



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

Subject: BDA - Implementation Guidelines & Support

11-19-2019

The Orange County Sheriff's Department, Communications and Technology Division is responsible for the operation and maintenance of the Countywide Coordinated Communications System (CCCS) 800MHz Simulcast P-25 trunked radio system. As the license custodian, the department issues authorization for all radio transmitters communicating through this system. This includes all In-Building Emergency Responder Radio Communications Systems (ERRCS) (BDA systems).

As required by NFPA, CFC, County of Orange, 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 the CCCS.

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 OCSD/COMM.

This document is effective immediately for all submittals or projects not already approved for construction.

Any projects currently under construction will be subject to these guidelines if not completed and granted final approval by 31 December 2019.

Beginning 1 December 2019 all email correspondence regarding ERRCS matters should be directed to ERRCS@ocsd.org.



**Orange County Sheriff's Department
Communications & Technology Division**
Emergency Responder Radio Communications Systems





Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

Table of Contents

Contents.....	3
Conventions.....	4
Application and Approval Process	5
Appendix A - BDA System Design Requirements	9
Appendix B - Minimum Submittal Requirements	13
Appendix C - System Installation Requirements	17
Appendix D - 900 MHz Paging System Alarm Reporting	21
Appendix E - Commissioning and Annual Testing Report Requirements	23
Appendix F - Annual Inspection Report Form & Approval to Operate Samples	29
Appendix G - Typical Project Process Flow	31



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

Conventions used in this document:

AHJ	Agency having Jurisdiction
ALC	Automatic Level Control
BBU	Battery Back-Up Unit
BDA	Bi-Directional Amplifier
CCCS	Orange County 800 MHz Countywide Coordinated Communications System
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"
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
OCFA	Orange County Fire Authority
OCSD	Orange County Sheriff's Department
OCSD/COMM	Orange County Sheriff's Department – Communications & Technology Division
PDF	Portable Document Format
POTS	Plain Old Telephone Service
RANPLAN	Network planning and optimization software
TPC	Third Party Contractor
TSU	Technical Services Unit – OCSD, Communications & Technology Division
UPS	Uninterruptable Power Supply



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

Application and Approval Process

- 1) For initial submittal, OCSD/COMM 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. BDA Model (S/N if available).
 - f. Proposed mode of operation (Class A/B).
 - g. Proposed project timeline.

This information is to be submitted via email to ERRCS@ocsd.org.

- 2) OCSD/COMM will respond with list of required frequencies to be supported and donor site(s) to be used.
- 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: Local ordinance will determine whether contractor is to submit to local jurisdiction or OCSD/COMM at this point.
 - 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. BDA location within structure:
 - IV. BDA type, model#, (SN# if available)
 - V. BDA 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 up and down link power projections
 - XI. Floor plans for all floors (including those without BDA 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



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

- 4) OCSD/COMM will review design to determine acceptability for operation within the CCCS and any requirements for modification or correction. Contractor will then provide hard copy plan sets to OCSD/COMM for formal approval.
- 5) Submit as multiple hard copies (per local planning department requirements) and accompanying digital copy (for OCSD/COMM records). This step may have been required in item 3 by local ordinance.
- 6) OCSD/COMM 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 OCSD/COMM for a unique Site ID. This submittal shall contain the following as-built details:
 - a. Site Address.
 - b. BDA location within building (Floor & Room #).
 - c. BDA 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 BDA, Power Supply, Power Disconnect, Auto Dialer and Donor Antenna(s).
 - h. Phone number of line used for auto dialer.

(Note: please allow 3-5 days for grant of Site ID.)

- 8) On acceptance of the submittal in item 7, OCSD/COMM will issue the SITE ID. The BDA auto dialer will be programmed by the contractor or third-party technician with the assigned BDA ID to the County paging system and tested with OCSD Communications staff. No final approval will be granted without successful completion of this test.
 - a. **NOTE: New systems shall not be enabled without prior coordination with OCSD/COMM System Watch (714) 628-7020. No EXCEPTIONS!**
 - b. See APPENDIX D for instructions to program the auto-dialer.
- 9) For final approval a third-party evaluation and report must be submitted to OCSD/COMM and the Fire Agency having jurisdiction.
 - a. Test and report requirements are described in APPENDIX E
 - b. Test date is to be coordinated in advance with both the Fire Agency having jurisdiction and OCSD/COMM, NO EXCEPTIONS.



