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USACE / NAVFAC / AFCESA / NASA	**UFGS-13852A (July 2004)**

Preparing Activity: USACE	**MasterFormat™ 2004 - 28 31 33.00 10**
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UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 23 June 2005
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DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13852A

FIRE ALARM REPORTING SYSTEM, RADIO TYPE

07/04

-- End of Section Table of Contents --

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SECTION 13852A

FIRE ALARM REPORTING SYSTEM, RADIO TYPE
07/04

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NOTE: This guide specification covers the requirements for radio transmitted fire alarm reporting systems.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.
****

PART 1 GENERAL

1.1 REFERENCES

****
NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C135.30	(1988) Zinc-Coated Ferrous Ground Rods for Overhead or Underground Line Construction

ELECTRONIC INDUSTRIES ALLIANCE (EIA)

EIA ANSI/TIA/EIA-222-F	(1996) Structural Standards for Steel Antenna Towers and Antenna Supporting Structures

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41	(1991; R 1995) Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 1	(2000) Industrial Control and Systems: General Requirements

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2005) National Electrical Code
NFPA 72	(2002) National Fire Alarm Code
NFPA 780	(2000) Installation of Lightning Protection Systems

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

47 CFR 15	Radio Frequency Devices

UNDERWRITERS LABORATORIES (UL)

UL 1242	(2000; Rev thru May 2003) Electrical Intermediate Metal Conduit -- Steel
UL 467	(2004) Grounding and Bonding Equipment
UL 6	(2000; Rev thru May 2003) Rigid Metal Conduit
UL 797	(2004) Electrical Metallic Tubing -- Steel

1.2 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01330 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fire Alarm Reporting System[; G][; G, [_____]]

Detail drawings, signed by the Registered Professional Engineer, consisting of a complete list of equipment and material, including manufacturer's descriptive and technical literature, catalog cuts, and installation instructions. Note that the contract drawings show layouts based on typical detectors. The Contractor shall check the layout based on the actual detectors to be installed and make any necessary revisions in the detail drawings. Detail drawings shall also contain complete wiring and schematic diagrams for the equipment furnished, equipment layout, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit.

Wiring for Systems[; G][; G, [_____]]

Detail point-to-point wiring diagram, signed by the Registered Professional Engineer, showing all points of connection. Diagram shall include connections between system devices, appliances, control panels, supervised devices, an all equipment that is activated or controlled by the panel.

SD-03 Product Data

Battery

Substantiating battery calculations for supervisory and alarm power requirements. Ampere-hour requirements for each system component, each panel component and the battery recharging period shall be included.

Spare Parts

Spare parts data for each different item of material and equipment specified, after approval of detail drawings, and not later than [_____] months prior to the date of beneficial occupancy. Data shall include a complete list of parts and supplies with the current unit prices and source of supply and a list of the parts recommended by the manufacturer to be replaced after [1] [_____] year of service.

Qualifications

Verification of experience and license number for Registered Professional Engineer, as specified.

Training

Training course for the operation and maintenance staff. The course shall be conducted in the building where the system is installed or as designated by the Contracting Officer. The training period shall consist of [3] [_____] training days (8 hours per day) and shall start after the system is functionally completed but prior to final acceptance tests. The instructions shall cover all of the items contained in the operating and maintenance instructions.

Test Procedures

Detailed test procedures for the fire alarm reporting system [30] [_____] days prior to performing system tests. The test procedures shall be signed by the Registered Professional Engineer.

SD-06 Test Reports

Testing

Test reports in booklet form showing field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall document all readings, test results, and indicate the final position of controls.

SD-07 Certificates

Equipment

Certified copies of current applicable approvals or listings issued by UL, FM or other nationally recognized testing laboratory showing compliance with applicable NFPA standards.

SD-10 Operation and Maintenance Data

Fire Alarm Reporting System[; G][; G, [_____]]

[Six] [_____] complete copies of operating instructions outlining step-by-step procedures required for system startup, operation, and shutdown. The instructions shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features.

[Six] [_____] copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The instructions shall include conduit layout, equipment layout and simplified wiring, and control diagrams of the system as installed. Instructions shall be approved prior to training.

