



EMERGENCY RESPONDER RADIO COVERAGE SYSTEM STANDARD

Revised 1/1/17

Acceptance Test (*New Construction, Tenant Improvement, first time*)

Requestor

Owner:

Phone
Email

3rd Party Test Organization/Contractor

Phone
Email

Date/Time

Requested Date: _____

Duration: _____ hours

Building

Address: _____

Description: _____

Attachments

- Verification of Compliant Installation Statement of Operation prior to Inspection
- Or
- Record of Inspection, Testing, and Maintenance

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Emergency Responder Radio Coverage System Testing

Purpose

The Fire Department (AHJ) is providing this Acceptance Test Procedure to the Owner/Developer/Contractor (Owner) to define the criteria for scheduling and performing contractor installation pre-testing and initial 3rd party acceptance testing required necessary to operate an Emergency Responder Radio Coverage System in this jurisdiction.

Scheduling and Coordination

Acceptance testing will utilize active channels in the San Mateo County Public Safety Radio System. The Owner will provide a minimum ten (10) day advance notice prior to the requested test dates. All testing is subject to postponement or cancellation in the event of an emergency.

Contractor installation testing process

In order for a contractor to perform on-the-air testing prior to final 3rd party acceptance testing, they shall contact the Fire Department Prevention Office and obtain the written testing protocol which they must follow.

3rd party acceptance testing

The approved 3rd party tester will also be required to contact the Fire Department Prevention Office and obtain the written testing protocol. Requests will include the building address, size of building, anticipated durations, and contact information of Owner personnel and testing personnel. The Owner will identify the 3rd party test organization contracted to perform the tests.

Criteria

The Owner must complete and provide a copy of the final acceptance testing documentation when requesting Acceptance Testing from the AHJ.

On an annual basis or as modifications to the structure or use of the structure are completed, the Owner must request Reacceptance Testing and provide a copy of the current Record of Inspection, Testing, and Maintenance, certifying recent completion of manufacturer recommended tests and inspections.

The Benchmark Test Records and As-Built/Record documentation must be available on-site for review by the AHJ.

Duties and Responsibilities

Owner: Special Inspection is required to demonstrate compliance to the provisions of CA Fire Code Section 510. The Owner or an authorized agent of the owner is responsible to obtain and fund special inspections services by contract with a 3rd Party Testing Service (*Special Inspector*). The

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Contractor responsible for the system will not supervise the 3rd Party Testing Service. The Owner is responsible to provide acceptable radio coverage within the building, access to documentation and to request Special inspection after a system is first installed, annually and when modifications are made to the building. Inspection requests will identify the 3rd Party Testing Service; include a schedule and supporting records. The Owner is responsible to register with the AHJ that a Class A amplifier is being installed and operated, and to register Class B amplifiers with the FCC.

3rd Party Testing Service (Special Inspector):

1. The Special Inspector will review as-built documentation and commissioning test data provided by the Contractor, perform a visual inspection of the installed equipment and test the performance of the signal booster system. The Special Inspector will witness and/or perform additional tests to **verify system operation** prior to the Contractor placing the system on-the-air and to **document indoor radio coverage** after the Contractor commissions the system.
 - a. **Non-Conforming Items:** Non-conforming items will be reported to the Contractor. If any item is not resolved in a timely manner, is about to be incorporated into the work, or could potentially cause interference to Public Safety, the special inspector shall immediately notify the AHJ by telephone or in person; notify the Owner or authorized agent and post a written discrepancy/stop work notice. The discrepancy/stop work notice will be posted in a conspicuous place near the primary signal booster. Work shall not continue until all non-conformance issues are resolved and the discrepancy/stop work notice has been removed.
 - b. **Test Report:** The 3rd Party Testing Service will submit final reports to the AHJ and the Owner documenting system performance and the final Radio Coverage inside the building. Test Reports will be retained by the Owner for the life of the building.
2. **AHJ:** The AHJ shall review submittal documents for compliance and is charged with legal authority to review the plans, specifications, special inspection reports and other submittal documents for compliance with code requirements.
 - a. Testing will not be performed by the AHJ; however, the AHJ may perform operational checks at any time after the system has been accepted.
 - b. The AHJ will coordinate test schedules and activities with Public Safety Agencies and Dispatch Centers. The Owner/Contractor must notify the AHJ prior to any interruption.
 - c. The AHJ will coordinate test schedules and activities with Public Safety Agencies and Dispatch Centers. The Owner/Contractor must notify the AHJ prior to any interruption.

Test Procedure

The Owner will perform Acceptance Tests to demonstrate operation of the enhancement system prior to on-the-air operation and to document indoor radio coverage. The Owner's Test Plan will minimize interruption of Public Safety communications. Conduct all tests on a secondary channel whenever possible. If a test fails on a secondary channel, re-test the failed grid on the primary channel. If the grid passes, you may pass that grid. The Special Inspector contracted by the Owner will **verify system operation** and **document indoor radio coverage**. Acceptance Tests will adhere to the following Test Procedure or as directed by the AHJ.

