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**USACE / NAVFAC / AFCEC / NASA** **UFGS-27 21 00.00 40 (February 2016)**
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**Preparing Activity: NASA** **Superseding**
**UFGS-27 21 00.00 40 (February 2011)**

**UNIFIED FACILITIES GUIDE SPECIFICATIONS**

**References are in agreement with UMRL dated January 2021**
**********

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**02/16**

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SECTION 27 21 00.00 40

INTERCOMMUNICATION SYSTEM
**02/16**

**********

**NOTE: This guide specification covers the requirements for five different types of intercommunication systems. Select one of the five types for the project.**

**Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.**

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

**Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).**

**********

**********

**NOTE: (Select Type 1 for brig facilities for the station to station intercommunications. Select type 5 for the public address and monitoring function for the project.) The various types are as follows:**

**1. Type 1: Direct connected, keyed system: This type of system is applicable for relatively small systems (maximum quantity of remote stations approximately 30) and generally when only a small number of master stations (usually 1 or 2) are required. However, if there is a requirement for annunciation at more than one location or a requirement for multiple conversation paths the use of this system with more than 1 or 2 master stations or with many more than 30 remote stations may be justified or required.**

2. Type 2: Single conversation path, central control system: This type of system is applicable to relatively large systems (more than approximately 30 stations) where only one conversation path is required and usually only one master station. This type of system is applicable to BEQs.

3. Type 3: Multiple conversation paths, central control system: This type of system is applicable to various size systems where a large portion of the total quantity of stations are master stations. A limited quantity of conversation paths may be specified as required.

4. Type 4: Paging system: This type of system provides one-way communications, using conventional public address system components. By proper inclusion of radio components it applies to radio paging.

5. Type 5: Public address and monitoring system (for brigs): This type of system provides two-way paging and monitoring communications, using conventional public address system components.

**********

**********

NOTE: Require shop drawings to supplement or clarify contract drawings. Contract drawings should clearly indicate approximate locations of all stations, conduit, and junction boxes. State precisely in the project specifications what is to be shown in detail drawings. If contract drawings do not show the locations of master stations, remote stations, junction boxes, and other system components, then include the number and type of stations, junction boxes, and the distance between them as a part of the contract specifications.

The guide specification covers intercommunication system and lists desirable features of electronic systems; however, not all manufacturers produce products with all the listed features. Manufacturers catalogs should be consulted for the features required. Where intercommunication systems are to be used with other communication devices, give consideration to the electromagnetic capability of the intercommunication system. This intercommunication system guide specification does not include all features and design parameters which are available. However, specifying equipment configuration or design parameters which are unnecessarily restrictive to competition should be avoided.

**********

## 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 Reference Identifier (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.**

**********

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.

ACOUSTICAL SOCIETY OF AMERICA (ASA)

| | |
|---|---|
| ASA S3.2 | (2009; R 2014) Method for Measuring the Intelligibility of Speech Over Communication Systems (ASA 85) |

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

| | |
|---|---|
| IEEE C62.41.1 | (2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits |
| IEEE C62.41.2 | (2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 70 | (2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 6 | (2007; Reprint Sep 2019) UL Standard for Safety Electrical Rigid Metal Conduit-Steel |
| UL 50 | (2015) UL Standard for Safety Enclosures for Electrical Equipment, Non-Environmental Considerations |

UL 797 (2007; Reprint Mar 2017) UL Standard for Safety Electrical Metallic Tubing -- Steel

1.2 SUBMITTALS

**********
**NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a “G” to an item, if the submittal is sufficiently important or complex in context of the project.**

**For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters 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.**

**The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.**

**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" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Intercommunication System; G[, [____]]

SD-03 Product Data

Type [1] [2] [3] system; G[, [____]]

[ Paging System; G[, [____]]

][ Public Address and Monitoring System; G[, [____]]

] Cables and Raceways; G[, [____]]

Surge Protection; G[, [____]]

SD-10 Operation and Maintenance Data

Operation and Maintenance Data

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

**********
**NOTE: Delete paragraph and subparagraph if Type 4 or 5 is specified.**
**********

Submit shop drawings for overall intercommunication system, including Data Package 5, and for each major component. Illustrate how each item of equipment will function in the system. Include an overall system schematic indicating relationship of intercommunication units on one diagram identifying type, size, and number of wiring, conduits and each major component.