1.3 GENERAL REQUIREMENTS

1.3.1 Standard Products

Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that can provide service within 24 hours.

1.3.2 Nameplates

Major components of equipment shall have the manufacturer's name, address, type or style, voltage and current rating, and catalog number on a noncorrosive and nonheat-sensitive plate which is securely attached to the equipment.

1.3.3 Tags

Tags with stamped identification numbers shall be furnished for keys and locks.

1.3.4 Keys and Locks

Locks shall be keyed alike.

1.3.5 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

1.3.6 Compliance

****
NOTE: Insert appropriate NFPA Standard in blank.
****

The central reporting system shall comply with [NFPA 72] [_____]. The equipment furnished shall be listed by Underwriters Laboratories, or Factory Mutual Engineering and Research, or be approved or listed by a nationally recognized testing laboratory.

1.3.7 Qualifications

The Contractor shall provide the services of a Registered Professional Engineer with at least 4 years of current experience in the design of fire protection and detection systems. The Contractor shall submit the qualifications, with verification of experience and license number, for this engineer.

1.4 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be protected from the weather, humidity and temperature variations, dirt, dust, and other contaminants.

1.5 SYSTEM OPERATION

****
NOTE: Radio link supervision may be by periodic reporting of radio fire alarm transmitters or by periodic polling of all transmitters by the radio fire alarm receiver. The total number of transmitters on any one frequency and their polling rate in a two-way system must be determined and checked to ensure code compliance. The following definitions are given to help clarify the use of the words transmitter and receiver in this specification.

1. "Fire Alarm Transmitter" refers to any device that transmits a fire alarm message back to the fire alarm receiver at the alarm monitoring station.

2. "Radio Transmitter" is an electronic device that generates a coded RF signal.

3. "Radio Fire Alarm Transmitter" refers to a device that uses radio signals to transmit a fire alarm message back to the alarm monitoring station. The radio fire alarm transmitter may operate with either one-way or two-way data transmission. For one-way data transmission, the radio fire alarm transmitter would incorporate a radio transmitter, antenna, cables, power supply, message encoder, and possibly an interface circuit.

a. The radio fire alarm transmitter generates and sends a coded alarm when an alarm is received at the transmitter. The signal is received at the radio fire alarm receiver and an alarm is given.

b. Radio fire alarm transmitters that use two-way data transmissions have all the same components as the one-way system, but, in addition, they have a receiver and controller. They operate by waiting for the radio fire alarm receiver to send them a radio signal to report. The radio fire alarm transmitter then sends back a signal reporting any alarms. Another method involves two-way radio transmission systems which transmit signals as soon as they are received.

4. "Fire Alarm Receivers" refer to equipment that receives fire alarm messages from one or more fire alarm transmitters.

5. "Radio Receiver" is an electronic device that detects radio signals and generates an alarm message.

6. "Radio Fire Alarm Receiver" is a system that receives fire alarm signals, displays, and records the alarm messages. It may simply listen for any alarm messages (one-way data transmission) or it may sequentially transmit a radio signal asking each radio fire alarm transmitter to report any alarms (two-way data transmission).

When an addition to an existing system is required, provide the make, model number, and other pertinent information to the designer. This will eliminate most of this specification because the additional interfaces have to be compatible with the existing central radio fire alarm reporting system.

****

The radio system shall report alarms to the radio fire alarm monitoring base station. The system shall be a completely supervised radio type fire alarm reporting system. The system shall indicate the area of alarm. The radio communication link shall be supervised and operated in accordance with NFPA 72.

1.6 ELECTRICAL SUPERVISION

Electrical supervision shall be provided for all circuits and for all positions of interface panel control switches.

PART 2 PRODUCTS

2.1 RADIO FIRE ALARM TRANSMITTER (TRANSCEIVER)

****

NOTE: Transceiver is a radio device that receives an interrogating or challenging radio signal and automatically transmits a response on the same or a different frequency.

****

Radio Fire Alarm Transmitter (Transceiver) shall be compatible with the Radio Fire Alarm Monitoring Base Station. The transmitter shall be all

solid state and comply with applicable portions of 47 CFR 15 governing type acceptance. All transmitters of a common configuration shall be interchangeable with the other devices furnished by the manufacturer. Each transmitter [and interface device] shall be the manufacturer's current commercial product completely assembled, wired, tested at the factory, and delivered ready for installation and operation.

