

SECTION 275223 - NURSE CALL/CODE BLUE SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Retain or delete this article in all Sections of Project Manual.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes visual/tone nurse-call system.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment cabinets and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Cabling Diagrams: Single-line block diagrams showing cabling interconnection of all components for this specific equipment. Include cable type for each interconnection.
 - 3. Station Installation Details: For built-in equipment, dimensioned and to scale.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordinate first paragraph below with qualification requirements in Division 01 Section "Quality Requirements" and as supplemented in "Quality Assurance" Article.
- B. Qualification Data: For qualified Installer.
- C. Field quality-control reports.
- D. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For nurse-call equipment to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: All colors for corridor dome lights and zone lights equal to 20 percent of amount installed.
2. Fuses: One for every 10 of each type and rating, but no fewer than 5 of each.
3. Printed Circuit Boards: Each kind, equal to 10 percent of amount installed, but no fewer than one unit.
4. Master-Station Privacy Handset: One.
5. System program backup software.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Compatibility: System shall be capable of integration with any brand of phone system (wired or wireless), staff locating system, CCTV, and fire-alarm system.
- C. Electrical Components, Devices, and Accessories: Listed and labeled according to UL 1069 as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.8 WARRANTY

- A. When warranties are required, verify with Owner's counsel that special warranties stated in this article are not less than remedies available to Owner under prevailing local laws.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace batteries that fail in materials or workmanship within specified warranty period. Special warranty for batteries applies to materials only, on a prorated basis for specified period.
 1. Warranty Period: Include the following warranty periods, from date of Substantial Completion:
 - a. Nickel-Cadmium Batteries, Lithium Batteries, and Wet-Cell Batteries:
 - 1) Full Warranty: Five years.
 - 2) Pro Rata: 15 years.

1.9 SOFTWARE SERVICE AGREEMENT

- A. Services in this article may not be allowed for publicly funded projects.

- B. Technical Support: Beginning with Substantial Completion, provide software support for two years.
- C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
 - 1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 NURSE-CALL SYSTEM GENERAL REQUIREMENTS

- A. Station Zones: Able to program 256 station zones for each master station in the network with eight priority levels and addressable visual and audible annunciation of audible devices such as smoke detectors and door contacts.
- B. System shall provide integrated and centralized "Code Blue" and "Staff Emergency" calls.
- C. Expansion Capability: Equipment ratings, housing volume, spare keys, switches, relays, annunciator modules, terminals, and cable conductor quantities adequate to increase the number of stations in the future by 25 percent above those indicated without adding internal or external components or main trunk cable conductors.
- D. Retain first paragraph below if equipment connects with an existing system. Insert descriptions of specific operational sequences that must be achieved.
- E. Existing System Compatibility: Functionally and electrically compatible with existing system so components and wiring operate as an extension or upgrade of the existing system and existing or upgraded functional performance of the existing system applies to the entire final system. Colors, tones, types, and durations of signal manifestation shall be common among new and existing systems.
- F. Resistance to Electrostatic Discharge: System, components, and cabling, and the selection, arrangement, and connection of materials and circuits, shall be protected against damage or diminished performance when subjected to electrostatic discharges of up to 25,000 V in an environment with a relative humidity of 20 percent or less.

- G. Equipment: Microprocessor, electronic, modular.
- H. Master Nurse-Call Station: Programmed via a PC.
- I. Connection method in first paragraph below is optional method for some manufacturers.
- J. Wall-Mounted Component Connection Method: Components connect to system wiring in back boxes with factory-wired plug connectors.
- K. Telephone Interface: Permit use of wired and wireless telephones to execute nurse-call master station functions.
- L. Third-Party Pager Interface: Programmable to send tone, numeric, and alphanumeric message to pocket pagers or personal digital assistants and to use industry standard-protocol, RS-485 interface.

2.2 VISUAL/TONE NURSE-CALL SYSTEM

- A. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. Retain one of first two paragraphs and list of manufacturers below. See Division 01 Section "Product Requirements."
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Retain option in first paragraph below if manufacturer's name and model number are indicated in schedules or plans on Drawings; delete option and insert manufacturer's name and model number if not included on Drawings.
 - 2. Aiphone Co., Ltd.
 - 3. Alpha Communications.
 - 4. Cornell Communications, Inc.
 - 5. GE Security, Sound and Communications.
 - 6. Intego Systems, Inc.
 - 7. Intercall Systems, Inc.
 - 8. Jeron Electronic Systems, Inc.
 - 9. Rauland-Borg Corporation.
 - 10. SimplexGrinnell LP.
 - 11. TekTone Sound & Signal Mfg., Inc.
- C. Operational Requirements:
 - 1. Patient Station Call: Lights a steady call-placed lamp on the station, steady lamps in the zone light and corridor dome light associated with the patient's room, and steady lamps at the central annunciator and other system display devices and displays message on master and staff/duty stations. At the same time, it

sounds a programmed tone at intervals, at the respective annunciator and master and staff/duty stations. Legends at the central annunciator and master station identify the calling station.

