Preparing Activity: NAVFAC

Superseding
UFGS-27 21 00.00 20 (April 2006)
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**UNIFIED FACILITIES GUIDE SPECIFICATIONS**

**References are in agreement with UMRL dated July 2023**
**********

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DIVISION 27 - COMMUNICATIONS

SECTION 27 51 23

INTERCOMMUNICATION SYSTEM

**11/21**

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**USACE / NAVFAC / AFCEC / NASA** **UFGS-27 51 23 (November 2021)**

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**Preparing Activity: NAVFAC**

**Superseding**
**UFGS-27 21 00.00 20 (April 2006)**
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**UNIFIED FACILITIES GUIDE SPECIFICATIONS**

**References are in agreement with UMRL dated July 2023**

**********

SECTION 27 51 23

INTERCOMMUNICATION SYSTEM
**11/21**

**********

**NOTE: This guide specification covers the requirements for electronic intercommunication systems, including master and remote stations of the wired and wireless types.**

**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).**

**********

PART 1 GENERAL

**********

**NOTE: This guide specification covers intercommunication systems and lists desirable features of electronic systems; however, not all manufacturers produce products with all the listed features. Consult manufacturers as to the availability of features desired and the availability of those features. Additional features, requirements, etc., may be made to this specification. Where intercommunication systems are to be used with other communication devices, consider the electromagnetic compatibility of the**

**intercommunication system in accordance with AR 5-12 - Army Use of the Electromagnetic Spectrum. This intercommunication system guide specification does not include all features and design parameters which are available. Do not specify exact equipment configuration or design parameters that are unnecessarily restrictive.**

**********

## 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 | (2020) American National Standard Method for Measuring the Intelligibility of Speech Over Communication Systems (ASA 85) |

ELECTRONIC COMPONENTS INDUSTRY ASSOCIATION (ECIA)

| | |
|---|---|
| ECIA EIA/ECA 310-E | (2005) Cabinets, Racks, Panels, and Associated Equipment |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 70 | (2023) National Electrical Code |

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

| | |
|---|---|
| TIA-568.0 | (2020e) Generic Telecommunications Cabling for Customer Premises |
| TIA-568.1 | (2020e) Commercial Building Telecommunications Infrastructure Standard |

| | |
|---|---|
| TIA-568.2 | (2018d) Balanced Twisted-Pair Telecommunications Cabling and Components Standards |
| TIA-568.3 | (2022e) Optical Fiber Cabling Components Standard |

UNDERWRITERS LABORATORIES (UL)

| | |
|---|---|
| UL 50 | (2015) UL Standard for Safety Enclosures for Electrical Equipment, Non-Environmental Considerations |
| UL 1449 | (2021; Reprint Dec 2022) UL Standard for Safety Surge Protective Devices |

## 1.2 RELATED REQUIREMENTS

Section 25 05 11 CYBERSECURITY FOR FACILITY-RELATED CONTROL SYSTEMS applies to this section.

Section 27 51 16 PUBLIC ADDRESS SYSTEMS.

## 1.3 SYSTEM DESCRIPTION

**********

**NOTE: Public address systems are covered in specification 27 51 16 PUBLIC ADDRESS SYSTEMS and not in this specification; this guide specification covers the requirements for three different types of intercommunication systems, select those appropriate to the project and remove those not applicable to the project.**

**For brig facilities, a 2-way public address system for paging and monitoring must be provided in addition to the intercom system; use specification 27 51 16 PUBLIC ADDRESS SYSTEMS for the 2-way public address system. The various types are as follows:**

**Type 1 systems are hardwired, single-master systems with selector switches at the master station allowing for a single 2-way conversation with a remote station at a time. This system also allows for calls to the master station from a remote station, allows the master station to make a one-way announcement to one, several, or all remote stations at one time. Remote stations typically consist of a single speaker, a call button, and a visual indicator to show that the master station is connected to the particular remote station. This system typically cannot provide a video option. This type of system is applicable for relatively small systems (maximum quantity of remote stations approximately 30). If there is a requirement for annunciation at more than one location, multiple master stations, a large number of remote stations,or a requirement for multiple conversation paths, the use of a Type 1 system might not be**

