Emergency Responder/ Public Safety Radio Amplification Systems

Updated November 2019

Emergency responders need reliable communications wherever they work, including inside buildings. Section 510 of the Seattle Fire Code requires that certain buildings be provided with radio amplification systems designed to provide radio coverage in areas of the buildings where signal strength does not meet minimum criteria due to building construction features and/or location. These radio coverage amplification systems are also referred to as BDA (bi-directional amplifier) and DAS (distributed antenna systems). In this Client Assistance Memorandum, they are collectively referred to as BDA/DAS systems.

Section 1: Buildings Required to Have an Emergency Responder Radio Coverage System

1. All new high-rise buildings require installation of an emergency responder radio coverage system, unless the responsible party can demonstrate that the building meets minimum coverage standards for the King County Radio System. Where these buildings will pass radio signals through part of the building, emergency responder radio coverage need only be provided for those areas within the building that do not pass radio signals.

2. All new buildings that have total building area of 50,000 square feet or more; or the total basement area is 10,000 square feet or more; or there are floors used for human occupancy more than 30 feet below the finished floor of the lowest level of exit discharge, must have an emergency responder radio coverage system, unless the responsible party can demonstrate that the building meets minimum coverage standards for the King County Radio System. Where these buildings pass radio signals through part of the building, emergency responder radio coverage need only be provided for those areas within the building that do not pass radio signals.

3. New buildings that are smaller than those described in item 2 above are exempt from the requirements of SFC Section 510.

4. Existing high-rise buildings that do not have a wired communication system or approved radio coverage for emergency responders within the building shall be retrofitted with such system or coverage by October 28, 2015; however, a wired fire department communication system in accordance with SFC Section 907.2.13.2 and SFC Section 1103.2 may be provided in lieu of an approved radio coverage system.

For information on how to document that a new or existing building meets radio coverage requirements without BDA/DAS, please use the Radio Coverage Assessment Form stored here: http://www.seattle.gov/Documents/Departments/Fire/Business/Assessment%20of%20Coverage%20Without%20BDA-DAS.pdf

For information on wired fire department communication systems, see SFD Client Assistance Memo #5122 at: www.seattle.gov/fire/firecode.

Section 2: Working with the City of Seattle

During the design and installation of a BDA/DAS system, customers can expect to work with the City of Seattle's Information Technology Department (Seattle IT), the Seattle Department of Construction and Inspections (SDCI) formerly Planning and Development (DPD) , and the Seattle Fire Department (SFD).

Seattle Information Technology Department Requirements

Seattle IT manages Seattle's portion of the public safety radio system, commonly referred to as the King County

Regional 800 MHz System. To ensure that BDA/DAS systems do not cause any harmful interference to the public safety radio system, building owners or their designees will be required to provide specific information about their BDA/DAS system and to coordinate system turn-up with Seattle IT. Building owners or their designees can request authorization using the "Request for Authorization: BDA/DAS Installation for In-Building Public Safety Radio System Coverage" form, which is available on the SFD website: http://www.seattle.gov/Documents/Departments/Fire/Business/BDA-DASInstallationAuthorizationRequest.pdf. Customers should complete items 1-19 on the form. Seattle IT will then complete items 20-24 and provide the information to the customer including the list of frequencies needed for the BDA/DAS system. Note that all BDA/DAS systems in Seattle are required to use a fully channelized Federal Communications Commission (FCC) Class A bi-directional amplifier unless a waiver is provided by Seattle IT and a non-channelized option is approved. Waivers are not routinely granted.

After the BDA/DAS system design firm, installing contractor, or other responsible party has completed installation of the BDA/DAS system, the building owner or designee must notify Seattle IT prior to turning on or activating the BDA/DAS system. Notification should be sent to Seattle IT by email at least five business days prior to the BDA/DAS system being activated for coverage testing. "Request for Authorization: BDA/DAS Installation" forms, notifications and other communication with Seattle IT related to BDA/DAS systems should be directed to BDA@seattle.gov.

Coordination with the Seattle IT Communication Shop is required before a new BDA/DAS system is turned on for the first time. A technician will typically monitor inbound radio system noise and signal levels at the donor radio site during this process. Customers should call the Communications Shop at (206) 386-1213 at least one week prior to initial system activation in order to coordinate this activity.

The Seattle IT Communications Shop can provide a small quantity of radios for post-installation testing. These are loaned out to qualified entities for one to two days of system testing prior to final SFD inspection. Requests to use these radios should be directed to the technician group. Please call (206) 386-1213 to reserve radios for testing.