2.1.1 Performance Requirement for Type [1] [2] [3] System

Install a solid state system, modular in design, and of the [wired] [and] [wireless] type with [all master stations] [a single master with remote stations] [master and remote stations intermixed]. [Ensure the station has capacity for later expansion to [[_____] master] [and] [[____] remote] stations [with [_____] handset] without sacrificing any equipment or feature performance].[ When both wired and wireless circuitry is used, do not reduce such interface function or quality].

2.1.1.1 Sound Reproduction

Ensure the intercommunication system reproduces, at all receiving stations, a 30 dB dynamic range of a 40 dB minimum input signal referenced to sound pressure level (SPL) over the frequency range of [300] [_____] to [3300] [_____] Hz. Unless otherwise specified, ensure SPL is 20 micro Pascal (0.00002 Newtons per square meter). Ensure the root-mean square (rms) extraneous noise (e.g. hum) level introduced by the intercommunication system is at least [30] [_____] dB below the nominal signal level. Distortion, including envelope delay, intermodulation, cross talk, and other nonlinear source, is not to exceed 5 percent.

2.1.1.2 System Performance

Provide system with normally acceptable speech intelligibility, defined as a score of at least 75 percent, obtained utilizing the phonetically balanced monosyllabic work intelligibility test in accordance with ASA S3.2.

2.1.1.3 System Operation and Service Features

a. Provide the system with a power switch and an associated pilot light for ON and OFF operations. Include a volume switch at each station to

regulate listening volume. Unless otherwise specified, operate the system on 120 Vac, single phase, 60 Hz source.

b. Provide all master stations with a "call-in" switch to provide an audible and visual indication of incoming calls from remote station. Ensure individual visual indication identifies calling station and status, and remains actuated until a call is answered by a master station.

c. In addition to the manufacturer's standard identification plates, provide engraved laminated phenolic identification plates for each component connection and terminal identification labels. Each label is 3-layer black on white on black, engraved to show white letters on black background. Warning or caution labels are 3-layers red on white on red, engrave to show white letters on red background. Clearly mark control switches and knobs with their function and status. Locate identification strips for station selector switches to clearly identify remote and master stations and protect by transparent plastic inserts. Ensure lettering is a minimum of 6.35 mm 1/4-inch high, normal block style.

d. At speaker/handset stations, lifting the handset automatically cuts out the loudspeaker in the station and all conversation is carried through handset.

**********

**NOTE: Regarding the text below, where noise does not exceed 55 dB, specify hands-free operation from distances up to 6100 mm 20 feet. In areas where the noise occasionally exceeds 55 dB, a talk-listen switch which overrides the hands-free operation should be specified. Where a high noise environment exists, delete hands-free operation and specify only a talk listen switch.**

**********

e. Provide a privacy switch at each remote station. In the ON position, ensure the switch prevents any transmission of sound from the remote station. When in the OFF position, without further switch manipulation, ensure the station responds to incoming calls upon voice activation from anywhere within 6100 mm 20-foot radius of station.

## 2.2 EQUIPMENT

Provide equipment and components which conform to applicable requirements of NFPA 70. Ensure units of the same type of the equipment are the product of single manufacturer. Ensure units mounted outside or subject to inclement conditions are weatherproof or are mounted in weatherproof enclosures.

### 2.2.1 Type 1 System: Direct Connected Keyed Intercommunication System

**********

**NOTE: Select the appropriate paragraph and its following subparagraphs for the features desired. Delete all paragraphs describing unwanted features.**

**********

Provide master stations and remote stations in the quantities indicated.

Each master station selectively communicates with any other master station and any remote station by actuating an appropriate selector switch. [Ensure each master station is capable of initiating a message to all other master stations and all remote stations simultaneously or in groups of not less than ten stations per group.]

