

SECTION 33 83 01

RADIO NETWORK / TRUNKED RADIO SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

This Section covers the general approach for the alterations or additions to the Trunked Radio System.

1.02 MEASUREMENT AND PAYMENT

Separate measurement and payment will not be made for work required under this Section. All costs in connection with the work specified herein will be considered to be included with the related item of work in the Bid Schedule of the Bid Form, or incidental to the Work of this Contract.

1.03 REFERENCES

- A. Codes and Orders: The Trunked Radio System design of all equipment and materials shall conform to the following codes and orders:
1. Federal Communications Commission (FCC) Rules
Code of Federal Regulations, 47 CFR
 2. National Public Safety Planning Administration Committee (NPSPAC) Region 6 (Northern California) planning regulations for 800 MHz Public Safety Agencies.
- B. M/A-Com Incorporated:
Document AE/LZT 123 4618/1, Site Grounding and Lightning Protection
- C. Telecommunications Industry Association (TIA)
Technical Systems Bulletin, TSB 88-A

1.04 EXISTING TRUNKED RADIO SYSTEM DESCRIPTION

- A. The District owns and operates a 800 mhz radio network. Modifications to the radio network are anticipated over time due to expansion of the BART system. The Trunked Radio System is one element of the BART radio network. The trunked system is used for voice communications between Operations Control Center and trains, BART Police Dispatch and Police officers, coordination of maintenance workers, and administrative purposes. It is the primary radio communication medium throughout the District.
- B. The existing above ground trunked radio system is a 10 channel Enhanced Digital Access Communications System (EDACS™) simulcast system, as manufactured by M/A-Com. It

operates at 800 mhz, on National Public Safety Planning, Advisory Committee (NPSPAC) frequencies.

- C. The radio system is designed to provide clear, intelligible communication from portable radios with area coverage reliability of 95% or better. In some locations, radio signal penetration into wayside facilities is insufficient to provide this level of communication performance. The provision of a Bi-directional Radio Amplifier (BDA) system within such a facility corrects for this condition.
- D. In Underground areas of the BART system, the trunked radio signals are propagated by a Distributed Amplifier Cable System.

1.05 SUBMITTALS

- A. General: Refer to Section 01 33 00 - Submittal Procedures, and Contract Specifications Section 01 33 23 - Shop Drawings, Product Data and Samples, for submittal requirements and procedures.
- B. Drawings: Submit detail drawings including panel and cabinet layouts, equipment interconnection diagrams, equipment and material lists, manufacturer's descriptive and technical literature, catalog cuts, and installation instructions.
- C. Design: Submit design information as required for review and approval. If requested by the Engineer, a Design Review Meeting shall be held in a District facility for the Contractor to present the design submittal.

PART 2 - PRODUCTS

2.01 DESIGN

- A. General
 - 1. The trunked radio system shall provide trunked radio coverage inside and around all areas along the BART track alignment, on the surface and inside tunnels and subways. The coverage shall include inside wayside facilities including passenger stations, parking garages, train control and communications room, traction power substations, maintenance, yard and shops, revenue processing buildings, administration buildings, revenue vehicles, and other BART facilities supporting train operations, maintenance, administration, engineering, and police activities. Above ground coverage shall extend 1.5 miles in both directions of the alignment at the prescribed performance levels.
 - 2. The system reliability performance goals of the trunked system shall be with 95% coverage at 95% of the time. The system shall be balanced between talk out and talk in directions. All coverage shall deliver performance deemed "loud and clear with occasional background noise", and as defined in TIA Standard TSB 88-A Delivered Audio Quality (DAQ) 4.0. The system reliability performance shall analyze the space inside of BART Revenue Vehicle (train car) as a separately evaluated coverage area. Performance standards shall be based upon use of handheld radios.

3. In underground trackway, stations, and facilities, a connection to the distributed amplifier network shall be deployed to extend the above ground trunked radio signals into the underground. The requirements for the distributed underground amplifier network are elsewhere in the BART Radio Network Specification.
4. Trunked Radio System equipment shall be designed to operate in an environmentally controlled facility.
5. Trunked radio system equipment shall be housed in seismic zone 4 rated cabinets.
6. New trunked radio system site equipment shall be powered by utility power with an automatic start generator-standby source, connected to the trunked system via an automatic transfer switch. The generator shall be minimally sized to handle design operating loads for the radio equipment and supporting environmental equipment, plus 30 %. The trunked radio system shall also be provisioned to ride thru 30 seconds of absence of any utility AC power without service interruption.
7. All antenna entrances to the trunked radio equipment facility shall be protected against lightning strikes.
8. Trunked radio coverage shall be made available above and below ground along the BART operating alignment and wayside facilities including the stations, yards and shops, operations control center, maintenance facilities, police zone facilities, administrative offices, and revenue processing facilities.
9. The system shall be designed for use by BART operations, maintenance, administration, engineering and police personnel.
10. The system shall have talkgroups for inter-agency operations including fire, police, and other emergency agency personnel.

