

Orange City Fire Department

1176 E. Chapman Ave., Orange, CA 92866

714-288-2541 • www.orangecityfire.org

Emergency Responder Radio Coverage

Bi-Directional Amplification (BDA) Systems
Digital Antenna System (DAS)



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PURPOSE

This guideline establishes framework to provide effective “in–building” radio coverage in the City of Orange for use during emergencies and by local law enforcement agencies utilizing the Countywide Coordinated Communication System.

SCOPE

The regulatory authority for the provisions contained within this Guideline are found in Section 510 of the 2022 California Fire Code as locally adopted. This guideline provides specific standards and procedures for meeting code requirements. Where conflicts exist between code and the guideline, the code shall take precedence.

This Guideline shall apply to every building, structure and subterranean parking or storage except the following:

1. Existing Construction.
2. Elevators.
3. Buildings and structures three (3) stories in height or less and those without subterranean storage or parking.
4. Any building or structure where coverage consistent with the minimum level of service as set forth in the Specifications is naturally provided.
5. Modifications to existing construction unless the building is undergoing extensive remodel and/or expansion and the building exceeds three (3) stories or contains subterranean parking or storage.

Note: When these conditions exist, prior to placing any requirement for the installation of any In-building Emergency Radio Communication equipment, Orange City Fire Department (OCFD) staff, will as early in the construction approval process as practical:

- i. Determine if radio communications has historically been problematic for emergency response personnel (fire and police)
- ii. Communicate and coordinate with the Building Official, the Orange City Police Department and the property owner.

Definitions

Amplification System: In-building public safety radio amplification system composed of FCC-certified bi-directional 800 MHZ amplifier(s), associated distribution system, and subcomponents.

FCC Certified Technician: An individual who is qualified with a General Radiotelephone Operator License (GROL/PG), or equivalent, to review design plans and perform tests in affected structures to measure compliance with the specifications set forth in this article.

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Countywide Coordinated Communication System: The radio system used by local law enforcement, fire, lifeguard and public works departments within the County of Orange for emergency and non-emergency radio communication on the 800 MHZ radio band.

OCFD: Orange City Fire Department

The owner of any building or structure to which this article applies shall be responsible for all costs associated with compliance with the Public Safety Radio System Coverage Specifications.

REQUIRED SPECIFICATIONS

The following levels of coverage are required for public safety radio communication on the Countywide Coordinated Communication System:

- A. A delivered audio quality of level 3.5 on each floor of the building or structure, which constitutes audio quality that, makes speech understandable with slight effort with occasional repetition required due to noise or distortion.

"DAQ" Delivered Audio Quality	Subjective Performance Description
1	Unusable, speech present but unreadable
2	Understandable with considerable effort. Frequent repetition due to noise/distortion.
3	Speech understandable with slight effort. Occasional repetition required due to noise / distortion.
3.5	Speech understandable with repetition only rarely required. Some noise / distortion.
4	Speech easily understood. Occasional noise / distortion.
4.5	Speech easily understood. Infrequent noise / distortion.
5	Speech easily understood.

- B. A minimum signal strength of (-95dBm) in 90% of the area of each floor of the building or structure from both the Countywide Coordinated Communication System and from within the building or structure.

- C. A frequency range supported *from* the Countywide Coordinated Communication System of 851 - 861 MHZ (base transmitter frequencies), and a frequency range supported *to* the Countywide Coordinated Communication System of 806 - 816 MHZ (radio field transmit frequencies) on each floor of the building or structure.

- D. All new buildings or structures falling within the scope of these guidelines shall be constructed with a two-inch (2") conduit installed between the first floor and the bottom subterranean floor, as needed or applicable, and said conduit shall extend along the center of the building to the roof. At each floor and the roof, an opening shall be made to afford easy access to the conduit from the ceiling. Access in either the form of drop ceiling or conduit shall be made available along hallways and through firewalls. All floors of subterranean parking garages shall have a similar conduit installation.

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OPTIONS FOR COMPLIANCE

Buildings and structures unable to be constructed to provide the performance specified above shall be equipped with an amplification system or an active device that complies with the following criteria or any other system approved in writing by the OCFD.

A. Amplification System Specifications.

1. The amplification system shall include filters to reject frequencies below 851 MHz and frequencies above 861 MHz by a minimum of 35 dB.
2. All amplification system components must be 100% compatible with analog and digital modulations after installation without additional adjustments or modifications. The system must be capable of encompassing the frequencies stated above and capable of future modifications to a frequency range subsequently established by Orange City Fire Department and Police Department. If the system is not capable of modification to future frequencies, then a new system must be installed to accommodate the new frequency band.
3. All electrical components must be equipped with independent auxiliary battery power or generators to function at full capacity for at least twelve (12) hours. The auxiliary battery systems shall be replaced per manufacturer's specifications at least every two (2) years.
4. The amplification system shall be installed by an approved manufacturer - trained and certified installer.

