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USACE / NAVFAC / AFCEA / NASA UFGS-27 51 13.00 10 (April 2006)  
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Preparing Activity: USACE Replacing without change  
UFGS-16755A (December 2004)

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UML dated October 2007

Latest change indicated by CHG tags

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04/06

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SECTION 27 51 13.00 10

RADIO PAGING SYSTEM  
04/06

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NOTE: This guide specification covers the requirements for signaling system for radio paging.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

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).

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## PART 1 GENERAL

### 1.1 REFERENCES

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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.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2005; TIA 2005) National Electrical Code

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-222-G (2005) Structural Standards for Antenna Supporting Structures and Antennas

TIA-329-B (1989) Minimum Standards for Communication Antennas Part I Base Station Antennas

TIA-374-A (2002) Land Mobile Selective Signaling Standard

TIA-603-C (2004) Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

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

47 CFR 15 Radio Frequency Devices

UNDERWRITERS LABORATORIES (UL)

UL 1069 (2001; Rev thru Mar 2006) Standard for Safety Hospital Signaling and Nurse Call Equipment

1.2 SUBMITTALS

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NOTE: Review submittal description (SD) definitions in Section 01 33 00 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.

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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 01 33 00 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

Radio Paging System[; G][; G, [\_\_\_\_]]  
Installation[; G][; G, [\_\_\_\_]]

Detail drawings consisting of a complete list of equipment and material, including manufacturer's descriptive and technical literature, catalog cuts, and installation instructions. Detail drawings shall also contain complete wiring and schematic diagrams, system riser diagrams, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. System riser diagrams shall include all system components, all raceways, conductors, and elevation or plan showing physical location of all components.

#### SD-03 Product Data

Field Training[; G][; G, [\_\_\_\_]]

Training plan outlining material covered and proposed schedule, [30] [\_\_\_\_] days prior to start of courses.

#### Radio Paging System

[Six] [\_\_\_\_] copies of design manuals consisting of manufacturer's standard literature. The design manual shall identify the operational requirements for the system and explain the theory of operation, design philosophy, and specific functions. A description of hardware and software functions, interfaces, and requirements shall be included for all system operating modes. The manual shall describe all equipment provided, including general description and specifications.

### Spare Parts

Spare parts data, as specified.

### Contractor Qualifications

Document certifying that Contractor meets specified qualifications.

### Manufacturer Qualifications

A statement attesting that manufacturer meets specified qualifications.

## SD-06 Test Reports

### Approved Test Plan

Test plan and procedures, not later than [\_\_\_\_\_] days prior to the start of testing. The test plan and test procedures shall explain in detail, step-by-step actions and expected results to demonstrate compliance with the requirements of this specification, and the methods for simulating the necessary conditions of operation to demonstrate performance of the system.

### Testing

Test reports in booklet form showing all field tests performed to adjust each component and acceptance tests performed to prove compliance with the specified performance criteria, upon completion of installation and testing of the system. Each test report shall include the final position of controls, operation mode of the equipment, and the manufacturer's name, model number, and serial number of test equipment used in each test.

## SD-07 Certificates

Encoder/CPU  
Transmitter  
Antenna  
Pocket Page Receiver

Manufacturer's certificate indicating compliance. Where equipment or materials are specified to conform to the standards or publications and requirements of EIA and UL, certificates attesting that the items furnished under this section of the specification conform to the specified requirements.

## SD-10 Operation and Maintenance Data

Radio Paging System[; G][; G, [\_\_\_\_\_]]

[Six] [\_\_\_\_\_] complete copies of maintenance manuals listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions shall include equipment layout and simplified wiring and control diagrams of the system as installed. [Six] [\_\_\_\_\_] complete copies of operator manuals outlining the step-by-step procedures required for system

startup, operation and shutdown. The manuals shall include the manufacturer's name, model number, service manual, parts list, and a brief description of all equipment and their basic operating features.

### 1.3 GENERAL REQUIREMENTS

#### 1.3.1 Standard Products

Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of such 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 Identical Items

All items of the same classification shall be identical. This requirement includes equipment, assemblies, parts, and components.

#### 1.3.3 Nameplates

Nameplates with manufacturer's name, type or style, model and serial number shall be secured to each item of equipment.

#### 1.3.4 Verification of Dimensions

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

#### 1.3.5 Contractor Qualifications

The Contractor shall have the following qualifications in radio paging systems:

- a. A minimum of 5 years experience in the application and installation of this type of system and equipment.
- b. Factory trained personnel to perform systems engineering and design, installation, testing, training, maintenance and repair service.

#### 1.3.6 Manufacturer Qualifications

The manufacturer shall have a minimum of 5 years experience in producing the types of radio paging systems and equipment specified. Manufacturer shall guarantee parts availability for a minimum of 7 years from date of system acceptance by the Contracting Officer.

