SECTION 27 51 29

TWO-WAY EMERGENCY COMMUNICATION SYSTEMS

**BASED ON DFD MASTER SPEC DATED 03/01/23**

Notes to A/E:

This section has been written to cover most (but not all) project conditions that you will encounter. Depending on the project, you may need to add material, delete items, or modify what is currently written.

This document is structured to automatically update the Table of Contents when printed or in response to an “Update Field” command (right mouse click on TOC opens menu) in MS-Word. Confirm that changes to the document outline are reflected in the TOC. TOC entries are Hyperlinks and can be used to navigate the document.

Two-way emergency communication systems complying with IBC sections 1009.8.1 and 1009.8.2 shall be provided at the landings serving each elevator or bank of elevators on each accessible floor that is one or more stories above or below the level of exit discharge. Two-way emergency communication systems are not required at the landings serving the elevator(s) where the two-way emergency communication systems are provided within areas of refuge in accordance with IBC section 1009.6.5.

1. GENERAL

Scope

Provide Two-way Emergency Communication Systems (a.k.a. Area of Refuge Systems, Area of Rescue Assistance Systems) as shown on the plans and as specified herein.

The system shall support Internal and External calling.

The Internal Call System shall provide communications between each required location and the Fire Command Center or a Central Control Point location. Visual indicators on the Master Control Station (located at the Central Control Point) will notify rescue personnel which Remote Call Station(s) need assistance. The Master Control Station must allow rescue personnel to speak to all Remote Call Stations simultaneously or to individual Remote Call Stations.

The External Call System shall provide external building calls for assistance to a central monitoring location at [Campus Police][\_\_\_\_\_\_\_\_\_\_\_\_\_]. Upon activation of the emergency pushbutton at a Remote Call Station, a call will be automatically placed to the Master Control Station. If no one answers at the Master Control Station, the External Call System shall dial a secondary location outside the building to activate two-way off-site person-to-person voice communication. The External Call System shall have the ability to be programmed with a minimum of two (2) emergency phone numbers.

Included are the following topics:

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Related Work

Applicable provisions of Division 1 govern work under this Section.

Section 26 05 26 – Grounding and Bonding for Electrical Systems

Section 26 05 29 – Hangers and Supports for Electrical Systems

Section 26 05 33 – Raceway and Boxes for Electrical Systems

Section 27 05 53 – Identification for Communications Systems

Section 28 31 00 – Fire Detection and Alarm

References

NFPA 101 Life Safety Code (Chapter 7.2.12 – Areas of Refuge)

IBC 1009.8 Two-way Communication

SPS 316 Wisconsin Dept. of Safety and Professional Services Electrical Code

ADA Americans with Disabilities Act

Delivered Audio Quality Definitions (DAQ): This is a universal standard often cited in system designs and specifications:

* + DAQ 1: Unusable, speech present but unreadable.
	+ DAQ 2: Understandable with considerable effort. Frequent repetition due to noise/distortion.
	+ DAQ 3: Speech understandable with slight effort. Occasional repetition required due to noise/distortion.
	+ DAQ 3.5: Speech understandable with repetition only rarely required. Some noise/distortion
	+ DAQ 4: Speech easily understood. Occasional noise/distortion.
	+ DAQ 4.5: Speech easily understood. Infrequent noise/distortion.
	+ DAQ 5: Speech easily understood. Coupled Bonding Conductor (CBC) – The term "Coupled Bonding Conductor" shall mean a bonding conductor placed, e.g. strapped, on the outside of any technology cable, used to suppress transient noise.

Submittals

Submittals shall include, at a minimum, the following information:

General

Cover Sheet including the submittal date, specification section, contractor name, system vendor name, and the project name.

Equipment list, including quantity, manufacturer, manufacturer part number, and equipment description. A separate equipment list shall be provided for each specification section.

Manufacturer’s Data Sheets, wiring diagrams, and installation manuals for each piece of equipment provided. Data sheets shall be bound in the order they occur in the equipment list. If an item occurs more than once in the equipment list, only one data sheet is needed.

Data sheets shall be clearly marked, noting which item or items on that sheet are being provided.

Riser diagrams shall be provided to illustrate communication circuits. Riser and wiring diagrams shall be job specific and show the point of origin for each circuit, areas served by each circuit, circuit type and wire type.

