

MODIFIED BY EI 91-011 EFFECTIVE 11/14/91		ENGINEERING INSTRUCTION NEW YORK STATE DEPARTMENT OF TRANSPORTATION	
SUPERSEDED BY EI 04-005 EFFECTIVE 9/9/04		SUBJECT: COMMUNICATION SPECIFICATIONS Subject Code: 7.27-1-634	
Distribution: ☒ Main Office ☒ Regions ☐ Special		Code: <u>79-13</u> Date: <u>4-5-79</u> Supersedes:	
APPROVED: <i>Robert H. Edwards</i> Deputy Chief Engineer, Facilities Design Subdiv.			

Attached to this Engineering Instruction are copies of the following specifications:

- | | |
|---------------|---|
| 1. 15634.0498 | 2 Way FM Radio Base Station |
| 2. 15634.0499 | 2 Way FM Mobile Radios |
| 3. 15634.0401 | Furnish Mobile Telephone Equipment |
| 4. 15634.0402 | Message Unit Charges for Mobile Telephone Service |



These specifications are intended to provide the engineer in charge with a communication system, to aid in the supervision and inspection of the contract work. These systems are expensive. They should be used only where the Regional Construction Engineer has determined that there will be sufficient benefits to justify their cost.

1. The Mobile Radio System will provide a single FM frequency to allow communications between the engineers field office and the state inspectors. The mobile radios may be installed in state or privately owned vehicles. The Mobile Radio System may be used on contracts which fall into the following general categories:
 - A. Major new construction
 - B. Long spread out contract
 - C. Many construction operations taking place simultaneously.

2. The Mobile Telephone System will provide the engineer in charge with a means to communicate with the contractor and the regional office. The mobile telephone may be installed in a state or privately owned vehicle. The designer must verify that his project falls within the coverage area of a mobile telephone transmission tower. The Mobile Telephone System is intended to be used on the following type of contracts:
 - A. Projects which do not contain an engineers field office.
 - B. Projects which contain many job sites spread out over a wide area.

RHE:RTH:ELZ

ITEM 15634.0498 - 2-WAY FM RADIO BASE STATION
ITEM 15634.0499 - 2-WAY FM MOBILE RADIOS

Description

This work shall consist of furnishing and maintaining for the duration of the contract, a mobile radio system. The system to be provided shall consist of a single frequency desk top base station which shall be installed in the project engineers field office and single frequency mobile radios to be installed in the vehicles designated by the Engineer. The contractor shall obtain all necessary FCC licenses, permits, and copies of FCC regulations required for the operation of the equipment furnished.

Materials

All electronic circuitry of the equipment described herein shall be completely solid-state. All transmit/receive units shall be FCC type accepted and conform to current EIA Standards. The mobile units shall be installed in the vehicles in accordance with current EIA Installation Standards.

Equipment List

The contractor shall furnish equipment in the following listed quantities, in accordance with the referenced paragraphs of this specification.

<u>Quantity</u>	<u>Description</u>	<u>Spec. Para.</u>
1	Base Station Transmitter/Receiver	A
1	Antenna, Mast, Mounting Hardware	B
1	Microphone	A
1	Transmission Cable	B
as required	Mobile Transmitter/Receiver	C
as required	Mobile Antenna	C

A. Two Way Radio, FM Base Station

The contractor shall furnish and install a desk top FM Base Station with standard desk microphone. This station shall operate from a nominal 120 volts, 60 hz power source, consuming no more than 50 watts. All necessary interconnecting and power cables shall be furnished. The base station shall provide one channel (T/R) in the 150-174 Mhz range. Tone coded squelch shall be provided. The channel provided for use of the engineer shall not be used by the contractor or his employees for any purpose other than to contact the engineer.

A.1 TRANSMITTER

Minimum RF Power Output: 25 watts

Modulation: ± 5 KHz for 100% at 1 KHz

Spurious and Harmonic Emissions: down 60 db below carrier

Frequency Stability: $\pm .0005\%$ of assigned center frequency from -30° C to 60° C

FM Noise: down at least -70 db for mobiles, -55 db for base

Audio Response: within +1 to -3 db over 300 to 3000 hz with 6 db/octave pre-emphasis at less than 3% distortion.

A.2 RECEIVER

Sensitivity: .35 microvolts for 20 db quieting.

Squelch Sensitivity: 0.2 microvolts

Selectivity: -70 db EIA for two signals on 30 KHz channel spacing.

Frequency Stability: $\pm 0.0005\%$ from -30°C to 60°C temperature range with 25°C reference.

Modulation Acceptance: $\pm 6.5\text{ KHz}$

Audio Output: 3 watts with less than 5% distortion over 300 to 3000 Hz

Intermodulation: down -70 db

The base station shall exhibit equivalent capabilities as determined by the Engineer to at least one of the units listed below:

<u>Manufacturer</u>	<u>Model No.</u>
General Electric	Century II CE5
Motorola	MAXAR D 33TRA/L43TRB
RCA	TAC-300 MFA 02

The contractor shall submit catalog cuts to the Engineer for approval of equivalent units at least one week prior to the expected date of installation.

B. Antenna, Mast, Transmission Line, and Mounting Hardware

The contractor shall furnish a Base Station Antenna which accepts RF energy up to 500 watts in the frequency band from 150 to 174 Mhz, into an impedance of 50 ohms. The antenna shall radiate this energy with a gain of 5 db in an omni-directional pattern. The VSWR shall not exceed 1.5 to 1. The antenna shall be equipped with a 20 foot mast.