B. Active Device Specifications.

1. Active devices shall have a minimum of -50 dB 3rd order intermodulation protection.
2. All active devices shall be FCC Part 90 Type Certified.
3. All electrical components must be equipped with independent auxiliary battery power or generators to function at full capacity for at least twelve (12) hours. The auxiliary battery shall be replaced per manufacturer's specifications or at least every two (2) years, whichever is more frequent.
4. Active devices shall be alarmed with a phone line that will provide dial tone to an alarm device. The alarm device shall be programmed to activate a pager on the County of Orange's 900 MHz paging system. Access to the active device is required twenty-four (24) hours a day by Orange City Fire Department and Police Department. The minimum alarms will indicate loss of AC failure and operational failure. The device shall also have modem access to allow remote monitoring.
5. Any AC operated power supplies shall have a UL listing,

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TESTING AND SYSTEM DESIGN PROCEDURE

A. Initial Tests.

1. Prior to issuance of a building permit for a building or structure to which these specifications apply, the applicant shall:
 - a. Retain an FCC-certified technician to review, sign, and stamp construction plans in order to ensure that such plans satisfy these specifications, and recommend, if needed, an amplification system or an active device for reliable radio communication;
 - b. Submit a minimum of three sets of plans certified by an FCC-certified technician to the City of Orange Building Division for OCFD review and permit issuance.
2. Prior to the issuance of a certificate of occupancy for any building or structure to which these specifications apply, the applicant shall:
 - a. Retain an FCC-certified technician to test all areas of the building or structure in accordance with subsection b, below and certify by stamp and signature compliance with these specifications.
 - b. For purposes of testing, each floor of the building shall be divided into a grid of approximately twenty (20) equal areas. A maximum of two (2) nonadjacent areas will be permitted to fail the test on each floor. In the event that three (3) of the areas fail the test, and to provide greater statistical accuracy, the floor may be divided into forty (40) equal areas. In such an event, a maximum of four (4) nonadjacent areas will be permitted to fail the test. The test shall be conducted with a Motorola APX 8000XE or equivalent portable radio talking through the Countywide Coordinated Communication System. The test shall be conducted from a spot located approximately in the center of each grid area. The radio will then be keyed to verify two-way communication to and from the outside of the building through the Countywide Coordinated Communication System. Once the spot has been selected and tested, prospecting for a better spot within the grid area is prohibited.

All auxiliary power systems shall be tested under load for a period of one (1) hour to verify that the system will operate properly in the event of a power outage. The testing technician reserves the discretion to determine whether the battery exhibits symptoms of failure. The FCC-certified technician will decide if the auxiliary system requires replacing or upgrade.

B. Periodic Tests.

The OCFD may perform periodic tests on each floor of each building or structure to which these specifications apply to confirm continued compliance with the specifications set forth in this article. The periodic test does not replace any maintenance and testing that is the requirement or the responsibility of, the property owner.

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C. Annual ERRCS Inspection & Testing.

The owner of the building or owner's authorized agent shall have the Emergency Responder Radio Coverage System inspected and tested annually or when structural changes occur including additions or remodels that could materially change the original field performance tests.

D. Record Retention.

The owner of any building or structure to which these specifications apply shall retain all records of initial and annual tests performed pursuant to this section and shall submit copies to the Orange City Fire Department at 1176 E. Chapman Ave., Orange, CA 92866 within thirty (30) days of completion of such tests.

SYSTEM DESIGN REQUIREMENTS

A. System Design.

1. System design and installation must comply with FCC and CFC Section 510 requirements.
2. Interconnection to the building fire alarm system is required and must be monitored for proper function of the signal booster and batteries. The monitoring signal shall be supervisory and display on the fire alarm control panel (FACP) as follows: "Emergency Responder Radio System Trouble".
3. The system shall be fully rebandable.
4. The manufacturer shall support the system for seven years after installation.
5. BDA system shall be equipped with an uninterruptible power supply (UPS) system.
6. The system shall be equipped with an auto-dialer.
7. Indoor antennas shall be 700/800 MHz compliant.
8. Use of indoor tri-band antennas for BDA/DAS and cell phone coverage is acceptable.
9. BDA systems design shall utilize inductive couplers rather than splitters.
10. Drawings shall detail the model numbers for all proposed equipment (i.e. BDA system, indoor antennas, donor antenna, UPS, etc.)
11. Rack layout documentation (must be provided).
12. If applicable fiber optics layout and interconnection (must be depicted).
13. Provide a floor plan with 20x20 signal grid layouts, for before and after, of the BDA system install for each floor.
14. A plan showing the signal levels from the BDA system and indoor antennas is required.
 - a. Plan shall include drawing showing indoor antenna layouts and signal levels, splitter/hybrid layouts, and donor antenna.

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PLAN SUBMITTAL PROCEDURE

A. Prior to issuance of a building permit.

1. Retain an FCC-certified technician to review, sign and stamp construction plans in order to compliance with these specifications, and recommend, if needed an amplification system or an active device for reliable radio communication.