2. Pull-Cord-Call Station Call: Flashes a call-placed lamp on the station and distinctive-color lamps in the zone light and corridor dome light and at the central annunciator and staff/duty stations. At the same time, it sounds a programmed tone at intervals, at the central annunciator and master and staff/duty stations. A legend at the master station identifies the calling station, priority as programmed, and bed identification.
3. Emergency-Call Station Call: Produces the same responses as pull-cord-call station calls except rapidly flashing red emergency digital display and tone repetition rates are more frequent, tone frequency is higher, and lamps in the zone light and corridor dome light are a different color. Indicator lamps may be extinguished and the system reset only at the calling station. Displays message on pocket pagers, sounds programmed tone on phones, and displays message on display equipped phones.
4. System Reset: Operating reset button at the originating station cancels signals associated with the call. Illuminates a green digital display on the patient station and log presence on the master station.
5. Cord-Set Removal: Initiates a patient station call when the cord set is removed from the jack in the patient station faceplate. Displays location and "cord removed" message on master station, pocket pagers, and display equipped phones. Inserting a cord-set plug or a dummy plug into the jack and operating the station reset button resets the call.
6. Patient Control Unit: Controls entertainment volume and channel selection. Nurse button on the unit initiates a patient station call. Integral speaker reproduces entertainment sound.
7. Emergency Bath Station Call: Illuminates the digital display on the emergency bath station; rapidly flashes white dome lamp; displays location, priority, and bath on master station; and sounds programmed tone on master station display equipped phones and pocket pagers.

8. Staff/Duty Station Operation: Operation shall be identified to patient station except the message staff shall display on all devices when the staff call button is activated.
 9. Privacy Key Activation: When privacy key is activated on patient station, the system shall disconnect the patient station microphone and slowly flash yellow privacy digital display on the patient station. Displays "privacy" on master station when selecting this room/bed.
- D. Central Annunciator:
1. Lamp type.
 2. Lamp Legends: Machine lettered and legible from a distance of at least 48 inches (1200 mm) when a call is present. Legend shall identify initiating station and priority of call.
 3. Power-on Indicator: Digital, or push-to-test switch.
 4. Audible Signal: Electronic tone.
- E. Central Equipment Cabinet:
1. Lockable metal.
 2. Houses power supplies, controls, terminal strips, and other components.
 3. Power-on indicator lamp.
 4. Subparagraph below is optional feature depending on applicable codes and regulations. See the Evaluations in Division 26 Section "Central Battery Equipment" for discussion of battery types.
 5. Battery Backup Unit: Sealed nickel-cadmium, wet-cell battery supplies power through an automatic switch when normal power fails, for a period of not less than six minutes at rated output. System shall lose no unanswered calls or calls in progress during the transfer operation.
 - a. Automatic retransfer to normal power, after a 15-minute time delay.
 - b. Two-rate battery charger with an automatic trickle rate and a recharge rate.
- F. Single-Patient Station: Call-placed lamp, reset push button, and polarized receptacle matching cord-set plug; mounted in a single face-plate.

- G. Dual-Patient Station: Single call-placed lamp, single reset push button, and two polarized receptacles matching cord-set plug; mounted in a single faceplate.
- H. Ambulatory-Patient Station: Call push-button switch, call-placed lamp, and reset push button; mounted in a single faceplate.
- I. Revise paragraph below to suit Project. Simple equipment has one call lamp. If including Code Blue emergency system, specify two levels of emergency-call indication.
- J. Staff/Duty Stations: A minimum of two call lamps, one for routine calls and one for emergency calls; and an audible tone signal device.

2.3 AUDIOVISUAL/VOICE NURSE-CALL SYSTEM

- A. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. Retain one of first two paragraphs and list of manufacturers below. See Division 01 Section "Product Requirements."
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Retain option in first paragraph below if manufacturer's name and model number are indicated in schedules or plans on Drawings; delete option and insert manufacturer's name and model number if not included on Drawings.
 - 2. Aiphone Co., Ltd.
 - 3. Alpha Communications.
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 - 5. GE Security, Sound and Communications.
 - 6. Intego Systems, Inc.
 - 7. Intercall Systems, Inc.
 - 8. Jeron Electronic Systems, Inc.
 - 9. Rauland-Borg Corporation.
 - 10. SimplexGrinnell LP.
 - 11. TekTone Sound & Signal Mfg., Inc.
- C. Operational Requirements:
 - 1. Station Selection from Master Station: Capable of selectively communicating with other stations or groups of stations on its system by touch screen, mouse click, or manual switch; and capable of programming up to 256 stations for each master station in the network.

2. Master Station Privacy: Capable of conversing with individual stations in complete privacy.
3. Called Station:
 - a. Capable of hands-free and two-way conversation.
 - b. Pressing "talk/listen" key shall cause the annunciation tone to cease.
 - c. Pressing "cancel" key terminates normal calls and conversations.
 - d. Terminating of high-priority level 1, 2, 3 or 4 shall not be allowed except at calling station location and shall send "re-mind" message if the call is not acknowledged at point of origin in programmed time frame.
4. Annunciation:
 - a. At the master station, a programmable tone announces an incoming call; an annunciator light or digital display identifies the calling station and indicates the priority of the call.
 - b. Call type indications include alarm assist, bath, bed, code, communication fault, cord out, door, emergency, and fire.
 - c. Memory lamps or lighted displays identify stations selected for outgoing calls.
5. System Reset at Master Station: A normal, incoming call can be canceled, associated lights and audible tones extinguished, and the system reset when the station switch is returned to the normal position.
6. Patient Station Calls:
 - a. Lights the call-placed lamp at patient station, zone, and corridor dome lights.
 - b. Sounds a tone and lights the call lights at staff/duty stations and actuates annunciation at the master station.
 - c. When the calling station is selected at the master station, the patient can converse with the master station without moving and without raising or directing the voice.
 - d. During voice communications, entertainment audio at the calling station is automatically muted.
7. Pull-Cord-Call Station Calls and Emergency-Call Station Calls:
 - a. Lights call-placed lamp and corridor dome light and flashes zone light.