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

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

1. (At present, OCSD/COMM 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 OCSD/COMM. for review. Once, approved OCSD/COMM. will request a hard copy for final sign-off.
3. Contractor is to include County Form 161 or equivalent form provided by the appropriate city, with design and completed sections executed for final signature by OCSD/COMM.
4. OCSD/COMM 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,

Bruce Cobb,
Telecommunications Engineer III
Orange County Sheriff's Department
Communications & Technology Division – Technical Services Unit
840 N Eckhoff Street, Suite 104
Orange, CA 92868-1021
W: (714) 704-7986, C:(714) 920-0115
bcobb@ocsd.org



**Orange County Sheriff's Department
Communications & Technology Division**
Emergency Responder Radio Communications Systems





Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

APPENDIX A

BDA 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. BDA coverage shall be based on operation with fire door(s) closed.
4. BDA system shall be fully compatible with current operational frequencies of the CCCS.
5. Shall be capable of supporting both analog and digital modulation.
6. Class B devices must support a minimum of two (2) sub bands (uplink and downlink) within the 806-816/851-861MHz operating spectrum. Devices with uplink gating (Uplink squelch or muting) are preferred.
7. Operational Frequencies:
 - a. Must be operational on both 700MHz and 800MHz Public Safety bands.
 - b. Operate on assigned CCCS 800MHz frequencies and sites as determined in design approval.
 - c. Shall include all Countywide Cell frequencies.
 - d. Shall include all assigned primary Cell frequencies as specified by OCSD.
 - e. May require additional conventional frequencies.
8. System Gain
 - a. System shall be designed to minimize amplifier downlink gain required to achieve required signal strength in all areas.
 - b. Uplink gain is not to exceed 65dB without prior approval.



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

9. BDA system shall be new product and supported by manufacturer for seven years after installation.
10. BDA system shall be equipped with Battery backup (preferred) or Uninterruptable Power Supply (UPS) system providing not less than 24 hour operation at full power.
11. The BDA alarm outputs shall be connected to the facility FACP.
 - a. If no existing FACP, one must be included.
12. BDA system shall be equipped with auto-dialer system driven by the system alarm outputs. The BDA auto dialer shall be programmed to report the assigned SITE ID to the County 900MHz paging system via dedicated telephone line (POTS) or cellular auto dialer. In the event of loss of commercial power, the Auto dialer will be supported by a battery backup, providing a minimum of 24 hours of operation.
13. The Auto-dialer back up battery shall be fitted with a properly sized, intelligent battery charger which will automatically recharge the Auto-dialer backup battery upon restoration of power.
14. Donor antenna(s) to be minimum 11dBd 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.
15. 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.
16. BDA system design shall not utilize "Tee" type connectors for power division. Inductive couplers or isolated splitters are required.
17. 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.
18. All antennas shall be assigned unique alpha-numeric identifiers which shall be shown in all line drawings, documentation and floor plans.



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

19. 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.
20. 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 of the BDA. The Loma Ridge site, for example, comprises three trunked systems with a total of 53 channels. The composite power of 53 carriers is approximately 17dB higher than a single carrier.
21. The BDA system shall include anti-oscillation circuitry and be designed with adequate isolation to preclude BDA oscillations that impair / degrade the donor public safety 700 / 800 MHz systems.
22. The BDA 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.
23. The BDA 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.
24. The transmitted noise and spurious interference, measured within a 10 kHz bandwidth at the donor antenna shall not exceed -43dBm and in no case shall result in a calculated noise level at the donor site greater than -150dBm



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

Page left blank on purpose



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

APPENDIX B

Minimum Submittal Requirements

The Orange County Sheriff's Department, Communications and Technology Division is responsible for the operation and maintenance of the Countywide Coordinated Communications System (CCCS) 800MHz Simulcast P-25 trunked radio system. As the license custodian, 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 Orange 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 CCCS.

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 Orange County Sheriff's Department, Communications Division as the license custodian for the 800MHz radio system (CCCS) 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.

OPTIONAL PRE-SUBMITTAL REVIEW

In order to reduce time and paper waste OCSD 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 OCSD communications on portable media for review.