2.2.1.1 Master Station

Ensure [desk] [surface wall] [recessed wall] [rack]-mounted master stations, as a minimum, conform to the following specifications:

a. Capacity: Accommodate [_____] stations

b. Speaker sensitivity: Minimum 40 dB

2.2.1.2 Intercommunication Amplifier

Ensure intercommunication amplifier, as a minimum, conforms to the following specifications:

a. Output power: [2] [_____] watts rms or greater

b. Total harmonic distortion: Less than 5 percent at rated power with a load equivalent to one station connected to output terminals

c. Signal-to-noise ratio: 60 dB or greater at rated output

d. Frequency response ratio: Plus or minus 2 dB from 200 Hz to 10,000 Hz

2.2.1.3 Remote Station

Ensure [desk] [surface wall] [recessed wall] [rack]-mounted remote stations with [stainless] [anodized aluminum] faceplates with temper proof mounting screws and [galvanized steel] [aluminum] backbox [with "station call-in" capabilities]. Provide a speaker at the remote station with a minimum sensitivity of 40 dB for speakers less than 200 mm 8-inches in diameter and 45 dB for speakers 200 mm 8-inches or greater. Provide a call announcement monitor lamp [and recurring momentary tone] at the remote station.

2.2.1.4 All-Call Amplifier

**********
**NOTE: Include only when it is determined that an all-call feature is an operational requirement.**
**********

Ensure the all-call amplifier, as a minimum, conforms to the following specifications:

a. Output power: Minimum of [0.5] [_____] watts for each station

b. Total harmonic distortion: Less than 5 percent at rated power with a load equivalent to the quantity of stations connected to it in all-call mode of operation

c. Signal-to-noise ratio: 60 dB or greater at rated output

d. Frequency response ratio: Plus or minus 2 dB from 200 Hz to 10,000 Hz

[2.2.2 Type 2 System

**********
**NOTE: Select the appropriate paragraph and its following subparagraphs for the features desired. Delete paragraphs describing the features not required.**
**********

Provide single conversation path, central control intercommunication system with a master station, automatic switching equipment, remote stations and [an annunciator panel] and all amplifiers. Ensure the master station selectively communicates with any remote station by actuating the [two] [three] digit number assigned to that remote station. [Design master station to communicate with all remote stations simultaneously or in groups of not less than 10 stations by actuating an assigned "all-call" number.] Ensure only the selected remote station is able to listen or talk to the master station. Ensure a non-selected remote station is not able to hear or interfere with any portion of conversation between master station and selected remote station. Hanging up the master station handset resets the system for the next call. Quantity and location of remote stations is as indicated.

2.2.2.1 Master Station

Provide [desk-top] [rack]-mounted type master station equipped with a handset with a switch for private conversations [with permanently coiled cord, approximately 1525 mm 5-feet long extended]. Provide a master station with molded shock-resistant plastic handset and housing. Mount housing on a steel base plate with a station selector with ten-digit, silent operating touch key mechanism.

2.2.2.2 Remote Station

Provide a [desk-top] [surface wall] [recessed wall] [rack]-mounted remote stations with [stainless steel] [anodized aluminum] face plates with tamperproof mounting screws and [galvanized steel] [aluminum] backbox. [Provide a "call-in" switch mounted on a faceplate to provide selective call-in to master station as an integral part of the remote station.] For remote stations, provide a speaker with a minimum sensitivity of 40 dB for speakers less than 200 mm 8-inches in diameter and at least 45 dB for speakers 200 mm 8-inches or greater. Ensure remote stations have a call announcement monitor lamp [and recurring momentary tone].