**appropriate; consider a Type 2 or 3 system instead.**

**Type 2 systems are typically microprocessor-based, and hardwired or multiplexed with one or more multiple master stations; the master station typically utilizes a telephone-type instrument. This system allows for calls to the master station from a remote station, calls from master station to master station, and allows each master station to make a one-way announcement to one, several, or all of its remote stations at one time. A multiplexed version of this system could be appropriate for a facility with multiple remote stations distributed in various wings, such as in a BEQ, detention facility, or other building where it is not desirable to provide an individual cable from the master station to each remote station. Remote stations can be connected to a local electronic (not necessarily an IP Ethernet switch) switch and each switch connected to the master station by a single cable. Some of these systems allow for a designated master station to take control from another master station such as in a correctional facility where central control might need to take over the master station in a particular block in case of an emergency. These systems do not have to be IP-based, although addition of video will often require an IP system.**

**Type 3 systems are similar to Type 2 systems except that they can communicate among multiple buildings and sites and are IP-based to allow communications over local and wide area networks.**

**********

Provide Data Package 5 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

Provide an Intercommunication System that is solid state, modular in design, and as indicated.[ Stations must have capacity for later expansion to [[_____] master] [and] [[_____] remote] stations [with [_____] handset] [and][or] [with hands free operation] without sacrificing any equipment or feature of performance.][ When both wired and wireless circuitry are used, such interface must not present a reduction of function or quality.][ System must provide one-way video from the remote stations to the master stations where video-type remote stations are indicated].

1.3.1 Sound Reproduction

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.

Provide an intercommunication system to provide an audio output of no less than 10 dBA above ambient at [900] [_____] mm [3] [_____] feet from the surface of each receiving stations over the frequency range of [200] [_____] to [5000] [_____] Hz, when driven by a sound pressure level at the calling station of at least 70 dBA at the face of the transducer

enclosure. All sound pressure levels are referenced to 1 pascal equals 94 dB. The entire system must have a dynamic range of at least 40 dB. The root-mean-square (rms) extraneous noise (e.g. hum) level introduced by the intercommunication system must be at least [30] [_____] dB below the nominal signal level. Distortion, including envelope delay, intermodulation, cross talk, and other nonlinear sources, must not exceed 5 percent.

[1.3.2 Video Capability

Provide intercom stations with video in addition to audio. Master stations must be able to view individuals at remote stations equipped with video, but remote stations must not be able to view video from the master station(s). Provide video equipped remote stations where indicated and provide master stations with video feature.

Video Master Stations must have the following features:

a. Color touch screen with a diagonal size of at least 170 mm 7 inches.

b. Hands-free (VOX) and handset communications.

c. Pan, tilt, zoom,contrast, and brightness controls.

d. Automatic camera pan, tilt, and zoom setting specific to the remote stations when communicating with a remote station.

e. Audio and video storage of at least twenty calls of at least five minutes each on removable SD or SDHC media. Include software for viewing and listening on a standard PC if files are a proprietary format.

f. Low voltage power supply requirement complete with AC power adapter.

[ g. Door release function.

]]1.3.3 System Operation And Service Features

1.3.3.1 Control and Power Requirements

Provide the system with a power switch and an associated visual indicator for ON and OFF operations. Provide a volume control at each station to regulate listening volume. System must operate on [110-125 Vac] [220-250 Vac], single phase, [60] [50] Hz.

[ a. Remote stations must utilize Power over Ethernet (PoE). Include all necessary PoE switches, equipment and PoE injectors.

][b. Provide an IP-based system[ utilizing Power over Ethernet (PoE)]. Include all necessary PoE switches, equipment and injectors.

]1.3.3.2 Call-In Indication

Master stations must have an audible and visual call-in indicator to provide indication of incoming calls from remote stations. Indication must identify the specific calling station and status, and remain actuated until the call is answered by a master station. Visual call-in indicators must be clearly visible at off-center angles of at least 45 degrees.

1.3.3.3 Identification Plates

In addition to the manufacturer's standard identification plates, provide engraved laminated acrylic plastic identification plates for each component, connection, and terminal. Identification labels must be 3-layered white on black, engraved to show black letters on a white background. Warning and caution labels must be 3-layered white on red, engraved to show white letters on red background. Control switches and knobs must be clearly marked with their function and status. Identification strips for station selector switches must be located to clearly identify remote and master stations and must be protected by transparent plastic inserts. Lettering must be no smaller than 6.35 mm 1/4 inch high, normal block style.

