



# FIRE CONSTRUCTION PERMIT SUBMITTAL CHECKLIST

SERVING THE CITIES OF LAKE STEVENS, MILL CREEK, MONROE AND SULTAN

## EMERGENCY RESPONDER RADIO SYSTEM

### PROJECT INFORMATION

Site address:	Associated Permits:
Project Name / Tenant:	Property Owner:

### **Electronic file standards**

File naming standard: Electronic plans and documents shall be named as specified in bold type under "permitting requirements". For example, the seating plan must be named "Seating Plan".

Acceptable file types: Plans, calculations, specifications and supporting documents shall be uploaded as a PDF file.

Document Orientation: All plans must be uploaded in "Landscape" format in the horizontal position. All other documents can be in "Portrait" format.

### CODE EDITIONS

- IFC & IBC 2018 edition, Washington State IFC & IBC amended code and as applicable - Lake Stevens Municipal Code 14.84, Monroe Municipal code 15.04.110, Mill Creek Municipal Code 15.04.120, Sultan Municipal Code 15.05.

### PERMITTING REQUIREMENTS

A Fire Construction Permit is required to install or modify an **Emergency responder radio system** required by Section 510 of the 2018 Washington State Fire Code and local code amendments. **The following information is required at time of application for the Fire Construction Permit.**

- Completed **emergency responder radio submittal checklist**. Check all checkboxes that are applicable to your project.
- **Site plan**
- **SNO911 Letter of Provisional Authorization available at [www.sno911.org](http://www.sno911.org)**
- Manufacturer's **cut sheets** for a National Electrical Manufacturer's Association (NEMA) 4 cabinet, battery backup (if using battery back up as standby power), and other equipment being installed.
- Proof of a valid FCC-issued general radio operator's license
- A certification of in-building system training issued by a nationally recognized organization/school or by the manufacturer of the equipment being installed. (2018 WSFC 510.5.2)

### **PLANS**

The following is a list of information required on all plan submittals for review of an "Emergency responders radio coverage system" permit application. The plan shall be drawn to 1/8"=1'-0" minimum scale. The applicant is required to submit all of this information so an accurate and timely review may be done:

### **SPECIFICATION AND REQUIREMENTS**

## **Snohomish Regional Fire and Rescue**

### **Specification and Requirements for Emergency Responder Radio Coverage in Buildings required per WSFC 510.4.2.2**

Snohomish Regional Fire and Rescue has developed this specification in conjunction with the requirements of the WAC 51-54A-003, Washington State Fire Code Section 510 and Chapter 11, 2016 NFPA 72, 2016 NFPA 1221 and FCC 47 CFR Part 90.219.

The installation and operation of radio based emergency responder communication systems must comply with this document.

The minimum qualifications of the system designer and lead installation personnel shall include both of the following:

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

**NOTE** - These qualifications shall not be required where demonstration of adequate skills and experience satisfactory to the fire code official is provided.

Property owners who maintain compliance with this specification are granted permission to operate the signal boosters on frequencies licensed by the Federal Communications Commission to Snohomish Regional Fire and Rescue and the Cities of Monroe, Mill Creek, Lake Stevens and Sultan Police Departments.

Failure to maintain compliance with this specification will result in the automatic withdrawal of said permissions.

**Prior to the construction of an Emergency Responder Communication System, visit [www.sno911.org](http://www.sno911.org) to obtain a "Letter of Provisional Authorization" prior to submitting a permit to the appropriate cities permit department.**

The permit application shall be submitted with all information required for review of an **emergency responder radio** system. The plan shall be drawn to 1/8"= 1'-0" minimum scale. The applicant is required to submit all of the following information so an accurate and timely review may be done:

A Survey signal report, preferably utilizing IB Wave modeling software.

Plans containing the riser diagram, cable paths, antenna, battery backup (if used) and equipment locations.

Equipment technical specifications.

Product certifications (FCC ID, UL Listing and File Number).

Battery Calculations.

Plans shall be signed by a person holding a valid FCC GROL License.

Contact information and license number of the electrical contractor.

Indicate if DAS is passive, active or a hybrid system.

