to support normal two-way radio communications through the SRRCS.

It is the intent of this document to assist the building owner or their contracted system installation team in securing approval for construction, verification of operation and ultimately approval for continuing operation of the required In-Building (ERRCS) system.

Prior to construction of an in-building radio amplifier System (ERRCS), the Sacramento DTECH Radio Communications Division as the frequency license holder for the 700/800MHz radio system (SRRCS) must review and approve the design prior to the commencement of installation.
The use of a standardized format and content in all submittals will greatly reduce the potential for delays caused by repeated resubmittals required to assure complete and accurate documentation. To that end, the following minimum requirements for standardized submittals have been established.

<u>OPTIONAL PRE-SUBMITTAL REVIEW</u>
In order to reduce time and paper waste SRRCS will review digital copies of plan and equipment submittals should the contractor wish to provide said documents. Submittals should be in the form of single documents in PDF format made available for download or delivered to SRRCS communications on portable media for review.

<u>OFFICIAL SUBMITTAL</u>
Construction of ERRCS systems require the contractor to obtain building permits from the local authority. Approval of the design by SRRCS is required for grant of such construction permits.

Official Submittals are processed through the appropriate Building Permits Department for the County or City region in which the construction will take place. Multiple paper copies in the quantity required by the local authority and a digital copy for SRRCS records will be submitted. These will either be forwarded to SRRCS Communications by the County/City or by the contractor depending upon the locality involved.

The most successful submittals include the following data presented as described:

1. Format – Construction (Engineering) print:
    a. Size – As required by local jurisdiction
    b. Minimum Architectural D (36” x 24”)
    c. All pages of digital copy must be of the same dimension

2. Cover page showing:
    a. Project Name and Address
    b. Property Owner Contact Information
    c. Contractor’s Contact information
    d. Vicinity map showing property location
    e. Scope of work
    f. Proposed start and finish dates of project
    g. Full description of concept including any phases represented or connection to existing or future elements
    h. Document Index

3. Subsequent pages shall each contain:
    a. Project Name
    b. Revision
    c. Page Identifier
    d. Page description

4. Floor Plans, Exterior Elevations and Area drawings shall also contain:
    a. Legend
    b. Scale / dimensions
    c. Compass orientation

5. Document content pages sufficient to provide:
    a. Ordinance compliance statement(s)
    b. Designer and installation staff qualifications to include:
        i. FCC GROL License verification.
        ii. BDA (Manufacturer training certification).
        iii. Manufacturer training certification for system designer software i.e. IBwave, RanPlan etc.
        iv. Valid California C7 or C10 State Contractor’s License

6. Materials list (All Active and passive components excluding small hardware)
    a. Full model or part number
    b. Manufacturer
    c. Manufacturer's description
    d. FCC ID# (Type Acceptancy Approval for Active devices)
    e. Quantities for each device
7. Physical installation details and requirements:
    a. Wall and floor penetration details
    b. Equipment mounting details and construction standards
    c. Electrical, ground and alarm cabling details
    d. Fireproofing requirements

8. System Schematic of proposed system showing Unique identifier of:
    a. Active devices
    b. Antennas
    c. Splitters, taps, etc.
    d. Cable segments
    e. NOTE: Unique identifiers MUST be represented on all line drawings and floor plans.

9. Power projections for each antenna describing uplink at donor and downlink power at each DAS antenna.
    a. Provide uplink and downlink system diagrams to include all gains and losses throughout the system. The information will include power per channel for all potential donor sites total channels.

10. Anticipated attenuation for each cable segment and device port.

11. Include vertical and horizontal path views
    a. List of all frequencies to be amplified by system
    b. Area map showing donor site location and path to designated donor site

12. Floor plans for all levels (even those not covered by system)
    a. Showing all components with identifiers
    b. Cable routes and identifiers
    c. Rack or wall mount elevations including attachment method and grounding details (graphic with notes).
    d. Fiber optics layout, and interconnect (if applicable)
    e. Heat maps (IBWave or similar) for every floor

f. Divide each floor into 20 or 40 equal signal grids as required by floor size.