1.3.3.4 Combination Speaker-Handset Stations

At combination speaker-handset stations, lifting the handset must automatically cut out the loudspeaker in the station and all conversation must be carried through the handset.

1.3.3.5 Privacy Switch

**********

**NOTE: Where ambient noise does not exceed 55 dBA, specify hands-free operation from distances up to 4.5 m 15 feet. In areas where the noise occasionally exceeds 55 dB, a talk-listen switch that overrides the hands-free operation should be specified. Where a high noise environment exists (above 80 dBA), delete hands-free operation and specify only a talk-listen switch.**

**General Noise Level Guidelines Library 30 dBA, Quiet Private Office 40 dBA, General Open Office 50 dBA, face-to-face conversation 60 dBA; full symphony 90 dBA.**

**********

Provide privacy switch at [each] [each indicated] remote station that prevents listening to that station when activated. Activation of the privacy switch must provide a initial temporary audible indication at the master station along with a constant visual indication of the specific station that activated its privacy switch. The visual indication at the master station must only be turned off by resetting the privacy switch at the remote station.

1.4 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.**
**********

**********
**NOTE: Submit detail drawings consisting of illustrations, schedules, performance charts, instructions, brochures, diagrams, catalog cuts, manufacturer's data, materials and equipment lists, and operational and general maintenance instructions, including the overall system and for each major component. Indicate the quantities of stations and provided spare capacity, including amplifier and power supply spare capacity; amplifer headroom must not be considered part of the spare capacity. Illustrate on the drawings how each item of equipment has been coordinated to function properly in the system. Include on detail drawings an overall system schematic indicating relationship of intercommunication units on one diagram and showing power source, system controls, impedance matches, plus number, size, and maximum lengths of interconnecting wires and indicate clearances required for maintenance and operation. Provide calculations for power requirements of equipment to show that the proper power levels, including headroom, are provided for the specified equipment.**

**[Submit details of interface with Electronic Security System when providing door control via the intercom system.]**
**********

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

Installation; G

SD-03 Product Data

All-Call Amplifier; G[, [_____]]

Cone-Type Loudspeakers; G[, [_____]]

Horn-Type Loudspeakers; G[, [_____]]

Intercommunication Amplifier; G[, [_____]]

Master Station; G[, [_____]]

[ Remote Audio and Video Station; G[, [_____]]

] Remote Audio-Only Station; G[, [_____]]

Speaker Enclosures; G[, [_____]]

Spare Parts; G[, [_____]]

SD-06 Test Reports;

Acceptance Tests; G[, [_____]]

SD-10 Operation and Maintenance Data

All-Call Amplifier; G[, [_____]]

Intercommunication Amplifier; G[, [_____]]

Master Station; G

[ Remote Audio and Video Station; G[, [_____]]

] Remote Audio-Only Station; G[, [_____]]

## 1.5 DELIVERY, STORAGE, AND HANDLING

Protect all equipment delivered and placed in storage from the weather, humidity and temperature variation, dirt and dust, or other contaminants.

## 1.6 EXTRA MATERIALS

After approval of detail drawings and not later than [2] [_____] months prior to the date of beneficial occupancy, furnish spare parts data for each different item of equipment and component in the system. Include with the data a complete list of parts and supplies, with current unit prices and source of supply.

## PART 2 PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

**********

**NOTE: Project drawings should clearly indicate the exact location of all stations, conduit, wiring, and junction boxes. If no drawings of the locations of master stations, remote stations, junction boxes, etc., are furnished with the specification, the number and type of stations and junction boxes and the distance between them must be included as a part of the project specification.**

**********

#### 2.1.1 Standard Products

Provide materials and equipment which are the standard products of a manufacturer regularly engaged in the manufacture of such products and that essentially duplicate equipment that have been in satisfactory use at least 2 years prior to bid opening. Equipment must be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

#### 2.1.2 Product Data

Submit Product Data including, but not limited to, capabilities, technical data, operating parameters, operating instructions, and installation instruction for Intercommunication System equipment and components requiring submittals.