OFFICIAL SUBMITTAL

Construction of ERRCS systems require the contractor to obtain building permits from the local authority. Approval of the design by OCSD is required for grant of such construction permits.

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



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

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



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

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 full calculations for each segment or point in tabular format

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



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

- 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



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

APPENDIX C

System Installation Requirements

As Licensee and custodian for the Orange County CCCS 800MHz Radio System, The Orange County Sheriff's Department, Communications and Technology Division (OCSD/COMM) 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 Orange, 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 Orange County Fire Authority Ordinance, including adherence to CFC Chapter 5 (2019).
2. All active components shall be enclosed in NEMA 4/4X enclosures (NEMA 3R for batteries requiring venting are acceptable).
 - a. Exception may be granted for rack-mounted equipment if contained within a 2 hour rated area.
 - b. Power and signal cabling between the BDA, BBU and Power Distribution panel / disconnect to be run in EMT (Electrical Metallic Tubing) and terminated with approved fittings per the NEC and local building codes.
3. Power to be provided by single, dedicated 120V 20A circuit.
 - a. Active components must be hard-wired to the dedicated branch circuit in the associated power distribution panel in accordance with NEC 310. No appliance cord connections are permissible.
 - b. A single point equipment disconnect switch is to be provided.
 - c. Shall meet appropriate power rating.
4. A disconnect means shall be provided allowing the BDA to be isolated from the power source with ability to lock off position.
 - a. Shall be protected from accidental tripping by physical design or cover.
 - b. Shall be labeled to show equipment protected and source circuit(s) (panel & breaker ID).
 - c. All active elements shall be provided 24 hour battery-based backup power.



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

5. Grounding, Bonding, and Lightning Protection.

- a. All active devices shall be grounded pursuant to NFPA 780 (2017) unless otherwise directed herein.
- b. All active devices shall be grounded to the master building ground bus.
- c. All ground connections shall be made with stranded copper wire no smaller than #2 AWG.
- d. All ground bus bars shall be copper
- e. No copper wire shall come into direct contact with aluminum.
- f. No copper bus bar shall come into direct contact with aluminum.
- g. Surge protection shall be grounded to the master building ground bus.
- h. Donor Antenna Surge Protector
 - i. To be installed internally to the building.
 - ii. May be housed in NEMA4 enclosure at point of entry provided entire run to amplifier is enclosed in conduit with prior approval.
 - iii. Mounted within 24" of building entry point where possible.
- i. Donor antenna feed line shall be equipped with a ground attachment which shall be grounded to the building master ground at the building service entrance point whenever possible.
- j. Donor antenna mounting structures shall be grounded to the master building ground bus.

6. The donor antenna shall be positioned to provide clear line of sight (LOS) with the designated donor site. The measured downlink carrier level (control channel) at the donor antenna shall be within 6 dB of the calculated LOS value.

7. 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.

8. Antenna Isolation (Donor to DAS)

- a. Shall be >20dBm greater than amplifier's maximum rated gain.
- b. >100dBm is desired.



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

9. 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 Orange ERRCS System".
 - ii. Site ID (BDA and Auto Dialer 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 "OC 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 "OC ERRCS" and the unique identifier of the component.
 - ii. Cable segments to be labeled with "OC ERRCS" and unique identifier within 18" of each end.



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

10. On Site Documentation

- a. System documentation to be located with head end amplifier
- b. May be in sealed container within BDA or BBU enclosure if a document pocket of sufficient size is provided.
- c. If stored externally to equipment, installer must provide appropriate metallic or rigid plastic document holder.
- d. 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
- e. Manufacturer's manual for Amplifier and BBU
- f. Maintenance log containing:
 - i. Date of service
 - ii. Service provider
 - iii. Name
 - iv. Contact phone number
 - v. Email
 - vi. Nature of service provided



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

APPENDIX D

900 MHz Paging System Alarm Reporting

OCSD/COMM maintains an automated alpha-numeric paging system with coverage throughout Orange County for the reporting of alarms and system failures. Each ERRCS is to be equipped with an automated dial out (auto dialer) device capable of interacting with this system to generate a numeric page consisting of the site ID in the event of any monitored failure within the system. Normally this device requires a full time dedicated conventional analog (POTS) phone line. A cellular auto dialer is acceptable if reliable operation can be demonstrated.

