UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021
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04/06

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-- End of Section Table of Contents --

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USACE / NAVFAC / AFCEC / NASA	**UFGS-27 21 00.00 20 (April 2006)**

Preparing Activity: NAVFAC	**Replacing without change UFGS-16822N (August 2003)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021

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SECTION 27 21 00.00 20

INTERCOMMUNICATION SYSTEM
04/06

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NOTE: This guide specification covers the requirements for five different types of intercommunication systems one of which shall be selected 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).

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NOTE: (For brig facilities, Type 1 shall be selected for the station to station intercommunications and Type 5 shall be selected 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.

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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 the number and type of stations, junction boxes, and the distance between them shall be included 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, consideration must be given 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.

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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 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.

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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.

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 SYSTEM DESCRIPTION

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NOTE: Delete paragraph and subparagraph if Type 4 or 5 is specified.
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1.2.1 Performance Requirement for Type [1] [2] [3] System

Solid state, modular in design, and shall be of the [wired] [and] [wireless] type with [all master stations] [a single master with remote stations] [master and remote stations intermixed]. [Station shall have 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, such interface shall not reduce function or quality].

1.2.1.1 Sound Reproduction

The intercommunication system shall reproduce 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, SPL shall be 20 micro Pascal (0.00002 Newtons per square meter). The root-mean square (rms) extraneous noise (e.g. hum) level introduced by the intercommunication system shall be at least [30] [_____] dB below the nominal signal level. Distortion, including envelope delay, intermodulation, cross talk, and other nonlinear source, shall not exceed 5 percent.

1.2.1.2 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.

1.2.1.3 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, the system shall operate on 120 Vac, single phase, 60 Hz source.

b. All master stations shall have a "call-in" switch to provide an audible and visual indication of incoming calls from remote station. Individual visual indication shall identify calling station and status, and remain 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, and shall be 3-layer black on white on black, engraved to show white letters on black background. Warning or caution labels shall be 3-layers red on white on red, engrave to show white letters on red background. Control switches and knobs shall be clearly marked with their function

and status. Identification strips for station selector switches shall be located to clearly identify remote and master stations and shall be protected by transparent plastic inserts. Lettering shall be a minimum of 6.35 mm 1/4 inch high, normal block style.

d. At speaker/handset stations, lifting the handset shall automatically cut out the loudspeaker in the station and all conversation shall be 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. A privacy switch shall be provided at each remote station. In the ON position, the switch shall prevent any transmission of sound from the remote station. When in the OFF position, without further switch manipulation, the station shall respond to incoming calls upon voice activation from anywhere within 6100 mm 20 footradius of station.

1.3 SUBMITTALS

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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

Submit for overall system and for each major component. Illustrate how each item of equipment will function in the system and 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.

SD-03 Product Data

Materials and equipment for Type [1] [2] [3] system

[Paging system equipment]

[Public address and monitoring system equipment]

Cables and raceways

Surge protection

SD-10 Operation and Maintenance Data

Intercommunication system, Data Package 5

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

PART 2 PRODUCTS

2.1 EQUIPMENT AND COMPONENTS

Equipment and components shall conform to applicable requirements of NFPA 70. Units of the same type of the equipment shall be product of single manufacturer. Units to be mounted outside or subject to inclement conditions shall be weatherproof or to be mounted in weatherproof enclosures.

2.1.1 [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 shall selectively communicate with any other master station and any remote station by actuating an appropriate selector switch. [Each master station shall be 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.]

2.1.1.1 Master Station

[Desk] [surface wall] [recessed wall] [rack]-mounted master stations shall as a minimum conform to the following specifications:

a. Capacity: Accommodate [_____] stations

b. Speaker sensitivity: Minimum 40 dB

2.1.1.2 Intercommunication Amplifier

Intercommunication amplifier shall 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 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

2.1.1.3 Remote Station

[Desk] [surface wall] [recessed wall] [rack]-mounted remote station shall have [stainless] [anodized aluminum] faceplate with temper proof mounting screws and [galvanized steel] [aluminum] backbox [with "station call-in" capabilities]. Remote station shall provide a speaker 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. Remote station shall have a call announcement monitor lamp [and recurring momentary tone].

2.1.1.4 All-Call Amplifier

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

All-call amplifier shall as a minimum conform 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

]2.1.2 [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. Master station shall selectively communicate with any remote station by actuating the [two] [three] digit number assigned to that remote station. [Master station shall be designed to communicate with all remote stations simultaneously or in groups of not less than 10 stations by actuating an assigned "all-call" number.] Only the selected remote station shall be able to listen or talk to the master station. A nonselected remote station shall not be able to hear or interfere with any portion of conversation between master station and selected remote station. Hanging up master station handset shall reset system for next call. Quantity and location of remote stations shall be as indicated.