- b. Master station tone pulses and annunciator light for that room flashes.
 - c. When master station acknowledges the call by touch screen or switch, the tone stops but lights continue to flash until the call is canceled at the initiating point.
- 8. Code Blue and Staff/Duty Station Calls:
 - a. Lights the call-placed lamp at the station and actuates annunciation at the master station.
 - b. When the called station is selected at the master station, the caller and the master station operator can converse.
 - c. Code Blue: Unique sound and light pattern indicating the highest priority emergency.
 - d. Staff Station: Unique sound and light pattern indicating an emergency.
 - e. Duty Station: Sound and light pattern indicating a call to the nurse station.
- 9. Handset Operation: Lifting the handset on master station disconnects speaker/microphone and transfers conversation to the handset.
- 10. Station Privacy: No patient or staff/duty station can be remotely monitored without lighting a warning lamp at the monitored station.
- 11. Patient Station Cord-Set Removal:
 - a. A patient station call is initiated as described above when a patient station cord-set plug is removed from the jack in the station faceplate.
 - b. Tone stops but lights continue to flash until the call is canceled at the initiating point or the plug is reinserted or replaced with a dummy plug when the master station call button for the station is pressed.
- 12. Patient Control Unit:
 - a. Controls entertainment volume and channel selection.
 - b. Speaker is used for both nurse communication and entertainment sound.
 - c. Entertainment sound is automatically muted when station is communicating with master station.
 - d. Nurse button on the unit initiates a patient station call.

13. Remaining subparagraphs specify optional functions. Retaining some of these functions limits competition. Coordinate with Drawings.
14. Selective Paging: Master station is capable of initiating a message to selected groups of stations or speakers simultaneously by using station group switches.
15. Staff Reminder:
 - a. Master station can initiate a staff reminder that a patient requires direct staff response by operating a reminder control while in contact with the patient station.
 - b. This reminder will light a distinctive-color lamp in the corridor dome light at the patient's room and in the appropriate zone lights.
 - c. Reminder calls are canceled by operating a staff reminder cancel switch in the patient's room.
16. Revise first subparagraph below if one method of initiating priority signal is preferred over another.
17. Call Priority Indication:
 - a. Capable of eight call priority levels in addition to normal.
 - b. Call priority switch near each patient station, or integral with the master station, shall control priority status of the call transmitted by individual stations.
 - c. Switch selects one of the following status levels:
 - 1) Normal: No change to the normal call initiation and canceling sequence.
 - 2) Emergency: Call initiation produces signals and indications identical to those of emergency-call stations. Indicator lamps are extinguished and the system is reset only at the originating station.
 - 3) Priority: System response is the same for emergency status except voice communication between the master station and the calling station is locked in from the time of call initiation until the system is reset at the originating station.
18. Additional Call:
 - a. Waiting display window on the master station similar to current call window displays incoming calls.

- b. Master station shall have a call-overflow indicator when incoming calls exceed 3 calls.
 - c. System shall store unlimited number of incoming calls.
 - d. System shall be capable of automatically answering incoming calls in order of priority.
- 19. Calling Intercom Stations:
 - a. Master station shall be capable of calling any intercom station using the handset or the hands-free speaker/microphone.
 - b. Receipt of a call at the intercom station shall be preceded by an optional pre-announce tone.
 - c. If there is a call in process, system shall place the active call on automatic hold while the new call is placed, then reestablish the previous call when the new call has ended.
- 20. Privacy Override:
 - a. Temporarily deactivates the "Privacy" mode of a called station by calling the station and instructing the called party to press the call-cord button.
 - b. On completion of the conversation, the called station shall automatically return to the "Privacy" mode.
 - c. When in "Privacy" mode, a called station shall be capable of hearing the master station; however, the master station shall not be capable of hearing the called station; a privacy message shall be indicated on the master station display.
- 21. Master-Station-to-Master-Station Calls:
 - a. Master stations shall be capable of calling other master stations using the handset.
 - b. Calls from master stations shall be answered using the handset only.
 - c. Busy master stations shall be indicated by a master station intercom busy tone.
- 22. Station Monitor:
 - a. An audio monitor feature shall allow a user to sequentially or simultaneously listen to one or all stations that are included in the user-created list.
 - b. Master station display shall indicate which station is being monitored when in sequential mode.