Programming of the auto dialer is critical as the transmitted elements must be timed to coincide with specific input windows from the paging system.

Auto Dialer Configuration:

The assigned BDA ID for the auto dialer will be in the following format:

NNN NNN-NNNN

The OCSD/COMM 900 MHz Paging System phone number is will be provided during plans review. You will need to program pauses (usually 4 each) between the number dialed, cap code and BDA ID for the auto dialer to function properly into the County's 900MHz paging system.

Upon notification by Pager in the event of a BDA failure the OSCD/COMM Technical Services Unit technician on duty in the will make notifications to the affected Law and/or Fire agencies as well as Control One alerting them of lack of coverage and a need for service in the future.



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

APPENDIX E

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 OCSD/COMM (FCC Licensee) as shown in the current BDA Annual Inspection Form (APPENDIX F).

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 9).

Inspections shall be conducted by OCSD/COMM or OCSD/COMM's designee. No person may conduct an annual test or inspection unless that person has been specifically approved by OCSD/COMMS 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 calibration.

Downlink RF measurements are to be taken using control channel for both 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)



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

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
- Phone number of line used for auto dialer
- 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 Lightning Protection
 - Interference Test
 - Auto Dialer Test
 - Isolation Tests
 - Amplifier Gain Measurements
 - Uplink for both Cells
 - Downlink for Both Cells
 - Any other applicable test results



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

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
 - f. Auto dialer
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 span of 15-20MHZ centered at 859MHz (Downlink) and 814MHz (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



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

5. Active noise floor
 - a. Repeat item 4 with power applied to BDA, with all antennas connected.

6. Antenna systems isolation
 - a. Inject reference signal to donor antenna system at 814MHz
 - b. Show Injected power level
 - c. Show Measured signal from DAS system

7. 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.

8. 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.

9. 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.



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

10. 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
11. The Fire Marshal and/or the Fire Marshal's designee 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.
12. Annual testing will be done at no expense to the City or County.
13. Annual tests results shall be filed with the AHJ Fire Marshal and OCSD/COMM as directed.



**Orange County Sheriff's Department
Communications & Technology Division**
Emergency Responder Radio Communications Systems





Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

APPENDIX F

Annual Inspection Report Form & Approval to Operate Samples

IN-BUILDING BI-DIRECTIONAL AMPLIFIER (BDA) ANNUAL INSPECTION / CERTIFICATION TEST OVERVIEW

The purpose of Annual inspection & certification test is to confirm that the ERRCS system continues to operate effectively and within the requirements of the FCC, NFPA and CFC requirements. Failure to operate within compliance is grounds for removal of operational authorization, penalties and revocation of occupancy permits. (See FCC CFR 47, FCC Part 90, §90.219, NFPA 1221-72 2019, CFC Section 510 2019 and local ordinance)

The In-Building Bi-Directional Amplifier (BDA) systems are required to be installed and maintained in accordance with the California Building and Fire Codes, and has been a part of the Public Safety Ordinance in the County of Orange since 2006. The County of Orange requires that the 800 MHz coverage is maintained for public safety radio communication on the Countywide Coordinated Communication System.

Roles:

Building/Property Owner	FCC Licensed Technician:		
<ul style="list-style-type: none"> Identify and Hire Contractor 	<ul style="list-style-type: none"> Inspect and Test System Provide Annual Test Report (see OCSD Ordinance) Provide the deficiencies or Certificate to OCFA 		
	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border: none;"> <p style="color: red; font-size: small;">OCFA via email or mail BDAcert@ocfa.org PO Box 57115</p> </td> <td style="width: 50%; border: none;"> <p style="color: red; font-size: small;">OCSD via email bcobb@ocsd.org rg or deliver to OC</p> </td> </tr> </table>	<p style="color: red; font-size: small;">OCFA via email or mail BDAcert@ocfa.org PO Box 57115</p>	<p style="color: red; font-size: small;">OCSD via email bcobb@ocsd.org rg or deliver to OC</p>
<p style="color: red; font-size: small;">OCFA via email or mail BDAcert@ocfa.org PO Box 57115</p>	<p style="color: red; font-size: small;">OCSD via email bcobb@ocsd.org rg or deliver to OC</p>		
<ul style="list-style-type: none"> Correct the deficiencies within 90 days Request any extensions to compliance time frames 	<ul style="list-style-type: none"> Certify that all corrections were made. Provide the completed form to the OCFA via email or mail. 		
	<p style="color: red; font-size: small;">BDAcert@ocfa.org PO Box 57115 Irvine, CA 92619-7115</p>		
<ul style="list-style-type: none"> Consult with OCSD/Communication for any technical guidance: 	<p style="color: blue; font-size: small;">Bruce Cobb bcobb@ocsd.org 714 704-7986 OCSD Service desk 714 704-7999</p>		



Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

IN-BUILDING BI-DIRECTIONAL AMPLIFIER (BDA) ANNUAL INSPECTION / CERTIFICATION TEST

Site Name:

Address:

BDA Location:

BDA Inspection date:

BDA Serial #:

BDA Model #:

Site ID:

Customer contact Tel#:

Alt. Customer contact Tel#:

Technician name:

FCC License #:

Technician tel #:

Primary Customer Contact:

Customer EMAIL:

Alternate Customer Contact:

Inspecting Agency:

Inspector's EMAIL:

Are you the same Contractor which had done originally BDA install? YES NO

OPERATIONAL TEST:

Is BDA still functional? YES NO

If NO, explain:

Cost (Labor & Material) to repair:

COVERAGE TEST:

Does the 800MHz Coverage test meet the Ordinance Spec.? YES NO

If NO, explain:

Cost (Labor & Material) to repair:

Notel: Test shall be conducted utilizing 800MHz Portable radios, or Service Monitor.
Test for both Countywide Talkgroups, as well as primary cell site for the area.

Countywide South
 Northwest Southwest
 North Laguna

AUTO-DIALER TEST:

Does Auto-dialer function properly? YES NO

If NO, explain:

Notel: Test shall be done to OCSD/Communications paging system.

Call DSU group duty tech (714)704-7999, or System Watch @714-628-7021 to confirm correct BDA ID goes through

Cost (Labor & Material) to repair:

BACK-UP POWER TEST:

Is the UPS still functional? YES NO

Perform Battery 1-hour drop test? YES NO

Do UPS Batteries(s) need to be replaced? YES NO

Date code from battery:

If NO, explain:

Notel: Recommended UPS battery life is typically 2-3 years.

Cost (Labor & Material) to repair:

ANTENNA SYSTEM:

Is condition of Donor (outside) antenna satisfactory? YES NO

Is the Donor (outside) antenna clear from obstruction? YES NO

Is condition of inside antenna(s)/coax cables satisfactory? YES NO

If NO, explain:

Cost (Labor & Material) to repair:

Remarks and Recommendations:




Orange County Sheriff's Department Communications & Technology Division




Emergency Responder Radio Communications Systems

Sample Authorization to Operate

Must be posted at primary amplifier & updated annually



Orange County Sheriff's Department Communications and Technology Division



Emergency Responder Radio System Authorization to Operate on Licensed Frequencies

In accordance with FCC Part 90, §90.219, as representative of license holder for the frequencies used by the Orange County CCCS as assigned to this facility, approval to operate a single FM transmitter is granted for the device and location shown below. Continued approval to operate is conditional, based on continued compliance with NFPA 1221-72, CFS 510, CFR 47, FCC Part 90, §90.219, County and Local ordinances and guidelines. Annual inspection by an agent approved by the County of Orange is required to provide proof of compliance.