#### 2.1.3 Identical Items

Items of the same classification must be identical. This requirement includes equipment, modules, assemblies, parts, and components.

#### 2.1.4 Nameplates

Each major component of equipment must have the manufacturer's name, model number, serial number, and markings for all required code, compliant, and conformant certification on plates mechanically attached to the equipment.

#### 2.1.5 Common Equipment Requirements

##### 2.1.5.1 Intercommunication Amplifier

The system intercommunication amplifier must, as a minimum, conform to the following specifications:

| | |
|---|---|
| Rated Output Power | 10 watts rms minimum |
| Total Harmonic Distortion | Less than 5 percent at rated output power with a load equivalent to one station connected to output terminals |
| Signal-To-Noise Ratio | 60 dB or greater at rated output |

| | |
|---|---|
| Frequency Response | Plus or minus 3 dB from 150 Hz to 12,000 Hz |
| Input Sensitivity | Matched to input circuit and providing full-rated output with sound-pressure level of not more than 70 dBA impinging on master stations, speaker microphones, or handset transmitters. |

2.1.5.2 All-Call Amplifier

All-call amplifier must, as a minimum, conform to the following specifications:

| | |
|---|---|
| Rated Output Power | Minimum of 2 watts rms for each station, but no less than 20 watts. |
| 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 |
| Signal-To-Noise Ratio | 60 dB or greater at rated output |
| Frequency Response | Plus or minus 2 dB from 200 Hz to 10,000 Hz |
| Output Regulation | Maintains output level within 2dB from full to no load |
| Input Sensitivity | Compatible with master stations and central equipment so amplifier delivers full-rated output with sound pressure level of less than 10 dynes/sq. cm 0.000145 psi impinging on master station, speaker microphone or hand set transmitter. |
| External Microphone Input | Balanced low-impedance with switchable 48VDC phantom power |
| Amplifier Protection | Prevent damage from shorted and open circuits |

2.1.5.3 Power Line Surge Protection

Provide a permanently-mounted (not a portable power strip) UL 1449 Type 3 Listed Surge Protective Device for all amplifiers. The surge protector must have a Maximum Continuous Operating Voltage of 150 volts for 120 VAC supply voltage and 300 volts for a 230 or 240 VAC supply voltage. The maximum Voltage Protection Rating must not exceed 600 VAC line-to-neutral, 700 VAC line-to-ground, and 600 VAC neutral-to-ground for a 120 VAC supply voltage or 1200 VAC line-to-neutral, 1500 VAC line-to-ground, and 1200 VAC neutral-to-ground for a 230 or 240 VAC supply voltage. Surge protection device must be UL listed and labeled as having been tested in accordance with UL 1449, 4th Edition.

2.1.5.4 Signal Circuit Protection

All amplifiers must have internal protection circuits that protect the internal components from mismatched loads, direct current and shorted output lines. Communication conductors must have surge protection installed at each point where it exits or enters a building.

2.1.5.5 Remote Audio-Only Station

[Desk] [Surface wall] [Recessed wall]-mounted remote station must have [stainless steel] [anodized aluminum] faceplate with tamper proof mounting screws and [galvanized steel] [aluminum] backbox. The remote station must have:

a. A speaker with a minimum sensitivity of 90 dB on axis at 1200 mm 4 feet from the speaker when driven at one watt rms.

b. A call announcement visual indicator that illuminates when there are incoming calls. Visual announcement indicators must be clearly visible at off-center angles of at least 45 degrees.

c. A recurring momentary tone that announces incoming calls.

d. Call Switch that permits a call to the master station.

e. Provide a privacy switch at each remote station. When in the ON position, the switch must prevent any transmission of sound from the remote station. When in the OFF position, persons must be able to respond to incoming call without manual intervention.

[ f. A handset with hook switch, telephone type, arranged to disconnect the speaker when the handset is lifted. The cord must be 450 mm 18 inches long and [permanently coiled] [metallic jacketed].

][g. NEMA 4X IP66 rating.