2.2.2.3 Intercommunication Amplifier

Ensure intercommunication amplifiers, as a minimum, conform to the following specifications:

a. Output power: [2] [_____] watts rms or greater

b. Total harmonic distortion: Less than 5 percent at rated output power with a load equivalent to one station connected to output terminals

c. Signal-to-noise ratio: 60 dB or greater at rated output

d. Frequency response ratio: Plus or minus 2 dB from 200 Hz to 10,000 Hz

2.2.2.4 All-Call Amplifier

Provide an all-call amplifier, conforming to the following specifications:

a. Output power: Minimum of [0.5] [_____] watt rms for each station

b. Total harmonic distortion: Less than 5 percent at rated output power with a load equivalent to the quantity of stations connected to it in all-call mode of operation

c. Signal-to-noise ratio: 60 dB or greater at rated output

d. Frequency response ratio: Plus or minus 2 dB from 200 Hz to 10,000 Hz

2.2.2.5 Horn-Type Loudspeakers

**********
**NOTE: Use 57 decibels for axial sensitivity of bi-directional and compound diffraction horns.**
**********

Provide horn-type loudspeakers with line transformers and mounting brackets and as a minimum conform to the following specifications:

a. Frequency response: Plus or minus 3 dB from 250 Hz to 10,000 Hz

b. Power rating: [5] [_____] watts

c. Horizontal dispersion angle: [one] [1.57] [2] [_____] rad [57] [90] [115] [_____] degrees

d. Vertical dispersion angle: [one] [1.57] [2] [_____] rad [57] [90] [115] [_____] degrees

e. Axial sensitivity: Minimum of [57] [60] [_____] dB

f. Line transformers power rating: At least 4 watts

][2.2.3 Type 3 System

**********
**NOTE: Select the appropriate paragraph and its following subparagraphs for the features desired. Delete all paragraphs describing features not required.**
**********

Provide multiple conversation paths, central control intercommunication system capable of communicating with the other master stations and remote stations selectively or in any combination thereof. [Ensure each master station selectively communicates with any other master station or remote station by actuating number assigned to initiate a message to all other master stations and all remote stations simultaneously or in groups of not less than 10 stations.]

2.2.3.1 Master Stations

Provide [desk-top] [surface wall] [recessed wall] [rack]-mounted master stations with ten digit touch key station selector mechanism. Provide the

master station with a speaker-microphone with at least 40 dB sensitivity. Ensure the master station also has a push-button type reset button to cancel calls and reset system for next call.

2.2.3.2 Remote Station

Provide [desk-top] [surface wall] [recessed wall] [rack]-mounted remote stations with [stainless steel] [anodized aluminum] face plates with tamperproof mounting screws and [galvanized steel] [aluminum] backbox. [Provide a "call-in" switch mounted on a faceplate to provide selective call-in master station as an integral part of the remote station.] For remote stations, provide speakers with a minimum sensitivity of 40 dB for speakers less than 200 mm 8 inches in diameter and at least 45 dB for speaker 200 mm 8 inches or greater.

2.2.3.3 Intercommunication Amplifier

Ensure intercommunication amplifier, as a minimum, conforms to the following specifications:

a. Output power: [2] [_____] watts rms or greater

b. Total harmonic distortion: Less than 5 percent at rated output power with a load equivalent to a load equivalent to one station connected output terminals

c. Signal-to-noise ratio: 60 dB or greater at rated output

d. Frequency response ratio: Plus or minus 2 dB from 200 Hz to 10,000 Hz

2.2.3.4 All-Call Amplifier

Ensure all-call amplifier, as a minimum, conforms to the following specifications:

a. Output power: Minimum of [0.5] [_____] watt rms for each station

b. Total harmonic distortion: Less than 5 percent at rated power with a load equivalent to [_____] stations connected to output terminal all-call mode of operation

c. Signal-to-noise ratio: 60 dB or greater at rated output

d. Frequency response ratio: Plus or minus 2 dB from 50 Hz to 10,000 Hz

2.2.3.5 Horn-Type Loudspeakers

**********

**NOTE: Use 57 decibels for axial sensitivity of bi-directional and compound diffraction horns.**

**********

Provide horn-type loudspeakers with line transformers and mounting brackets and as a minimum conform to the following specifications:

a. Frequency response ratio: Plus or minus 3 dB from 250 Hz to 10,000 Hz

b. Power rating: [25] [_____] watts

c. Horizontal dispersion angle: [one] [1.57] [2] [_____] rad [57] [90] [115] [_____] degrees

d. Vertical dispersion angle: [one] [1.57] [2] [_____] rad [57] [90] [115] [_____] degrees

e. Axial sensitivity: Minimum of [57] [60] [_____] dB

f. Line transformers power rating: At least 4 watts

][2.2.4 Type 4 System: Paging System

**********

**NOTE: Select the appropriate paragraph and its following subparagraphs for the features desired. Delete paragraphs describing the features not required. System capacity should include future expansion requirements.**

**********

Provide paging system including amplifier, preamplifier, control panel, speakers, microphone, and interconnecting cables. Operate all speakers from a [70] [25] volt distribution system. Provide a solid state system from a single supplier with an integrated design.