# **Fire Fighter Communication System Specification**

## **1. General**

**Existing buildings** other than Group R-3, that do not have approved radio coverage for emergency responders in the building based on existing coverage levels of the public safety communications systems, shall be equipped with such coverage according to one of the following:

1. Where an existing wired communication system cannot be repaired or is being replaced, or where not approved in accordance with section 501.1, Exception 1.
2. Within a time frame established by the adopting authority.

EXCEPTION: Where it is determined by the fire code official that the radio coverage system is not needed.

**All New buildings** shall have approved radio coverage for Fire Fighters within the building based upon the existing signal levels of public safety communication systems utilized by the jurisdiction, measured at the exterior of the building. This section shall not require improvement of the existing public safety communication systems.

### ***Exceptions:***

- A. Where approved by the building official and the fire code official, a wired communications system in accordance with Section 907.2.12.2 shall be permitted to be installed or maintained instead of an approved radio coverage system.
- B. Where it is determined by the fire code official that the radio coverage system is not needed.
- C. In facilities where emergency responder radio coverage is required and such systems, components or equipment required could have a negative impact on the

normal operations of that facility, the fire code official shall have the authority to accept an automatically activated emergency responder radio

D. Buildings that have sufficient levels of radio coverage to satisfy the requirements of this specification may request a waiver with the following constraints:

1. A radio survey as described in this specification must be submitted and signed by a qualified FCC GROL licensed technician. (*Building must be substantially completed with all walls, windows, roof, interior partitions completed prior to the survey*)
2. The survey shall be submitted with the waiver request.
3. If approved, the waiver will only be valid for a 5-year period at which time a new radio survey must be submitted.
4. If at any time it is determined that radio coverage does not meet this specification, the waiver will be withdrawn and the property owner is then required to provide radio coverage as required by this specification.

E. One and 2 family dwellings

1.1 Buildings and structures that cannot support the required level of radio coverage shall be equipped with a distributed antenna system and FCC-certified, UL 2524 listed signal boosters. 2018 WSFC §510.4

2. **Signal Strength:**

2.1 The in-building radio system is an integral component of the life safety equipment of a building or structure. The primary function is to provide reliable firefighter communications at the required signal strength within the specified areas.

2.2 Critical Areas such as emergency command center, fire pump room, exit stairs, exit passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations and similar critical areas shall be provided with 99% floor area radio coverage. 2016 NFPA 1221 §9.6.7.3

2.3 General building areas shall be provided with 95% radio coverage. 2018 WSFC §510.4.1

2.4 In-building radio systems required by this ordinance must provide the following signal strengths:

**Downlink** - Minimum signal strength of -95 dBm throughout the coverage area and provide not less than a Delivered Audio Quality (DAQ) of 3.0 or an equivalent Signal-to-Interference-Plus-Noise (SINR) applicable to the technology for either analog or digital signals. 2018 WSFC §510.4.1.1

**Uplink** – Minimum outbound signal strength shall be sufficient to provide usable voice communications throughout the coverage area and provide not less than a DAQ of 3.0 or an equivalent SINR applicable to the technology for either analog or digital signals. 2018 WSFC §510.4.1.2

**3. Radio Signal Strength Survey: 2018 WSFC §510.5.3**

- 3.1** The building owner shall have the in-building radio system tested to ensure that two-way radio coverage on each floor of the building meets or exceeds the required levels. Building must be completed with all walls, windows, roof, interior partitions completed prior to the survey.
- 3.2** Each floor of the building shall be divided into a grid of a minimum of twenty (20) approximately equal test areas. Each critical area shall contain at least one test reading. The failure of more than one (1) test area shall result in failure of the test. In the event that two of the test areas fail to test, the floor shall be divided into 40 equal test areas. Failure of not more than two nonadjacent test areas shall not result in failure of the test. If the system fails the 40 –area test, the system shall be altered to meet the 95% coverage requirement. A 100% of all critical areas must pass. A spot located approximately in the center of a grid area will be selected for the test. Once the spot has been selected, prospecting for a better spot within the grid area will not be permitted. Field strength testing instruments are to be performed using a calibrated (within the last year) portable radio of the latest brand and model used by the agency talking through the agencies communications system or equipment approved by the fire code official.
- 3.3** Rebroadcasting the Snohomish County 911 Public Safety frequencies shall be accomplished utilizing class “A” bi-directional amplifiers. **CLASS “B” BDA/DAS SYSTEMS ARE NOT GRANTED AUTHORIZATION TO RETRANSMIT ON THE SNOHMISH COUNTY 911 RADIO SYSTEM.**
- 3.4** RF plots indicating the enhanced coverage shall be submitted at the time of acceptance testing.
- 3.5** The Snohomish Regional Fire and Rescue Fire Marshal is to be notified prior to any testing.
- 3.6** Unattended operation of the in-building radio system is not permitted until the completion of acceptance testing.