][2.1.5.6 Remote Audio and Video Station

Wall-mounted remote station must have [stainless steel] [anodized aluminum] faceplate with tamper proof mounting screws and [galvanized steel] [aluminum] backbox. The remote audio-video station must have the following features:

a. A speaker with a minimum sensitivity of 90 dB on axis at 1200 mm 4 feet from the speaker when driven at one watt rms.

b. A call announcement indicator that illuminates when there are incoming calls. Visual announcement indicators must be clearly visible at off-center angles of at least 45 degrees.

c. A recurring momentary tone that announces incoming calls.

d. Call Switch that permits a call to the master station.

e. A fixed-focal length, recessed color camera with the following features:

(1) Sufficient depth of field to provide clear images with no discernable difference in sharpness for subjects between 300 to 1800 mm 12 inches to 84 inches from the camera lens surface.

(2) An angle of view between 80 and 115 degrees.

(3) Resolution of at least one megapixel.

(4) Full color video when the vertical illumination on the subject's face is as low as 20 lux 2 footcandles.

(5) Effective frame rate of at least 20 frames per second.

(6) Dynamic range of at least 100 to 1.

(7) H.264 or H.265 compressed video output.

(8) Integral white LED to illuminate subject to maintain above specifications when ambient light level is below 20 lux 2 footcandles.

(9) Scratch-resistant multicoated clear or neutral-tinted optical cover.

(10) Operating temperature of minus 30 to plus 55 degrees Celsius minus 20 to plus 130 degrees Fahrenheit with no discernable loss of performance.

(11) Operation over IPv4 and IPv6 network protocol.

[ (12) NEMA 4X IP66 rating.

]]2.1.5.7 Cone-Type Loudspeakers

**********

**NOTE: Larger diameter speakers will typically have better low-frequency response than smaller diameter speakers, but is not as important for intercom use. Smaller diameter speakers typically have a wider dispersion angle than larger diameter speakers and can often be placed further apart than larger diameter speakers for the same coverage.**

**********

Cone-type loud speakers, not integral with a remote station, must be enclosed in a [steel housing] [back boxes] and must be acoustically dampened with a front face of at least 1.21 mm 0.0478 inches steel. The whole assembly must be rust proofed and factory primed complete with mounting assembly.[ Baffle for flush speakers must be a minimum thickness of 0.8128 mm 0.032 inches aluminum [brushed to a satin sheen and lacquered] [with textured white finish] [_____]].[ Vandal-proof high strength baffles for flush mounted speakers must be cast aluminum with tensile strength of 3,093 kg/sq. cm 44,000 psi and a minimum thickness of 0.635 mm 0.025 inch. The mounting screws must be heat-treated alloy.] The cone-type loudspeakers must comply with the following specifications:

| | |
|---|---|
| Axial Sensitivity | Minimum of [90][_____] dB with one watt input measured at 1 meter 4 feet |
| Frequency Response | Within plus or minus 6 dB from [70][180] to 15,000 Hz |
| Minimum Power Rating | 8 watts |

| | |
|---|---|
| Minimum Dispersion Angle | [100][135] degrees |
| Line Transformers Power Rating | At least 4 watts with at least four taps with insertion loss of no more than 0.5 dB |
| Speaker Size | [200][100] mm [8][4] inches with 25 mm 1 inch voice coil and minimum 142 grams 5 oz ceramic magnet |
| Speaker Cone | Resistant to fracture and delamination. |
| Speaker Cone Surround | Provide sealer on cone surround to minimize environmental effects and aging degradation. |

2.1.5.8 Horn-Type Loudspeakers

**********

**NOTE: A round horn speaker might have a dispersion angle of 95 to 130 degrees in all directions. Rectangular horns might control the dispersion pattern 70 x 95 degrees or, for a sectoral horn, 60 x 80 degrees. Specify the type of horn speaker based on the area of coverage, weather resistance, and whether an explosion proof speaker is needed.**

**********

Horn-type loudspeakers must be all metal [weather proof] construction complete with universal mounting brackets.[ Horn-type loudspeakers must be suitable for Class [1, Groups C and D] [1, Groups B, C, and D] [2, Groups E, F and G] hazardous locations and equipped with 13 mm 1/2 inch threaded conduit entry]. The horn type loudspeakers must be provided with an internally mounted, factory installed line transformers and must as a minimum conform to the following specifications:

| | |
|---|---|
| Minimum Power Rating | [25][_____] watts |
| Horizontal Dispersion Angle | [57][70][90][115][_____] |
| Vertical Dispersion Angle | [57][90][115][_____] |
| Axial Sensitivity | Minimum of [110][_____] dB with one watt input measured at 1 meter 4 feet |
| Line Transformers Power Rating | At least 4 watts with at least four taps with insertion rate of 0.5 dB |

2.1.5.9 Master Station Capacity

Master Stations and associated equipment, regardless of system type, must have an as-installed spare capacity of at least [25] [____] percent to allow this amount of remote stations to be added without additional system, software, or hardware additions or modifications except for the added remote stations and their connection to their immediate upstream device.

