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USACE / NAVFAC / AFCEC / NASA **UFGS 27 52 24 (November 2020)**

Preparing Activity: USACE **Superseding**
UFGS 27 52 24 (August 2017)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

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

SECTION TABLE OF CONTENTS

DIVISION 27 - COMMUNICATIONS

SECTION 27 52 24

NURSE CALL SYSTEM

11/20

PART 1 GENERAL

1.1 REFERENCES
1.2 DEFINITIONS
1.3 SUBMITTALS
1.4 MAINTENANCE MATERIAL SUBMITTALS
1.4.1 Extra Materials
1.5 QUALITY CONTROL
1.5.1 Regulatory Requirements
1.5.1.1 Cybersecurity
1.5.2 Product Standardization
1.5.3 Service Organization
1.5.4 Qualifications
1.5.4.1 System Contractor Qualifications
1.5.4.2 Lead Installer Qualifications
1.5.4.3 Manufacturer Qualifications
1.6 STORAGE AND PROTECTION
1.7 SOFTWARE SERVICE AGREEMENT

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION AND REQUIREMENTS
2.1.1 General Requirements
2.1.1.1 Integration/Coordination
2.1.1.2 Expansion Capability
2.1.1.3 Existing System Compatibility
2.1.1.4 Call Annunciation Priorities
2.1.2 System Shop Drawings
2.1.2.1 System Riser Diagrams
2.1.2.2 Wiring Diagrams
2.1.3 Nurse Call Tone-Visual (NCTV) System
2.1.3.1 Operational Requirements
2.1.3.2 Master Station - Tone-Visual
2.1.3.3 Nurse Call Control Cabinet
2.1.4 Nurse Call Audio-Visual (NCAV) System
2.1.4.1 Operational Requirements

2.1.4.2 Master Station - Audio Visual
2.1.4.3 Nurse Call Controller
2.2 MATERIAL AND EQUIPMENT
2.2.1 Pull Cord
2.2.2 Pull Cord - with Audio
2.2.3 Patient Station
2.2.4 Patient Station - Audio
2.2.5 Patient Station - Behavioral Health
2.2.6 Staff Emergency Station
2.2.7 Staff Station
2.2.8 Staff Station - Audio
2.2.9 Staff Station - Behavioral Health
2.2.10 Central Code Annunciation Station
2.2.11 Cord Sets
2.2.11.1 Cord Set - Push-Button
2.2.11.2 Cord Set - Geriatric Call-Button
2.2.11.3 Cord Set - Squeeze-Bulb Switch
2.2.11.4 Cord Set - Breath Call Cord
2.2.11.5 Cord Set - Pillow Speaker
2.2.12 Bed Interface Outlet Station
2.2.13 Cancel Station
2.2.14 Code Blue Station
2.2.15 Infant Distress Code Station
2.2.16 Dome Light
2.2.17 Zone Light
2.2.18 Corridor Light
2.2.19 Duty Station
2.2.20 Equipment Alarm Station
2.2.21 Nurse Call - Lighting Interface
2.2.22 Nurse Call - TV Interface
2.2.23 Call Logging Workstation
2.2.24 Maintenance Workstation

PART 3 EXECUTION

3.1 INSTALLATION
3.1.1 System Installation
3.2 FIELD QUALITY CONTROL
3.2.1 Periodic Inspection and Testing
3.2.2 Final Inspection and Acceptance Testing
3.2.2.1 Inspection
3.2.2.2 Acceptance and Operational Testing
3.2.2.3 Corrective Action for Rejected Work
3.2.2.4 Warranty Period Inspection and Testing
3.3 TRAINING
3.4 MAINTENANCE

-- End of Section Table of Contents --

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Preparing Activity: USACE | **Superseding UFGS 27 52 24 (August 2017)**

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SECTION 27 52 24

NURSE CALL SYSTEM
11/20

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NOTE: This specification covers the requirements for requirements for nurse call systems in medical treatment facilities.