#### **4. Technical Specifications and Component Installation:**

**The installation of the public safety radio coverage system shall be in accordance with 2016 NFPA 1221 and Sections 510.5.1 through 501.5.5 of the 2018 WSFC and 2016 NFPA 72.**

- 4.1** Assembly and installation of all components of the Fire Fighter Communication System shall comply with all applicable sections of the National Electrical Code.
- 4.2** Survivability from attack by fire shall be a Level 1, 2 or 3 and meet 2016 NFPA 72 §24.3.13.1 and §12.4, and 2016 NFPA 1221 §9.6.2.1.1 (plenum rated cables) requirements.
- 4.2.1** The feeder and riser coaxial cables shall be rated as specified in 2016 NFPA 1221 § 9.6.2 – 9.6.3.
- 4.3** The system must comply with all applicable sections of FCC rules. Signal booster shall have FCC certification prior to installation.
- 4.4** For systems with DAS equipment located in a room other than the Fire Control Room, a Remote Annunciator / Dedicated Annunciator and Monitoring Panel shall be installed in the Fire Control Room.
- 4.5** The signal booster and all other active components shall be listed for the intended purpose. The acceptable listing is UL 2524 – UL listing for In-building 2-Way Emergency Radio Communication Enhancement Systems. 2018 WSFC §510.4
- 4.6** External filters or attachments or aftermarket modifications of the original equipment shall not be permitted.
- 4.7** All signal booster components shall be contained in a NEMA type 4, IP65 approved waterproof cabinet. All enclosures shall be painted red with a locking mechanism. 2018 WSFC §510.4.2.4
- 4.8** The signal booster system shall include built-in automatic alarming of malfunctions of the signal booster and battery system as per 2016 NFPA 1221 Section 9.6.13.1 and 2016 NFPA 72, Chapter 10. Aftermarket equipment add-ons and modifications to comply with this specification will not be accepted.
- 4.9** Maximum Propagation delay of the signal booster system shall be 14us (microseconds) or as otherwise approved by the AHJ. 2018 WSFC §510.4.2.2
- 4.10** Antenna isolation shall be maintained between the donor antenna and all inside antennas (D.A.S.) to a minimum of 20dB under all operating conditions. 2016 NFPA 1221 § 9.6.9

**4.11** Frequencies:

**Downlink frequencies for Fire** – Contact [www.sno911.org](http://www.sno911.org)

**Downlink frequencies for Police** – Contact [www.sno911.org](http://www.sno911.org)

**Uplink frequencies for Fire** – Contact [www.sno911.org](http://www.sno911.org)

**Uplink frequencies for Police** – Contact [www.sno911.org](http://www.sno911.org)

**4.12** Radio Repeater Locations:

**Main Repeater Site:** Contact [www.sno911.org](http://www.sno911.org)

**Backup Repeater Site Location:** Contact [www.sno911.org](http://www.sno911.org)

**4.13** To reduce the possibility of unwanted interference affecting the operation of the system, all UHF and VHF signal boosters shall be band or channel selective type. Wide-band signal boosters shall not be accepted.

**4.14** Active RF-emitting devices used in emergency responder radio coverage systems shall have oscillation detection and control circuitry to protect the public safety radio system in case of signal booster malfunction.

**4.15** To prevent radio interference and degradation of public safety radio systems, signal boosters shall not emit any measurable uplink noise while idle. The signal booster shall contain an automatic uplink noise suppression function.