2.2.4.1 Preamplifier/Mixer

Provide preamplifier/mixer either separately or as an integral part of power amplifier. If separate, ensure it is completely self-contained, requiring only a 120 Vac power source. Provide controls which are front panel mounted, and include ON/OFF switch with power on visual indicator. Ensure preamplifier employs only solid state devices and conforms to the following specifications:

a. Inputs: Microphone: Low impedance, 150 ohms nominal

b. Auxiliary: High impedance, 500,000 ohms or greater

c. Signal-to-noise ratio: 60 dB or greater at rated output

d. Frequency response ratio: Plus or minus 2 dB from 20 Hz to 20,000 Hz

e. Total harmonic distortion: Less than 3 percent at rated output power

f. Output: Sufficient to drive power amplifier to rated output

2.2.4.2 Power Amplifier

**********

**NOTE: To specify proper power rating of amplifier, allow 1 watt for each cone type speaker and 1.5 watts for each horn type. Special circumstances may dictate greater power requirements.**

**********

Provide controls which are front panel mounted, and include ON/OFF switch with power-on visual indicator. Ensure the power amplifier employs only solid state devices, and as a minimum conforms to the following performance characteristics:

a. Power output: [_____] watts or greater

b. Signal-to-noise ratio: 60 dB or greater at rated output

c. Frequency response ratio: Plus or minus 3 dB from 100 Hz 10,000 Hz

d. Total harmonic distortion: Less than 3 percent at rated output

e. Power requirements: 120 Vac, 60 Hz

2.2.4.3 Cone Speaker

Provide [ceiling] [wall] [pendant]-mounted cone type speakers. Include rust-proof back boxes of acoustically damped construction, minimum 20 gage steel or aluminum; provide for relief of back pressure. Include suitable recessed mounted speaker grille, made of 20 gage minimum steel or aluminum. Ensure the speaker assembly conforms to the following specifications:

a. Sensitivity (sound pressure level): Minimum of 92 dB, measured at 1 watt input, 1200 mm 4 feet on axis

b. Frequency response ratio: Plus or minus 3 dB from 80 Hz to 12,000 Hz

c. Dispersion angle: 1.57 rad 90 degrees

d. Transformer with 4 level taps: [1/4] [1/2] [1] [2] [5] [10] [15] [_____] watts

e. Voice coils: 25 mm one inch

2.2.4.4 Horn-Type Loudspeakers

**********
**NOTE: Ensure mounting height is indicated on the drawings.**
**********

Provide horn-type loudspeakers with line transformers, mounting brackets and all hardware. Mount at heights indicated on drawings. As a minimum conform to the following specifications:

a. Power rating: [15] [20] watts

b. Frequency response ratio: Plus or minus 3 dB from 250 Hz to 10,000 Hz

c. Horizontal dispersion angle: [one] [1.57] [2] [_____] rad [57] [90] [115] [_____] degrees

d. Vertical dispersion angle: [one] [1.57] [2] [_____] rad [57] [90] [115] [_____] degrees

e. Sensitivity (sound pressure level): Minimum of 97 dB measured at 1 watt input, 1200 mm 4 feet on axis

f. Power taps: [1/2] [1] [2] [4] [5] [10] [15] [20] [25] [_____] watts

2.2.4.5 Microphone

Provide dynamic omni-directional microphones, [wall-mounted] [desk-mounted with desk stand and touch-to-talk bar]. Include zone selector switches[ with indicating lights]. Ensure microphones conform to the following specifications:

a. Frequency response ratio: Plus or minus 3 dB from 60 Hz to 10,000 Hz

b. Impedance: Low impedance, 150 ohms nominal

c. Output level: 58 dB minimum

][2.2.5 Type 5 System: Public Address and Monitoring System for Brigs

**********
**NOTE: Choose the appropriate paragraph and its following subparagraphs for the features desired. Delete paragraphs describing features not required. System capacity should include future expansion requirements.**
**********