The Base Station Antenna shall be mounted with a heavy duty galvanized steel wall mount set in the exact location and in a manner approved by the Engineer. The antenna and its 20 ft. mast shall be adequately grounded for lightning protection according to N.E.C. standards.

The transmission cable shall be 1/2 inch coaxial cable with corrugated copper outer and copper clad aluminum inner conductors, and foam dielectric and vinyl sheath.

The contractor shall furnish all necessary connectors, adaptors and installation hardware. The antenna furnished shall have the equivalent capabilities of at least one of the units listed below:

<u>Manufacturer</u>	<u>Type</u>
Phelps Dodge	220-509
Decibel Products	DB 258
KRECO	SC 155A

The transmission line furnished shall have equivalent capabilities of at least one of the units listed below:

<u>Manufacturer</u>	<u>Type</u>
Phelps Dodge	FXCC12-50
Andrews	FHJ4-50B
Decibel Products	DB-2034.

The contractor shall submit catalog cuts or descriptions to the Engineer for approval of equivalent units at least one week prior to the expected date of installation.

C. Two-Way Radio, FM Mobile

The contractor shall provide and install mobile FM transmitter/receivers as follows:

The mobile unit shall be dash-mounted, with control unit mounted under the dash, an inside speaker and an outside P.A. speaker, a press-to-talk microphone, a vehicular antenna and all necessary power and interconnecting cables. The unit shall have tone controlled squelch and one channel capability in the 150 to 174 Mhz band. The unit shall operate on nominal 12 volts DC, negative ground. The transmitter and receiver parameters shall be the same as those of the base station. The mobile units must exhibit equivalent capabilities, as determined by the engineer, to at least one of the units listed below:

<u>Manufacturer</u>	<u>Type</u>
General Electric	Century II CE5
Motorola	MAXAR D 33TRA/L43TRB
RCA	TAC-300 MFA 02

The contractor shall submit catalog cuts to the Engineer for approval of equivalent units at least one week prior to the expected date of installation.

Construction Details

Construction Details: The two-way radios and base station shall be for the exclusive use of the project engineer and his authorized representatives. The two-way radios and base station shall be made available and shall be returned upon 30 calendar days notice from the Engineer-in-Charge.

All equipment shall be fully maintained by the contractor at all times. At any time that any of the radio units or miscellaneous hardware become inoperative, the contractor shall immediately replace that unit with one in operational order.

As soon as the radio equipment is installed, the contractor shall supply qualified instruction to State personnel or their authorized representatives to insure the proper operation of the two-way radio communication system and he shall acquire all necessary FCC licenses.

Method of Measurement

Two-way FM Radio Base Station shall be measured by the month that the complete base station (including mobile radios) is in operation. Monthly measurement will continue until the Engineer notifies the contractor in writing that the equipment is no longer needed. Measurements will be made during periods of seasonal shutdown of contract operations provided the equipment remains in operating condition. No measurement will be made for service during periods of contract extension of time where engineering charges are assessed.

A one-day deduction will be made for each day during an estimated period that the base station is not available and/or operating properly as determined by the Engineer.

Two-way FM Mobile Radios - The quantity to be measured for payment under this item shall be the number of month units that the mobile radio units are operable. A month unit is defined as the number of months that each unit is operable.

Basis of Payment

Payment will be made during periods of seasonal shut down of contract operations provided the unit remains in operating condition. No payment will be made for service during periods of contract extensions of time where engineering charges are assessed.

A one-day deduction will be made for each day during an estimate period that each mobile unit is not available or fully operable as determined by the Engineer.

The daily deduction shall be figured by dividing the monthly rate by thirty (30) days.

The unit price bid per month unit shall include the cost of all labor, material and equipment including instruction and licensing fees, electric power, maintenance charges and any incidental hardware necessary to complete the work.

All equipment shall remain the property of the contractor.

Item 15634.0401 Furnish Mobile Telephone Equipment

Description:

Under this item the contractor shall furnish, install and maintain mobile telephone equipment in the Engineer-in-Charge's vehicle. The telephone will be used by the EIC in the performance of his official contract duties.

Materials:

The mobile telephone shall have a sufficient number of available channels to provide service without unreasonable delays. The equipment shall include a "Message Waiting" indication.

Construction Details:

Upon written request of the Engineer, the contractor shall arrange for the installation of the equipment in the EIC's vehicle, either private or state-owned, within one week. The vehicle will be delivered to the installer's shop, if necessary. Not later than the completion of the contract, the contractor will remove the equipment from the vehicle upon written notification from the Engineer that the telephone is no longer required for performance of the EIC's duties.

Method of Measurement:

Furnishing mobile telephone equipment shall be measured as the number of months during which the mobile telephone service is operable and provided as specified. Payment units will be measured to the nearest one-quarter month.

Basis of Payment:

The unit price will include the cost of installation, maintenance and removal of the telephone equipment as well as any rental and/or basic service charges.

Item 15634.0402 Message Unit Charges for Mobile Telephone Service

Description:

Under this item the contractor shall provide for message units in addition to the basic allowance provided with the mobile telephone.

Materials:

Not specified.

Construction Details:

The contractor shall provide the Engineer with legible copies of all bills showing the number of minutes of message units for the mobile telephone provided for his use under item 15634.0401, Furnish Mobil Telephone Equipment.

Method of Measurement:

Measurement shall be taken as the number of minutes (as determined from the actual bills issued to the contractor) of telephone message service in excess of the basic allowance which is included in the monthly rental rate.

Basis of Payment:

The unit price will include all costs involved in this service. The cost of furnishing the equipment as well as the monthly rental fee will be included under its respective item.