13. Assign unique ID to each grid. This grid system shall be used for initial coverage calculations and all future test documentation.

14. Manufacturer's Data Sheet for all:
    a. Active components
    b. Antennas
    c. Passive coupling devices (Taps, Power Dividers, etc.)
    d. Coaxial Cable
    e. Coaxial Connectors
    f. Enclosures to be provided by contractor

APPENDIX C

System Installation Requirements

As Licensee and custodian for the Sacramento County SRRCS 700/800MHz Radio System, Sacramento Regional Radio Communications System (SRRCS) requires adherence to the following specifications as prerequisites to granting authorization for operation of Emergency Responder Radio Coverage Systems (ERRCS) supporting said radio system within the County of Sacramento, California. Application procedures for authorization to operate are defined in the "ERRCS/BDA/DAS system Guidelines" published by this entity and if provided, supplemental ordinance and guidelines applicable to incorporated Cities within the County.

Minimum Construction Requirements – Additional requirements may be applied by local Fire Jurisdiction

1. Must comply with current Sacramento County Fire Authority Ordinance, including adherence to CFC Chapter 5 (2019).

2. DAS Antenna System
    a. Antenna location must minimize exterior signal emissions.
    b. Antenna location minimize Near-Far effect.
    c. Cabling must match building fire rating.
    d. Exposed cabling must be minimized.
    e. Feed lines and flexible jumpers must be located to prevent overlapping runs or looping of jumpers.
    f. Excess cable to be minimized.

3. Antenna Isolation (Donor to DAS)
    a. Shall be 20dBm greater than the amplifier's maximum rated gain. Attenuators are a viable resource to use as needed.
    b. >100dBm is desired.
4. Labeling
    a. All labels shall be moisture proof and indelible, easily readable and appropriately fixed to the device. Service antennas may be labeled in such a way as to not be visible in public areas.

    b. Amplifier, battery enclosure, and ancillary enclosures must have visible identification showing:
        i. Description "County of Sacramento ERRCS System".

ii. Site ID (Signal Booster only).
iii. Full model and serial number of device.
iv. Power distribution panel ID and circuit branch/breaker ID of power source.
v. Operational class (A or B) (Amplifier(s) only).
vi. Date of last inspection (Amplifier only).
vii. Contact information of most recent service provider.
viii. Contact information for building representative with access to system components and records.
ix. Location of system documents.
    1. NOTE: Recommend items vi-vii be on label provided and affixed by contractor performing inspection.

c. Donor Antenna
    i. Engraved or Stamped brass tag only
    ii. Minimum 1" diameter
    iii. Secured to antenna feed line using solid stainless steel safety wire or stainless-steel tie at eye level on support structure or at easily accessed point as close to antenna as practical.
    iv. Stamped "SRRCS 700/800MHz ERRCS Donor"

d. Power Distribution Panel (Circuit Breaker Panel)
    i. Breaker(s) to be clearly and legibly labeled on the Panel Schedule and Dead Front.
    ii. Label to state "ERRCS" and function (Amplifier, BBU, Etc.)

e. Components and cabling
    i. Each item to be tagged showing "SRRCS ERRCS" and the unique identifier of the component.
    ii. Cable segments to be labeled with "SRRCS ERRCS" and unique identifier within 18" of each end.

5. On Site Documentation
    a. System documentation to be located with head end amplifier

    b. Completed SRRCS BDA Management form and Authorization of Retransmission from Licensee.

    c. May be in sealed container within Signal Booster or BBU enclosure if a document pocket of sufficient size is provided.

d. If stored externally to equipment, installer must provide appropriate metallic or rigid plastic document holder.

e. Must contain copies of system Diagrams required for commissioning consisting of but not limited to:
    i. Floor plans showing all component locations and unique identifiers.
    ii. System line drawings showing all components and unique identifiers
    iii. Equipment programming details (initial and current)
    iv. Commissioning test reports
    v. Most recent annual inspection
    vi. Supplemental reports as required
    vii. Original documents should be maintained by property owner

f. Manufacturer's manual for Amplifier and BBU

g. Maintenance log containing:
    i. Date of service
    ii. Service provider
    iii. Name
    iv. Contact phone number
    v. Email
    vi. Nature of service provided

APPENDIX D

Commissioning and Annual Testing Report Requirements

It is the responsibility of the owner of a building containing or requiring an in-building Emergency Responder Radio Coverage System (ERRCS) to acquire, file and have available for inspection, copies of annual inspection report, conducted within the previous 13 calendar months. Annual testing and proof of compliance shall be in accordance with Section 510.6.1 of the 2019 California Fire Code.