Sequence of Operation

Provide a Sequence of Operation narrative describing the functions of the system. Sequence of Operation shall include intended preprogrammed phone numbers for the External Call System.

Example Sequence of Operation:

Someone requiring assistance in an emergency situation proceeds to a location equipped with a Remote Call Station. The person seeking assistance pushes the “Push for Help” button on the Remote Call Station. A one-shot tone is made at the Remote Call Station and a LED is lit that is steady. The call is displayed digitally on the Master Control Station along with a tone and a display of the call and its location on a multi-character LCD multi-line display. When the alarm signal is answered by the Master Control Station, the Remote Call Station is signaled by the flashing LED that voice communication has been initiated.

The Master Control Station operator, upon receiving a Remote Call Station signal, activates a zone button that illuminates both a flashing LED and a green “voice” LED. By depressing and releasing the “talk” button, voice communication is established with the Remote Call Station for as long as required. If more than one Remote Call Station is signaling, the Master Control Station accepts the calls in the same manner.

When the emergency is resolved, the Master Control Station operator pushes a reset button to restore the entire system to standby status.

In the event of a wiring fault, each annunciator zone button, equipped with a yellow LED, will illuminate and an alarm that will sound identifying the area requiring service.

If there is no answer on the Master Control Station from a Remote Call Station, the Remote Call Station shall be programmed to dial an alternate number to [Identify location] after a preset amount of time (programmable from 10 to 30 seconds).

When the call is answered, the Call Progress Lamp shall be illuminated.

Each Remote Call Station shall be provided with an automatic “unique caller identifier”. In addition, an automatic pre-recorded voice location identifier announcement shall initiate after a pre-programmed amount of time (in case the person calling is incapable of speaking).

Basic programming functions are given above. Coordinate additional phone numbers with the User Agency. Coordinate with the User Agency for the proper number of phone circuits for the system.

1. PRODUCTS

Two-way Emergency Communication Systems

Provide Two-way Emergency Communication Systems as indicated on the drawings and as specified herein. Catalog numbers are shown for quality and performance requirements only. Two-way Emergency Communication Systems manufactured by others are equally acceptable provided they meet or exceed the performance of the indicated system and meet the intent of the design.

General

System shall comply with all state and local Electrical Codes.

System must be capable of being programmed and reprogrammed on-site and remotely.

System must have non-volatile memory to protect programming.

System shall have capability to dial to an outside phone number after an adjustable time delay when a Remote Call Station is not acknowledged at the Master Station. Feature shall allow two-way voice communication with an external constantly attended station.

A dry contact for each station shall close when the Remote Call Station is activated.

All low-voltage wiring shall be completely supervised.

Two-way telephone communications conductors shall be monitored for open-circuit and short-circuit fault conditions that would cause the telephone communications circuit to become fully or partially inoperative. Fault conditions shall result in a trouble signal in accordance with NFPA 72.

Failure of either primary or secondary power supply shall result in trouble signal in accordance with section 10.14 of NFPA 72

Coordinate the location of the Master Control Station with the local fire marshal. Master Control Stations are typically located in the Fire Command Center, near the main entrance, or at the main reception desk.

Master Control Station

The Master Control Station must allow rescue personnel to speak to all Remote Call Stations simultaneously or to individual Remote Call Stations.

Master Control Station shall be 120VAC powered and include a rechargeable battery to maintain backup power for a minimum of 4 hours of talk time.

Master Control Station shall have a stainless steel or powder coated steel housing, red coil cord, and red emergency handset.

Master Control Station is to be flush mounted (where practical).

The AE shall coordinate the type of communication lines to be used with the User Group. Indicate the type of communication line on a block diagram on the plans. Coordinate with the Div. 27 engineer to ensure communication lines are provided to the Master Control Station.

Master Control Station must allow for calls out on analog, digital, cellular, or IP communication lines as specified for this project. Provide products that function with the available communication lines.

Master Control Station shall have Communication Line verification. The Master Control Station must be programmable to check the status of the outgoing communication lines every 10 minutes up to every 23 hours.

Upon failure to detect an active communication line, the Master Control Station must provide a relay contact closure output to a fire alarm monitoring module to initiate a Two-way Emergency Communication System “trouble” signal on the fire alarm system.