- c. The dwell time each station is monitored shall be user programmable.
 - d. The user shall be able to stop the monitoring sequence by activating a "pause" key.
 - e. The user shall be able to manually sequence through stations using a "next" key.
23. Night Service:
- a. Functions shall be adaptable for nighttime staffing levels, patient traffic, and day/night operations.
 - b. Staff Follow:
 - 1) Capable of locating roving staff; forwarding visual and audible annunciation of incoming calls to station(s) where personnel have registered presence.
 - 2) Master station shall display locations where staff have registered presence.
 - 3) Incorporates a programmable timer that automatically cancels a forgotten staff presence registration.
 - c. Tones:
 - 1) Deactivates audio signals from a duty station and mini-master display telephones.
 - 2) Capable of changing the tone volume at the master and duty stations.
 - 3) Satellite function shall permit the user to deactivate audio signals from duty stations and other remote annunciator devices.
 - d. Transfer:
 - 1) Permits one nurse station to take control of all or individually selected bed call cords from another nurse station. It shall be possible to view transfer status of a nurse station.
 - 2) Includes a minimum of three transfer modes to allow one nurse station to take control or share calls and operations from another nurse station.
 - a) Parallel Transfer Mode: Permits both nurse stations to share all calls and operations.
 - b) Supervised Transfer Mode: Permits the transferred nurse station to share all calls and operations with the con-

trolling nurse station; however, the controlling nurse station calls are not shared with the transferring station.

- c) Capture Transfer Mode: Transfers all calls and operations from the transferred nurse station to the controlling nurse station.
 - d) Transferred station shall have no control over calls, and its display shall indicate calls have been transferred to another station.
- 3) Includes two "patient swing" modes to allow one nurse station to take control or share calls from one or many calls from another nurse station.
- a) Supervised Transfer Mode: Permits the transferred calls to be shared with the controlling nurse station.
 - b) Capture Transfer Mode: Transfers all calls from the call cord from the transferred nurse station to the controlling nurse station.
 - c) Transferred station has no control over those transferred calls.

24. Service Request:

- a. Permits users to assign a service request to a substation, at programmable priority level.
- b. Displays service request on the nurse station display and light the green flashing corridor lamp at the respective substation and automatically generate a service reminder request.
- c. Cancels service requests only at the initiating point.
- d. Recall calls shall sound and be displayed at the master station if the service request has not been cancelled at the initiating point within the programmed period of time.

25. Call Reminder Function:

- a. Automatically generates a reminder call for a patient- or staff-initiated, high-priority [2] [3] [or] [4] request that has had the call tones silenced, allowing time to physically attend to the request and cancel the call at the initiating point.

- b. Regenerated calls shall display the same tones and visual indications and priority as the original call and shall also display a "regenerated call" message.
 - c. Capable of manually adding low-priority calls to the reminder list.
 - d. "Call Reminder" function and reminder timer shall be programmable by call priority.
- 26. Hide Function: Prevents a selected station from displaying calls or generating tones on the nurse station.
- 27. Door Control Function: Capable of being programmed to enable the user to remotely activate electric door locks.
- 28. Test and Diagnostics Feature:
 - a. Able to automatically diagnose system faults and categorize them as warnings, communication errors, or fatal errors.
 - b. Warnings shall indicate possible system problems.
 - c. Communication errors shall indicate the inability of the master station to communicate with a substation or another nurse-call station.
 - d. Fatal errors shall indicate a major hardware or software failure.
- 29. User-Configured System Programming - Access Code Not Required:
 - a. Patient call-cord priority levels.
 - b. Monitor list.
 - c. "All Call" list.
 - d. Master station communication parameters (volume, filtering, talk/listen, sensitivity).
 - e. Master and duty station call annunciation tone volume.
 - f. Date/time.
 - g. Staff-follow operating mode.
 - h. Transfer type.
 - i. Pocket pager list assignment.
 - j. Presence mode.
- 30. User-Configured System Programming - Access Code Required:
 - a. Master station number.
 - b. Room device type.
 - c. Room number.
 - d. Bed number.

- e. Bed alpha or numeric.
- f. Reminder duration.
- g. Staff presence registration cancel duration.
- h. Display language.
- i. Paging group assignment(s).
- j. Zone group assignments.
- k. Monitoring duration.
- l. Pocket pager number.
- m. Call tone assignment by priority.
- n. Pretone activation.
- o. Call tones minimum volume.
- p. Clock mode (12 h/24 h).

D. Master Station:

- 1. Speaker/microphone unit with operating controls.
- 2. Indicator lamps with legends or by digital display designate identification and priority of calling stations and called stations.
- 3. Retain first subparagraph below if call priority option is not specified.
- 4. Pulse rate of incoming-call lights denotes priority of calls awaiting response.
- 5. Station Selection Controls: Touchpad select stations for two-way voice communications.
- 6. Signal Tones: Programmable to announce incoming calls.
- 7. Retain first subparagraph below if call priority option is not specified.
- 8. Pulse rate and frequency of tone identify the highest priority call awaiting response at one time.
- 9. Volume Control: Regulates incoming-call volume.
- 10. Privacy Handset with Hook Switch: Of the type that does not require push-to-talk switch attached to each station unless otherwise indicated.
- 11. Retain first subparagraph below if specifying optional reminder function.
- 12. Staff Reminder Control: Initiates flashing of corresponding corridor dome lights for patients requiring service. Permits scanning equipment to indicate which patients are currently in reminder status.