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

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 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.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code
NFPA 99	(2021) Health Care Facilities Code

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-569	(2015d) Commercial Building Standard for Telecommunications Pathways and Spaces

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-06	(2016; with Change 1, 2017) Cybersecurity of Facility-Related Control Systems
UFC 4-510-01	(2019; with Change 2, 2019) Design Medical Military Facilities

UNDERWRITERS LABORATORIES (UL)

UL 1069	(2007; Reprint Apr 2020) UL Standard for Safety Hospital Signaling and Nurse Call Equipment

1.2 DEFINITIONS

Use UL 1069, NFPA 99, UFC 4-510-01, and TIA-569 for definitions, abbreviations and acronyms unless noted otherwise. In the case of discrepancies UL 1069 takes preference. UFC 4-510-01 takes preference over TIA-569.

1.3 SUBMITTALS

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

complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

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

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

****

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

SD-02 Shop Drawings

Wiring Diagrams; G[, [____]]

System Riser Diagrams; G[, [____]]

SD-03 Product Data

Master Station - Tone-Visual; G[, [____]]

Master Station - Audio-Visual; G[, [____]]

Nurse Call Control Cabinet; G[, [____]]

Battery Backup or Uninterruptible Power Supply; G[, [____]]

Nurse Call Controller; G[, [____]]

Pull Cord; G[, [____]]

Pull Cord - with Audio; G[, [____]]

Patient Station; G[, [____]]

Patient Station - Audio; G[, [____]]

Patient Station - Behavioral Health; G[, [____]]

Staff Emergency Station; G[, [____]]

Staff Station; G[, [____]]

Staff Station - Audio; G[, [____]]

Staff Station - Behavioral Health; G[, [____]]

Central Code Annunciation Station; G[, [____]]

Cord Sets; G[, [____]]

Bed Interface Outlet Station; G[, [____]]

Cancel Station; G[, [____]]

Code Blue Station; G[, [____]]

[Infant Distress Code Station; G[, [____]]

] Dome Light; G[, [____]]

Zone Light; G[, [____]]

Corridor Light; G[, [____]]

Duty Station; G[, [____]]

Equipment Alarm Station; G[, [____]]

Nurse Call - Lighting Interface; G[, [____]]

Nurse Call - TV Interface; G[, [____]]

Call Logging Workstation; G[, [____]]

Maintenance Workstation; G[, [____]]

SD-06 Test Reports

Acceptance Test Plan; G[, [____]]

Acceptance Test Report; G[, [____]]

Operational Test Report; G[, [____]]

Corrective Action Results; G[, [____]]

Warranty Period Inspection And Testing Plan; G[, [____]]

Warranty Period Inspection And Test Report; G[, [____]]

SD-07 Certificates

System Contractor Qualifications; G[, [____]]

Lead Installer Qualifications; G[, [____]]

Manufacturer Qualifications; G[, [____]]

SD-10 Operation and Maintenance Data

Operation and Maintenance Data; G[, [____]]

Software Service Agreement; G[, [____]]

SD-11 Closeout Submittals

As-Built System Drawings; G[, [____]]

Equipment Spare Parts List; G[, [____]]

1.4 MAINTENANCE MATERIAL SUBMITTALS

1.4.1 Extra Materials

****
NOTE: Do not ordinarily include extra materials in Navy Projects.
****

Furnish the spare parts to the facility as itemized below, after the successful completion of system acceptance testing.

Quantity	Items
[_____]	Each type of Station
[_____]	Patient Station
[_____]	[Dome Light]
[_____]	[Push Button Cord Sets]
[_____]	[Zone Light]
[_____]	[Corridor Light]
[_____]	[Pneumatic Cord Sets]
[_____]	[Pillow Speaker Cord Sets]
[_____]	[Sets of Main Terminal/Equipment Panel plug-in modules]
[_____]	[_____]
[_____]	[_____]

1.5 QUALITY CONTROL

1.5.1 Regulatory Requirements

Conform to UL 1069, UFC 4-510-01, and NFPA 99. Nurse call system components listed by UL or a nationally recognized testing laboratory (NRTL).

1.5.1.1 Cybersecurity

Comply with the cybersecurity requirements identified in UFC 4-010-06, Section 25 05 11, and NFPA 99 while maintaining compliance with UL 1069. Document compliance of cybersecurity requirements for the fundamental nurse call system(s) and all proposed integrations of supplemental systems.