[2.2 TYPE 1 SYSTEM

**********
**NOTE: Delete this System unless specifying a Type 1 System.**
**********

A manually switched direct connected keyed intercommunication system that must accommodate at least [_____] remote stations. Remote stations must be provided in the quantities indicated. The master station must selectively communicate with any remote station by actuation of an appropriate selector switch.[ The master station must be capable of initiating a message to all remote stations simultaneously or in groups of not less than 10 stations per group.]

2.2.1 Master Station

[Desk] [Surface wall] [Recessed wall] [Rack]-mounted master stations must have:

a. Station-selector switches and talk-listen switches with heavy duty type gold plated contacts rated for at least five million operations.

b. Volume Control to regulate incoming call volume.

c. A light annunciation that identifies the calling stations and stations in use. The light must remain on until the call is answered.

d. A tone annunciator with a momentary audible tone signal that announces incoming calls.

[ e. A handset with hook switch, telephone type, arranged to disconnect the speaker when the handset is lifted. The cord must be permanently coiled and have a length between 450 and 1500 mm 18 and 60 inches when extended.

] f. A lockable, ventilated metallic central control cabinet complying with ECIA EIA/ECA 310-E. The cabinet must house terminal strips, power supplies, amplifiers, system volume control, and auxiliary equipment.

][2.3 TYPE 2 SYSTEM

**********
**NOTE: Delete this Type unless specifying a Type 2 System.**
**********

A microprocessor switched single conversation path, central control intercommunication system must include[ an annunciator panel,] a master station, automatic switching equipment, remote stations and all amplifiers, control equipment and ancillary devices required to provide features specified. The master station must selectively communicate with any remote station by actuating the number assigned to that remote station.[ The master station must 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 must be able to listen or talk to the master station. A non-selected remote station must not be able to hear or interfere with any portion of conversation between a master station and the selected remote

station. Hanging up the master station handset must reset the system for next call. The quantity and location of remote stations must be as indicated on the drawings. The system must be programmable and password protected and allow access to be granted or denied to various stations on an individual basis for each master station.

2.3.1 Master Station

[Desk-top] [Surface wall] [Recessed wall] [Rack-mounted] type master station equipped with:

a. A 12 digit keypad selector to transmit calls to other stations and initiate commands for programming operations.

b. Volume control to regulate incoming call volume.

c. Visual annunciation to identify calling stations and stations in use. The light must remain on until a call is answered. Visual indicators must be clearly visible at off-center angles of at least 45 degrees.

d. Tone annunciation with a momentary audible tone signal that announces incoming calls.

e. Reset controls that cancels calls and resets system for the next call.

[ f. A handset with hook switch, telephone type, arranged to disconnect the speaker when the handset is lifted. The cord must be permanently coiled and have a length between 450 and 1500 mm 18 and 60 inches when extended.

] g. A metallic central control cabinet that must comply with ECIA EIA/ECA 310-E. The cabinet must house terminal strips, power supplies, amplifiers, system volume control, and auxiliary equipment. It must be lockable and ventilated.

**********

**NOTE: Not all systems require door release. Determine if the controlled door should be monitored and possibly also controlled by the Electronic Security System. Not having this interface could mean that unauthorized access to an area could occur with no security personnel response. Coordinate the requirements with Government security.**

**********

h. Door release feature to allow activation of electric strikes and electric latches from the video master station. Coordinate with the electronic security system design and Section 28 10 05 ELECTRONIC SECURITY SYSTEMS (ESS).