2.1.2.1 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]. Master station shall have molded shock-resistant plastic handset and housing. Housing shall be mounted on a steel base plate with a station selector with ten-digit, silent operating touch key mechanism.

2.1.2.2 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. [A "call-in" switch mounted on a faceplate to provide selective call-in to master station shall be provided as an integral part of the remote station.] Remote stations shall 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. Remote stations shall have a call announcement monitor lamp [and recurring momentary tone].

2.1.2.3 Intercommunication Amplifier

Intercommunication amplifier shall 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

2.1.2.4 All-Call Amplifier

All-call amplifier shall as a minimum conform 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

2.1.2.5 Horn-Type Loudspeakers

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

Horn-type loudspeakers shall be provided with line transformers and mounting brackets and shall 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

]2.1.3 [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. [Each master station shall selectively communicate 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.]

2.1.3.1 Master Stations

Provide [desk-top] [surface wall] [recessed wall] [rack]-mounted master stations with ten digit touch key station selector mechanism. Master station shall have a speaker-microphone with at least 40 dB sensitivity. Master station shall also have a push-button type reset button to cancel calls and reset system for next call.

2.1.3.2 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. [A "call-in" switch mounted on a faceplate to provide selective call-in master station shall be provided as an integral part of the remote station.] Remote station shall 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.

2.1.3.3 Intercommunication Amplifier

Intercommunication amplifier shall 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 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

2.1.3.4 All-Call Amplifier

All-call amplifier shall as a minimum conform 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

2.1.3.5 Horn-Type Loudspeakers

****

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

****

Horn-type loudspeakers shall be provided with line transformers and mounting brackets and shall be 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

]2.1.4 [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. All speakers shall operate from a [70] [25] volt distribution system. System shall be solid state, and shall be integrated design of a single supplier.

2.1.4.1 Preamplifier/Mixer

Provide preamplifier/mixer either separately or as an integral part of power amplifier. If separate, it shall be 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. Preamplifier shall employee only solid state devices and shall be as a minimum conform to the following specifications:

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

Auxiliary: High impedance, 500,000 ohms or greater

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

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

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

e. Output: Shall be sufficient to drive power amplifier to rated output

2.1.4.2 Power Amplifier

Power amplifier shall employ only solid state devices and shall be as a minimum conform to the following specifications:

****

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. Power amplifier shall employ only solid state devices. 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

2.1.4.3 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. Speaker assembly shall as a minimum conform 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

2.1.4.4 Horn-Type Loudspeakers

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

Horn-type loudspeakers shall be provided with line transformers, mounting brackets and all hardware, shall be mounted at heights indicated on drawings, and shall 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

2.1.4.5 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]. Microphones shall as a minimum 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

]2.1.5 [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. Speakers shall operate from a [70] [25] volt distribution system.

2.1.5.1 Detection of Central Public Address System Trouble

Central public address system shall be continuously supervised 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. System supervisory equipment shall be rack-mounted.

2.1.5.2 Speakers

Speaker shall be two-way speaker/microphone type for use as audio monitoring devices as well as public address speakers. Each speaker installation shall be 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. Speaker installed in inmate housing groups shall be [dual] reentrant horn suitable for voice announcements and area monitoring in areas of high ambient noise level. Speakers shall be suitable for indoor [and outdoor] use and shall 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. Speakers installed for large area public address systems shall be loudspeaker reflex trumpet of weatherproof construction conforming to not less than the following specifications:

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

(2) Frequency response: [_____] Hz

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

(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 mounted speakers shall be mounted in acoustically treated backbox and shall be provided with high impact square plastic baffle attached to backbox with spanner head bolts. Speakers shall conform to not less than the following:

(1) Continuous power rating (Watts):	[10]	[15]
(2) Frequency response (Hz):	[80 to 12,000]	[30 to 20,000]
(3) Speaker diameter mm inches:	[Nominal 200] [Nominal 8]	[Nominal 200] [Nominal 8]

2.1.5.3 Security Baffle

Provide [flush] [surface]-mounted speakers in security type enclosures. Baffle shall consist 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. Baffle shall securely attached to speaker enclosure with tamperproof flush screws. Speaker enclosure shall be acoustically treated, of the correct depth for the speaker assembly to be installed and shall be suitable for flush mounting in masonry [wall] [ceiling].

b. Baffle shall be securely mounted from the inside to a surface mounted 11 gage tempered, aluminum plate, housing, rolled into cylindrical shape heliarc welded. Installation shall include an 11 gage aluminum ring for support of speaker/baffle. All components shall be attached with tamperproof, flush screws. Housing shall be attached 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. Monitor speakers shall be installed with each subsystem to have monitoring feature. Speaker shall be rated at not less than 5 watts output continuous with frequency response from 100 Hz to 10,000 Hz. Nominal diameter shall not be less than 150 mm 6 inches. Where speakers are indicated to be independently mounted, speakers shall be provided with high impact plastic or stainless steel baffle and shall be flush mounted in acoustically treated back box. Provide speakers where monitor speaker is indicated to be rack mounted with other equipment.