1.5.2 Product Standardization

Provide standard product[s] for the nurse call system from a single manufacturer/vendor, designed to integrate together and operate as a complete system.

1.5.3 Service Organization

****
NOTE: Generally a 4-hour response time is appropriate. Consult with facility for special circumstances including remote locations.
****

Support from a factory-authorized service organization within a [4][_____]-hour window, from notification to arrival at site.

1.5.4 Qualifications

1.5.4.1 System Contractor Qualifications

Authorized vendor/contractor and service organization for the manufacturer of the nurse call system, with a minimum of five years regularly engaged in performing services for projects with similar level of complexity, features and functions including system application, design, integration, installation, testing, training, and maintenance.

Ensure system contractor personnel are factory trained or certified for the make and model of the system(s) provided.

1.5.4.2 Lead Installer Qualifications

Factory trained or certified on the type of system(s) provided. Minimum of five years regularly engaged in the installation of systems for projects with similar level of complexity, features, and functions.

1.5.4.3 Manufacturer Qualifications

Minimum of five years regularly engaged in the manufacture of UL 1069 -listed nurse call systems and equipment, of the same level of complexity, features and functions.

1.6 STORAGE AND PROTECTION

Deliver equipment, components, and materials in original packaging, labeled with the manufacturer/vendor name, part name and part number as appropriate. Inspect equipment, components, and materials upon receipt. Replace damaged items.

Comply with manufacturer's instructions and recommendations for storage and handling of all equipment, components, and materials. Protect

materials and components from deleterious environments including weather, direct sunlight, moisture, contamination, corrosion, and construction traffic.

[1.7 SOFTWARE SERVICE AGREEMENT

Submit a proposal for maintenance, licensing, and any other running costs associated with the nurse call system for the next [5][_____] years, divided into annual costs. Coordinate proposal with the Using Services and DHA.

]PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION AND REQUIREMENTS

2.1.1 General Requirements

Provide a complete and fully functional nurse call system in compliance with UL 1069, UFC 4-510-01, and NFPA 99. Compliance to include all aspects of the nurse call system and subsystems including components and cabling, and the selection, arrangement, and connection of materials and circuits.

Supply and install all necessary equipment required, whether or not enumerated, to provide a complete and operating nurse call system. Include the following capabilities:

a. Simultaneously process and signal all calls regardless of the priority level within the nurse call system. When several different priority level calls are present on the system at one time, precedence is given to the highest priority level for call tones and visual indicators.

b. Electronically supervise all call initiation and notification devices, and associated wiring in accordance with UL 1069. Report station failure to designated console[, PC], e-mail, and wireless device.[Provide integral diagnostics able to quickly locate the source of the problem.][Provide network monitoring tool to ensure network reliability.]

c. Support the routing of patient calls to any annunciator[, wireless/telephone network/hands-free/personally assignable communications devices][, pager,] or other annunciating device anywhere in the facility, or to any combination of the above regardless of the location of the calling station. Process calls based on location, room assignment, priority or combination thereof.

d. Perform resetting or canceling of a call with a priority of level #3 or higher only at the initiating station or device within the originating room.

e. Accomplish all programming and firmware changes on a working system without interruption to the normal operation of the system. In the event of an error or failure in the update process, revert to the previous firmware. Test and approve for installation all security patches prior to implementation to prevent interruption in service.

f. Minimum [99][_____] different event types may be defined in the nurse call network to facilitate work flow within and outside of normal nurse call activity (i.e. environmental services, facilities,

transportation, lab, pharmacy, etc.).

g. Provide separate, dedicated nurse call network to accomplish all fundamental nurse call operations.[Provide gateways to enable nurse call system integration(s) via the facility network(s).]

h. Provide battery backup or uninterruptible power supply capable of operating the nurse call system(s) at full power for 15 minutes upon AC power failure.

i. Provide the nurse call network to support at least [990][_____] call processes to facilitate work flow and call escalations to various staff or groups.

[2.1.1.1 Integration/Coordination

****
NOTE: Each system integrated will add cost and difficulty in achieving the goals of the cybersecurity approval process.
****

Integrate the nurse call system with the following[existing] systems, by use of agnostic and non-proprietary software. Provide middleware that allows for system integration and provides for interoperability of other systems. Where facility has both tone-visual and audio-visual systems, integrate all subsystems into a combined, fully-functioning nurse call system. Obtain cybersecurity approval for integrations and middleware, while maintaining UL 1069 listing.