SFC Section 510.5.3.8 requires that the building owner or designee send all final system documentation, including the system certification letter, to Seattle IT upon successful completion of coverage testing. The report shall verify compliance with SFD Section 510.5.4, and include the emergency responder radio coverage system equipment data sheets, diagram showing device locations and wiring schematic, and a copy of the electrical permit and system certification letter. Documentation should be sent to BDA@seattle.gov.

Seattle Department of Construction and Inspections Electrical Permits

BDA/DAS systems and associated battery or other backup power systems are required to be installed under an SDCI electrical permit.

In order for SDCI to sign off on the electrical permit, a system certification letter as described in SFC Section 510.5.3.8 must be completed and made available at the project site for the SDCI inspector. For information on SDCI electrical permits, visit: www.seattle.gov/dpd/Permits/PermitTypes/Trade_Permits/Electrical_Permits/

Seattle Fire Department Requirements

After acceptance testing is successfully conducted by the building owner and after electrical sign-off by SDCI, SFD inspectors will conduct talk-back testing for selected areas of the building using SFD radios for verification of radio function.

To schedule an inspection, call the SFD Engineering Section at (206) 386-1443 between 8 a.m. and 9 a.m. Inspections need to be scheduled at least five working days in advance, however more notice is generally advisable given the high volume of construction inspection requests. SFD inspectors will also confirm functionality for the Seattle Police Department (SPD) radio channels, so there is no need for the customer to request separate testing from SPD.

Prior to scheduling SFD functional verification testing:

1. The building owner or designee shall submit a "Request for Authorization: BDA/DAS Installation" form to Seattle IT via email at BDA@seattle.gov.
2. Seattle IT shall provide frequency and other information to the building owner or designee. The BDA/DAS installation contractor or other responsible party shall perform and certify results of acceptance

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testing to verify proper performance of the system. System information and acceptance test results as described below, along with the certification letter, should be made available on site for SFD and SDCI and emailed to Seattle IT at BDA@seattle.gov

3. The electrical permit shall be signed off by SDCI.

Customers should ensure the following information is available on site for use by the SFD inspector:

1. A copy of the "Request for Authorization: BDA/DAS Installation" form submitted to Seattle IT.
2. Locations of the BDA/DAS system control equipment, amplifiers, signal boosters, backup battery systems, and any outdoor antennas.
3. Diagram for each floor where coverage is provided, divided into a grid of 20 approximately equal test areas, and include pre-test received signal strengths and frequencies for each test area. Indicate all critical areas where 99% coverage is required.
4. Copies of manufacturer specification sheets for all BDA/DAS systems components, including amplifiers, signal boosters, antennas, coax, couplers, splitters, combiners, filters, or any other passive components proposed. Include data sheets for the backup battery and charging system (if utilized), and include calculations to ensure the backup power requirements are met.
5. A certification letter stating that the BDA/DAS system has been installed and tested per code and that the system is complete and fully functional.

The above information shall be present at the subject property when the SFD inspector arrives and shall be maintained at the subject property for the life of the system.

It is the responsibility of the contractor to perform all acceptance tests and provide the necessary equipment for the tests. Acceptance testing and certification requirements are enumerated in SFC Section 510.5.3.

BDA/DAS system installations, acceptance testing, and annual inspection and testing are required to be performed or supervised by personnel meeting the minimum qualifications outlined in the SFC.

The minimum qualifications of the system designer and lead acceptance test personnel shall include:

1. A valid FCC-issued general radio operators license; and
2. Certification of in-building system training issued by a nationally recognized organization, school or a certificate issued by the manufacturer of the equipment being installed.

BDA/DAS systems are required to be inspected and tested annually or whenever structural changes occur including additions or remodels that could materially change the original field performance tests in accordance with SFC Section 510.6. Technicians for annual testing are required to have specific qualifications (see section 510.6.4 of the Seattle Fire Code) and a Seattle Fire Marshal's Office certification is not required.

The occurrence of any fault in an emergency responder radio coverage system where the system function is decreased shall result in the transmission of a supervisory signal to a supervisory service. Systems that are out-of-service for more than eight hours require notification to the fire code official. To report an out-of-service system, visit: http://www.seattle.gov/Documents/Departments/Fire/Business/ReportofImpairedSystemForm.pdf.