B. Modification and Additions Requirements

Modifications or additions to the system shall follow the design criteria:

1. Modifications or extension to the Trunked Radio System design shall be fully compatible with and become an integral part of the existing radio network.
2. The products shall utilize the Enhanced Digital Access Communication System (EDACS) format, as manufactured by M/A-Com, Inc.
3. Unless otherwise specified in the Contract, the Trunked Radio System shall be designed to operate as a GPS-coordinated simulcast system. It shall operate in the 800 Mhz radio band, and contain the 10 duplex 800 Mhz NPSPAC radio channels assigned to the District.
4. Trunked Radio System additions shall be compatible with and provide the same functions and operability as the existing trunked radio system. This includes a remote network management capability, and interfaces to other BART and other agencies radio systems. If upgrades to the existing BART EDACS system equipment are required to

establish compatibility to the new equipment, then those upgrades shall become part of the Work.

5. An RF Coverage assessment to evaluate proposed extension to existing trunked radio system coverage shall be conducted as part of the design planning.
 - a. Assessment shall consist of two parts:
 - 1). The first part is a computer generated mapping showing predicted radio performance from each proposed radio site, as well as a composite model of all sites.
 - 2) The second part is a drive test to verify real world performance of the computer modeling predictions. Signal strength, urban clutter, simulcast time domain interference over the BART right of way are minimally required in the computer prediction.
6. Existing system coverage modifications, if required, shall be developed and shown in the predictive mapping of extension sites.
7. A performance guarantee from the manufacturer/designer shall accompany the RF coverage assessment.
8. Though primarily an above ground system, the Designer shall include the equipment and designs necessary to furnish the trunked radio signals into the BART underground by interface to the Distributed Amplifier Radiating Cable (DAS) System and specified buildings by either adequate trunked RF signals, or by enhancement by DAS equipment or by Bidirectional Amplifier equipment (BDA) to meet specified performance levels.

2.02 SYSTEM INTERFACE REQUIREMENTS

- A. Audio, data, and control signals to and from each newly proposed transmit site shall interface with the existing EDACS control point radio equipment at Lake Merritt and shall also be configured to be compatible with the requirements of the BARTnet.
- B. Below ground radio coverage shall be provided to all subway stations and tunnel areas, and shall be designed to interface with the radio network equipment in a manner similar to that of the existing below ground radio communication equipment throughout the District. Typically, fiber optic cables are used to transfer the RF signal between tunnel portal section equipment and specific above ground radio site equipment. An interface to the underground equipment at the trunk radio site shall be anticipated in system design.

2.03 RADIO SYSTEMS LOCATION

- A. Newly proposed transmit sites shall be located to obtain the specified system radio coverage and reliability percentages. New transmit site facilities shall be protected from existing sources of signal interference to prevent degradation to the trunked radio system.
- B. New trunked radio site locations shall be placed upon District-owned property or projected-District-owned property along the right of way if at all possible. If the location of District

property is not suitable for establishing radio coverage performance, then the designer shall attempt to find space in an existing and developed radio facility. Failing that, other off-site property locations may be evaluated.

- C. Radio Shelter: The Trunked Radio equipment radio system shall be installed in an environmentally controlled communication shelter.
1. The shelter shall be provided with a concrete exterior; AC power distribution; smoke, heat and power fail detection; interior lighting; a halo ground system; and a bullet-proof door.
 2. The shelter shall be as specified herein and / or otherwise in the Contract.

2.04 DISPATCHER CONSOLE EQUIPMENT

Personal Computer (PC) based trunk radio dispatch console system shall be provided in Central Control, Police Dispatch Centers, and in Yard Control Towers. The system shall be a Designated Matching Product, C3 Maestro console system, as manufactured by M/A-Com Inc. The system shall interface to the existing EDACS control point radio equipment at Lake Merritt.

PART 3 – EXECUTION

NOT USED

END OF SECTION 33 83 01