**4.16** The cabinet shall be painted red and labeled (in bright yellow):

***PUBLIC SAFETY COMMUNICATION SYSTEM RADIO***

*Serviced by: vendor name and telephone number*

**4.17** To maintain proper alignment with the system designed donor site, donor antennas shall be permanently affixed to the highest point on the building or where approved by the fire code official. A clearly visible sign stating “**Movement or repositioning of this antenna is prohibited without approval of the fire code official**”. The antenna installation shall be in accordance with the applicable requirements of the *International Building Code* for weather protection of the building envelope. 2018 WSFC §510.5.5

Main office: 360-805-0338, Inspection request 360-805-0338 option 2,  
Email: [FireMarshal@SRFR.org](mailto:FireMarshal@SRFR.org) , Headquarters: 163 Village Court, Monroe, WA 98272



- 4.18** Buildings equipped with emergency responder radio systems shall have signage at fire alarm panel and at main entrance(s) that states, **“This building is equipped with an emergency responder radio coverage system.”**
- 4.19** Doors into rooms or areas containing emergency responder radio systems shall be provided with approved signs stating **“Emergency Responder Radio System”**
- 4.20** Signage required by 4.16 thru 4.18 shall have 1" white letters on a red background that is permanent in nature. Signs are subject to approval.

**5. System Monitoring:**

- 5.1** The In-Building Radio system shall include automatic supervisory and trouble signals for malfunctions of the signal booster(s) and power supplies that are monitored and annunciated by the fire alarm system. Building owner shall immediately report all trouble and supervisory alarms to the signal booster provider.
- 5.2** The integrity of the circuit monitoring the signal boosters and power supplies shall comply with 2016 NFPA 72 Chapter 10 and 2016 NFPA 1221 §9.6.12.3.
- 5.4** A fire alarm remote annunciator shall be provided within the emergency command center to annunciate the status of all signal booster locations. The remote annunciator shall provide visual and labeled indication of the following supervisory signals for each signal booster: 2018 WSFC §510.4.2.5
1. Loss of normal AC power
  2. Failure of battery charger
  3. Donor antenna malfunction
  4. Active RF emitting device failure
  5. Low battery capacity at 70% reduction of operating capacity
  6. Failure of critical system components
  7. Supervision of communications link between the fire alarm system and the emergency responder radio enhancement system.
- 5.5** A sign will be located at the dedicated monitoring panel with the name and telephone number of the service provider.

**6. Distributed Antenna System:**

- 6.1** The distributed antenna system may utilize a radiating cable, conventional cable, fixed antennas or a Combination of all three.
- 6.2** The distributed antenna system shall not be shared with commercial cellular systems OR with other commercial in-building radio systems.

**7. Power Supply:**

- 7.1** At least 2 independent and reliable power supplies shall be provided.
- 7.2** The primary power source shall be supplied from a dedicated twenty (20) ampere branch circuit and comply with 2016 NFPA 72 Section 10.6.3 and 2016 NFPA 1221 Section 9.6.12.
- 7.3** The emergency responder radio coverage system shall be equipped with a secondary source of power capable of operating the system at 100% capacity for not less than 12 hours. The secondary source of power shall be one of the following:
- A. 2-hour standby batteries and connected to a facility generator power system meeting the requirements of IFC §1203. 2018 WSFC §510.4.2.3
  - B. A battery system with a dedicated battery charger powered by a separate, dedicated and independent electrical circuit of sufficient size. The secondary power supply shall supply power automatically when the primary power source is lost. The secondary source of power shall be capable of operating the emergency responder radio coverage system at 100% system capacity for a period of at least 12 hours. The battery system shall automatically charge in the presence of external power input. Battery systems used for the emergency power source shall be fully enclosed in a NEMA 3R or higher, IP65 waterproof cabinet or equivalent approved enclosure. 2016 NFPA 1221 §9.6.11.2.1, 9.6.11.2.2, 2018 WSFC §510.4.2.3, 510.4.2.4

**8. Acceptance Testing:**

- 8.0** A second radio strength survey shall be conducted as outlined in section 3 of this document to verify that two-way coverage on each floor of the building is not less than 95%. 2018 WSFC §510.5.3 ***This test shall be conducted on-site utilizing signal strength measuring equipment.***
- 8.1** Delivered audio quality (DAQ) testing will be conducted using a calibrated portable radio of the latest brand and model used by the agencies talking through the agency's radio communications system to ensure that two-way radio coverage, on each floor of the building, meets the minimum coverage requirements of Section 2. 2018 WSFC 510.5.3 (2)
- 8.2** The signal booster vendor shall certify that the in-building radio system was installed and tested in accordance with the requirements of the current AHJ In-Building Radio Specification.