2.1.1 Frequency Allocation

****
NOTE: Frequency assignment is made by the base's communications Officer. The frequency must be reserved in advance. Multiple frequencies may be needed to meet response time requirements. Polling type systems will need separate polling frequencies.
****

The transmitters shall operate on a frequency of [_____] MHz.

2.1.2 Power Requirements

****
NOTE: Delete requirements for manual street boxes if not applicable.
****

Transmitters shall be powered by a combination of locally available 120 Vac, and sealed [nickel-cadium] [or] [lead-acid] type batteries requiring no additional water. [Transmitters used in manual street box configuration [as indicated] shall be powered by battery only.] In the event of loss of 120 Vac power, the transmitter shall automatically switch to battery operation. The switchover shall be accomplished with no interruption of protective service, without adversely affecting the battery-powered capabilities, and shall cause the transmission of a trouble message in no less than [_____] seconds. Upon restoration of ac power, transfer back to normal ac power supply shall be automatic and the battery shall be recharged. The converter/battery charger shall be installed within the transmitter housing. Power supply transient filtering shall be provided.

2.1.2.1 Battery Power

The battery package shall be capable of supplying all the power requirements for a given transmitter.

2.1.2.2 Battery Duration

Radio fire alarm transmitter standby battery capacity shall provide sufficient power to operate the transmitter in a normal standby status for a minimum of 60 hours and shall be capable of transmitting alarms during that period. The capacity for battery-only powered transmitters shall be 6 months before recharging is necessary.

2.1.2.3 Battery Supervision

Each radio fire alarm transmitter shall constantly monitor and supervise its own battery powered supply. A low-battery condition shall be reported when battery voltage falls below 85 percent of the rated voltage.

2.1.3 Functional Requirements

2.1.3.1 Interfacing Indicators and Controls

Transmitters shall incorporate the provisions for auxiliary interconnection to existing interior alarm systems.

2.1.3.2 Generation of Signals

Each transmitter shall be a standard design which allows the immediate transmission of all initiated signals.

2.1.3.3 Power Output

****
NOTE: The designer should provide the necessary data to determined the required RF power level; this may require a site visit.
****

The radio frequency (RF) power output of each transmitter shall be sufficient for reliable alarm reporting. The minimum RF power output shall be [1] [_____] watt.

2.1.3.4 Memory

Transmitters shall have memory capability. Multiple, simultaneous alarms shall not result in the loss of any messages. Messages shall be stored until they are transmitted.

2.1.3.5 Transmission Confirmation

****
NOTE: Use with fire alarm boxes only.
****

When a signal is initiated at a public box (push button or pull lever), the transmitter shall produce an audible or visual indication that the transmitter is operating and that a signal is being sent.

2.1.3.6 Transmitter Identity Code

Each transmitter shall transmit a distinct identity code number as part of all signals emanating from the transmitter. The identity code shall allow for no less than a [_____] digit code selection and be transmitted not less than three complete rounds (cycles).

2.1.3.7 Message Designations

Each transmitter shall allow as a minimum no less than 10 [_____] distinct and individually identifiable message designations as to the types or causes of transmitter actuation.

a. Master Message: Master messages shall be transmitted upon automatic actuation of the transmitter. The building and zone causing actuation shall be individually identified as part of this transmission. The transmitter shall be capable of identifying and transmitting a minimum of [_____] master (zone) messages.

b. Test Message: Test message shall be capable of both manual and automatic actuation. When a transceiver method is employed, it shall provide for automatic interrogation at preselected periods or continuous automatic interrogation in accordance with the governing standard. Additionally, transceiver systems shall provide for selective interrogation at times determined by the user. Testing the automatic test actuation shall occur a minimum of once in each [24-] [_____] hour period, at an optionally preselected time. Stability of the electronic actuating device shall be plus or minus 1 minute per month within the temperature range stipulated for system operation. Actuation of the "Test" message designation, regardless of initiating means, shall cause no less than 1 complete message to be sent.

c. Tamper Message Designation: The tamper message shall be automatically transmitted when a tamper switch is tripped in the transmitter housing.

d. Trouble Message Designation: Trouble message shall be automatically transmitted in the event of a failure in excess of 1 minute of the main operating power source of the transmitter.

