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

The Attleboro Fire Department has developed this specification in conjunction with requirements of Massachusetts Building Code IBC 2015, 780 CMR 916.

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

Property owners who maintain compliance with this specifications are granted permission to operate the signal boosters on frequencies licensed to the City of Attleboro Fire And Police Departments by the Federal Communications Commission.

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

Prior to the Construction of an Emergency Responder Communications system, a permit must be applied for and submitted in person at:

 Attleboro Fire Department

 Fire Prevention Office

 1476 West St. Attleboro, MA 02703

The Following Document are required for permit application:

* Planes containing the riser diagram, cable paths, antenna and equipment location.
* Equipment technical specification
* Product certification (FCC, 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 installing electrical contractor.

Erik Johnson

Superintendent of Fire Alarm

Attleboro Fire Department

Emergency Responder Radio Communications Enhancement System

1. General:

All new buildings, as well as all existing building undergoing substantial renovation, a change in occupancy, or the installation of a new fire alarm system shall have approved radio coverage for all emergency responders with in the building based upon the existing signal levels of the Attleboro Fire and Police Department communications system at the exterior of the building. This section shall not require improvements of existing public safety communications system.

*Exception:*

1. Buildings that have sufficient levels of radio coverage to satisfy the requirements of this specification may request a waiver with the following constraints:
2. A radio survey as described in this specification must be submitted and signed by a qualified FCC GROL (general radio operator license) license technician. (Building must be substantially completed with all walls , windows, roof, interior partitions completed prior to the survey)
3. The survey shall be submitted with the waiver request.
4. If approved, the waiver will only be valid for a 5-period at which time a new radio survey must be submitted.
5. If at any time it is determined that the 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 Buildings and structures that cannot support the required level of radio coverage shall be equipped with a distribution antenna

 1.1 Building and structures that cannot support the required level of radio coverage shall be equipped with at distributed antenna system and FCC-certified, UL 2524 listed signal booster, or system otherwise approved to achieve the require adequate levels of radio coverage.

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

1. Submittal, Approval and Permits:
	1. Prior to the installation of a signal booster permit from the Attleboro Fire Department will be issued by the Fire Alarm Superintendent to install booster on Attleboro Fire Department required frequencies
	2. Prior to the installation of a signal booster an electrical permit will also be required for the installation though the Attleboro Building Department.
	3. Permit application/Submittal shall include:
2. Detail plans containing riser diagram, cable paths, antenna location and equipment location.
3. Equipment technical specifications
4. Product certification (FCC, UL Listing and Fill Number)
5. Battery Calculation
6. Plans shall be signed by a person holding a valid FCC GROL License.
7. Contact Information and License number of the installation electrical contractor.
	1. Upon approval, a permit for the installation of a signal booster will be issued. Any field changes that occur during construction shall be incorporated into new as-built plans, including any manufacture’s data sheets for any equipment changes not submitted in the original submittal. As-built plans, if required due to system changes, shall be submitted for approval.
	2. The Attleboro Fire Department assumes the responsibility of registering the approved signal booster with FCC.
	3. Property Owner who maintains compliance with this document are granted permission to operate a signal booster on frequencies licensed to the Attleboro Fire and Police Department by the Federal Communications Commission. Failure to maintain compliance with this specification will result in the automatic withdrawal of said permission.
8. Signal Strength:
	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 emergency responder communications at the required signal strength with in the specified area.
	2. Critical Areas such as emergency command center, fire pump room, exit stairs, exit passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve location and similar critical areas shall be provided with 100% are radio coverage.
	3. General building areas shall be provided with 95% radio coverage.
	4. In-building radio systems required by this ordinance must provide the following signal strengths:

 **Downlink** – Minimum signal strength of -95dBm throughout the coverage area.

 **Uplink** – Minimum signal strength of -95dBm received at the public safety Radio System.

1. Signal Strength Survey:

* 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 complete prior to survey.
	2. Each floor of the building shall be divided into a grid of a minimum of twenty (20) equal areas of no larger than, 2,500 sq ft each. Each critical area shall contain at least one test reading. Maximum of one test point of general area will be allowed to fail the test per floor. 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 recently calibrated (1 year) and of the frequency selective type I incorporating a flexible antenna similar to the one used on the hand-held transceiver.
	3. RF plots indicating the enhanced coverage shall be submitted at the time of acceptance.
	4. The Superintendent of Fire Alarm will be notified minimum of 24 hours prior to any testing.
	5. Unattended operation of the in-building radio system is not permitted until the completion of the acceptance test.
1. Technical Specifications and Component Installation:
	1. Assembly and installation of all components of the emergency communications system shall comply with all applicable sections of the National Electrical Code 2017 edition.
	2. Survivability from attack by fire shall meet NFPA 72, National Fire Alarm Code, 2013 edition and NFPA 1221 2019 edition.
	3. The system must comply with all applicable sections of FCC rules. Signal boosters shall have FCC certification prior to installation.
	4. The signal booster and all other active components shall be listed for intended purpose. The acceptable standard is UL 252- Standard for in-building 2-way emergency radio communications enhancement system.
	5. External filters or attachments or aftermarket modifications of the original equipment shall not be permitted.
	6. All signal booster components shall be contained in a type-4 approved waterproof cabinet. All enclosures shall be painted red with locking mechanism.
	7. The signal booster system shall include built-in automatic alarming of malfunction of the signal booster and battery system as per NFPA 1221 2019 Edition Section 9.6 and NFPA 72 2013 edition, 24.5.2.6.1-24.5.2.6.2. Aftermarket equipment add-ons and modification to comply with this specification will not be accepted.
	8. Maximum Propagation delay of the signal booster system shall be 14us (microseconds) or as otherwise approved by the AHJ.
	9. Antenna isolation shall be maintained between the donor antenna and all inside antennas (DAS) to a minimum of 20dB under all operating conditions.
	10. Frequencies:

 Downlink frequency for Attleboro Fire Ch1 471.6000

 Downlink frequency for Attleboro Police Ch1 460.1500

 Downlink frequency for Attleboro Police Ch2 460.4625

 Uplink frequency for Attleboro Fire Ch1 474.6000

 Uplink frequency for Attleboro Police Ch1 465.1500

 Uplink frequency for Attleboro Police Ch2 465.4625

* 1. Radio Repeater location:

 O’Donnell Drive Attleboro MA 02703

 Lat: 41.92972 Log:-71.31250

* 1. 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.
	2. Signal boosters shall have oscillation prevention circuitry to protect the public safety radio system, signal boosters shall not emit any measurable uplink noise while idle. The signal booster shall contain an automatic uplink noise suppression function.
	3. The cabinet shall be painted red an labeled ( in bright yellow):

 Example: Attleboro Fire Dept. Radio BDA

 Serviced By: vendor name and telephone number

1. System Monitoring:
	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. Building owner shall immediately report all trouble to the signal booster provider.
	2. The integrity of the circuit monitoring the signal booster and power supplies shall comply with NFPA 72, National Fire Alarm Code, 2013 edition and NFPA 1221 2019 edition.
	3. System and Signal booster supervisory signal shall include Antenna Malfunction and Signal booster failure.
	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 charge remaining).
	5. A dedicated supervised monitoring panel shall be provided within emergency command center or alternate location approved by AHJ 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:
2. Normal AC Power
3. Signal booster trouble
4. Antenna Failure
5. Loss of normal AC Power
6. Failure of battery charger
7. Low battery capacity
	1. A sign will be located at the dedicated monitoring panel with the name and telephone number of the service provider.
	2. All Fire Alarm system addressable control modules that monitor the Emergency Responder Radio Communication Enhancement System will trip one zone in radio master box if building is equipped.
8. Distributed Antenna System:
	1. The distributed antenna system may utilize a radiating cable, convention cable, fixed antenna or a combination of all three that are listed for intended purpose.
	2. The distributed antenna system shall not be shared with commercial cellular systems. Sharing of the passive DAS with other commercial in-building radio system is allowed only if approved by the AHJ. Intermodulation study and the list of commercial frequencies study and the list of commercial frequencies shall be submitted with the permit application.
	3. A secondary user of the distributed antenna system (DAS) must comply with all requirements of the Attleboro Fire Department as part of the permit application if the DAS will have a non-emergency responder’s frequencies included.

1. Power Supply:
	1. At least 2 independent and reliable power supplies shall be provided.
	2. The primary power source shall be supplied from a dedicated twenty (20) ampere branch circuit with breaker lock and comply with NFPA 72, National Fire Alarm Code, 2013 edition and NFPA 1221 2019 edition.
	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 with breaker lock. The secondary power supply shall supply power automatically when the primary power source is lost. The secondary source of power shall be cable 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 type 4 approved enclosure. Batteries shall be enclosed in a separate, vented NEMA 3R type approved enclosure.
2. Acceptance Testing:
	1. Delivered audio quality (DAQ) testing will be conducted by Attleboro Fire Department personnel to ensure that two-way radio coverage, on each floor of the building, meets the minimum coverage requirements of section 3.
	2. The signal booster vendor shall certify the in-building radio system was installed and tested in accordance with the requirements of the current AHJ in- building radio specifications.
	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.
	4. RF plotting (grid Test) results, gain values of all amplifiers, as built drawings which include BDA manufacture, model#, Serial#, FCC certification #, and link budget must be submitted.
3. Annual Test:
	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.
	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.
	3. Back-up batteries and power supplies shall be tested under load to verify that they will operate during an actual power outage.
	4. Active components shall be checked to determine that they are operating within the manufacture’s specification for the intended purpose.
	5. Documents of the test shall be maintained on site in document cabinet located in Fire Command Room or next to Fire Alarm Control Panel. Copy of test shall be forwarded by the signal booster service company to the Attleboro Fire
	6. Department Fire Prevention Office Attn. Superintendent of Fire Alarm.
4. Five Year Test:
	1. In addition to the annual test, a radio coverage test shall be conducted a minimum of once every five years (5) years to ensure that the radio system continues to meet the requirements of this ordinance. The procedure set forth in section 4 shall apply to such test.
5. Signal Booster Service Provider Responsibilities:
	1. All test shall be conducted, documented, and signed by a person in possession of a FCC Grol License (General Radio operators License).
	2. All Testing personnel shall be certified and authorized by the BDA manufacture in the installation and operation of their equipment.
	3. Must submit reports of annual test and 5 year tests.
	4. Attleboro Fire Department Superintendent of Fire Alarm shall be notified in writing at least thirty (30) days prior to cancellation of a maintenance contract.
	5. Attleboro Fire Department Superintendent of Fire Alarm shall be notified in writing upon procurement of contractual agreement related to in-building radios covered by this specification.
6. Modification:
	1. Any Modification of an existing Emergency Responder Radio Communication Enhancement System will require a written request to Attleboro Fire Department Fire Prevention Office.
	2. After completion of any modification to an Emergency Responder Radio Communication Enhancement System a full acceptance test as required in this specification will be conducted and submitted for review.
7. Fire Department Inspection:

 14.1 Attleboro Fire Department 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.

1. Property Owner Responsibilities:
	1. Upgrades to the system as directed by the Attleboro Fire department.
	2. Maintenance contract maintained with a qualified radio service contractor, who will provide a twenty four (24) hour by seven (7) day emergency response within 2 hours after notification.

Note to Installers: These guidelines are subject to change; please make sure you are using the most recent revision. Revision: 9/20/2019