2.1.5.4 Amplifiers

Power amplifiers shall be [rack] [shelf]-mounted. [Where mounted in same location as other audio equipment, all equipment shall be mounted in

common rack.] Power amplifiers shall contain circuit breaker for overload protection, high temperature automatic reset protection and electronic output protection. Power amplifiers shall 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]
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. Pre-amplifier shall be solid state for use with the power amplifiers specified and shall be [rack] [shelf]-mounted. Provide pre-amplifier with power on-off switch, monitor volume control, program volume control, and call selector switch and VU meter. Connections shall be made between the station selector switch panel for either "program" or "monitoring" of selected stations. Pre-amplifier shall as minimum conform 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. Booster amplifiers shall be solid state type incorporated into total system to amplify audio signal from central power amplifiers. Booster amplifier shall be [rack] [shelf]-mounted and shall as minimum conform to not less than the following 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

2.1.5.5 Microphone

Microphone shall be dynamic, omni-directional type with desk stand and touch-to-talk bar. Frequency range shall be from 60 to 10,000 Hz. Construction shall be of die cast zinc alloy. Finish shall be satin chrome. Microphone shall be connected 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. Handset shall be constructed of high impact plastic with heavy-duty coil cord. Handset shall contain a press-to-talk switch, which, when pressed, shall automatically connect handset to "all call" mode of system.

2.1.5.6 Station Selector Switch Panel

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

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

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

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

2.1.5.7 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. Panel shall contain a silencing switch to deenergize audible signal and pilot lamps to remain activated until system fault has been corrected. Panel shall be [rack-mounted with central amplification equipment] [mounted with preamplifier at central operation location].

]2.2 CABLES AND RACEWAYS

Cable and raceways shall conform to UL 6 and UL 797. Cabinets and boxes shall conform to UL 50. Cables for use in air plenums shall be UL classified low smoke and low flame in accordance with NFPA 70.

2.2.1 Speaker Cable

Basic cables shall be 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.

2.2.2 Microphone Cable

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

2.3 TERMINALS

Terminals shall be [solderless, tool-crimped pressure] [or] [_____] type.

2.4 SURGE PROTECTION

Major components of the system such as master stations, amplifiers, and remote stations, shall have a device, either internal or external, which shall provide protection against voltage spikes and current surges conforming to IEEE C62.41.1 and IEEE C62.41.2.

2.5 SPEAKER ENCLOSURES

Speaker enclosures shall be compatible with the speakers specified and shall 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

Wiring shall be installed in rigid metal conduit, intermediate metal conduit, cable tray, or electric metallic tubing as specified in Section

26 20 00 INTERIOR DISTRIBUTION SYSTEM. Wiring for signal circuits shall terminate on identified terminal blocks in cabinets and master station enclosures. Terminate audio circuits on identified terminal blocks in cabinets and master stations. Cable shield shall be grounded at all points of termination.

3.1.2.1 Signal Wiring and Control Wiring

Signal and control circuits shall be installed in accordance with NFPA 70. Type of signal and control wires and number of conductors shall be provided as recommended by the intercommunication system manufacturer, and as necessary to provide a complete and operable system.

3.1.3 Grounding

NFPA 70. Ground and distribution ground buses shall be solid copper wire with insulating covering.

3.2 FIELD QUALITY CONTROL

3.2.1 Acceptance Tests

After installation has been completed, Contractor shall 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. Contractor shall notify the Contracting Officer [2 weeks] [_____] prior to performance of tests. The acceptance tests shall include originating and accepting messages at specified stations, at proper volume levels, without cross-talk or noise from other links or non-designated units. Test shall utilize the phonetically balanced monosyllabic work intelligibility test in accordance with ASA S3.2. In order to be acceptable a score of at least 75 percent must be obtained for each system test.

3.2.2 Retesting

Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies at Contractor's expense.

3.3 INSPECTION

Make observations to verify that units and controls are properly labeled, and interconnecting wires and terminals identified.

-- End of Section --