Annual testing should be conducted concurrent with the building's annual fire inspection unless the previous inspection or commissioning report was conducted within the previous 9 calendar months.

Initial Third Party tests shall be performed by a qualified third party entity not employed by the construction contractor nor any entity or individual related to the construction contractor.

The report is to be filed with the Fire authority having jurisdiction (AHJ) and digital copies of all documents provided to SRRCS (FCC Licensee).
Copies are to be maintained by the building owner at the site and available for review on demand.
Specific documents are to be stored with the head end equipment (APPENDIX C Item 5).

Inspections shall be conducted by SRRCS or SRRCS's designee. No person may conduct an annual test or inspection unless that person has been specifically approved by SRRCS to conduct annual inspections. A list of approved testing agents will be available online or by request.
All RF measurements are to be made using spectrum analyzer or communications monitors with current NIST: National Institute of Standards and Technology calibration or manufacture equivalent.
Downlink RF measurements are to be taken using control channel for all supported cells per site design.

Reports shall be submitted as bound 8.5 x 11" booklet format and shall contain the following:

Cover page
- Site name and address
- Date(s) of Inspection
- Site Owner name address, phone number and email address
- Inspector's name, contact address, phone number and email address
- Inspector's proof of qualification (Minimum 2 items)
  - FCC GROL
  - BDA certification & agency
- Testing company's contact information

Results summary page(s)

Test description
- Test requirements per applicable ordinances
- Test methodology
- Model, Serial Number and Calibration date for all test equipment

Site Description
- Site ID Number
- Location of primary components within property
- Signal Booster FCC Certification
- Model and Serial number of all active components
  - Amplifier or Master Unit
  - Remote Amplifiers
  - Battery Backup Units
  - Remote Alarm Reporting Devices
- Date of most recent prior test report

Inspection Result Summary Page
- List requirements and Pass/Fail Result
  - Interior Signal Strength (Downlink)
  - Exterior Signal Strength (Uplink)
  - DAQ test
  - Correct Frequency Filtering
  - Spurious Uplink Emissions Measurement
  - Quiescent Noise Floor Measurement
  - Donor Antenna Azimuth
  - Backup Power Supply Battery Condition
  - Backup Power Supply Calculated Runtime
  - Backup Power Load Test
  - Physical Condition of Installation
  - NEMA 4/3R compliance of Equipment Enclosures Inter-cabinet cabling
  - AC Power Termination
  - Power Cut-Off device
  - Grounding and Lightening Protection
  - Interference Test
  - Isolation Tests
  - Amplifier Gain Measurements
    - Uplink for both Cells
    - Downlink for Both Cells
  - Any other applicable test results

Detailed Test Results
- Donor Site Path Profile

1. Graphic representation of horizontal and vertical paths showing:

a. Donor Site(s) Name
b. Azimuth (degrees Magnetic) to Donor Site(s)
c. Path Length (Miles)
d. Calculated Path Loss to each donor site

Graphic or tabular verification for all required tests (following)

2. 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
    c. Amplifier/Master (Headend)
    d. Remote amplifiers
    e. Fault display
3. System gain and measured RF power
    a. Uplink and downlink
    b. single channel
    c. near-far (uplink only)
4. 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 two spans of 15-20MHZ and 50MHZ centered at 852.500MHz (Downlink) and 807MHz (Uplink)
    e. Provide a screenshot displaying noise entering BDA from donor antenna
    f. Provide a screenshot displaying noise entering BDA from service antennas
    g. If an active DAS is used, provide a screenshot of the noise entering the BDA from the active DAS
5. Active noise floor
    a. Repeat item 4 with power applied to BDA, with all antennas connected and two CW carriers injected at MIN and Max predicted levels from subscriber units (Radios). Verify compliance with FCC part 90.219. Use channels 11(806.825Mhz) and 19 (808.800Mhz) when on the Main P25 system. Twitchell Island P25 system use channels 1 (804.63125Mhz) and 12 (799.10625Mhz).