1. Owner/Contractor will request Acceptance Testing and provide a schedule 10 business days in advance. The Owner will confirm test dates and time with the AHJ 24 hours prior to the scheduled test date.
2. Owner/Contractor and the Special Inspector will arrive on-site at the designated time to commence testing.
3. The Special Inspector will notify the San Mateo County Public Safety Communications (SMCPSC) Dispatch Supervisor at (650) 363-4905 (for the VHF fire channels, UHF SMCO law mutual aid channels, and 700 MHz P25 trunked system) and the appropriate Police Department Dispatch Supervisor (for the police UHF channels) just prior to the starting and immediately after completing Acceptance Tests. They will also notify the San Mateo County ISD Radio Communications shop at (650) 363-4548 testing will be conducted on the UHF Law Mutual Aid channels and on the 700 MHz system just prior to the starting and immediately after completing Acceptance Tests. The Special Inspector will be the on-site contact should an emergency situation require suspension of acceptance tests or use of the Radio System.
4. Testing shall be performed using portable VHF, UHF and 700 MHz radios issued by or approved by the AHJ. The entity or entities checking out the radios for use in testing will be financially liable for any loss or damage to the radios. A loan agreement for the portable radios checked out will be filed with the AHJ.
5. **System Operation** – Prior to placing the signal booster system on-the-air or connecting an amplifier to the Donor Antenna, the Contractor will demonstrate interference free operation of the enhancement system to the Special Inspector. The Special Inspector will verify/document the following:
 - a. **Receive Level of Each Channel:** Measure and record the signal level near the Donor Antenna for each channel.
 - i. **For the VHF fire channels:** Obtain signal strength measurements Command 21 (or 11) and Command 51. If all signal levels are comparable. Commence testing on Command 51. Always attempting testing on a secondary channel first.
 - ii. **For the UHF law channels:** Obtain signal strength measurements on PD1, PD2, CWMA Green, TAC2 and TAC3. If all signal levels are comparable, Commence testing on PD2. Always attempting testing on a secondary channel first.
 - iii. **700 MHz P25 system:** Obtain signal strength measurements from the Control Channel and test audio on the COCOM4 talkgroup.
 - b. **Spectrum Map:** Provide a spectrum recording at the output of the Donor Antenna System to document signal levels within the spectrum of the amplifier (Min of 10min, Maximum Hold, +/- 2MHz ΔF). The signal level of each conventional channel provisioned in the enhancement system must be represented in the Spectrum Map. The control channel and a minimum of 20% of traffic channels must be represented in the Spectrum Map for a trunked system.
 - c. **Gain Setting of Amplifier:**
 - i. **Downlink Gain:** Inject a test signal, at the recorded level (*include gain/loss of Donor Antenna*), into the Donor Port of the Amplifier. Measure/record the output power of the amplifier towards the DAS. (*Level In – Level Out = Amplifier Gain*). Record the Downlink Gain.
 - ii. **Uplink Gain:** Inject a test signal, 3dB above the uplink squelch limit that is provisioned in the equipment, into the DAS port of the amplifier. Measure/Record the output of the amplifier at the Donor port. Record the Uplink Gain and add the gain/loss of the Donor Antenna System.

- d. **Antenna Isolation:** Antenna isolation must be a minimum of 15dB greater than the gain of the amplifier.
 - i. **Downlink:** With the indoor DAS fully connected, inject a test signal, at the same output level as the amplifier, into the DAS. Measure the reflected power into the amplifier. Measure the signal level received at the input to the Amplifier through the Donor Antenna System.
 - ii. **Uplink:** Connect the Donor antenna and Inject a test signal into the amplifier DAS input. Measure the signal level at the output of the indoor DAS.
 - e. **Alarm Reporting:** Verify visual alarms and alarms connected to the Fire Alarm Panel. Disconnect primary power to verify Normal AC, AC Fail and 70% Battery alarms. Disconnect Donor and DAS Antenna system to verify Antenna Failure alarm. Turn off amplifier to verify BDA failure alarm.
 - f. Failure of System Tests will require the Contractor to correct deficiencies and re-schedule Acceptance Testing.
6. **Indoor Radio Coverage:** The Special Inspector will document indoor radio coverage. The AHJ Dispatch Supervisors (SMCPSC and PD) will confirm the radio channel to utilize and will start down-link transmissions from the designated donor radio site. The selected radio will transmit at a preset interval to allow measurement of the RF signal within the building. The AHJ may also instruct the Special Inspector to inject test signals into the Signal Booster system to minimize interruptions to Public Safety.
 7. Downlink and Uplink measurements will be made with the amplification system in an active condition and operating on back-up power.
 8. Radio Coverage Testing will include measurements around the perimeter of the building, on the roof-top, general floor area and critical areas designated by the AHJ.
 - a. The general floor area will be broken into grids, not to exceed 128Ksq/ft. Each grid will consist of 20 cells that equally divide the general floor space.
 - b. Critical areas will include Exits, Stairwells, Elevator Lobbies, Electrical rooms/closets, server rooms, fire pump rooms, sprinkler/valve locations, Fire/Emergency control rooms, and other locations designated by the AHJ as critical.
 - c. Signal Level measurements will document RF levels during a timed interval in each test location.
 9. The Signal Booster System must deliver a minimum signal level of -95dBm in the downlink and uplink paths from 90% of the general floor area and 99% of the critical areas designated by the AHJ. No two adjacent cells, in the general floor area, can fail. If an area does fail, re-test on a primary channel. If the primary channel passes, you may pass that grid.
 10. Signal Level measurements will be made by the Special Inspector utilizing a Spectrum Analyzer or an Automated Test Platform.
 - a. Downlink signals will be generated by the Donor radio site or by a test signal inserted into the system locally. Measurements are made in each of the designated test locations.
 - b. Uplink signals are generated by a portable radio transmitting from designated test locations inside the building. Measurements are made at the Donor antenna port or at the Donor site.
 - c. Failure of Signal Level testing will require the Owner to correct deficiencies and re-schedule Acceptance Testing.