[a. Wireless/networked-telephone, hands-free, personally-assignable communication device

][b. Closed circuit television (CCTV)

][c. Hospital-grade televisions

][d. Admit, discharge and transfer system

][e. Patient entertainment system

][f. Infant protection system

][g. Electronic medical records / Electronic health records systems

][h. Patient education system

][i. Access control system

][j. Patient room lighting control

][k. Shade control

][l. Bed exit system

][m. Equipment monitoring[, including [____]]

][n. Real time location services

][o. Staff assignment

][p. Radio paging

][q. Network time synchronization

][r. Call logging workstation

][s. [_____]

][t. [_____]

][Coordinate patient's control units (headwall[,][and][pillow speaker][, and][bed side-rails]) to provide remote control of devices such as lighting and television, which are not part of the nurse call system.

]][2.1.1.2 Expansion Capability

Provide nurse call system with capability for future expansion. Equipment ratings, housing volume, spare keys, switches, relays, annunciator modules, terminals, and main trunk 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.

Provide ability to change any individual room without reprogramming by the manufacturer.

][2.1.1.3 Existing System Compatibility

****

NOTE: Integration to an existing system will be outside of the new systems UL 1069 listing, and may require middleware to communicate between the two systems.

****

Maintain UL 1069[and cybersecurity approval] through additions or modifications to the existing nurse call system.

]2.1.1.4 Call Annunciation Priorities

Sequence the annunciation of all call types in a four level priority matrix, with the highest priority of Level 1 and the lowest priority of Level 4. Coordinate the call type names, meanings and priority levels with facility.

Priority Level	Call Type	Lamp Color
#1 Code	Code Blue Code Call	[Blue][Purple][Color coordinated with facility]

Priority Level	Call Type	Lamp Color
#2 Emergency	Emergency Bed Exit Alarm Staff Assist Failure Alarm [Medical Device Emergency Alarm]	[Red][Color coordinated with facility]
#3 Priority	Patient Priority Call Cord Disconnected Bed Cable Disconnected	[Yellow][White][Color coordinated with facility]
#4 Routine	Patient Routine [Medical Device Routine Alarm] [Voice Intercom - Staff and Duty Stations (Audio Only)]	[Green][Color coordinated with facility]

2.1.2 System Shop Drawings

2.1.2.1 System Riser Diagrams

Submit system riser diagram for the overall system, including any integration, and for each subsystem. Identify systems integrated with the nurse call system, and provide description and details for the integration of each system. Identify the level of responsibility of the nurse call system provider for each integration, including provision of interface or gateway modules.

2.1.2.2 Wiring Diagrams

Submit wiring diagrams for the overall system and each subsystem. Indicate wiring type and size, as well as conduit or raceway size for each section of the nurse call system. Ensure system wiring reflects the required expansion capability.

2.1.3 Nurse Call Tone-Visual (NCTV) System

2.1.3.1 Operational Requirements

Provide NCTV system with capability to meet UL 1069 fundamental nurse call functions utilizing alert tones, visual indicators, selectable voice annunciation, and alphanumeric text displays.

2.1.3.2 Master Station - Tone-Visual

LED or monitor display meeting UL 1069. Provide tone-visual annunciation of calls, service requests, staff registration, with ability to display events from any device in the nurse call system network. Call-in priorities are differentiated through unique tone signals and call-in LED flash patterns. Tone may be muted at annunciator, but automatically re-engage if another call is received.

2.1.3.3 Nurse Call Control Cabinet

Wall or rack mounted cabinet for nurse call system head-end equipment including power supplies, battery backup or uninterruptible power supply, [Ethernet switch,]and other ancillary equipment.

2.1.4 Nurse Call Audio-Visual (NCAV) System

2.1.4.1 Operational Requirements

Provide NCAV system with capability to meet UL 1069 fundamental nurse call functions utilizing alert tones, visual indicators, selectable voice annunciation, alphanumeric text displays, and full duplex voice intercom. Full duplex audio communications capability on all handsets and all loud-speaking devices including patient, staff, duty, and master stations.