2.1.4 Transmitter Housings

The housings on transmitters shall be fabricated from corrosion-resistant cast metal or suitable substitute which has the physical strength sufficient to ward off physical damage normally expected to be received by vandalism. The housing shall be sealed against the entry of moisture, dust, dirt, insects, and other foreign objects. Exterior housings shall be NEMA 4X.

2.1.4.1 Lock

Internal components shall be protected from vandalism by a tamper-proof lock on the transmitter housing. The housing shall allow access to all internal components for testing, servicing, and replacement at the installation site.

2.1.4.2 Mounting

****
NOTE: Choose the type of mounting most suited for application of design.
****

Transmitter housings shall be designed for universal mounting on walls, poles, or pedestals. Mounting shall utilize either lag bolts, anchor bolts, stainless steel banding, mounting brackets, or a shackle/bolt combination, as applicable to the specific installation.

2.1.4.3 Operating Panel

****
NOTE: Use with manual street boxes only.
****

Each publicly accessible transmitter shall have an operating panel that incorporates a dedicated signal initiating device (pull hook or push button) clearly identified for the initiation of "FIRE" signals. The

device shall be protected with a conventional spring-loaded, "fast-action" break-glass, or similar pull-type door that allows observation of the actuation device when in the closed position. The door shall be fabricated and finished in a manner consistent with that required of the main housing.

2.1.4.4 Labeling

****
NOTE: Use with manual street boxes only.
****

Each publicly accessible transmitter shall be labeled on both sides and on the front surface with the word "FIRE." The label shall be white with red lettering.

2.1.5 Environmental Operating Requirements

****
NOTE: Check local condition for design wind gust and ice loading. Lowest design wind speed is 160.9 km per hour (100 mph); typical design wind speed is 201.2 km per hour (125 mph).
****

The transmitter shall be designed for reliable outside operation in an ambient temperature range of [-30] [_____] to [60] [_____] degrees C [-22] [_____] to [140] [_____] degrees F. Transmitters shall be corrosion-resistant and designed for reliable operation under adverse climatic conditions including [160.9] [_____] km/hour [100] [_____] mph winds, ice, rain, and snow storms.

2.1.6 Painting

Radio fire alarm transmitter [and interface housings] shall be factory painted. The finish color shall be [fire engine red] [_____]. Painted surfaces damaged during installation shall be repainted to match existing paint.

2.2 RADIO TRANSMITTER INTERFACE DEVICE

****
NOTE: If a radio transmitter interface device is not required, delete this paragraph.
****

The interface device shall provide a means of converting the signals that are available from the local control equipment into a form that is compatible with the transmitter inputs, while still maintaining electrical supervision of the entire system. Interface devices shall be utilized when direct connection between local control equipment and the transmitter is not possible. Interface devices shall be completely assembled, wired, tested at the factory, and delivered ready for installation and operation.

2.2.1 Enclosure

****
NOTE: Use with manual street boxes only.
****

When furnished as an independent self-contained device, the interface device shall be incorporated into an enclosure conforming to NEMA ICS 1or other national standard as required by its location.

2.2.2 Indicators

****
NOTE: Use with manual street boxes only.
****

Indicators shall be provided to indicate alarm and trouble conditions and shall consist of a red fire alarm and an amber trouble light. The indicators shall be designed to ensure visibility during daylight hours and to indicate the reporting zone.

2.2.3 Access

Switches and other controls shall not be accessible without the use of a key. Access to controls shall be by unlocking and opening a panel or door.

2.2.4 Mounting

****
NOTE: Choose the type of mounting most suited for application of design.
****

Interface housings shall be designed for universal mounting on walls, poles, or pedestals. Mounting shall utilize either lag bolts, anchor bolts, stainless steel banding, mounting brackets, or a shackle/bolt combination, as applicable to the specific installation.

2.2.5 Inputs/Outputs

Each interface panel shall provide, as a minimum, the number of alarm circuit inputs and outputs indicated. Each input circuit shall be arranged so that the alarm signals shall override the trouble signals.