][2.4 TYPE 3 SYSTEM

**********

**NOTE: Delete this Type unless specifying a type 3 system.**

**********

A microprocessor switched multiple conversation path central control intercommunication system must be provided. The system must be capable of

communicating with other master stations and remote stations selectively or in any combination thereof over local and wide-area networks. Each master station must selectively communicate with any other master station or any remote station by entering a number assigned to the called station.[ Each master station must also be designed to initiate a message to all other master stations and all remote stations simultaneously or in groups of not less than 10 stations.] Station quantities must be as indicated on drawings. The system must be programmable and password protected and allow access to be granted or denied to various stations on an individual basis for each master station.

2.4.1 Master Station

[Desk-top] [Surface wall] [Recessed wall] [Rack-mounted] master stations equipped with:

a. A 12 digit keypad selector to transmit calls to other stations and initiate commands for programming operations.

b. Volume control to regulate incoming call volume.

c. Light annunciation to identify calling stations and stations in use. The light must remain on until a call is answered.

d. Tone annunciation with a momentary audible tone signal that announces incoming calls.

e. Reset controls that cancels calls and resets system for the next call.

[ f. A handset with hook switch, telephone type, arranged to disconnect the speaker when the handset is lifted. The cord must be permanently coiled and have a length between 450 and 1500 mm 18 and 60 inches when extended.

] g. A metallic central control cabinet that must comply with ECIA EIA/ECA 310-E. The cabinet must house terminal strips, power supplies, amplifiers, system volume control, and auxiliary equipment. It must be lockable and ventilated.

h. Door release feature to allow activation of electric strikes and electric latches from the video master station. Coordinate with the electronic security system design and Section 28 10 05 ELECTRONIC SECURITY SYSTEMS (ESS).

]2.5 SPEAKER ENCLOSURES

Speaker enclosures must be compatible with the speakers specified and comply with UL 50.

2.6 TERMINALS

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

2.7 COMMUNICATIONS WIRING

Type of signal and control circuit wire and number of conductors must be provided as recommended by the intercommunication system manufacturer, and as necessary to provide a complete and operable system. Where required, cable must be UL classified low smoke and low flame for use in air plenums

in accordance with NFPA 70.

a. Unless manufacturer, voltage drop, or attenuation requirements are more stringent, multi-conductor cables not used with modular connectors must contain only stranded conductors of minimum 22 AWG gauge, insulated with minimum 105-degree Celsius-rated insulation. Cable jacket must be rated at minimum of 105 degrees Celsius.

b. Balanced twisted-pair telecommunications cables must be rated as above, except that conductors must be minimum 24 AWG; cables including modular connectors must be rated at least Category [5e] [_____].

c. Comply with Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM when utilizing IP-based systems.

## 2.8 SURGE PROTECTION

Major components of the system such as Master Stations, Amplifiers, and Remote Stations, must have devices, either internal or external, that must provide protection against voltage spikes and current surges.

**********

**NOTE: Consider fiber-optic transmission media, without any metallic elements to connect far away remote intercom stations. An example of this is a remote station at a vehicle gate hundreds of feet from the connection to the system. This can provide better protection from the differential voltage which can occur between the two locations in case of a lightning strike in the vicinity. Do not run any metallic conductors or raceways for signal, power, or data between those locations.**

**********

a. Signal, Data, and low-voltage power: Continuous voltage rating of surge protective devices internal to the units must be between 120 and 140 percent of the nominal circuit voltage, maximum leakage current must be less than one milliampere, and the unit must be able to absorb at least one hundred 1,000-ampere 8x 20 microsecond pulses without appreciable degradation.

b. External surge protective devices for incoming AC line-voltage protection must be UL 1449-listed Type 3 with a maximum Voltage Protective Rating (VPR) of 330 volts for nominal line voltages of 120 VAC and a VPR of 600 volts for nominal line voltages above 120 volts when tested in accordance with UL 1449.

# PART 3 EXECUTION

## 3.1 EXAMINATION

After becoming familiar with the details of the work and working conditions, verify locations and dimensions in the field, and advise the Contracting Officer of any discrepancies before performing the work.

## 3.2 INSTALLATION

**********

**NOTE: State precisely what is to be shown in detail**

**drawings. State also the calculations that need to be a part of the submittal.**
**********

Install all system components and appurtenances in accordance with the manufacturer's instructions and as specified and shown. Units to be mounted outside or subject to inclement conditions must be weatherproof or be mounted in weatherproof enclosures.