**********
**NOTE: Use these paragraph and its subparagraphs for brig facilities only. Not all manufacturers produce all the listed features. Therefore, manufacturers catalogs may be consulted as to the features required. Avoid specifying equipment configuration or design parameters which are unnecessarily restrictive to competition.**
**********

Provide amplifier, preamplifier, control panel, speakers, microphone, and interconnecting cables. Operate speakers from a [70] [25] volt distribution system.

2.2.5.1 Detection of Central Public Address System Trouble

Provide a continuously supervised central public address system for detection of system trouble such as opens, shorts, grounds, mechanical damage, power loss in all amplifiers (signal generators), external wiring and speakers including voice controls and cones. Rack-mount system supervisory equipment.

2.2.5.2 Speakers

Install two-way speaker/microphone speakers for use as audio monitoring devices as well as public address speakers. Ensure each speaker installation is complete, including where applicable, drivers, matching transformers, mounting brackets, acoustically treated back boxes, and baffles selected with audio characteristics and physical construction that are compatible with the total system.

a. For speakers installed in inmate housing groups, use a [dual] reentrant horn suitable for voice announcements and area monitoring in areas of high ambient noise level. Provide speakers that are suitable for indoor [and outdoor] use and conform to not less than the following:

| | | | | |
|---|---|---|---|---|
| Continuous Power rating (Watts) | [15] | [30] | [30] | [30] |
| Frequency Response (Hz) | [275-14,000] | [225-14,000] | [250-14,000] | [225-14,000] |
| Dispersion | [1.74 rad][100 degrees] | [1.74 rad][100 degrees] | [2.09 by 1.04 rad][120 by 60 degrees] | [1.74 rad][100 degrees] |
| Sound Pressure at 1200 mm 4 Feet on Axis with Rated Inputs (Decibels): | [121] | [125] | [123] | [121] |
| Impedance Range (Ohms) | [45 to 5000] | [45 to 2400] | [45 to 2500] | [45 to 2500] |
| Mounting: | [Universal 3-way adjustable] | [Universal 3-way adjustable] | [Universal 3-way adjustable] | [Universal 3-way adjustable] |
| Area Use: | [Indoor / Outdoor] | [Indoor / Outdoor] | [Indoor / Outdoor] | [Indoor / Outdoor] |

b. For large area public address systems, install weatherproof loudspeaker reflex trumpets conforming to not less than the following specifications:

(1) Continuous power rating with driver: [_____] watts

(2) Frequency response: [_____] Hz

(3) Dispersion angle: [85 degrees] [120 by 60 degrees] [1.48 rad] [2.09 by 1.04 rad]

(4) Sound pressure level input: [_____] dB at 1200 mm 4-feet on Axis with Rated Input

(5) Impedance range: [_____] Ohms [Manufacturer's standard for 40 watt audio power on 70 volt system]

(6) Mounting: Universal three-way adjustable

(7) Area use: Indoor/Outdoor

c. Flush mount speakers in an acoustically treated backbox and provided with high impact square plastic baffle attached to backbox with spanner head bolts. Ensure speakers conform to not less than the following:

| | | |
|---|---|---|
| Continuous power rating (Watts): | [10] | [15] |
| Frequency response (Hz): | [80 to 12,000] | [30 to 20,000] |

| | | |
|---|---|---|
| Speaker diameter mm inches: | [Nominal 200] [Nominal 8] | [Nominal 200] [Nominal 8] |

2.2.5.3 Security Baffle

Provide [flush] [surface]-mounted speakers in security type enclosures. Baffle consists of high tensile strength 275.6 MPa 40,000 psi case aluminum alloy outer ring and stainless steel woven wire mesh speaker screen spun over and attached to subplate mounting assembly.