2.1.4.2 Master Station - Audio Visual

****

NOTE: Association with a VoIP network requires an integration beyond fundamental UL 1069 requirements. Use caution in requiring integrations, unless directed.

****

a. Provide a master station console display that meets the system manufacturer's minimum specifications, utilizing [touch screen][or][keypad][or][standard mouse] control.[Provide an automated service reminder when selecting a call or log item.][While in audio contact with the patient, display all user defined information, such as caregiver assigned[, and pertinent patient information] in an enriched display.][When a PC is "associated" with a VoIP console, provide user with easy to follow on-screen functions, such as display of call priority, room and patient information.]

b. Display calls on the master station in order of their priority level, and then in the order of call placement.

c. Provide the following additional functions at each one of these users' screens:

(1) Full display of all calls, including corridor light color sequence.

(2) Text message to multiple devices such as pagers, wireless phone displays, handsfree devices, and personally assignable communication devices.

[(3) Display calls in a centralized display format (i.e. Centralized Code Blue display).

] (4) Display and route calls in a de-centralized workflow environment.

[(5) Display all staff information, staff status, wireless extension and their location.

]2.1.4.3 Nurse Call Controller

a. Provide a nurse call network controller in each nursing unit or service with an audio-visual system, capable of non-blocking, duplex communications between consoles and rooms, duty stations, staff stations, sub stations, and master stations.

b. Provide controller as life safety grade meaning that it does not require regular rebooting for continued basic functions of system. Maintain fundamental nurse call operations upon loss of facility's

communication network. A PC may not be used as a nurse call controller.

2.2 MATERIAL AND EQUIPMENT

****
NOTE: Refer to UFC-4-510-01 for operation of devices and required locations.
****

2.2.1 Pull Cord

An emergency call device activated by pulling cord. Provide pendant attached to the end of the cord, within patient reach. Provide with call assurance LED[, second, unique call-in priority button,] and cancel button. Provide water-resistant device where installed in wet area.

2.2.2 Pull Cord - with Audio

****
NOTE: Pull cord with audio stations are available from limited manufacturers. Only provide if requested by and coordinated with the using department. Remove pull cord with audio for projects seeking competitive bids.
****

An emergency call device activated by pulling cord. Provide pendant attached to the end of the cord, within patient reach. Provide with call assurance LED,[second unique call-in priority button,] cancel button, and speaker/microphone. Provide water-resistant device where installed in wet area.

2.2.3 Patient Station

Call placed lamp, reset pushbutton, and polarized receptacle matching cord set plug, mounted in a single faceplate. Provide each patient bed with a cord set plug, call placed lamp and unique system address where patient station serves two adjacent patient beds.

2.2.4 Patient Station - Audio

****
NOTE: Keep second paragraph of Patient Stations for systems where the patient station rather than the dome light functions as the hub for the devices in the patient room.
****

a. Call placed lamp, reset pushbutton, speaker/microphone, and polarized receptacle matching cord set plug, mounted in a single faceplate. Provide each patient bed with a cord set plug, call placed lamp and unique system address where patient station serves two adjacent patient beds.

[b. Where the patient station functions as a system hub, provide support of up to [13][_____] call in stations, [3][_____] of which can have audio capability. Provides annunciation at associated console and visible annunciation at device, for calls originating from connected

call stations.

]2.2.5 Patient Station - Behavioral Health

Provide tamper-proof pushbutton call device. Pull cords are prohibited. Provide water-resistant device where installed in wet area. Provide each patient bed with a pushbutton and unique system address where patient station serves two adjacent patient beds.

2.2.6 Staff Emergency Station

Call station with the ability to place a staff emergency call. Provide station with a call assurance LED and a cancel button, mounted in a single faceplate.

2.2.7 Staff Station

Provide with call button, call assurance LED, and cancel button mounted in a single faceplate.

2.2.8 Staff Station - Audio

Provides two-way intercom capability. Provide with call button, call assurance LED, cancel button, and speaker/microphone mounted in a single faceplate.

2.2.9 Staff Station - Behavioral Health

Provide two-way intercom capability via ceiling-mounted speakers and microphone. Include call-assurance LED.