All relevant documentation for the BDA/DAS system, including the acceptance and annual maintenance test reports, must be kept on the building premises and be made available to the SFD upon request. Beginning January 1, 2019, annual test reports are required to be provided to the Seattle Fire Department via our vendor's website www.thecomplianceengine.com, using the Seattle-standard system test report form. Reporting forms are incorporated in the vendor's website and available for review on the Seattle Fire Department website at http://www.seattle.gov/fire/business-services/systems-testing.

Test reports must be uploaded by the testing company within 7 calendar days of the annual test. Reports of red tagged or impaired systems must be submitted by the end of the day of the test. Additional reporting requirements can be found in Administrative Rule 9.02 Inspection, Testing, Maintenance and Reporting Requirements for Fire Protection Systems and Emergency Responder Radio Amplification Systems.

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The 2015 Seattle Fire Code can be viewed at: www.seattle.gov/dpd/codesrules/codes/fire/default.htm

Federal Communications Commission (FCC) Registration Requirement

BDA/DAS system owners are required by the FCC to register their BDA/DAS system (which the FCC identifies as 'signal boosters') with the FCC. This applies to those systems already placed in operation, in permitting or under construction. The FCC Rule requiring registration is CFR 47, FCC Part 90.219(d)(5). Additional information may be found at: http://wireless.fcc.gov/signal-boosters/part-90-boosters/index.html

Section 3: Planning for Technological Development

Federal and regional initiatives could lead to future technological change in the King County public radio system infrastructure. Building owners may wish to evaluate design options such that newly installed radio enhancement systems are forward-compatible and/or capable of being modified to accommodate technological development in the King County radio system, in order to allow maintenance of the minimum system design criteria. Ref: 2010 NFPA 72 – A.24.5.2.4.2.

Nationwide "Rebanding" Effort
Seattle Region timing: Q1 2016 Followed by Retuning

The federal government initiated a "rebanding" effort that reassigned spectrum to eliminate current interference issues between cellular carriers and public safety agencies in the 800 MHz band. This effort modified the frequencies assigned to local jurisdictions for their public safety radio systems. In Seattle the transition occurred in early 2016.

BDA/DAS installed prior to the transition in February 2016 require retuning in order to continue meeting requirements for public safety communications in structures. If your BDA/DAS has not been retuned, you must contact your radio system service technician to schedule the required maintenance. This service may be combined with your annual required maintenance to save money on service calls.

Replacement of Aging Analog Infrastructure with P25 Digital Infrastructure

Estimated timing: 2019-2022

The public safety radio system in King County will be replaced by a new digital system that will extend through the Puget Sound region. The new Puget Sound Emergency Radio Network (PSERN) is being funded by a levy approved by voters in 2015. The new system is required because the current system is reaching the end of its service life.

Channelized BDA/DAS systems installed in buildings in King County will require retuning to continue to interoperate with the new radio system.

Development of new nationwide wireless network for first responders
Estimated timing: 2018-2028

In 2012, Congress passed legislation to start developing a nationwide, interoperable broadband cellular network for public safety. Congress set aside spectrum in the 700 MHz band for this broadband cellular network. The initiative is referred to nationally as FirstNet and in Washington State is called WashingtonOneNet. If the network is built, first responder communications could evolve significantly over the next 10 to 15 years.

The exact timing and implications for the PSERN system have not yet been defined, however at a minimum BDA/DAS systems will need to also transmit on the 700 MHz spectrum. For information, visit: http://firstnet.gov/.

Section 4: Cable Installation

SFD, along with many cities in King County, has included clarifications in a new Section 510.5.6 of the upcoming 2018 Fire Code regarding cable installation. This new section is based on NFPA 1221, 2019 Edition, Section 9.6 for cable installation. NFPA 1221 has eliminated the need for pathway survivability for antenna cables in these systems. The new requirements are: (1) The backbone, antenna distribution, radiating, or any fiber-optic cables shall be rated as plenum cables. (2) The backbone cables shall be connected to the antenna distribution, radiating, or copper cables using hybrid coupler devices of a value determined by the overall design. (3)Backbone cables shall be routed through an enclosure that matches the building's fire-resistance rating for shafts or interior exit stairways, and passage of the antenna distribution cable in and out of the enclosure shall be protected as a penetration per the International Building Code. Although the effective date of the 2018 Seattle Fire Code will be July 2020, the provisions for cable installation summarized in this Section 4 are in effect now and may be followed for new systems.

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