Master Control Station must include wording identifying the number of each phone and instructions on how to operate the Master Control Station.

The Master Control Station must provide an audible and visual indicator that a Remote Call Station has been activated.

The products listed for Basis of Design are IP based. Analog based products are also available from the manufacturers. Coordinate the design type with User Group and edit as appropriate.

Basis of design: IP based Cornell Sentinel Series 4800 IP, model 4800-IPM; or Rath Microtech IP Base Station Series 2500.

Remote Call Stations

Remote Call Stations shall be 120VAC powered and include a rechargeable battery to maintain backup power for a minimum of 4 hours of talk time.

Remote Call Stations shall include a “hands-free” speakerphone with an LED to indicate status of call. Call Stations shall be vandal resistant and ADA compliant.

The Remote Call Stations must allow for programming of a specific voice message unique to each Remote Call Station which indicates the location of the Station. This allows rescue personnel to know the location of the activated Remote Call Station.

The Remote Call Station wording must include “Help Phone”, an International Phone symbol, and raised Braille lettering to ensure conformance with ADA requirements.

The products listed for Basis of Design are IP based. Analog based products are also available from the manufacturers. Coordinate the design type with User Group and edit as appropriate.

Basis of design: Cornell Model 4800VIP; or Rath Microtech model 2100-958NSIP with mushroom pushbutton.

**Power Supplies**

Two-way Emergency Communication System(s) shall be provided with power supplies from the System manufacturer to power all local and remote equipment associated with the System.

Integral Battery Backup: Provide System with secondary power supplies (battery backup), which shall have sufficient capacity to operate system under quiescent load (system operating in non-alarm condition) for minimum of 24 hours and, at end of that period, shall be capable of operating all alarm notification appliances used for evacuation or to direct aid to location of emergency for 5 minutes.

**Boxes**

Minimum 4-inch square and 2-1/8 inch deep or as recommended by manufacturer.

Cabling

General

Refer to manufacturer’s published product installation instructions for additional information and requirements. Wherever a discrepancy is identified between Project Documents and manufacturer’s published product installation instructions, the more stringent requirements shall govern.

Line-voltage power wiring shall be a minimum of #12 AWG stranded.

All conductors shall be color coded. Color coding shall be consistent throughout the facility.

**Communications Cable**

Communications cabling from the Master Control Station to the Remote Call Stations shall be as recommended by the manufacturer and shall meet Pathway Survivability requirements as indicated below.

Cable shall be non-plenum, plenum, or riser rated as dictated by environment in which cable is installed.

Cable installed in wet or damp locations, including, but not limited to, in-slab and buried conduit, shall be rated for installation in wet locations.

Pathway Survivability

Two-way Emergency Communication System cabling shall have a minimum pathway survivability rating of Level 2 or 3.

Level 2 cabling shall consist of one or more of the following:

2-hour fire-rated circuit integrity (CI) or fire-resistive cable that is UL 2196 certified. Cable shall be CIC rated for installation in conduit.

2-hour fire-rated cable system (electrical circuit protective system(s)).

2-hour fire-rated enclosure or protected area.

Performance alternatives approved by the authority having jurisdiction.

Level 3 cabling shall consist of pathways in buildings that are fully protected by an automatic sprinkler system in accordance with NFPA 13, and one or more of the following:

2-hour fire-rated circuit integrity (CI) or fire-resistive cable that is UL 2196 certified. Cable shall be CIC rated for installation in conduit.

2-hour fire-rated cable system (electrical circuit protective system(s)).

2-hour fire-rated enclosure or protected area.

Performance alternatives approved by the authority having jurisdiction.

1. EXECUTION

General

The complete installation shall be done in a neat, workmanlike manner in accordance with Division 26 of these documents and manufacturer's recommendations.

Coordination

Coordinate installation with User Agency. Verify rough-in and installation requirements including the location of the Master Control Station and the locations of the Remote Call Stations.

Coordinate programming functions and phone numbers with the User Agency.

Installation

General

The system amplifiers and power supplies shall be located adjacent to the main system panel.