2.2.10 Central Code Annunciation Station

Provides central annunciation of code calls from any code station.

2.2.11 Cord Sets

Listed by UL or a NRTL and compatible with the nurse call system listing. Provide a cord set wall bracket with each cord set to hold device when not in use.

2.2.11.1 Cord Set - Push-Button

Sufficient length of cord for patient reach; compatible with medical gas environment; equipped with momentary-action, call button switch; sterilizable; washable cord.

2.2.11.2 Cord Set - Geriatric Call-Button

Sufficient length of cord for patient reach; compatible with medical gas environment; equipped with momentary-action, light-pressure switch in soft outer jacket; sterilizable; washable cord.

2.2.11.3 Cord Set - Squeeze-Bulb Switch

Sufficient length of cord for patient reach; compatible with medical gas environment; equipped with neoprene squeeze bulb activator and plug-mounted momentary contact switch; sterilizable; washable cord.

2.2.11.4 Cord Set - Breath Call Cord

Flexible PVC jacketed cable; momentary contact air-pressure sensitive switch; sufficient length of cord for patient reach; adjustable arm included for clamping; suitable for use in oxygen-enriched atmosphere; include 12 replacement straws; sterilizable; washable cord.

2.2.11.5 Cord Set - Pillow Speaker

Eight-conductor, DIN, flexible PVC jacketed cable. Contains nurse-call button, volume control, separate lighting control for room and reading lights, speaker, and channel control in molded flame-retardant ABS housing. Sufficient length of cord for patient reach with sheet clip; washable cord.

2.2.12 Bed Interface Outlet Station

37-pin receptacle, with dummy plug or dust cap and stainless steel wall plate, supervise and annunciate calls originating from the bed rails on the nurse call system and enable auxiliary functions.

2.2.13 Cancel Station

Cancel button, with flexible programming for cancellation of some or all call priorities, located in the same room as the originating call devices, mounted in a single faceplate.

2.2.14 Code Blue Station

Call station with the singular function to place a code call. Provide station with call assurance LED and cancel button.

[2.2.15 Infant Distress Code Station

****
NOTE: Not all facilities have a separate response team for infant code calls. Coordinate with facility.
****

Call station with the singular function to place a infant distress code call. Provide station with a call assurance LED and a cancel button.

]2.2.16 Dome Light

****
NOTE: For some manufacturer's, dome lights, corridor lights, and zone lights are the same device. Retain all device descriptions to identify performance requirements of system.
****

a. [Four][_____] segment light with integral tone device, with each segment capable of indicating a call in [white, blue, purple, red, yellow, green, orange, and pink][white, blue, red, yellow, and green][_____]. Fully programmable LED lights for the following criteria: colors, patterns, and flash rates.

2.2.17 Zone Light

Provide visual indication with integral tone device of calls by mimicking associated dome light tone, patterns, and flash rates. Provide device capable of producing the same colors as the dome light.

2.2.18 Corridor Light

Provide visual indication with integral tone device of calls by mimicking associated dome light tone, patterns, and flash rates. Provide device capable of producing the same colors as the dome light.

2.2.19 Duty Station

Provides visual and audible notification of calls. Contains [4][_____] LEDs to provide visual indication by mimicking dome light display. Provide device capable of producing the same colors as the dome light. Contains call-in button and speaker/microphone.

2.2.20 Equipment Alarm Station

[Two][_____] isolated inputs for auxiliary alarms with call assurance LEDs and cancel button, compatible with 6 mm 1/4 inch jack medical instruments. Supervise inputs to initiate a call if a cord is removed.

2.2.21 Nurse Call - Lighting Interface

****
NOTE: The 1 level selection is for on/off control of a single light. The 2 level selection is typically used for a reading/ambient/exam light. Coordinate with lighting controls to ensure intended functionality is present. Most nurse call systems will provide momentary contact inputs into the lighting control system rather than controlling the lights directly.
****

Provide [on-off control][full range dimming] for [1][2][_____] zone(s) of lighting from the pillow speaker or bed rail. Lighting interface listed by UL or a NRTL.

2.2.22 Nurse Call - TV Interface

Provides control of hospital grade TV, including power, channel selection, channel up/down, volume up/down, closed caption, and mute from the pillow speaker or bed rail. TV interface listed by UL or a NRTL.