a. Securely attach baffle to speaker enclosure with tamperproof flush screws. Ensure the speaker enclosure is acoustically treated, of the correct depth for the speaker assembly to be installed and suitable for flush mounting in masonry [wall] [ceiling].

b. Securely mount baffle from the inside to a surface mounted 11 gage tempered, aluminum plate, housing, rolled into cylindrical shape heliarc welded. Installation includes an 11 gage aluminum ring for support of speaker/baffle. Attach all components with tamperproof, flush screws. Attach housing to mounting surface with lead shields on masonry and machine bolts on structural steel.

**********

**NOTE: Regarding text below, coordinate speaker mounting detail on the drawings.**

**********

c. Install monitor speakers with each subsystem to have monitoring feature. Rate speaker at not less than 5 watts output continuous with frequency response from 100 Hz to 10,000 Hz. Ensure the nominal diameter is not less than 150 mm 6inches. Where speakers are indicated to be independently mounted, provide speakers with high impact plastic or stainless steel baffle and flush mounted in acoustically treated back box. Provide speakers where monitor speaker is indicated to be rack mounted with other equipment.

2.2.5.4 Amplifiers

[Rack][Shelf]-mount power amplifiers. [Where mounted in same location as other audio equipment, mount all equipment in common rack.] Ensure power amplifiers contain circuit breaker for overload protection, high temperature automatic reset protection and electronic output protection. Ensure power amplifiers, as a minimum, conform to the following:

| | | | | |
|---|---|---|---|---|
| Audio Power Output (Watts) | [60] | [125] | [250] | [400] |
| Distortion (percent) | [5] | [5] | [2] | [5] |
| Frequency Response (Hz) | [20 to 20,000] | [20 to 29,000] | [30 to 20,000] | [20 to [_____]] |
| Noise Level (below raised output in dB) | [75] | [75] | [80] | [75] |
| Load Impedance 70 volts (ohms) | [100] | [50] | [25] | [15] |

| | | | | |
|---|---|---|---|---|
| Audio Power Output (Watts) | [60] | [125] | [250] | [400] |
| Load Impedance 25 volts (ohms) | [12.5] | [6.25] | [3.25] | [1.88] |
| Power Required at Rated Output(watts) | [125] | [240] | [600] | [840] |
| Rack Mounting | [140] [5-1/2] | [220] [8-3/4] | [310] [12-1/4] | [355] [14] |

a. Use a solid state pre-amplifier for use with the power amplifiers specified and is [rack] [shelf]-mounted. Provide pre-amplifier with power on-off switch, monitor volume control, program volume control, and call selector switch and VU meter. Make connections between the station selector switch panel for either "program" or "monitoring" of selected stations. Ensure the pre-amplifier conforms to the following:

(1) Power output: Compatible with power amplifiers

(2) Frequency response: Plus and minus [_____] dB from 20 Hz to 20,000 Hz

(3) Noise level: -50 dB

(4) Distortion: Less than 5 percent

b. Incorporate solid state booster amplifiers into the total system to amplify audio signal from central power amplifiers. Ensure [rack] [shelf]-mount booster amplifier conforms to the following minimum specifications:

(1) Power output: 15 watts

(2) Peak power output: 25 watts

(3) Frequency response: Plus and minus [_____] dB from 20 Hz to 12,000 Hz

(4) Noise level: -50 dB

(5) Distortion: Less than 5 percent

2.2.5.5 Microphone

Provide a dynamic, omni-directional type microphone with desk stand and touch-to-talk bar. Provide a microphone with a frequency range between 60 to 10,000 Hz, die cast zinc alloy construction, with satin chrome finish. Connect microphone with portable cord and microphone plug inserted into flush mounted microphone jack.

Provide desk mounted telephone type handset [in the Commanding Officer's Office] [at the location indicated] for use with public address system. Construct handset of high impact plastic with heavy-duty coil cord. Provide a handset that contains a press-to-talk switch, which, when pressed, automatically connects the handset to "all call" mode of system.