13. Retain subparagraph below if individual selectability of patient-call priority indication is specified or if selection of patient-call priority indication is not at room station.
14. Call Priority Selection: Controls associated with patient-station selection switches determine the priority displayed when a call is initiated at a patient station.

E. Central Equipment Cabinet:

1. Lockable metal.
2. Houses amplifiers, tone generators, power supplies, controls, terminal strips, and other components.
3. Amplifier: With fidelity and overall gain necessary to achieve the sound-transmission and reproduction characteristics specified, considering interoperability with the installed speakers/microphones and wiring.
 - a. Power Output: Not less than 3 W at a total harmonic distortion not exceeding 5 percent.
 - b. Hum and Noise: 60 dB below full output with normal input open.
 - c. Volume Control: Concealed within the amplifier unit to control the volume of sound reproduced at all stations.
 - d. Protection: Circuit to prevent damage to the amplifier in case of shorted or open circuit.
4. Selective Paging Amplifiers: Plug-in card mounted in central equipment cabinet, rated 15 W.
5. System Power Supply:
 - a. 24-V dc for operation of the call system.
 - b. Equipment Rating: Suitable for continuous operation between 32 and 120 deg F (0 and 49 deg C), from a primary line voltage between 105- to 125-V ac, 60 Hz.
 - c. Output: Regulated 24-V dc with protection against overloads. Line-to-load regulation shall not exceed 2-1/2 percent with ripple and noise remaining below the 10-mV, rms level.
 - d. Overload Protection: Electronic fold-back circuit set to limit the volt-ampere output to less than 100 VA during overloaded or shorted output. Restore power output automatically on removal of overload without resetting circuit breakers or replacing fuses.
6. Power-on indicator lamp.

7. Surge Protector Device: Comply with Division 26 Section "Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits" for auxiliary panel suppressors, with digital indicator lights for power and protection status.
8. Subparagraph below is optional feature depending on applicable codes and regulations. See the Evaluations in Division 26 Section "Central Battery Equipment" for discussion of battery types.
9. Battery Backup Unit: Sealed nickel-cadmium, wet-cell battery supplies power through an automatic switch when normal power fails, for a period of not less than six minutes at rated output.
 - a. Automatic retransfer to normal power, after a 15-minute time delay.
 - b. Two-rate battery charger with an automatic trickle rate and a recharge rate.

F. Speaker/Microphones:

1. Type: Permanent-magnet, dynamic or ceramic, protected against dust and humidity.
2. Sound Reproduction: Sound level of 90 dB plus or minus 3 dB at a distance of 48 inches (1220 mm) on the axis without overdriving or distorting any frequencies between 300 and 3000 Hz when installed in an enclosure or in the pillow speaker.
3. Power Handling Capacity: Not susceptible to damage from overdriving within the range of power available from the amplifier.
4. Impedance Matching: Coordinated and matched to the input and output circuits of the amplifier, both for single connection and for group monitoring, to provide the sound reproduction specified. Subsystems or components shall not be combined, which could cause unacceptable distortion such as feedback between pillow speakers and unmuted room speaker/microphone combinations. This protection shall extend throughout the entire range of operation (volume control) of all components.

G. Single-Patient Station: Speaker/microphone with 2-inch (50-mm) dynamic cone, a polarized receptacle to match the cord-set plug, monitor lamp, reset switch, and call-placed lamp; assembled under a single faceplate.

H. Dual-Patient Station:

1. Speaker/microphone with 2-inch (50-mm) dynamic cone, two polarized receptacles to match cord-set plugs, monitor lamp, and reset switch; assembled under a single faceplate.
 2. Retain one of two subparagraphs below.
 3. Single call-placed lamp serves both beds.
 4. Dual call-placed lamps, one for each bed.
- I. Staff/Duty Stations: Audible call-tone signal device, speaker/microphone with 2-inch (50-mm) dynamic cone, monitor lamp, reset switch, routine-call lamp, emergency-call lamp, and call push button; assembled under a single faceplate.
- J. Code Blue Station: Audible call-tone signal device, speaker/microphone with 2-inch (50-mm) dynamic cone, monitor lamp, reset switch, Code Blue emergency-call lamp, and call push button; assembled under a single faceplate.
- K. Ambulatory-Patient Station: Speaker/microphone with 2-inch (50-mm) dynamic cone, monitor lamp, reset switch, call-placed lamp, and call push button; assembled under a single faceplate.
- L. Verify adequacy of standard amplifier capacity for Project applications.
- M. Selective Paging Speakers: 8-inch (200-mm) cone type with 1-inch (25-mm) voice coil and minimum 5-oz. (140-g) ceramic magnet, multitap matching transformer, flush-mounted steel back-box, and white enamel-finished metal ceiling grille.
- N. Retain first paragraph below if specifying optional call priority indication.
- O. Call Priority Switch Station: Three-position, tamper-resistant priority selection switch. Positions designated by labeling "Normal," "Emergency," and "Priority."
- P. Retain paragraph below if specifying optional staff reminder function.
- Q. Staff Reminder Cancel Switch Station: Momentary contact.