[2.2.23 Call Logging Workstation

Provide workstation to monitor, collect, process, store and archive call logs, and prepare analytical reports on the nurse call system and applicable integrations. Coordinate reports required with the Using Services.

][2.2.24 Maintenance Workstation

Provide workstation for remote monitoring, diagnostics, testing, and troubleshooting of nurse call system failures.

]PART 3 EXECUTION

3.1 INSTALLATION

****
NOTE: This specification is suited primarily for new building construction.. Modify as appropriate if used for a remodeling or retrofit type project. In retrofit projects, the designer should become familiar with as-built conditions, and maximize the use of existing conduits and raceway components. Use extreme care in retrofit specifications to avoid proprietary statements.
****

Provide a complete and operational nurse call system, with subsystems, in compliance with NFPA 70, NFPA 99, UL 1069, UFC 4-510-01, and TIA-569. Install equipment and accessory items to suit manufacturer's instructions and recommendations, plans and specifications. Provide insulated conductors in electrical metallic tubing and cable tray as the wiring method.

3.1.1 System Installation

a. Use water-resistant devices in wet areas, such as toilet rooms and showers.

b. [Surface mount main terminal/equipment panels][Rack][Cabinet]-mount the system LAN, server, and battery back-up equipment in the [server room][room approved by DHA to house servers]. Mounting of the panels and equipment in any other room, area or above-finished ceilings is not acceptable. Mark panels with the nurse call subsystem number and function served.

c. Master Station equipment that does not require attendant access for programming or call activities (such as the battery back-up) may be wall mounted in a protected area under the counter top at the master station location. If the under counter mounted equipment can be kicked and damaged by staff sitting at the counter, provide a protective shield for the equipment.

d. Firmly secure mounted equipment in place, plumb, square, and level.

e. Locate equipment to provide adequate ventilation and equipment access for service and repair.

f. Mount dome lights, corridor lights, zone lights so they are visible for the entire length of the corridor or room in which they are installed.

g. Develop zone light operational matrix, to ensure zone lights operate to notify and direct staff to the associated dome light and annunciated call device. Incorporate operational matrix into the system shop drawings.

h. Incorporate facility's final room naming convention and room numbering into the programming of the nurse call system. Provide permanent label for each new panel and equipment.

i. Install cabling in raceway and cable trays. Segregate cabling in separate raceways or cable tray as required per wiring diagrams. Install cable tray and raceway parallel and perpendicular to structural members, concealed from view except where specifically noted per drawings.

j. Install cables without damaging conductors or jacketing, pulling cables within manufacturer's recommended pulling tension.

k. For nurse call devices in behavioral health areas, provide tamper-proof screws, pushbutton devices, ceiling mount speakers, ability to limit calls from patient devices, and ability to mute calls from the master station.

3.2 FIELD QUALITY CONTROL

3.2.1 Periodic Inspection and Testing

All work and workmanship is subject to inspection and testing as requested by the Contracting Officer at any and all times during preparation and installation. The Contracting Officer, in his or her sole discretion, may reject defective work and workmanship and require its correction. The Government's right to inspect, test, and reject, or its failure to exercise such right, as provided herein, in no way diminishes the system Contractor's duty to inspect and reject work as necessary to comply fully with the requirements of the contract documents.

3.2.2 Final Inspection and Acceptance Testing

Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

3.2.2.1 Inspection

a. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Verify that the system and individual devices are installed in accordance with manufacturer's instructions.

b. Notify the Contracting Officer when the installation of [each phase of]the system is completed and operating in accordance with specifications and ready for final inspection.

c. After installation [of each phase]has been completed, and the system components installed [during the phase]have been final inspected, checked out, and approved by the Contracting Officer, conduct acceptance tests in accordance with the approved Acceptance Test Plan.