3.2.1 Signal and Control Circuits Wiring

Install signal and control circuits in accordance with NFPA 70, TIA-568.0, TIA-568.1, TIA-568.2, TIA-568.3, and as indicated. The conductors must be separated as recommended by the equipment manufacturer.

a. Size conductors to maintain voltage drop in power circuits to no more than 3-percent and loss in signal circuits to no more than 0.5 dB. Comply with Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM for IP-based systems. Include boosters, additional power supplies, amplifiers, switches, etc. as necessary to maintain these requirements.

b. Run conductors and cables from unit to unit without splicing.

c. Cables that do not use modular connectors can use terminal strips and junction boxes to extend the cable if in conformity with manufacturer recommendations.

d. Provide data switches to extend cable length as necessary for IP-based systems when cable run would otherwise exceed requirements.

e. Follow applicable portions of Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM when utilizing IP-based systems.

f. Locate switches and other consolidation points in Telecommunications Rooms.

3.2.2 Conduit, Cable Tray and Tubing Systems

Install wiring in rigid conduit, intermediate metal conduits, cable trays, or electric metallic tubing as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

3.3 WARRANTY

Provide a [5] [_____]-year warranty for all units, parts,and assemblies and a [2] [_____]-year warranty on all labor. Include travel and expense costs associated with repair and supervisory persons such that owner is not charged for these when warranty labor is provided.

3.4 GROUNDING

Perform the connection of interfacing components through the use of transformers and the tying of interconnecting lines to a unit ground bus at one end only.

3.5 TRAINING

Conduct a training course for [_____] members of the operating staff and

for [_____] members of the maintenance staff as designated by the Contracting Officer. The training course must be given at the installation during normal working hours for a total of [2] [_____] hours for the operating staff and [4] [_____] hours for the maintenance staff, and must start after the system is functionally complete but prior to final acceptance tests. The field instructions must cover all of the items contained in the approved operating and maintenance instructions, as well as the demonstration of routine maintenance operations. Notify the Contracting Officer at least 14 days prior to the start of the training course.

## 3.6 ACCEPTANCE TESTS

After installation has been completed, conduct an acceptance test, using the approved test plan, to demonstrate that the equipment operates in accordance with specification requirements. Submit test plan and procedures for the acceptance test explaining in detail step-by-step actions and expected results to demonstrate compliance with the requirements specified. The procedures must also explain methods for simulating the necessary conditions of operation to demonstrate system performance. Notify the Contracting Officer [_____] days prior to the performance of tests. In no case must notice be given until after the written approval of the test plans. The acceptance tests must include as a minimum the following tests:

### 3.6.1 Operational Test

Test originating station-to-station, and all call at each intercommunication station. Verify proper routing and volume levels and that the system is free of noise and distortion. Test available message path from each station on system.[ Test for proper video displays and automatic display of pre-preprogrammed video views.]

### 3.6.2 Frequency Response Test

Determine frequency response of two transmission paths, including all-call, by transmitting and recording audio tones. Minimum acceptable performance is within 3 dB from 150 to 2500 Hz.

### 3.6.3 Signal-to-Noise Ratio Test

Measure signal-to-noise ratio of complete system at normal gain setting as follows:

a. Disconnect speaker microphone and replace it in the circuit with a signal generator using a 1000 Hz signal. Measure signal-to-noise ratio at intercom station speakers.

b. Repeat test for 10-percent of the speaker microphones, but no less than one speaker-microphone.

c. Minimum acceptable ratio is 35 dB.

### 3.6.4 Distortion Test

Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 150, 200, 400, 1000, and 2500 Hz into each all-call amplifier, and a minimum of two selected intercommunication amplifiers. For each frequency, measure distortion in the all-call amplifier outputs.

Maximum acceptable distortion at any frequency is 5 percent total harmonics.

### 3.6.5 Video Tests

Verify that video from all remote stations appears at all master stations with proper resolution, focus, and color balance meeting the manufacturer's published specifications.

### 3.6.6 Test Reports

Submit test reports in booklet form, upon completion and testing of the installed system, showing all field tests performed to adjust each component and to prove compliance with the specified performance criteria. Include in each test report the final position of controls and operating mode of the system. Include the manufacturer, model number, and serial number of test equipment used in each test.

-- End of Section --