2.4 SYSTEM COMPONENTS

- A. Retain and revise this article for either visual or voice equipment.
- B. Emergency-Call Station: Locking-type push button, labeled "Push to Call Help"; reset trigger to release push button and cancel call; and call-placed lamp, mounted in a single faceplate.
- C. Emergency-Bath Station:

1. Consists of a sliding, chemical-resistant, ABS red fascia marked with the word "URGENT" in bold letters.
2. Capable of being activated with nylon pull cord or by sliding the face of the unit downwards.
3. Activation of the station shall illuminate a reassurance digital display on the face of the unit in addition to notifying the master station.
4. Water resistant and able to withstand routine cleaning and chemical disinfectants.
5. Uses magnetic reed switch technology for reliability and corrosion resistance.
6. Mounts on a single-gang electrical box wire to the respective patient station or input controller.

D. Code Blue Station:

1. Consists of a sliding, chemical-resistant, ABS blue fascia marked with the word "CODE" in bold letters.
2. Capable of being activated with nylon pull cord or by sliding the face of the unit downwards.
3. Activation of the station shall illuminate a reassurance digital display on the face of the unit in addition to notifying the master station.
4. Water resistant and able to withstand routine cleaning and chemical disinfectants.
5. Uses magnetic reed switch technology for reliability and corrosion resistance.
6. Mounts on a single-gang electrical box wire to the respective patient station or input controller.

E. Staff, Emergency Station:

1. Consists of a sliding, chemical-resistant, ABS red fascia marked with the word "EMERGENCY" in bold letters.
2. Capable of being activated with nylon pull cord or by sliding the face of the unit downwards.
3. Activation of the station shall illuminate a reassurance digital display on the face of the unit in addition to notifying the master station.
4. Mounts on a single-gang electrical box wire to the input controller.

F. Pull-Cord-Call Station:

1. Pull-Down Switch: Lever-locking type, labeled "Pull Down to Call Help."
2. Reset trigger.
3. Call-placed lamp.
4. Water-resistant construction.

G. First six paragraphs below specify plug-in components. Coordinate types and quantities furnished with Owner. Quantities stated are examples only. Verify Owner's sterilization procedures and retain requirements to suit Project. UL 1069 does not address sterilization.

H. Patient Control Unit:

1. Equipped with plug and 96-inch- (2400-mm-) long white cord.
2. Ethylene oxide, sterilizable.

3. Retain first subparagraph below if control of room lights is in patient control units.
 4. Light-Control Switch: Arranged for independent on-off control of patient's up and down light.
 5. Integral Speaker: 2 inches (50 mm), with 0.35-oz. (9.9-g) magnet, rated 0.2 W.
 6. Controls: Speaker volume, TV control, and nurse call.
 7. Housing: High-impact white plastic.
 8. Attachment: Stainless-steel bed clamp with permanently attached polyester film strap.
 9. Quantity: 12 units for every 10 patient beds.
- I. Call-Button Cord Set:
1. Plug and 72-inch (1800-mm) white cord; cord set shall be resistant to medical gas environment equipped with momentary-action, call-button switch.
 2. Ethylene oxide, sterilizable.
 3. Washable cord.
 4. Palladium switch contacts in high-impact white housing with cord-set strain relief.
 5. Attachment: Stainless-steel bed clamp with permanently attached polyester film strap.
 6. Quantity: Three cord sets for every 10 patient beds.
- J. Geriatric Call-Button Cord Set:
1. Plug and 72-inch (1800-mm) white cord.
 2. Resistant to medical gas environment equipped with momentary-action, light-pressure switch in soft outer jacket.
 3. Ethylene oxide, sterilizable.
 4. Washable cord.
 5. Palladium switch contacts in high-impact white housing with cord-set strain relief.
 6. Attachment: Stainless-steel bed clamp with permanently attached polyester film strap.
 7. Quantity: Two cord sets for every 10 patient beds.
- K. Squeeze-Bulb Switch Cord Set:
1. Plug and 72-inch (1800-mm) washable tube with white cord set.
 2. Resistant to medical gas environment; washable; equipped with neoprene squeeze-bulb activator, and plug-mounted, momentary contact switch.
 3. Ethylene oxide, sterilizable.
 4. Attachment: Stainless-steel bed clamp with permanently attached polyester film strap.
 5. Quantity: Two cord sets for every 10 patient beds.
- L. Breath Call Cord:
1. Flexible PVC jacketed cable and a momentary contact air-pressure sensitive switch.
 2. Cord: 108 inches (2700 mm) long.
 3. Include an adjustable arm for clamping and suitable for use in oxygen atmospheres.
 4. Include 12 replacement straws.
- M. Pillow Speakers:
1. Eight-conductor, DIN, flexible PVC jacketed cable.

