

Andover Fire Rescue
32 North Main Street, Andover, Ma 01810
978-475-1281

**Specification and Requirements for Emergency Responder
Radio Coverage in Buildings**

Andover Fire Rescue has developed this specification in conjunction with the requirements of Chapter 915 of the Massachusetts State Building Code 780 CMR 8th edition as updated in April 2014.

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

Property owners who maintain compliance with this specification are granted permission to operate the signal boosters on frequencies licensed to the Town of Andover Fire and Police Departments by the Federal Communications Commission.

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

The voluntary adoption of this specification must comply with all the requirements contained herein.

Prior to the construction of an Emergency Responder Communication System, a permit must be applied for and submitted to:

Fire Prevention Office
Andover Fire Rescue
36 Bartlet Street
Andover, Massachusetts 01810
978-623-6880

Effective Date: January 1, 2017

Fire Fighter Communication System Specification

1. General

All new buildings, as well as all existing buildings undergoing substantial renovation, a change of occupancy, or the installation of a new fire alarm system shall have approved radio coverage for Fire Fighters within the building based upon the existing signal levels of Andover Fire Rescue communication systems at the exterior of the building. This section shall not require improvement of the existing public safety communication systems.

Exceptions:

A. 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 radio vendor. (*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- 4.** If at any time it is determined that radio coverage does not meet this specification, the waiver will be withdrawn and the property owner is then required to provide radio coverage as required by this specification.

B. One and Two 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 signal boosters, or systems otherwise approved in order to achieve the required adequate radio coverage.

1.2 Existing buildings undergoing substantial renovation, a change of occupancy, or the installation of a new fire alarm system are required to provide radio coverage for fire fighters.

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 100% floor area radio coverage.

- 2.3 General building areas shall be provided with 95% radio coverage.
- 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.
 - Uplink - Minimum signal strength of -95 dBm received at the FD Radio System.

3. **Radio Survey:**

- 3.1 The building owner shall have the in-building radio system tested to insure that two-way radio coverage on each floor of the building meets or exceeds the required levels.
- 3.2 Each floor of the building shall be divided into a grid of approximately twenty (20) equal areas. A maximum of one (1) area will be allowed to fail the test per floor. 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 recently calibrated (1 year) and of the frequency selective type incorporating a flexible antenna similar to the ones used on the hand held transceivers.
- 3.3 RF plots indicating the enhanced coverage shall be submitted at the time of acceptance testing.
- 3.4 The FD is to be notified prior to any testing.
- 3.5 Unattended operation of the in-building radio system is not permitted until the completion of acceptance testing.

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

- 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 meet NFPA 72, National Fire Alarm Code, 2010 edition.
- 4.3 The system must comply with all applicable sections of FCC rules. Signal booster shall have FCC certification prior to installation.
- 4.4 External filters or attachments or aftermarket modifications of the original equipment shall not be permitted.
- 4.5 All signal booster components shall be contained in a NEMA4-type waterproof cabinet. All enclosures shall be painted red with a locking mechanism

- 4.6 The signal booster system shall include built-in automatic alarming of malfunctions of the signal booster and battery system as per NFPA 72, 2010 Edition, 24.5.2.6.1-24.5.2.6.2. Aftermarket equipment add-ons and modifications to comply with this specification will not be accepted.
- 4.7 Maximum Propagation delay of the signal booster system is 14us (microseconds)
- 4.8 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.
- 4.9 **Frequencies:**
- Downlink frequency for **ANDOVER Fire – 483.58750 MHz +/- 75 KHz**
Downlink frequency for **ANDOVER Police – 482.61250 MHz +/- 75 KHz**
- Uplink frequency for **ANDOVER Fire – 486.58750 MHz +/- 75 KHz**
Uplink frequency for **ANDOVER Police – 485.61250 +/- 75 KHz**
- 4.10 To reduce the possibility of unwanted interference affecting the operation of the system, signal boosters shall be band or channel selective type. Wide-band signal boosters shall not be accepted.
- 4.11 Signal Boosters shall have oscillation prevention circuitry to protect the public safety radio system in case of signal booster malfunction.
- 4.12 The cabinet shall be labeled (in bright yellow):

ANDOVER FIRE RESCUE RADIO

Serviced by: vendor name and telephone number

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 annunciated by the fire alarm system. Trouble signals must be immediately reported to the radio service provider.
- 5.2 The integrity of the circuit monitoring the signal boosters and power supplies shall comply with NFPA 72, National Fire Alarm Code, 2010 edition.
- 5.3 System and Signal booster supervisory signals shall include Antenna Malfunction and Signal booster failure
- 5.4 Power supply supervisory signals shall include loss of normal AC power, Failure of battery charger, and low battery capacity (alarming at 70% of battery capacity and 30% of the charge remaining).

5.5 A dedicated monitoring panel* shall be provided within the emergency command center to annunciate the status of all signal booster locations. The monitoring panel shall provide visual and labeled indication of the following for each signal booster:

- (1) Normal AC power
- (2) Signal booster trouble
- (3) Loss of normal AC power
- (4) Failure of battery charger
- (5) Low battery capacity

5.6 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 A secondary user of the distributed antenna system (DAS) must comply with all requirements of Andover Fire Rescue so as not to degrade the operational standards of the system. Notice will be made to Andover Fire Rescue as part of the permit application if the DAS will have non-fire department frequencies included.

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 NFPA 72, National Fire Alarm Code, 2010 edition.

7.3 The emergency responder radio coverage system shall be equipped with a secondary source of power. The secondary source of power shall be 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 for a period of at least 24 hours. The battery system shall automatically charge in the presence of external power input. Battery charger and all other electronic components must be fully enclosed in a non-vented NEMA4 enclosure. Batteries shall be enclosed in a separate, vented NEMA rated enclosure.

8. **Acceptance Testing:**

- 8.1 Delivered audio quality (DAQ) testing will be conducted by FD radio personnel to ensure that two-way radio coverage, on each floor of the building, meets the minimum coverage requirements of Section 2.
- 8.2 The radio service vendor shall certify that the in-building radio system was installed and tested in accordance with the requirements of the current FD In-Building Radio Specification.
- 8.3 A radio 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.
- 9.2 Amplifiers 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.
- 9.3 Back-up batteries and power supplies shall be tested under load to verify that they will operate during an actual power outage.
- 9.4 Active components shall be checked to determine that they are operating within the manufacturer's specifications for their intended purpose.
- 9.5 Documentation of the test shall be maintained on site and a copy forwarded by the radio service company to Andover Fire 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. Radio Service Provider:

- 11.1 All tests shall be conducted, documented, and signed by a person in possession of FCC General 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 will require a written request to FD.
- 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.

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.

14. Property Owner Responsibilities:

- 14.1 Upgrades to system as directed by Andover Fire 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