T684-6
Wireless communication system

684-6 Wireless Communication System.

 **684-6.1 Description:** Furnish and install a wireless communication system consisting of base station units, subscriber units, antennas, transient voltage surge suppressor (TVSS), power supplies, cabinets, cabling and all other materials required to provide a fully functional system.

 **684-6.1.1 General requirements:** Ensure the provided system is capable of transmitting TCP/IP data and multicast video streams.

 Install all components as shown in the Contract Documents and as directed by the Engineer.

 **684-6.2 Materials:**

 **684-6.2.1 Base Station and Subscriber Units:** Furnish a unit that operates within a Federal Communications Commission (FCC) unlicensed radio frequency range. Submit the proposed frequency to the Engineer for approval. The unit shall have the following features and specifications:

1. A power injector for Power over Ethernet (PoE)
2. Auto-sensing 10/100Base-TX Ethernet interface
3. Type-N Female connector antenna interface

Wireless Outdoor Router Protocol (WORP)

1. Dynamic Data Rate Selection
2. Transmit Power Control
3. Antenna Alignment
4. QoS Support; up to 8 classes of service, up to 8 services flows per class
5. Integrity Check for Software Upload
6. 5, 10, and 20MHz channels
7. Dynamic Frequency Selection
8. Spanning Tree (802.1D)
	1. Bridging and Routing
	2. Bridge (802.1d)
	3. Internet Protocol/Routing Information Protocol (IP/RIP) v1 Request for Comments (RFC) 1058
	4. IP/ RIPv2 (RFC 1388)
	5. Classless Inter-Domain Routing (CIDR) (RFC 1519)
	6. Internet Control Message Protocol (ICMP) (RFC 792)
	7. IP (RFC 791)
	8. Address Resolution Protocol (ARP) (RFC 826)
9. Filtering
	1. Ethernet protocol (Ethertype)
	2. Static MAC
	3. Storm threshold
	4. IP address
	5. Broadcast protocol
10. Services
	1. Dynamic Host Configuration Protocol (DHCP) Server (RFC 2131)
	2. DHCP Client (RFC 2131)
	3. Bi-Directional Bandwidth Control
11. VLAN− 802.1Q
12. Security Features
	1. MAC Authentication
	2. Radius MAC Access Control
	3. Wired Equivalent Privacy (WEP)/Advanced Encryption Standard-Offset Codebook Mode (AES-OCB) encryption
	4. RADIUS (RFC 2138)
13. Mobility
	1. Subscriber Unit Roaming
14. Management
	1. Link Test
	2. Temperature logging
	3. SNMPv1/v2 RFC 1157
	4. SNMP v2c RFC 1907
	5. HTTP Server RFC 2616
	6. Telnet RFC 855
	7. TFTP client RFC 783
	8. Command Line Interface (CLI)
	9. Management Information Base (MIB)-II RFC 1213
	10. Ethernet-like MIB RFC 1643
	11. Bridge MIB RFC 1493
	12. 802.3 Media Access Unit (MAU) RFC 2668
	13. 802.11 MIB
	14. Remote reboot (reload) or reset to factory default via power injector
	15. Private MIB
15. Environmental
	1. Operating
		1. -33º to 60ºC (-27.5º to 140º Fahrenheit)
		2. 100% humidity
	2. Storage
		1. -55º to 80ºC (-41º to 176º Fahrenheit)
		2. 100% humidity

 **684-6.2.2 COAX Cabling:** Provide LMR-400-BR coax cabling between antenna and wireless radio unit.

 **684-6.2.3 Pole Mount:** Provide a chain or band type mount, as shown in the Contract Documents for attaching the antenna or radio unit to the pole.

 **684-6.2.4 Weatherproofing:** Provide a means of weatherproofing exposed and buried connections that utilizes a combination of butyl rubber tape and plastic tape.

 **684-6.3 Installation Requirements:** Install all wireless communications system devices and components as shown in the Contract Documents, as directed by the Engineer, and in accordance with manufacturer’s recommendations.

 **684-6.3.1 Antenna Alignment:** Ensure proper alignment of antennas at both base station and subscriber unit locations to provide for minimum interference and maximum throughput based on line of sight and near line of sight.

 **684-6.3.2 Lightning Protection System:** Antenna locations, whether on poles or other structures, shall have a system that meets the requirements of Section 620.

 **684-6.3.3 Grounding and Bonding:** System components shall be grounded and bonded as shown in the plans and shall meet the requirements of Section 620.

 **684-6.4 Field Test Requirements:** Perform stand-alone tests at the device field sites and base station unit-to-subscriber unit ping echo tests as required by the Engineer in order to demonstrate compliance with Department specifications. Testing will include, but not be limited to, the following:

 1. Verify that physical construction has been completed as detailed in the plans.

 2. Inspect the quality and tightness of ground and surge protector connections.

 3. Verify proper voltages for all power supplies and related power circuits.

 4. Connect devices to the power sources.

 5. Verify all connections, including correct installation of copper, COAX, and power cables.

 6. Verify network connection between the base station unit and the subscriber unit through ping and telnet session from a remote PC.

 7. Verify that the connection will support multicast video by displaying a stream across the wireless link under test.

684-7 Warranty.

 **684-7.1 General:** Ensure that the manufacturer will furnish replacements for any part or equipment found to be defective during the warranty period at no cost to the Department or the maintaining agency within 10 calendar days of notification.

 **684-7.2 Wireless Communication System Devices:** Ensure that wireless communication system devices have a manufacturer’s warranty covering defects for five years from the date of final acceptance by the Engineer in accordance with 5-11 and Section 608.

684-8 Method of Measurement.

 **684-8.1 General:** The Contract unit price for each wireless communication system furnished and installed, will include furnishing, placement, and testing of all equipment and materials, and for all tools, labor, hardware, operational software packages and firmware, supplies, support, personnel training, shop drawings, documentation, and incidentals necessary to complete the work.

684-8 Basis of Payment.

 Price and payment will be full compensation for all work specified in this Section.

 Payment will be made under:

Item No. 684-6- ITS Wireless Communication System–each.