B. Submit Plans for Building Permit.

1. Submit a minimum of three (3) sets of plans and specification sheets to the City of Orange Building Department for fire department review and approval. The Building Department is located at 300 E. Chapman Ave, Orange, CA.
 - a. Drawings shall be Architectural D sheets or larger.
 - b. Each set of drawings must include a site plan, floor plans and wiring diagrams.
 - c. Supporting manufacturer specification sheets shall be on 8.5"x11" pages.
 - d. OCFD will route submitted plans to Orange County Sheriff's Department Communications & Technology Division for compliance with Federal Communication Commission (FCC) and OCSD requirements.

Note: The applicant is responsible for payment of all fees associated with OCSD's plan review. OCSD will invoice OCFD and in turn, OCFD will forward the invoice to the applicant for payment. Payment in the form of a check made out to OCSD Communications is due prior to receipt of approved plans. OCSD's plan reviews are billed per hourly rate.

- e. After receipt of approved plans from OCSD Communications & Technology Division, OCFD will review plan submittal for compliance to the California Fire Code (CFC) section 510 and the City of Orange Fire Code.
 - i. Fire department plan reviews are billed per hourly rate.
 - ii. At completion of OCFD plan review, fire permit and OCSD/Communications & Technology Division fees are collected, plans returned to applicant/contractor and BDA permit issued.

C. BDA auto-dialer ID assignment and scheduling final inspection.

1. The applicant/contractor shall obtain the service of a third party FCC certified technician i.e. third party contractor (TPC) for site inspection and testing of the BDA system.
 - a. Prior to the issuance of a certificate of occupancy for any building or structure to which these specifications apply the applicant shall comply with sub-section b.

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b. Retain an FCC-certified technician TPC to test all areas of the building or structure in accordance with the California Fire Code Section 510 and certify by stamp and signature compliance with the following specifications:

- i. For testing purposes each floor of the building is divided into a grid of approximately twenty (20) equal squares.
- ii. A maximum of two (2) nonadjacent areas will be permitted to fail on each floor.
- iii. In the event three (3) of the areas fail the test, the floor may be divided into forty (40) equal areas.
- iv. A maximum of four (4) nonadjacent areas are will be permitted to fail the test.
- v. The test shall be conducted with a Motorola APX 8000XE or equivalent portable radio talking through the countywide coordinated communication system.
- vi. The test shall be conducted from a spot located approximately in the center of each grid area.
- vii. The radio will then be keyed to verify two-way communication to and from the outside through the countywide coordinated communication system.
- viii. Once the spot has been selected and tested, prospecting for a better spot within the grid area is prohibited.
- ix. All auxiliary power systems shall be tested under load for a period of one (1) hour to verify the system will operate in the event of a power outage.
- x. The determination of a test passing or failing is at the discretion of the FCC-certified technician.

2. To schedule a BDA system final inspection, the applicant/contractor will need to call the Orange City Fire Department Fire Prevention office at (714)288-2541 during office hours to Schedule. **It is the applicant/contractors responsibility to schedule TPC for site Inspection and testing of the BDA system.**

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- a. When placing the request for inspection provide the building /project address, contractor's name , telephone number and the City of Orange permit number for the BDA system plans.
3. A copy of the approved BDA system plans shall be shall be maintained on site for review by OCFD and the TPC.
4. As-built plans will be required at the final inspection and must be on 8.5"x11" pages with Copies provided for OCSD Communications & Technical Division, OCFD and TPC.
5. To obtain a copy of the Certification-Public Radio System Coverage form contact the Orange City Fire Department, Fire Prevention Division, new construction inspector (714)288-2541.
6. Provide a copy of the Certification-Public Radio System Coverage form at time of final Inspection. The contractor's portion must be filled out in its entirety.

D. Third Party Contractor Responsibilities During Final Inspection/Testing.

1. Review as-built plans and documentation for accuracy.
2. Perform spot grid testing throughout the entire building.
3. Verify the BDA auto-dialer functions properly with the county paging system.
4. Perform Isolation test ensuring BDA system does not interfere with county cell sites.
5. At completion of testing, compose report detailing system functions, compliance with FCC and OCSD/COMM requirements and outline any defects in the system or areas with poor coverage. A copy of the report must be provided to OCSD and OCFD for review.

E. OCSD/COMM Responsibilities after Final Inspection/Testing.

1. Review TPC report
2. Assign BDA system an ID number and provide instructions to the applicant/contractor for Programming the auto-dialer to dial into the county paging system.
3. Receive a copy of the as-built plans.
4. Sign off Certification-Public Radio System Coverage form.

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F. O CFD Responsibilities Post Final Inspection/Testing.

1. Verify system compliance with California Fire Code Section 510 and the City of Orange Fire Code.
2. Approve as-built plans.
- 3, Verify system inter-connection with the building fire alarm panel.
4. Conduct/witness spot testing of BDA system throughout building in conjunction with TPC.
5. Receive approved as-built plans.
6. Receive completed and signed OCSD copy of Certification-Public Radio System Coverage form.
7. After all required documents are received and approved, sign Certification-Public Radio System Coverage form and City of Orange Building Department Job-card.