2. Contain nurse-call button, volume control, speaker, and channel control in molded flame-retardant ABS housing.
 3. Cord: 96 inches (2400 mm) long with sheet clip.
- N. Call-Button Plug:
1. Designed to plug into patient station cord-set receptacle.
 2. Button switches call circuit.
 3. Two plugs for every 10 patient beds.
- O. Dummy Plugs:
1. Designed to plug into patient station cord-set receptacle when call-button plug or patient cord set is not used.
 2. Three plugs for every 10 patient beds.
- P. Indicator Lamps: Digital type with rated life of 20 years unless otherwise indicated.
- Q. Retain one of first two paragraphs below for material and finish for faceplate.
- R. Station Faceplates:
1. Stainless steel, a minimum of 0.0375 inch (0.95 mm) thick.
 2. Finish: Brushed.
 3. Machine-engraved labeling identifies indicator lamps and controls.
- S. Station Faceplates:
1. High-impact plastic.
 2. Color: [**Beige**] <**Insert color**>.
 3. Molded or machine-engraved labeling identifies indicator lamps and controls.
- T. In first paragraph below, coordinate number of lamps with functional requirements.
- U. Corridor Dome Lights and Zone Lights:
1. Three-lamp signal lights.
 2. Lamps: Front replaceable without tools, low voltage with rated life of 7500 hours. Barriers are such that only one color is displayed at a time.
 3. Lenses: Heat-resistant, shatterproof, translucent polymer that will not deform, discolor, or craze when exposed to hospital cleaning agents.
 4. Revise colors in subparagraph below to suit Owner's preference.
 5. Filters: Two per unit, amber and red.
- V. Cable:
1. Conductors: Jacketed single and multiple, twisted-pair copper cables.
 2. Sizes and Types: As recommended by equipment manufacturer.
 3. Cable for Use in Plenums: Listed and labeled for plenum installation.
- W. Grounding Components: Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

2.5 SOFTWARE REQUIREMENTS

A. Telephone System Interface:

1. Permits use of wired and/or wireless telephones to execute nurse-call master station.
2. Two-way communication with patient and staff stations.
3. Two-way communication with the master nurse station.
4. "All Call," group call, and staff call paging.
5. Capable of being programmed to forward calls destined for a master nurse station to any connected telephone.
6. Telephones connected to the telephone interface shall have the same call tone ring patterns as those generated at the master nurse station.
7. Telephones having a display shall indicate the call type, priority code, and the calling station number of incoming calls.
8. Telephones shall be capable of initiating a service request for a particular patient station, logging calls on the master station's reminder list, and activating door lock mechanisms associated with a call station.
9. Capable of routine setup and configuration changes using the key-pads on display telephone and/or the master station.

B. Display Telephones:

1. Digital telephones for use as mini-master nurse-call stations.
2. Digital display shall indicate the call type, priority code, and calling station number of incoming calls.
3. Ring patterns shall be identical to those generated at the master station.
4. Capable of two-way communication with patient and staff stations and the master station, and other telephones interfaced with the system.
5. Capable of placing or answering outside calls when interfaced with the facility telephone system.
6. Capable of "All Call," group call, and staff call paging and of initiating service requests, logging calls to the reminder list, and activating optional door controls.

C. Third-Party Pocket Pager Interface:

1. Equipped with a standalone pocket pager interface.

2. Connects with the facility paging system and transmit alphanumeric messages to the pocket pagers as preprogrammed in the system.

D. Statistical Software:

1. Includes a data statistical software package that stores, sorts, and analyzes activities occurring on the nurse-call system network.
2. Windows based and operated on a PC that is connected to the nurse-call system network.
3. Stores events on the PC's hard disk. Accumulation of these stored events shall make up the database that is used to generate reports and statistics.
4. Events stored by the software shall include date, day of week, time, ward, priority, and room number.
5. Capable of assigning a patient name to bed number.
6. Stored events shall include, but not be limited to, calls placed, call priority, calls cancelled at the nurse station, calls cancelled at the point of origin, regenerated calls, calls answered, calls sent to pager interface, staff presence registration, staff presence cancellation, service request, service cancellation, and system and network error messages.

E. Data Analysis Software:

1. Capable of analyzing the stored information and generating computed analysis.
2. Analysis of the database can be conducted by specifying one, many, or all of the following parameters of the database: date, day of week, time, wards, priority, and room number.
3. Analysis shall include, but not be limited to, total number of calls placed, average call response time (from call placed to call cancellation), total number of presence registrations, average presence time in a room, total number of service requests, average response time (from audio answer to call cancellation), and average ring time (from call placed to audio answer).

F. Statistical Software Package:

1. Capable of displaying multiple calls/events on a PC monitor or on a RS-485 data-bus-driven digital display panel.

2. Calls from patient or staff stations and associated devices shall be displayed by priority. Display shall be customizable as follows:
 - a. Choice of color by type of call.
 - b. Choice of display size (character size).
 - c. Choice of priority levels, type of events, points of origin.
 - d. Identification of facility.
 - e. Identification of ward.
 - f. Identification of patient with specific patient information.

2.6 CONDUCTORS AND CABLES

A. Audio Cables:

1. Conductors: Jacketed, twisted-pair and twisted-multipair, untinned solid copper. Sizes as recommended by system manufacturer, but no smaller than No. 22 AWG.
2. Insulation: Thermoplastic, not less than 1/32 inch (0.8 mm) thick.
3. Shielding: For speaker/microphone leads and elsewhere where recommended by manufacturer; No. 34 AWG, tinned, soft-copper strands formed into a braid or equivalent foil.
4. Minimum Shielding Coverage on Conductors: 60 percent.
5. Plenum Cable: Listed and labeled for plenum installation.