    Antenna systems isolation
    b. Inject reference signal to donor antenna system at 807.500MHz
    c. Show Injected power level

d. Show Measured signal from DAS system

6. Downlink coverage measurement
   A. Conduct measurement on each floor with DAS antennas and each adjacent floor using 20 grid method. (Signal levels shall be no less than -95dBm in 95% of test grid areas).*
   B. Floors not measured in A to be measured as follows (annual testing only):
   C. Divide the level into four quadrants, each facing a different compass direction, and measuring the signal level as close to the center of each quadrant as possible.
   D. Measuring the signal level at the point where the four quadrants meet, as close to the location of the center of the building as possible.
   E. *For Commissioning, test all floors of all included structures, without exception, using 20 grid method.
   F. Verify and document there is little to no noticeable leakage from the DAS/ indoor antennas around the perimeter of the facility at 3ft above ground level.

7. Uplink free space loss calculation
   a. Using measurements from test 6 provide calculated transmission and noise levels anticipated at the assigned donor site for each supported cell.
   b. Show results for near and far examples.
8. Operations
   a. Determine and document DAQ for all grids. Minimum acceptable is DAQ 3.4 in 95% of test grid areas on every floor and for all critical areas.
   b. SINR testing using a calibrated piece of test equipment may be used in lieu of DAQ testing of all grid squares as long as those areas deemed critical by the AHJ such as elevators and stairwells are tested using standardized DAQ testing methods as specified by TSB88. Areas found not to be within SINR tolerances may be considered passing if the DAQ tests validate a DAQ of 3.4 or better.

9. Inspect and document
   a. Physical condition of equipment and installation
      i. Provide digital images of
         1. Headend Equipment
         2. Headend cabling
         3. Donor Surge protector
         4. Donor antenna and supporting structure

5. Interior of amplifier cabinet
6. Interior of BBU cabinet
7. Typical DAS antenna
8. Any items requiring repair or support

10. The Fire Marshal, Fire Marshal's designee and SRRCS representative 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.

11. Annual testing will be done at no expense to the City or County.

12. Annual tests results shall be filed with the AHJ Fire Marshal and SRRCS, no exceptions.

Appendix E

SRRCS Radio System Information

P25 - County Subsystem Site 12, System ID: 05F2		
RPTR	Tx (Mhz)	Rx (Mhz)
01	853.8750	808.8750
02	853.4500	808.4500
03	853.1875	808.1875
04	852.3500	807.3500
05	852.0750	807.0750
06	851.6000	806.6000
07	853.9000	808.9000
08	853.6125	808.6125
09	853.1625	808.1625
10	852.5750	807.5750
11	851.8250	806.8250
12	851.6250	806.6250
13	853.7125	808.7125
14	852.7375	807.7375
15	852.4625	807.4625
16	852.3000	807.3000
17	851.7500	806.7500
18	851.3875	806.3875
19	853.8000	808.8000
20	852.6875	807.6875
21	851.8500	806.8500
22	851.6750	806.6750
23	851.3250	806.3250
24	851.0500	806.0500
25	853.2625	808.2625
26	852.2500	807.2500
27	851.8000	806.8000
28	851.6500	806.6500
29	851.4375	806.4375
30	851.2625	806.2625

P25 - T I ARS Site 13, System ID: 05F2		
RPTR	Tx (Mhz)	Rx (Mhz)
1	774.63125	804.63125
2	774.23125	804.23125
3	773.88125	803.88125
4	773.48125	803.48125
5	772.70625	802.70625
6	772.33125	802.33125
7	771.88125	801.88125
8	771.50625	801.50625
9	771.05625	801.05625
10	770.58125	800.58125
11	770.03125	800.03125
12	769.10625	799.10625

