

BOSTON TRANSPORTATION DEPARTMENT

Specifications for Wireless Radio System

October 21, 2026

General:

The Contractor shall furnish, install, configure, test, and commission complete a field hardened wireless radio system consisting of a minimum of 2 wireless radios for use at signalized intersections where a physical communications connection is not available. The wireless system shall be designed to provide a reliable communications path between signalized intersections and the BTD central traffic communications system, supporting traffic signal communications and video. The contractor shall furnish and install radios, antennas, mounting hardware, CAT6 or better outdoor-rated Ethernet cabling, compatible PoE equipment, surge protection, grounding and bonding, weatherproof connectors, and all other components and accessories necessary for a complete and operational system.

The wireless communication system shall be suitable for point-to-point and point-to-multipoint applications. This is a performance-based specification focused on the required operational results, including throughput, latency, reliability, environmental performance, interoperability, and security, rather than a specific manufacturer or proprietary system. The Contractor shall provide and configure equipment capable of meeting or exceeding the requirements of this specification. Equipment shall be selected based on the required path length, RF environment, traffic load, video requirements, and site conditions to provide reliable communications and integration with the BTD central traffic communications system.

Radio Requirements:

Wireless radios shall operate in the 5 GHz unlicensed band, including the 5.8 GHz range where permitted by FCC requirements, and shall support DFS where required. Radios shall support 802.11a/n/ac or equivalent technology with selectable channel bandwidths of 20, 40, and 80 MHz. Each wireless link shall provide a minimum application-layer throughput of 300 Mbps under normal operating conditions, with higher-capacity equipment provided where required. Single-hop latency shall not exceed 10 ms, and multi-hop paths of up to three wireless links shall maintain a total round-trip time below 35 ms. Radios shall support QoS and multicast video, with traffic-control communications prioritized over video traffic. Where redundant paths are provided, automatic failover shall be supported. Critical wireless links shall be designed with adequate fade margin based on actual site conditions.

Antennas and RF:

The contractor shall provide integrated directional antennas where appropriate or external antennas where required by the link design. A typical high-capacity configuration shall provide approximately 20 dBi antenna gain with dual polarization and approximately 17-degree horizontal and vertical beamwidth. External antennas shall use suitable low-loss, outdoor-rated RF cable and weatherproof connectors. Directional antennas shall be accurately aligned, and final received signal level and SNR shall be recorded during commissioning.

Equipment Mounting and Environmental Requirements:

The contractor shall provide complete single or dual radio assemblies as required, including radios, antennas, heavy-duty mounting hardware suitable for traffic signal structures, Ethernet connections, PoE equipment, surge protection, grounding and bonding, connectors, and accessories. Components from different manufacturers may be used provided compatibility, performance, warranty, and environmental requirements are met. Outdoor radio equipment shall be rated for continuous operation from -40°C to +75°C and shall have a minimum IP67 enclosure rating. Equipment shall be suitable for long-term outdoor exposure and applicable traffic signal structure conditions.

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Ethernet Cabling and Power:

Each radio shall provide at least one 10/100/1000 Mbps Ethernet interface. Provide CAT6 or better, outdoor-rated Ethernet cable for each radio connection. Cable shall be suitable for installation within traffic signal poles and underground conduit and shall be protected from moisture, abrasion, excessive bending, and mechanical damage. Where PoE is used, contractor shall provide compatible PoE injectors, switch ports, power supplies, connectors, and accessories required for a complete installation. PoE equipment shall meet the radio manufacturer's power requirements. Contractor shall provide weatherproof cable glands/connectors, grounding and bonding, and surge protection as required.

Management, Security and Regulatory Requirements:

Equipment shall support static IP addressing and DHCP client operation. SNMPv3, IEEE 802.1Q VLANs, QoS, automatic reboot/watchdog functions, and remote status monitoring are preferred where supported. Equipment shall provide local or remote indication of operating status, Ethernet link status, and received signal strength. Wireless communications shall use appropriate encryption and authentication. WPA2-AES is acceptable where required for compatibility; WPA3-Enterprise or equivalent stronger security is preferred where supported. Administrative access shall use secure protocols such as HTTPS and SSH. Unencrypted management protocols shall be disabled where supported. Equipment shall comply with applicable FCC Part 15 requirements and shall be certified for the proposed operating frequencies.

Testing and Acceptance:

Final acceptance shall require successful Contractor testing and commissioning, subject to BTB Engineer approval. The completed wireless network shall undergo a 72-hour burn-in using representative or simulated high data loads. The Contractor shall verify and document throughput, latency, packet loss/error rate, received signal level, SNR, antenna alignment, network connectivity, QoS, PoE operation where applicable, and redundant-path failover where applicable. The Contractor shall correct deficiencies and re-test as required.

Submittals and Warranty:

Before purchase, the Contractor shall submit manufacturer product cut sheets and technical data for the proposed wireless radio, antenna, PoE equipment, and associated components for BTB review and approval. The submittals shall demonstrate compliance with this specification and suitability for the proposed installation. The Contractor shall provide additional information as reasonably requested by BTB to verify system performance and compatibility. Upon installation, the contractor shall provide equipment model numbers and serial numbers for BTB asset records. Complete equipment, materials, mounting hardware, cabling, and workmanship shall carry a minimum three-year warranty from date of installation by the contractor.