

Massachusetts State Trunked Radio System
In-Building Communications System Specification

The agency is searching for a qualified vendor who is interested in and capable of designing, supplying and installing an in-building communications system, such as a bi-directional amplifier and/or distributed antenna system, in the 700 / 800 MHz two-way radio communication frequency bands, to enhance the in-building coverage of the agency's two-way radio communications system.

System Specifications

1. The buildings and structures herein specified shall be equipped with a distributed antenna system and FCC-certified signal boosters to enhance the in-building coverage of the agency's communications system.
2. The agency will provide information about its communications system, such as the technology and frequencies in use and the location of its communications system and antennas.
3. The agency will provide information about the buildings and structures to be covered, such as building drawings, as well as information about any infrastructure that may be available to aid in the implementation of the system (such as existing dark fiber runs or conduit between facilities).
4. The vendor shall evaluate the buildings and structures specified to engineer the placement of all equipment and antennas on all floors of the buildings and structures.
5. The vendor shall specify all equipment and cable to be used to implement the system, installation locations, power requirements, interconnections to other systems, schematic wiring diagrams and a plan of installation.
6. The vendor shall present its design to the agency for approval prior to the start of work.

Equipment Specifications

1. The system, as installed, must comply with all applicable sections of the FCC rules (Part 90). All proposed equipment must be certified by the FCC.
2. The downlink passband(s) of the system shall be capable of operating between 851-860 MHz and 769-775 MHz. The uplink passband(s) of the system shall be capable of operating between 806-815 MHz and 799-805 MHz.
3. The system shall be capable of being programmed, via software, with up to 30 filters, ranging from 12.5 kHz wide (single channel) to 9 MHz wide (entire band).
4. System gain shall be programmable via software.
5. The system shall be compatible with both analog and digital (P25 Phase 1 and P25 Phase 2) simulcast trunked communications systems.

Installation Specifications

1. Assembly and installation of all system components shall be in accordance with all applicable building codes and the National Electrical Code.
2. The system shall meet NFPA 72 of the National Fire Alarm Code as it relates to survivability from attack by fire.
3. The system shall be installed in a NEMA Type 4 enclosure.
4. The system shall report supervisory and trouble signals for malfunctions, to include: antenna malfunction, signal booster malfunction, loss of AC power, battery charger malfunction and low battery capacity. The connection of these signals will be specified by the agency.
5. The primary power source shall be a dedicated branch circuit of appropriate capacity.
6. The backup power source shall provide full system operational capacity in the absence of the primary power source for a minimum of 12 hours. The backup power source shall automatically

charge in the presence of the primary power source. The backup power source shall be located in a NEMA Type 4 enclosure.

7. The system may use radiating cable, fixed antennas, or a combination of both.
8. The system may use head-end and remote components, such as a head-end system that feeds remote components via fiber. All components must meet these installation specifications as they relate to malfunction signals, enclosures, survivability, primary and backup power.
9. The donor antenna must maintain isolation from the distributed antenna system and shall be a minimum of 15dB above the signal booster gain under all operating conditions.

Signal Strength Specifications

1. 95% of each floor of the specified buildings and structures must be covered with a minimum downlink signal strength of -95 dBm, as received from the communications system to a test instrument, and a minimum uplink signal strength of -95 dBm, as received by the communications system from a hand held transceiver used by the agency. The downlink or uplink signal from or to the communications system shall not exceed -50 dBm in either direction.

Testing Acceptance Procedure

1. The vendor shall test the system after installation to ensure the signal strength specification is met for each floor.
2. The test may be witnessed by an agency representative.
3. The test results, system settings (including gain values), engineering design (including link budget), equipment specifications (including model/serial numbers) and as-built drawings shall be submitted to the agency prior to signoff of system acceptance.
4. Each floor of the building shall be divided into a grid of approximately (20) equal areas. A maximum of (1) area will be allowed to fail the test per floor (95%). 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 will not be permitted.
5. Field strength testing instruments are to be recently calibrated (1 year) and of the frequency selective type.
6. The downlink test shall be conducted by measuring the signal strength of the control channel utilizing a field strength testing instrument equipped with a flexible antenna similar to the ones used on hand held transceivers. The uplink test shall be conducted by measuring the signal strength of an agency's hand held transceiver as received at the receiver multicoupler of the communications system. The uplink test may be conducted by using a discrete conventional frequency within the passband of the system, using a filter configured in a similar manner as the filters employed for the trunked system.
7. All testing shall be coordinated with the agency prior to being conducted.
8. Unattended operation of the system is not permitted prior to signoff of system acceptance.