### 1.4 SYSTEM DESCRIPTION

#### 1.4.1 General

The Contractor shall supply a complete and operable system. [Radio paging system](#) shall provide selective signaling and message communications throughout the [base] [\_\_\_\_\_]. The system shall consist of locally and/or remotely controlled paging terminal/encoder, UHF radio transmitter, antenna, pocket page receivers, pager storage/charging units, and telephone

interface coupler to accomplish the specified functions. The system shall alert and transmit messages to individuals and to groups.

#### 1.4.2 Performance Requirements

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NOTE: UHF transmission of radio paging should provide full coverage of the facility and site, and for coverage of the surrounding areas near the site that can receive paging signals from the onsite transmitter. Vicinity coverage by the 100 watt transmitter will provide line-of-sight in all directions up to a 40.2 km (25 mile) radius of the facility, except as limited by the contours of the terrain and high rise buildings surrounding the site.

If the facility requires wide area radio paging coverage beyond the transmission range of the onsite Radio Page System, the facility will need to use a wide area paging service. This could be an existing Base/Post Radio Page System or leased pagers from a commercial Radio Common Carrier (RCC) serving the area. Fill in blank with name of base/post.

\*\*\*\*\*

The radio equipment shall provide total coverage of the facility [and] [\_\_\_\_\_] without degradation of message transmitted. Equipment shall comply with the requirements set forth in the applicable subparts of 47 CFR 15.

##### 1.4.2.1 Page Initiation

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NOTE: There are four different page initiation methods available: Total access paging from any telephone location, limited access paging from selected telephone location, access from push button at the encoder and access from the nurse call system. Facility requirements must be determined to select the appropriate mode of page initiation methods. Calls can be made from one or more specified encoder locations. These are designated here as administrative locations. Generally the PABX attendant will handle paging. If paging is not required from the nurse call system, delete paragraph C. Provide a page priority chart for input/source. Coordinate priorities with user.

\*\*\*\*\*

- a. Paging shall be initiated from [any telephone] [designated telephones] by entering the radio page access number. When the access connection is made the system shall respond with a connection tone. The paging party shall then enter the address of the pager or group of pagers. The paging party shall then enter up to [10] [\_\_\_\_\_] numeric digits and then hang up. The system shall immediately disconnect from the telephone connection. An automatic time out shall disconnect the call after a preset time limit in the event that the paging party does not complete the page or does not hang up.



- b. Paging shall be initiated from an administrative push button location by pressing those buttons corresponding to a [pocket page receiver](#) code. The address shall be visually displayed on the operator station. The message characters shall then be entered via the keyboard. The message shall be visually displayed on the operator station. A transmit key shall then be activated to transmit the signal. [A "BUSY" indicator lamp shall illuminate during transmission from any other administrative locations.]
- c. Paging shall be initiated from a nurse call master station by activating the appropriate function keys. Data and messages conveyed to the Radio Paging System shall include pager address, encoding data for at least 2 priority alert signals, one for routine calls and one for code blue calls, emergency and priority calls, and alphanumeric messages containing patient room/bed number, type of call and service required.

#### 1.4.2.2 Signal Processing Rates

System processing rates for paging signals shall be at least one page per second for tone and vibration alert, no more than 6 seconds for alphanumeric display message, and 5 to 15 seconds for a voice message.

#### 1.4.2.3 Priority

If there is more than one page input being processed at any one time, the highest priority page shall take precedence and shall be transmitted ahead of any lower priority page in the system. Within any one priority, all pages shall be sequenced on a first-in, first-out queue. Pages shall be processed by priority according to the rank order listed below.

Priority	Page Message	Page Input Source
[_____]	[_____]	[_____]

#### 1.4.2.4 Reception

A tone or silent pager vibration and an LED indication shall alert the user that a message is being received. [If tone notification is used it shall be mutable.] A button shall allow messages to be viewed or heard.

#### 1.4.3 [Spare Parts](#)

The Contractor shall submit spare parts data for each different item of equipment and component in the system, after approval of the detail drawings and not later than [\_\_\_\_\_] months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

### 1.5 DELIVERY AND STORAGE

Equipment shall be delivered in original packages with labels intact and identifications clearly marked. Equipment shall be stored until installation time, protected from weather, humidity, corrosive fumes, temperature variations, dirt and dust, and other contaminants.

## PART 2 PRODUCTS

### 2.1 EQUIPMENT REQUIREMENTS

Equipment installed indoors shall be capable of operating in an environment of 13 to 35.0 degrees C 55 to 95 degrees F temperature and 45 to 60 percent relative humidity.

### 2.2 PAGING TERMINAL

Paging terminal shall be a desk mounted unit having alphanumeric keyboard with function keys to initiate and control paging functions, a noise-cancelling microphone, and an LCD digital display to show all characters entered and alarm messages from system diagnostics. Terminal shall have the ability to program pager address and features.