11. All critical areas must have a Delivered Audio Quality (DAQ) level of 3.4 or better. The Special Inspector will evaluate and grade the audio quality of transmissions generated from the radio site and received inside the building.
- a. Critical areas identified on each floor are:
 - i. Exits
 - ii. Stairwells
 - iii. Elevator lobbies
 - iv. Electrical rooms
 - v. Server rooms
 - vi. Fire pump rooms
 - vii. Sprinkler/valve locations
 - viii. Fire/Emergency Control rooms
 - b. The Special Inspector will utilize a portable radio to generate transmissions from inside the building. The AHJ Dispatcher may monitor DAQ levels in the Uplink direction and report to the Special Inspector over the radio channel when the audio quality is out of tolerance or if interference or improper radio operation is detected.
 - c. The DAQ level of transmissions generated by the Radio Site in the Downlink direction will be evaluated by the Special Inspector.
 - d. The Special Inspector will make recordings of the radio transmissions in areas of the building that exhibit poor audio or signal quality issues.
 - e. Failure of DAQ tests will require the Owner to correct deficiencies and re-schedule Acceptance Testing.
12. After completion of Signal Level Measurements and evaluation of Audio Quality, the AHJ will schedule Fire personnel within the first 12 months to survey the building and verify radio enhancement system operation. Failure of the operational check will require that the Owner correct deficiencies and re-schedule Acceptance Testing.

Documentation

The Special Inspector will prepare and submit an Acceptance Test Report to the AHJ documenting System Operation and Indoor Radio Coverage. The test report will include floor plans and identify the location the measurements were made. The recorded measurements will be readings generated directly by the test instrument or include screen shots of the instrument display. The Acceptance Test Report will be reviewed and approved by the AHJ prior to allowing operation of the Public Safety Radio Enhancement System. The test report must be available in the on-site Documentation Cabinet. Electronic or online access to documentation is acceptable. Electronic Documentation must be in .PDF format or viewable through a standard Internet Browser. Documentation must be available for inspection by the AHJ at any time.

References

California Fire Code – 2013; Title 24, Part 9 Section 510
NFPA 72 – 2013, Chapter 7, 10, 14, and 24

Emergency Responder Radio System Frequency Requirements

DISPLAY	RX FREQ	RX CTCSS	TX FREQ	TX CTCSS	NOTES
Fire Foster City/San Mateo					SMCPSC (650) 363-4905
Command 21 (primary)	153.95000	114.8	156.04500	114.8	Central Command
Command 51 (secondary)	151.47500	167.9	159.01500	167.9	County Command
Fire Belmont					SMCPSC (650) 363-4905
Command 11 (primary)	154.3700	114.8	156.0150	123.0	South Command
Command 51 (secondary)	151.47500	167.9	159.01500	167.9	County Command
Police Belmont					Belmont PD (650) 595-7400
BPD1 (primary)	488.4875	162.2	491.4875	162.2	Police Dispatch
BPD2 (secondary)	483.0875	162.2	486.0875	162.2	Police Secondary
PD Green (secondary)	488.88750	114.8	491.88750	114.8	Police County wide
PD Tac3 (secondary)	488.53750	114.8	491.53750	114.8	Police South Zone
Police Foster City					Foster City PD (650) 286-3300
FCPD1 (primary)	488.61250	162.2	491.61250	162.2	Police Dispatch
FCPD2 (secondary)	488.93750	114.8	491.93750	114.8	Police Secondary
PD Green (secondary)	488.88750	114.8	491.88750	114.8	Police County wide
PD Tac2 (secondary)	488.71250	114.8	491.71250	114.8	Police Central Zone
Police San Mateo					San Mateo PD (650) 522-7700
SMPD1 (primary)	488.3125	114.8	491.3125	114.8	Police Dispatch
SMPD2 (secondary)	482.9875	114.8	485.9875	114.8	Police Secondary
PD Green (secondary)	488.88750	114.8	491.88750	114.8	Police County wide
PD Tac2 (secondary)	488.71250	114.8	491.71250	114.8	Police Central Zone
Sheriff/EMS Trunked Belmont/Foster City/San Mateo					SMCPSC (650) 363-4905
700 MHz system range	770.03125	to	773.48125		Downlink Base to Portable
	795.03125	to	798.48125		Uplink Portable to Base

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