B. Data Cable and Hardware: Category 5e UTP and UTP hardware. Comply with requirements in Division 27 Section "Communications Horizontal Cabling."

C. Power Conductors and Cables: Copper, solid, No. 20 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

D. Grounding Conductors and Cables: Copper, stranded, No. 16 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wiring Method:

1. Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling

- spaces and in gypsum board partitions where unenclosed wiring method may be used.
- a. Retain first subparagraph below if retaining option in paragraph above.
 - b. Install plenum cable in environmental air spaces, including plenum ceilings.
 - c. Conceal raceway and cables except in unfinished spaces.
2. Cable Trays: Comply with requirements in Division 27 Section "Communications Horizontal Cabling."
3. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.
- a. Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.
- B. Install cables without damaging conductors, shield, or jacket.
- C. Do not bend cables, while handling or installing, to radii smaller than as recommended by manufacturer.
- D. Pull cables without exceeding cable manufacturer's recommended pulling tensions.
1. Pull cables simultaneously if more than one is being installed in same raceway.
 2. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.
 3. Use pulling means, including fish tape, cable, rope, and basket-weave wire or cable grips, that will not damage media or raceway.
- E. Install exposed raceways and cables parallel and perpendicular to surfaces or exposed structural members, and follow surface contours. Secure and support cables by straps, staples, or similar fittings designed and installed so as not to damage cables. Secure cable at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, or fittings.
- F. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
- G. Separation of Wires: Separate speaker/microphone, line-level, speaker-level, and power-wiring runs. Run in separate raceways or, if ex-

posed or in same enclosure, provide 12-inch (300-mm) minimum separation between conductors to speaker/microphones and adjacent parallel power and telephone wiring. Provide separation as recommended by equipment manufacturer for other conductors.

- H. Splices, Taps, and Terminations: Make splices, taps, and terminations on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Install terminal cabinets where there are splices, taps, or terminations for eight or more conductors.
- I. Impedance and Level Matching: Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks if required.
- J. Identification of Conductors and Cables: Comply with requirements in Division 27 Section "Communications Horizontal Cabling" for cable administration, cable schedule, and cable and wire identification.
- K. Equipment Identification:
 - 1. Comply with requirements in Division 26 Section "Identification for Electrical Systems" for equipment labels and signs and labeling installation requirements.
 - 2. Label stations, controls, and indications using approved consistent nomenclature.

3.2 EXISTING SYSTEMS

- A. Retain this article if equipment being specified is to connect with existing sound, intercommunication, or nurse-call equipment.
- B. Examine existing systems for proper operation, compatibility with new equipment, and deficiencies. If discrepancies or impairments to successful connection and operation of interconnected equipment are found, report them and do not proceed with installation until directed. Schedule existing systems' examination so there is reasonable time to resolve problems without delaying construction.

3.3 GROUNDING

- A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other signal impairments.
- B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding except at connection to main building ground bus.

- C. Grounding Provisions: Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Retain first paragraph below to require a factory-authorized service representative to perform inspections, tests, and adjustments.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Retain first paragraph below to require Contractor to perform tests and inspections.
- D. Perform tests and inspections.
1. Retain subparagraph below to require a factory-authorized service representative to assist Contractor with inspections, tests, and adjustments.
 2. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- E. Retain first paragraph below to describe tests and inspections to be performed.
- F. Tests and Inspections:
1. Schedule tests a minimum of seven days in advance.
 2. Report: Submit a written record of test results.
 3. Operational Test: Perform an operational system test and demonstrate proper operations, adjustment, and sensitivity of each station. Perform tests that include originating station-to-station and "All Call" messages and pages at each nurse-call station. Verify proper routing, volume levels, and freedom from noise and distortion. Test each available message path from each station on the system. Meet the following criteria:
 - a. Speaker Output: 90 dB plus or minus 3 dB, 300 to 3000 Hz, reference level threshold of audibility 0 dB at 0.02 mPa of sound pressure.
 - b. Gain from patient's bedside station to nurse station, with distortion less than 65 dB (plus or minus 3 dB, 300 to 3000 Hz).
 - c. Signal-to-Noise Ratio: Hum and noise level at least 45 dB below full output.
 4. Test Procedure:

- a. Frequency Response: Determine frequency response of two transmission paths by transmitting and recording audio tones.
 - b. Signal-to-Noise Ratio: Measure the ratio of signal to noise of the complete system at normal gain settings using the following procedure: Disconnect a speaker/microphone and replace it in the circuit with a signal generator using a 1000-Hz signal. Measure the ratio of signal to noise and repeat the test for four speaker microphones.
 - c. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 300, 400, 1000, and 3000 Hz into each nurse-call equipment amplifier, and measure the distortion in the amplifier output.
- G. Retesting: Rectify deficiencies indicated by tests and completely re-test work affected by such deficiencies at Contractor's expense. Verify, by the system test, that the total system meets these Specifications and complies with applicable standards. Report results in writing.
- H. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
- I. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sound levels and controls to suit actual occupied conditions. Provide up to three visits to Project during other-than-normal operating hours for this purpose.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel and caregiver staff to adjust, operate, and maintain nurse-call equipment.

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