### 2.3 ENCODER/CPU

\*\*\*\*\*  
**NOTE: If Nurse Call System interface is not required, delete references to Nurse Call System.**  
\*\*\*\*\*

Encoder shall conform to the requirements of TIA-374-A. Encoder shall be modular in construction utilizing plug-in modules and stored program control for system features, receiver address and page grouping programming, and automatic supervision of system, cable or transmitter failure. Encoder shall provide all necessary programming, memory, processing, encoding, call prioritization, nurse call interface and self checking diagnostics for the radio paging system. Wired capacity shall be at least [8] [\_\_\_\_\_] data input lines capable of operating simultaneously. Display message storage shall be provided for at least [16] [\_\_\_\_\_] messages of up to [32] [\_\_\_\_\_] characters per message. Voice message storage shall be provided for a [30] [\_\_\_\_\_] -second code blue voice message. Stored Code Blue message shall be processed to the transmitter on a top priority basis. Interruption or loss of ac power to the system shall not cause loss of or change to stored programs. Nurse call system interface shall be in compliance with UL 1069.

### 2.4 TELEPHONE INTERFACE COUPLER

Telephone interface coupler shall contain the necessary circuitry to provide proper paging access for the telephone system. The unit shall provide automatic disconnect upon paging party hang-up, back-up timer to automatically disconnect after an adjustable period of [15] [\_\_\_\_\_] to [45] [\_\_\_\_\_] seconds, automatic disconnect or busy signal for override of higher priority signal, and balanced 600 ohm output.

### 2.5 TRANSMITTER

\*\*\*\*\*  
**NOTE: Radio paging systems are available in very high frequency (VHF) and ultra high frequency (UHF) range 30 MHz to 900 MHz. VHF systems are generally wide-area systems whereas UHF systems are usually onsite systems as called for by this specification. Systems that interface with Nurse Call Systems are always UHF and generally have a transmitting range of 40.2 km (25 miles) line-of-sight. Consult Base**

Frequency Coordinator for guidance in the selection of the frequency.

RF power output is dependent upon required range of transmission, contour of territory covered, antenna characteristics and antenna mounting height. Manufacturer can assist in determining proper power output and parameters of the transmitter.

\*\*\*\*\*

Transmitter shall conform to the requirements of TIA-603-C, TIA-374-A, and to the following:

- a. Frequency: [\_\_\_\_\_] [MHz] (Contractor shall contact the Contracting Officer to obtain the operating frequency of the system).
- b. Frequency stability over operating temperature range: plus or minus 1 PPM.
- c. Modulation deviation: plus or minus 5 kHz.
- d. Spurious and harmonic emissions: 85 dB down.
- e. RF power output: [\_\_\_\_\_] watts nominal.
- f. Output impedance: 50 ohms.

## 2.6 TRANSMISSION LINE

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NOTE: The type and parameters of the transmission lines are dependent on the distances between transmitter and antenna.

a. Solid foam polyethylene dielectric helixes rated at 2000 watts will be used when distance between base station and antenna is 18.3 m (60 feet) or less.

b. Solid foam polyethylene dielectric helixes rated at 3000 watts will be used when distance between base station and antenna is between 18.6 m and 39.6 m (61 and 130 feet).

c. Air-polyethylene dielectric helixes rated at 5000 watts for VHF will be used when distance between base station and antenna is between 39.9 m and 61.0 m (131 and 200 feet). For UHF, and specific applications, consult manufacturer.

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Transmission line shall be corrosion-resistant polyethylene-jacket type with inner and outer copper conductors, separated by [solid foam polyethylene dielectric] [air polyethylene dielectric] helixes. The line shall have a minimum bending radius of ten times the outside diameter and an average power rating of [2000] [3000] [5000] watts. Adapter kits for termination to antenna and base station shall be provided. Maximum attenuation at the specified frequency shall not exceed 1.51 dB per 30.5 m 100 feet.

## 2.7 ANTENNA

\*\*\*\*\*  
NOTE: The type of antenna indicated is applicable to some of the transmission sites. Based on the radiating space and coverage required, consult manufacturers to determine parameters of the correct antenna for the specific application.  
\*\*\*\*\*

Antenna and antenna structure shall conform to TIA-222-G and TIA-329-B. The antenna shall be [omnidirectional and vertically polarized 2 MHz band width, 500 watt power rating, 50 ohms nominal impedance, a voltage standing wave ratio of 1.5 to 1 or less, and a minimum gain of 2.8 dB over a half-wave dipole] [\_\_\_\_]. The antenna shall be constructed of fiberglass-encased radiating elements. Lightning protection and equipment for separate grounding of the antenna mast shall be provided.