- 8.3** A signal booster service company shall certify that a maintenance contract is in effect that provides 24-hour by 7-day response within 2 hours of notification of a problem. This contract must be for a period of at least 1 year.
- 8.4** RF plotting (grid tests) results, gain values of all amplifiers, as built drawings which include BDA Manufacturer, Model #, Serial #, FCC Certification #, and a link budget must be submitted.

**9. Annual Test:**

- 9.1** The owner shall check all active components of the in-building radio system, including but not limited to amplifier, power supplies, and back-up batteries, a minimum of once every twelve (12) months or where structural changes occur including additions or remodels. 2018 WSFC §510.6

**Testing shall consist of the following:**

- 1.** In building coverage test as described in Section 3 above or as required by the fire code official.
- 2.** Signal boosters shall be tested to ensure that the gain is the same as it was upon initial installation and acceptance. The original gain shall be noted and any change in gain shall be documented.
- 3.** Back-up batteries and power supplies shall be tested under load for 1 hour to verify that they will operate during an actual power outage. If within the 1-hour test period the battery exhibits symptoms of failure, the test shall be extended for additional 1-hour periods until the integrity of the battery can be determined.
- 4.** Active components shall be checked to determine that they are operating within the manufacturer's specifications for their intended purpose.
- 5.** Documentation of the test verifying compliance with 2018 WSFC §510.5.3 shall be maintained on site and a copy forwarded by the signal booster service company to the Snohomish Regional Fire and Rescue upon completion of the test.

**10. Five Year Test:**

- 10.1** In addition to the annual test, a radio coverage test shall be conducted a minimum of once every five (5) years to ensure that the radio system continues to meet the requirements of this ordinance.

The procedure set forth in Section 3 shall apply to such tests.

**11. Signal Booster Service Provider Responsibilities:**

- 11.1 All tests shall be conducted, documented, and signed by a person in possession of FCC General Radio Telephone Operators License.
- 11.2 All testing personnel shall be certified and authorized by the BDA manufacturer in the installation and operation of their equipment.
- 11.3 Must submit reports of annual test and 5-year tests.
- 11.4 FD shall be notified in writing at least thirty (30) days prior to cancellation of a maintenance contract.
- 11.5 FD shall be notified in writing upon the procurement of contractual agreements relating to in-building radios covered by this specification.

**12. Modifications:**

- 12.1 Any modification of an existing BDA System shall require an Emergency responder radio coverage system modification permit to be submitted to the AHJ.
- 12.2 After completion of any modification to a BDA, a full acceptance test as required in this specification will be conducted and submitted for review prior to a final inspection request being scheduled by the AHJ.

**13. Fire Department Inspections:**

- 13.1 Fire Department Radio personnel, after providing reasonable notice to the owner or their representative, shall have the right to enter onto the property to conduct field testing to be certain that the required level of radio coverage is present. 2018 WSFC §510.6.4

**14. Property Owner Responsibilities:**

- 14.1 Upgrades to system as directed by the Snohomish Regional Fire and Rescue.
- 14.2 Maintenance contract maintained with a qualified radio service contractor, who will provide a 24 hour by 7-day emergency response within two (2) hours after notification.

## FINAL INSPECTION CHECKLIST

- Confirmation of NEMA 4 on BDA, NEMA 3R or higher, IP65 waterproof cabinet or equivalent on battery system
- Confirmation of backup power
- A building post installation survey signal report, utilizing a spectrum analyzer in accordance with WSFC 510.5.3.
- Proper signage near fire alarm panel and on doorway to equipment
- Site plan posted near fire alarm control panel
- Trouble/supervisory signals confirmed with central station
- The signal booster electrical plug is secured in a way that it does not accidentally fall out of the electrical outlet –IF NOT HARDWIRED
- Verify that maintenance contract is in effect that provides 24-hour by 7-day response within 2 hours of notification of a problem. This contract must be for a period of at least 1 year.