2.2.5.6 Station Selector Switch Panel

Incorporate station selector switch panels into each public address and monitoring subsystem and into the central public address system. Ensure selector switch panels are rack mounted type containing not less than twenty-five switch positions. Switch positions not required may be blanked, or if switches are provided, clearly identify unused switches.

a. Subsystem selector switch panels contain [four] [_____] station control switches with double pole, three position for "MONITOR", "OFF", and "INTERCOM". Provide one additional switch for "ALL CALL" of subsystems stations.

b. Central system selector switch panel contains [_____] station control switches with double pole, two position lever type switch with "OFF" and "PUBLIC ADDRESS" positions. Provide one additional switch for "ALL CALL" to all subsystems.

c. Provide switches with self-wiping, precious metal contacts, and means of switch identification.

2.2.5.7 Supervision Module

Provide supervision module for the central public address system with audible and visual alarms to signify that a component of the supervised systems is malfunctioning. Provide a panel containing a silencing switch to de-energize audible signal and pilot lamps to remain activated until system fault has been corrected. Ensure the panel is [rack-mounted with central amplification equipment] [mounted with preamplifier at central operation location].

]2.3 COMPONENTS

2.3.1 Cables And Raceways

Ensure the cables and raceways conform to UL 6 and UL 797, cabinets and boxes conform to UL 50. For use in air plenums, provide cables that are UL classified low smoke and low flame in accordance with NFPA 70.

2.3.1.1 Speaker Cable

Provide basic cables that are single twisted pair shielded cables, 22 gage, stranded tinned copper with vinyl insulation aluminum polyester shield, stranded tinned copper wire with overall vinyl jacket. Multi-conductor shielded pair cables conforming to basic speaker cable specifications are acceptable.

2.3.1.2 Microphone Cable

Use single conductor shielded cable, stranded copper No. [25] [_____] AWG rubber insulated, tinned copper shield and rubber overall jacket.

2.3.2 Terminals

Use [solderless, tool-crimped pressure] [or] [_____] terminals.

2.3.3 Surge Protection

Ensure major components of the system such as master stations, amplifiers,

and remote stations, have a device, either internal or external, which provides protection against voltage spikes and current surges conforming to IEEE C62.41.1 and IEEE C62.41.2.

### 2.3.4 Speaker Enclosures

Ensure speaker enclosures are compatible with the speakers specified and comply with UL 50.

## PART 3 EXECUTION

## 3.1 INSTALLATION

### 3.1.1 General

Install all system components and appurtenances in accordance with the manufacturer's instructions and as specified herein.

### 3.1.2 Wiring

Install wiring in rigid metal conduit, intermediate metal conduit, cable tray, or electric metallic tubing as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Terminate wiring for signal circuits on identified terminal blocks in cabinets and master station enclosures. Terminate audio circuits on identified terminal blocks in cabinets and master stations. Ground cable shield at all points of termination.

#### 3.1.2.1 Signal Wiring and Control Wiring

Install signal and control circuits in accordance with NFPA 70. Provide type of signal and control wires and number of conductors as recommended by the intercommunication system manufacturer, and as necessary to provide a complete and operable system.

### 3.1.3 Grounding

NFPA 70. Provide ground and distribution ground buses constructed of solid copper wire with insulating covering.

## 3.2 FIELD QUALITY CONTROL

Verify that units and controls are properly labeled, and interconnecting wires and terminals identified.

### 3.2.1 Acceptance Tests

After installation has been completed, conduct an acceptance test in the presence of the Contracting Officer or its representative, to demonstrate that the equipment operates in accordance with specification requirements. Notify the Contracting Officer [2 weeks] [_____] prior to performance of tests. The acceptance tests includes originating and accepting messages at specified stations, at proper volume levels, without cross-talk or noise from other links or non-designated units. Utilize the phonetically balanced monosyllabic work intelligibility test in accordance with ASA S3.2. In order to be acceptable, obtain a score of at least 75 percent for each system test.

### 3.2.2 Retesting

Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies.

## 3.3 CLOSEOUT ACTIVITIES

Submit operation and maintenance data for the intercommunication system in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

-- End of Section --