## 2.8 POCKET PAGE RECEIVERS

### 2.8.1 Types

\*\*\*\*\*  
NOTE: The types of pocket page receivers are listed. Consult the facility for the types of pagers required and delete the types not required. Voice pagers are usually limited to code blue and priority/emergency pages that originate from a telephone access or page operator console.  
\*\*\*\*\*

Pocket page receivers shall conform to the requirements of TIA-603-C, and TIA-374-A. Receivers shall be of the following types, with quantities as indicated:

- a. Tone alert only; [\_\_\_\_] each.
- b. Tone alert and voice; [\_\_\_\_] each.
- c. Tone alert and numeric display; [\_\_\_\_] each.
- d. Tone alert, voice and numeric; [\_\_\_\_] each.
- e. Tone alert and alphanumeric display; [\_\_\_\_].
- f. Vibration alert; [\_\_\_\_].
- g. Vibration alert and numeric display; [\_\_\_\_] each.
- h. Vibration alert and alphanumeric display; [\_\_\_\_] each.

Display receivers shall have capacity to store at least 4 messages of at least 10 characters for numeric display and at least 8 messages of at least 32 characters for alphanumeric display. Stored messages in memory shall be recallable as often as desired by pressing a recall button. A protected memory location shall be available to store messages at the user's discretion. A back light shall be provided to allow reading of messages under low ambient light. Tone alert receivers shall have volume level

control and two distinct signals to distinguish routine pages from code blue, emergency and priority type pages. Codes for receiver address shall be programmable/reprogrammable using programmable firmware or replaceable code module. Receivers shall be assignable to at least two paging groups. Voice pagers shall have adjustable volume level.

#### 2.8.2 Power

Power source shall be interchangeable between disposable alkaline batteries and rechargeable nickel-cadmium batteries. Low battery alert shall be provided to indicate marginal charge on the battery. Battery charging contacts shall be recessed. Receivers shall come equipped with [alkaline] [nickel-cadmium] batteries.

#### 2.9 BATTERY CHARGERS

\*\*\*\*\*  
**NOTE: If disposable batteries are used, delete this paragraph. The recharge time for battery chargers varies with different manufacturers. Manufacturers should be consulted, based on facility requirement.**  
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Battery chargers for rechargeable batteries shall be of [single] [and] [multicharger] type with charging indicator for each receiver or battery. Multicharger unit shall be capable of charging [\_\_\_\_\_] receivers and [\_\_\_\_\_] spare battery sets simultaneously. The chargers shall have a nominal input voltage of [120] [\_\_\_\_\_] volts ac 50 to 60 Hz. The maximum charging time shall be [\_\_\_\_\_] hours. The Contractor shall furnish [[\_\_\_\_\_] desk-mounted single] [and] [[\_\_\_\_\_] multicharger] units as indicated. Chargers shall provide a signal to the encoder when the receiver is in the rack to indicate unavailability. Pages originating from telephones shall result in a distinct absence tone response to the paging party.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

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**NOTE: Because a Radio Page System is used to issue instructions during emergency conditions, the system must be connected to the Emergency Power System, Life Safety Branch according to the Health Care Facility standard, NFPA 99.**  
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Installation shall be as shown and in accordance with the manufacturer's recommendations, except where otherwise indicated.

##### 3.1.1 Wiring

Wiring shall be installed in rigid conduit, intermediate metallic conduit, or electric metallic tubing as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

##### 3.1.2 Transmission Line

The transmission line shall be installed in conduit, with the outer

conductor and lighting arrestor grounded to the conduit. Installation shall comply with NFPA 70.

### 3.2 TESTING

The Contractor shall notify the Contracting Officer [30] [\_\_\_\_\_] days before acceptance tests are to be conducted. Tests shall be conducted in accordance with the approved test plan. The Contractor shall furnish all instruments and licensed personnel required for the tests. The tests shall be conducted for all pages on all selected codes and groups to insure that the pages meet the operational requirement of these specifications. Tests shall be performed with a field intensity meter to measure the transmitted field strength throughout the required area of coverage. The minimum field strength shall assure specified tone and voice reception. If any deficiencies are revealed during any test, such deficiencies shall be corrected and the tests shall be reconducted.

### 3.3 MANUFACTURER'S SERVICES

Services of a manufacturer's representative who is experienced in the installation, adjustment, and operation of the equipment specified shall be provided. The representative shall supervise the installing, adjusting, and testing of the equipment.

### 3.4 FIELD TRAINING

The Contractor shall conduct separate training courses for operating and maintenance staffs. Number of attendees for each course shall be as designated by the Contracting Officer. The training period, to total [8] [\_\_\_\_\_] hours of normal work time per course, shall start after the system is functionally completed but prior to final acceptance tests. Training shall cover all of the items contained in the approved operating instructions and maintenance manuals and follow the submitted training plan.

-- End of Section --