

SECTION 33 83 03

RADIO NETWORK / ANTENNA SYSTEM

PART 1 – GENERAL

1.01 SECTION INCLUDES

This section includes specifications for designing, furnishing, installing, and testing the new radio antenna system.

1.02 RELATED SECTIONS:

The monopole, foundation, cable ladder tray, and tower grounding and lightning protection system are specified in Section 33 83 02, Trunk Radio Network / Monopole Antenna Tower.

1.03 MEASUREMENT AND PAYMENT

All work required under this Section will be measured separately and will be paid for as part of the Contract lump-sum price, as part of the related item of work, as indicated on the Bid Schedule of the Bid Form.

1.04 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 123 Specification for Zinc (Hot-Dipped Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strips
 - 2. ASTM A 563 Specification for Carbon and Alloy Steel Nuts
 - 3. ASTM B 695 Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
- B. Federal Communications Commission (FCC):
 - 1. FCC Rules and Regulations All applicable for radio equipment and materials furnished and installed by Contractor
- C. Institute of Electrical and Electronic Engineers (IEEE):
 - 1. IEEE 89 Fall of Potential Method
- D. National Electric Code (NEC):
 - 1. NEC Article 318 Cable Tray
 - 2. NEC Article 362 Wireway

- E. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA VE 1 Metallic Cable Tray Systems
 - 2. NEMA WD 1 General Requirements for Wiring Devices
 - 3. NEMA 1 General Purpose Enclosure
 - 4. NEMA 4 X Stainless Steel Enclosures
- F. National Electrical Safety Code (NEC)
- G. M/A-Com Incorporated
- H. Document AE/LZT 123 4618/1, Site Grounding and Lightning Protection

1.05 SUBMITTALS

- A. General: Refer to Section 01 33 00, Submittal Procedures, and Section 01 33 23, Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.
- B. Shop Drawings: Submit Shop Drawings showing the layout of the system identifying the location of equipment and accessories.
- C. Product Data: Submit manufacturers' Product Data for all manufactured items of materials, equipment, and accessories shown on the Shop Drawings.
- D. Test Reports: Submit Test Reports of all tests conducted by the Contractor.
- E. Certificates: Submit Certificates certifying that the equipment tested is ready for use.

1.06 QUALITY ASSURANCE

- A. The system shall be designed and installed by an experienced and qualified individual of firm regularly engaged in the design and installation of such systems.
- B. Materials shall be clearly marked with the manufacturer's name, nameplate data or stamp, rating, and conformance with standards, with corresponding standard number clearly marked, as applicable.
- C. Material and equipment shall be tested and shall be listed by a nationally recognized testing laboratory.
- D. All furnished and installed equipment shall be for service in a land mobile radio environment; be of latest types or models, consistent with the present state of the art; and be constructed for service life time of not less than 15 years. The equipment shall employ technologically advanced design techniques to provide an operating system that will perform as specified herein in these specifications.

1.07 SITE CONDITIONS

- A. Verify existing conditions prior to the start of any work. Notify the Engineer to gain entrance to the Train Control Room to inspect the radio equipment including the radio cabinets.
- B. Coordinate the installation of the system with other building systems and components so as to avoid conflicts.
- C. Contract Drawings for the radio system are diagrammatic and not necessarily to scale.

PART 2 – PRODUCTS

2.01 ANTENNAS

- A. Radio Antenna System shall be designated matching products, with quantities as shown in the drawings:
 - 1. Transit Antenna (2)
 - 2. Receive Antenna (1)
 - 3. Test Antenna (1)
- B. Global Positioning System: GPS Antenna (2)

2.02 TOWER TOP AMPLIFIER: SHALL BE DESIGNATED MATCHING PRODUCT:

Andrew Corp. Model DBLATS8TMAI8-R, with test port and bandwidth filtering.

2.03 RADIO FREQUENCY CABLE

- A. Heliac LDF 7-50 coaxial or approved equal
- B. Heliac LDF 4-50 coaxial or approved equal

2.04 CABLE TRAY:

Provide ladder type.

2.05 ACCESSORIES:

As required for a complete antenna system.

2.06 EQUIPMENT GROUNDING:

- A. The cabinet shall be grounded to the Train Control Room equipment ground bus.

1. The grounding conductor shall be installed in a separate conduit to the Train Control Room ground bus;
2. Ground connections are tight, free of paint, and suitably protected from physical damage and corrosion;
3. Ground leads are short, direct, and #6 AWG minimum capacity;
4. The ground resistance between each bus and prime communications grounding is less than 0.5 ohm;
5. The resistance from each ground connection to the ground bus is recorded;
6. Only one path exists between the Train Control Room prime ground bus bar and ground (disconnecting the leads from the bar to ground shall show a dc resistance from the bar to ground of over 0.1 Mohm); and
7. The resistance between the cabinet and other pieces of equipment required to be insulated from each other is at least 1 Mohm.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Contractor shall provide and install all brackets, antennas, tower top amplifier, radio frequency cable, connectors, conduit, cable trays, and other accessories as required and per Contract Drawings.
- B. The new monopole shall be installed; antennas and amplifier aligned; cables routed, connectorized, and tested; and the overall system placed into service before the existing monopole and equipment mounted to it may be removed.
- C. Unless otherwise specified, no old equipment shall be reused in the new installation.
- D. Radio frequency (RF) cable connecting to the new monopole-mounted antennas and amplifier, and GPS antennas, shall be routed to and connected to a new site grounding and lightning protection installed at the point of cable entrance into the existing Train Control Room. RF cable shall be installed in conduit or ladder tray, as depicted in the design drawings. Vertical cable support on the tower shall be as recommended by the tower manufacturer. New conduit and ladder trays shall be grounded per lightning protection and NEC requirements.
- E. Radio Frequency cable shall be routed as depicted in the plans from the new lightning protection to the radio transmitter cabinet number 5 inside the Train Control Room by way of the overhead cable ladder. Cable connectors shall be placed on the end of the cables, but not terminated into the cabinet. Requirements for lightning protection are in M/A-Com Incorporated Document AE/LZT 123 4618/1, Site Grounding and Lightning Protection.

- F. The radio antenna system shall be tested by the Contractor at the transmitter equipment cabinet connection point in the presence of BART personnel and be certified ready for use. District forces will make the final termination of the new work to the existing radio equipment cabinets for the final performance test.

3.02 FIELD QUALITY CONTROL

- A. Contractor shall test the antenna system prior to final connection to radio equipment cabinets and certify that they are ready for use.
- B. Contractor shall perform all tests in the presence of the Engineer and BART personnel.
- C. Contractor shall furnish all items used in testing. The Contractor shall give 48 hours notice prior to test. The Engineer will review test reports and certificates.
- D. Final connection to the existing radio equipment cabinets will be performed by designated District representatives.

END OF SECTION 33 83 03