2.3 RADIO FIRE ALARM MONITORING BASE STATION

****
NOTE: Radio link supervision may be by periodic reporting of radio fire alarm transmitters or by periodic polling of all transmitters by the radio fire alarm receiver. The total number of transmitters on any one frequency and the polling rate of the transmitters in a two-way system must be determined and checked to ensure code compliance.
****

2.3.1 Receiver (Transceiver) System

[Two identical] [One] master radio fire alarm receiving (transceiver) system compatible with transmitter frequency shall be provided. The system shall be completely assembled, wired, tested at the factory, and delivered ready for installation and operation. Transceivers shall be solid-state design and shall use frequency modulation. The transceiver can be a single integrated unit, or it may consist of separate transmitter and receiver modules with a common power supply, amplifier, and control unit.

2.3.1.1 Transmitter Section

Transmitter shall operate on a frequency of [_____] MHz. Frequency stability shall be within 0.00025 percent over the operating temperature range. Transmitter shall be designed to work into a 50-ohm load. Frequency deviation shall be less than or equal to 5 kHz. Audio response shall be within plus 1 dB and minus 3 dB over the 300 Hz to 3,000 Hz range.

2.3.1.2 Receiver Section

Receiver antenna input impedance shall be 50 ohms. Receiver shall be tuned to a frequency assignment of [_____] mHz. Receiver shall have no more than 5 percent audio distortion measured at 1,000 Hz. Receiver shall have a noise level not greater than minus 50 dB below the signal level. Receiver output shall be compatible with the associated device.

2.3.2 Fire Alarm Console

Console shall contain a complete and independent fire alarm receiving system, consisting of, as a minimum, a radio receiver/transmitter, signal to message decoder, audio alarm signaling devices, audio alarm silence switch, visual display, alarm reset switch(es), alarm recording printer, primary and emergency power supplies, power supply monitors, memory devices, and all necessary interconnecting cables.

2.3.2.1 Audible Fire Alarm

The audible alarm signaling devices used to indicate the receipt of fire alarm messages shall produce a unique sound. The device shall be internally mounted in the console and shall be activated upon receipt of all fire alarm signals. The audible devices used to indicate the receipt of transmitter/interface trouble messages, including tamper and low-battery voltage, shall be separate and distinct from the device used to denote receipt of fire alarm messages.

2.3.2.2 Visual Display

****
NOTE: Listed displays are minimum requirements, but if additional visual displays are required, such displays must be added to the list.
****

Console display shall indicate, as a minimum, the originating transmitter identity code number and shall include the following message designations:

a. Fire

b. Trouble

c. Battery

d. Test

e. Tamper

f. Master Zone [_____] thru [_____]

2.3.2.3 Console Memory

Console shall have a memory buffer capable of retaining a minimum of [500] [_____] transmitter codes, together with the specific message designations associated with each transmitter. The system shall reject any received message not matching the programmed transmitter codes where such message identification code is not stored in the system. Upon command, the console shall display and print a summary of transmitters which have transmitted a low-battery or trouble message, or failed to transmit a message during the previous 24 [_____]-hour test period. Any incoming transmitter signal shall pre-empt the command display and printout function, and be processed, displayed, and printed. The 24-hour memory shall not be purged and shall always be current and available. Transmitter memory data shall not be lost in the event of a total loss of operating or emergency power supplies.

2.3.2.4 Console Supervision

The supervisory system shall provide constant supervision of the operating conditions of the console. Indicators shall be provided for each major component, and an audible signal shall be produced in the event of failure of any major component. A switch shall be provided to silence the audible trouble signal.

2.3.2.5 Receiver Supervision

The supervisory system shall provide constant supervision and display of the operating condition of the radio receivers, and shall indicate an abnormal condition when a radio fire alarm transmitter carrier lasting more than 15 seconds is detected. The receiver's ability to properly receive and decode an incoming signal shall be tested at least once every [_____] minutes.

2.3.2.6 Manual Battery Test

Console shall have a switch to manually place the console on emergency battery power for test purposes.

2.3.2.7 Electrical Connections

Console shall be designed with modular components to allow interchange of components for maintenance purposes. Primary power cables shall incorporate positive twist-lock connections. Interconnecting cables and connectors shall be compatible with computer quality signal data transmission.