3.2.2.2 Acceptance and Operational Testing

a. Develop an Acceptance Test Plan, to include step-by-step actions and the expected results to demonstrate system compliance. Include tests defined in the Manufacturer's installation instructions; list of all test equipment, including data indicating that calibration of the test equipment is current; test data sheets; and names and qualifications of the person(s) who will perform the tests.[For project's with phased construction schedules, identify acceptance test criteria for

each phase in the test plan.]

b. Conduct acceptance tests in accordance with the approved Acceptance Test Plan upon approval of final inspection [of each phase]by the Contracting Officer.

c. Operational Test: After completion of the acceptance testing, perform an operational system test to demonstrate proper operations as defined in UL 1069. Test each station capable of originating calls by activating a call from the station and observing the proper sequence of operation. Demonstrate each call type and priority for stations capable of placing multiple types or priorities of calls. Perform tests that include originating station-to-station messages and pages at each nurse-call station. Verify proper routing, volume levels, and freedom from noise and distortion. Simulate power outage to demonstrate operation on battery back-up source and transition to the essential electrical system. Submit an Operational Test Report to document results.

d. Upon successful completion of [all phased]final acceptance tests, and 30 calendar days of consecutive operationwithout the occurrence of any major malfunctions, submit the final acceptance test report, including certificates of compliance stating that all requirements and conditions have been satisfied. Submit test reports in both electronic media form and hard copy booklet form. Indicate in the field reports all field tests performed to adjust each component and to prove compliance with the performance criteria.

e. Indicate in each test report the final position of controls and operating mode of the system, and the manufacturer, model number, and serial number of the test equipment used in each test. The effective date of final system acceptance is the date when the system has satisfied 30 days of operation without a major malfunction.

f. Submit as-built system drawings in accordance with Section 01 78 00.

3.2.2.3 Corrective Action for Rejected Work

Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies at Contractor's expense. Verify, by the system test, that the total system meets the system requirements and complies with applicable standards. Report corrective action results in writing.

3.2.2.4 Warranty Period Inspection and Testing

At the end of 3rd and 7th months of operation, observe the system in operation and conduct tests to assure system performance. Include interviews of users to determine if the system is satisfying requirements and that training is adequate. Coordinate this service with the Contracting Officer. During the [11][____]th month of operation conduct an inspection and test of the system to identify and correct any deficiencies before the end of warranty period. Conduct this inspection and testing in the presence of a medical facility representative to witness this procedure and certify that all necessary corrective actions have been taken. Submit the warranty period inspection and test report to the Contracting Officer. Submit warranty period inspection and testing plan, including contact information and dates of proposed warranty period inspection prior to final system acceptance.

3.3 TRAINING

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NOTE: Designer to coordinate timing of refresher course with the facility. Eleven months is intended to ensure the refresher training occurs as close to the end of the warranty period as possible, to allow the facility to develop experience with the systems to thereby improve the effectiveness of the training.

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[Engage a factory-authorized service representative to train][Train] Owner's maintenance personnel and caregiver staff to adjust, operate, and maintain nurse-call equipment. Provide training for each role assignable in the nurse call system. Coordinate number of roles with using services. Provide minimum two training sessions for system users and minimum two training sessions for maintenance personnel scheduled to accommodate shift work. [Eleven][____] months after [the system is installed][beneficial occupancy], provide a refresher course for each group of trainees.

3.4 MAINTENANCE

Submit Data Package 5 operation and maintenance data for the installed nurse call system in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

a. Utilize systems and devices in accordance with the UL 1069 listing of the nurse call system and the Cybersecurity approvals noted in this Section. Coordinate with Government to establish a plan of action for approval and dissemination of required Information Assurance Vulnerability Alert (IAVA) patches as well as software and security updates. Provide perpetual licenses for the nurse call system.

b. Provide equipment spare parts list for all spare parts furnished.

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NOTE: Requiring software upgrade after project completion will add substantial cost to nurse call system. Use caution when selecting this option.

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[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.]Upgrade operating system if required to support software upgrade. Provide new or revised licenses to enable use of upgraded software. Ensure cybersecurity approval is maintained through the upgrade(s).

][[c][d]. Technical Support: Beginning with Substantial Completion, provide software support for [two][___] years. Follow the DHA Business to Business (B2B) process, or other process as coordinated with the Using Services to provide connectivity to support remote repair, maintenance, and sustainment of the system.

][[c][d][e]. Provide [30][___] days notice to Using Service to allow scheduling and access to system and to allow Using Service to upgrade

computer equipment if necessary.

] -- End of Section --