Site ID: _____ 107 _____ Amplifier _____

Property: _____ Manufacturer: _____

Owner: _____ Model: _____

Address: _____ Serial Number: _____

City: _____ Mode: _____ Filters: _____

Phone: _____ Location: _____

Email: _____ Dial Out Line: _____

Initial Approval Date: _____ By: _____

Annual Inspection Date: _____ Pass/Fail: _____ Agent: _____

Annual Inspection Date: _____ Pass/Fail: _____ Agent: _____

Annual Inspection Date: _____ Pass/Fail: _____ Agent: _____

Annual Inspection Date: _____ Pass/Fail: _____ Agent: _____

Annual Inspection Date: _____ Pass/Fail: _____ Agent: _____

Annual Inspection Date: _____ Pass/Fail: _____ Agent: _____

Annual Inspection Date: _____ Pass/Fail: _____ Agent: _____

Annual Inspection Date: _____ Pass/Fail: _____ Agent: _____

Annual Inspection Date: _____ Pass/Fail: _____ Agent: _____

Must be Posted with Amplifier

OCSD/COMMS
Approval Form 2019



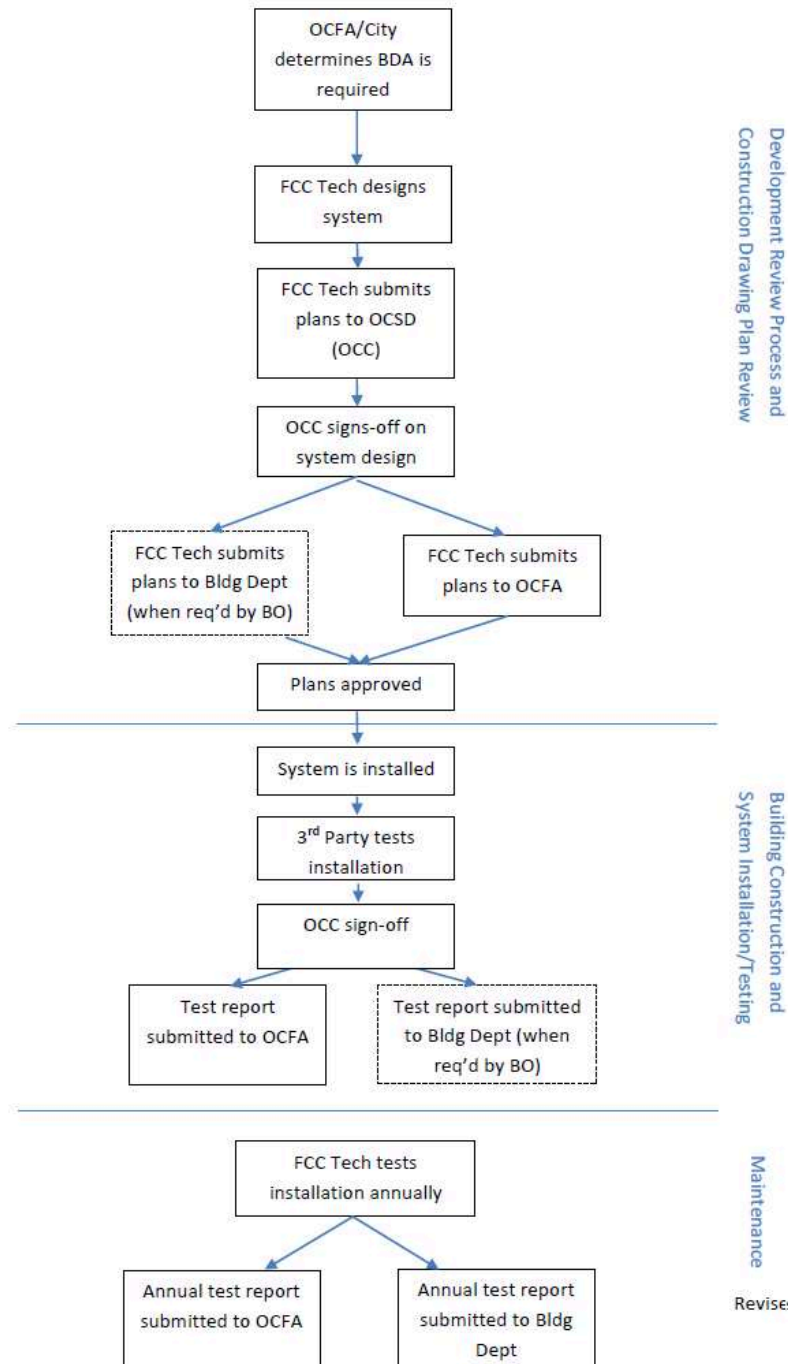
Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

APPENDIX G

Typical Project Process Flow (for OCFA supervised projects, may vary per local Fire Jurisdiction)