2.3.3 Antenna System

****

NOTE: The antenna for the dual transmitter and receivers shall be installed with a maximum vertical separation. The designer must check local conditions for design wind gust and ice loading. The lowest design wind speed is 160.9 km per hour (100 mph); typical design wind speed is 201.2 km per hour (125 MPR).

****

The antenna system shall utilize vertical polarization antennas, communication links between transmitters/receivers and antennas, and

matching networks as needed for the proper coverage. The antenna system shall be either omni-directional or shaped-coveraged as selected by the Contractor based on the topography. The antenna system and cabling shall be furnished to provide adequate system gain. The antennas shall be capable of withstanding the environmental conditions of [200] [_____] km/hour [125] [_____] mph wind and [13 mm 1/2 inch radial] [_____] ice without failure. Lightning protection shall comply with NFPA 780. Antenna supporting structures shall comply with EIA ANSI/TIA/EIA-222-F.

2.3.3.1 Grounding Conductors

Antenna grounding conductors shall be minimum 32-strand, No. 17 AWG copper.

2.3.3.2 Communication Links

Transmission line between the transmitter/receiver and the antenna shall be 50-ohm impedance rated for the transmitter output power. As a minimum, cable shall exhibit an attenuation not exceeding 1.1 dB per 30.5 m 100 feet at 200 mHz.

2.4 FIRE ALARM SYSTEM PERIPHERAL EQUIPMENT

****
NOTE: Check the terrain and distances to determine if a repeater will be needed to transmit a signal from a remote location to the main control console.
****

2.4.1 Repeaters

Repeaters shall be provided where indicated or required to meet system requirements. The repeater shall receive on [_____] MHz and transmit on [_____] mHz. The receiver and transmitter sections shall conform to the requirements specified for transceivers. Two-way data transmission shall be relayed between the base station and remote stations. Repeater shall utilize a bandpass-type duplexer and one antenna, or multiple-bandpass cavity filters and multiple antennas. The duplexer or filter cavities shall isolate the receiver from transmitter spurious noise and prevent receiver desensitization. The duplexer or filter cavities shall be rated to handle the output power of the transmitter. Repeater shall be keyed with tone-encoded control circuit. A transmitter time-out circuit shall be provided to prevent system lockup.

2.4.2 Radio Fire Alarm Transmitter Box Location Light

****
NOTE: Use with fire alarm boxes only. Delete paragraph where a light is not required. Do not use for radio fire alarm transmitters that operate on batteries only.
****

Each indicated transmitter providing publicly accessible actuating functions shall be provided with a vapor-tight, incandescent type light fixture constructed of a flame retardant, nonplastic, polycarbonate material with a threaded ruby globe. The light shall be supported with 15 mm 1/2 inch galvanized steel conduit and located approximately 300 mm 1 foot above the box. The light shall be provided with an incandescent, 50-watt, 120-volt extended service lamp. Transmitters which are powered by battery

only shall not be equipped with location lights.

2.4.3 Conduit

Conduit and fittings shall comply with UL 6, UL 1242, and UL 797.

2.4.4 Ground Rods

****
NOTE: Designer will determine the size, type, and number of ground rods to be used based on local conditions, earth resistivity data, and on the size and type of the electrical installation. Copper-clad steel rods will be specified for normal conditions. Zinc-coated steel or stainless steel rods will be used where low soil resistivities are encountered and galvanic corrosion may occur between adjacent underground metallic masses and the copper-clad rods. Stainless steel rods have a longer life than the zinc-coated steel, but use of zinc-coated steel must be justified based on the higher cost. Rods 16 mm (5/8 inch) in diameter and 2.5 m (8 feet) in length are generally acceptable; however, in rocky soils 19 mm (3/4 inch) rods shall be specified. In high resistivity soils, 3 m (10 foot) or sectional rods may be used to obtain the required resistance to ground. Where rock is encountered, additional rods, a counterpoise, or ground grid may be necessary. Coordinate and standardize rod selection for individual facilities with other specification sections.
****

Ground rods shall be of [copper-clad steel conforming to UL 467] [zinc-coated steel conforming to ANSI C135.30] [solid stainless steel not less than [16] [19] mm [5/8] [3/4] inch in diameter by [2.5] [3] m [8] [10] feet in length] [of the sectional type].