P25 - FOLSOM ARS Site 3, System ID: 05F2		
RPTR	TX	RX
1	853.8250	808.8250
2	852.8500	807.8500
3	852.2250	807.2250
4	851.7000	806.7000

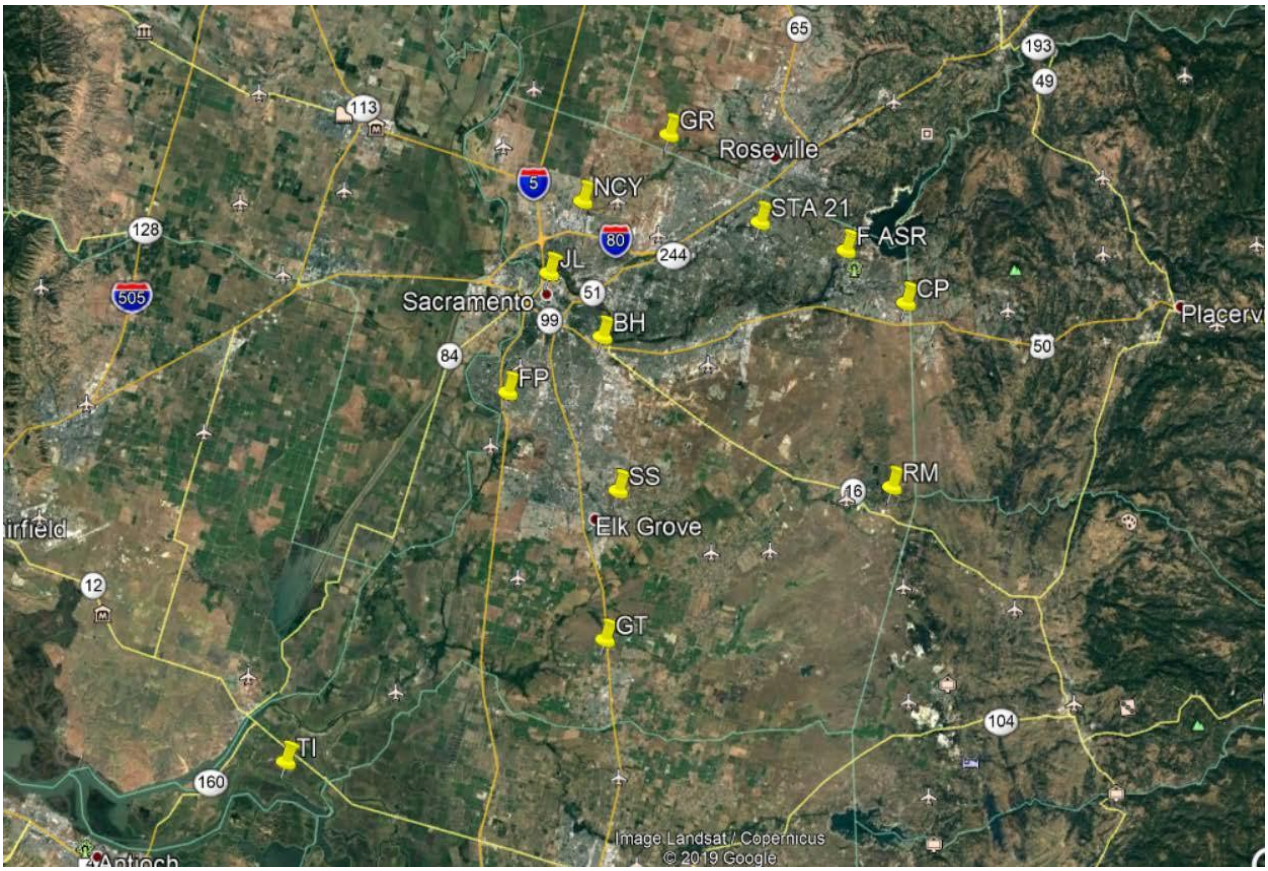
Control Channels

SRRCS Site Map & ERPs

Main P25 system = 307 Watts ERP

Twitchell Is. ARS site = 357.9 Watts ERP

Folsom ASR site = 100 Watts ERP



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