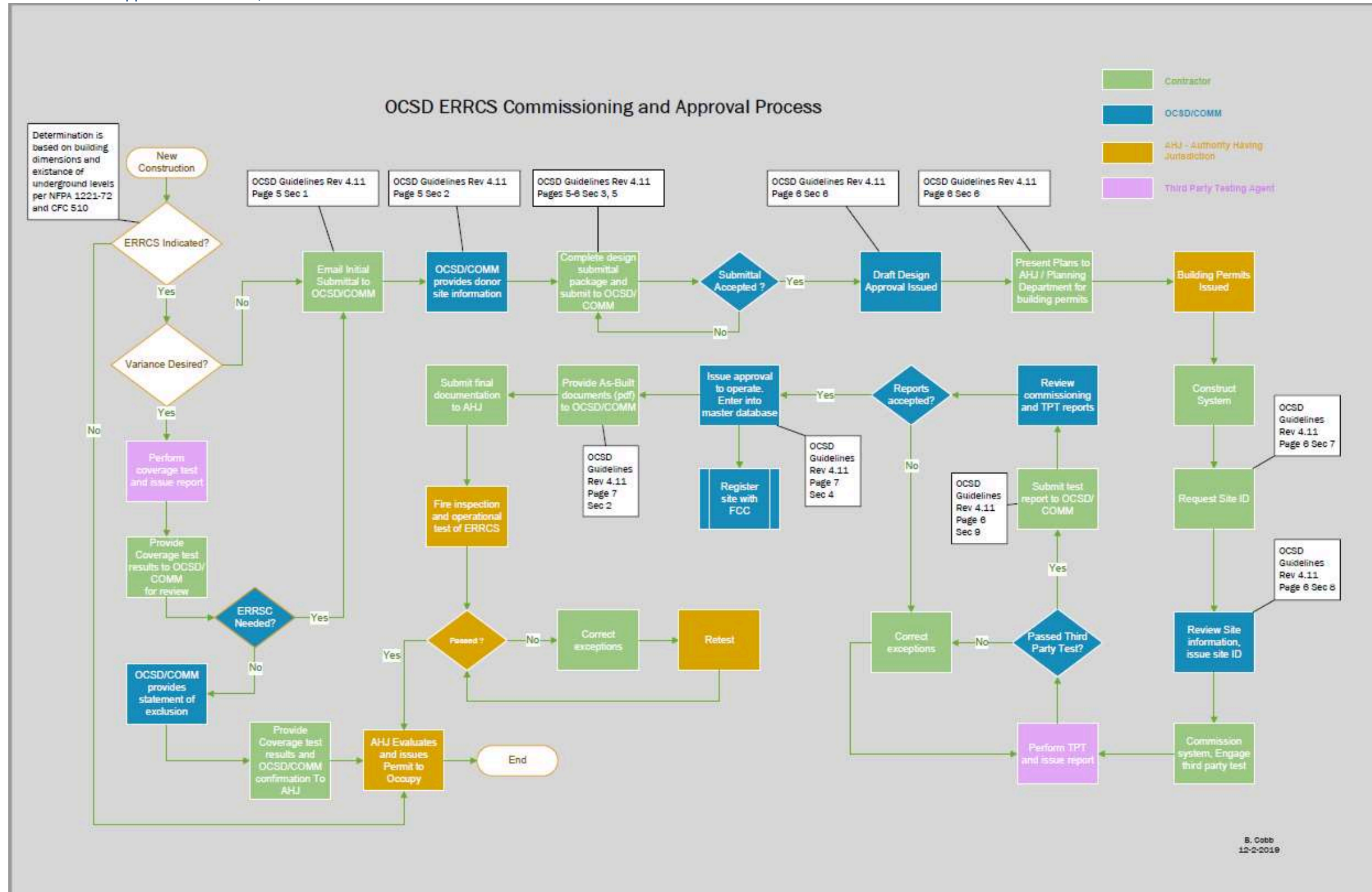
Development Review Process and
Construction Drawing Plan Review

Building Construction and
System Installation/Testing

Maintenance



Revised ERRCS Approval Flow Chart, Revised 12-2019





Orange County Sheriff's Department Communications & Technology Division



Emergency Responder Radio Communications Systems

Orange County Sheriff's Department
Communications & Technology Division
840 N. Eckhoff Street, Suite 104
Orange, CA 92868-1021
714-704-7999

Technical Services Unit

Nick Condaras - Senior Telecommunications Engineer Technical Services Unit 714-704-7953

Bruce Cobb – Telecommunications Engineer III – Technical Services Unit 714-704-7986