2.4.5 Power Supply

****
NOTE: Locations with automatic backup power generation shall require as a minimum 4 hours backup.
****

The operating power for the system shall be single phase taken from the building electric service as specified in paragraph Power Supply for the System. Emergency backup power shall be provided by sealed [lead-acid] [or] [nickel-calcium] type batteries requiring no additional water. The charging system shall recharge fully discharged batteries within 12 hours and maintain the batteries in the fully charged state. The battery shall have the capacity to operate the system for not less than 48 hours under maximum normal load with the power supply to the charger disconnected.

2.4.6 Wiring

Wiring shall be in accordance with NFPA 70 and as indicated. Station wiring shall be color coded.

2.4.7 Special Tools and Spare Parts

Special tools necessary for the maintenance of the equipment shall be furnished. One spare set of fuses of each type and size required and 5 spare lamps of each type shall be furnished.

PART 3 EXECUTION

3.1 INSTALLATION

All work shall be installed as shown and in accordance with the manufacturer's recommendations, unless otherwise specified. Necessary interconnections, services, and adjustments required for a complete and operational system shall be provided. Electrical work shall be in accordance with NFPA 70.

3.1.1 Power Supply for the System

A single dedicated branch-circuit connection for supplying power to the fire alarm system shall be provided. The backup power supply shall be automatically energized upon failure of the normal power supply.

3.1.2 Wiring for Systems

Wiring for systems shall be installed in rigid conduit, intermediate metallic conduit, or electric metallic tubing. The conductors for the fire alarm system shall not be installed in conduits, junction boxes, or outlet boxes with conductors of lighting and power systems. The sum of the cross-sectional areas of individual conductors shall not exceed 40 percent of the interior cross-sectional area of the conduit. Conduit shall comply with NFPA 70. Ample gutter space to accommodate necessary wiring shall be provided. The Contractor shall submit wiring diagrams as specified in the Submittals paragraph.

3.2 OVERVOLTAGE AND SURGE PROTECTION

Equipment connected to alternating current circuits shall be protected from surges per IEEE C62.41 and NFPA 70. Cables and conductors which serve as communications links, except fiber optics, shall have surge protection circuits installed at each end. Fuses shall not be used for surge protection.

3.3 GROUNDING

Ground rods shall not protrude more than 150 mm 6 inches above grade. Noncurrent-carrying metallic parts associated with radio fire alarm equipment shall have a maximum resistance to solid "earth" ground not to exceed 25 ohms.

3.4 TESTING

The Contractor shall notify the Contracting Officer 30 days before the performance and acceptance tests are to be conducted and shall submit the test procedures to be used. The tests shall be performed in the presence of the Contracting Officer under the supervision of the fire alarm system manufacturer's qualified representative. The Contractor shall furnish all instruments and personnel required for the tests.

3.4.1 Performance Testing

Upon completion of the installation, the system shall be subjected to a complete functional and operational performance test by the Contractor. Test shall determine that the system is free from grounded, shorted, or open circuits. When all corrections have been made, the system shall be retested to assure that it is functional. Copies of performance test reports shall be submitted in accordance with paragraph SUBMITTALS.

3.4.2 Acceptance Test

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NOTE: Listed tests are minimum required. If additional tests are required such tests must be added to the list.
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The testing shall be in accordance with NFPA 72. The recommended tests in NFPA 72 shall be considered mandatory and shall verify that all previous deficiencies have been corrected. The tests shall include the following:

a. Tests to indicate there are no grounded, shorted, or open circuits.

b. Tests of each radio fire alarm transmitter/receiver/transceiver/ repeater.

c. Tests of radio fire alarm monitoring base station for all required functions.

d. Tests of normal and emergency power supplies.

3.4.3 Training

The Contractor shall conduct a training course for operating staff in the building where the system is installed as designated by the Contracting Officer. The training period shall consist of [1 training day] [[_____] training days], [8] [_____] hours per day and shall start after the system is functionally completed but prior to the final acceptance tests. The field instructions shall cover all of the items contained in the approved operating and maintenance instructions.

-- End of Section --