Coordination

Basic programming functions are as given in the proposed Sequence of Operation above. Coordinate with the owner to provide additional phone numbers. Coordinate with the owner’s User Agency and phone service provider for the proper number of phone circuits for the system.

Cabling

The system shall be connected to a separate dedicated branch circuit from the building emergency power panel.

System communication cabling shall be routed in 1/2” (minimum) conduit, separate from power wiring.

Power wiring from the power supply to the annunciator shall be 16-gauge minimum or sized as recommended by the manufacturer. Route wiring in 1/2” (minimum) conduit. Locate the power supply above the accessible ceiling at the annunciator location. Wire power supply to a 120-volt emergency circuit. The contractor shall install the phone power supply where it is not visible from a public location.

Leave 8-inch wire tails at each Remote Call Station and device box, and 36-inch wire tails at the Master Control Station.

BAS Interface

Connect to the nearest Building Automation System (BAS) panel with 5 twisted pairs with overall shield in a 1-inch conduit.

Show a fire alarm monitoring module within three feet of the system panel. Coordinate with the fire alarm system designer.

Fire Alarm System Interface

Program the Two-way Emergency Communication System to activate its relay contacts if the System detects an inactive telephone line. Connect the relay contacts to a fire alarm system monitor module located within three feet of the system panel. Coordinate with the fire alarm system installer to program the monitor module to provide a “trouble” alarm when the system panel activates its relay contacts.

Identification and Labeling

**Directions for Use**

Provide directions for the use of the Two-way Emergency Communication System, instructions for summoning assistance via the Two-way Emergency Communication System and written identification of the location posted adjacent to the Two-way Emergency Communication System. Signage shall comply with the ICC A117.1 requirements for visual characters.

**Signage**

Provide signage indicating special accessibility provisions:

* Each door providing access to an area of refuge from an adjacent floor area shall be identified by a sign stating: AREA OF REFUGE.
* Each door providing access to an exterior area for assisted rescue shall be identified by a sign stating: EXTERIOR AREA FOR ASSISTED RESCUE.
* Signage shall comply with the ICC A117.1 requirements for visual characters and include the International Symbol of Accessibility. The Area of Refuge and Exterior Area for Assisted Rescue signs shall be illuminated. Additionally, visual characters, raised character and braille signage complying with ICC A117.1 shall be located at each door to an area of refuge and exterior area for assisted rescue in accordance with IBC section 1013.4.

**Directional Signage**

Directional Signage indicating the location of all other means of egress, and which of those are “accessible” means of egress shall be provided at the following per IBC 1009.10:

* At exits serving a required accessible space but not providing an approved accessible means of egress.
* At elevator landings.
* Within area(s) of refuge.

Manufacturer Field Services

A factory authorized technician shall supervise the installation and connection of all products furnished under this Section and shall perform start-up services and acceptance testing of the same.

Acceptance Testing

General

Conduct acceptance testing according to a schedule coordinated with the Agency, DFD, emergency responder agency, and AHJ. Provide a minimum of one (1) week advanced notice to allow for such participation. Failure to provide advanced notice will result in the tests being rejected and will require the system to be re-tested at a coordinated time.

Supply all equipment and personnel necessary to conduct the acceptance tests.

The Division 27 contractor shall assist the User Agency in the final system checkout and commissioning of the Two-way Emergency Communication System(s).

Document all tests.

System Testing

Demonstrate the following:

* Initiate calls from each Remote Call Station. At the Master Control Station, demonstrate receiving calls from each Remote Call Station.
* Each call station shall be tested to verify proper pre-recorded message unique to each call station is played before initiating two-way voice communication with master station or external constantly attended station.
* Verify the LEDs work at both the Master Control Station and the Remote Call Stations.
* Initiate calls from each Remote Call Station. At the Master Control Station, demonstrate what happens when calls are not answered. Demonstrate that the calls are answered at the primary External building phone number.
* Initiate calls from each Remote Call Station. At the Master Control Station, demonstrate what happens when calls are not answered. Demonstrate what happens when the calls are not answered at the primary External building phone number and are answered at the secondary External building phone number.
* Call quality: See below.

**Call Quality**

* For testing system call quality, the testing shall be based on the delivered audio quality (DAQ) system. A DAQ level below 3.0 shall be considered a failed test for a given call station.
* **Background noise levels: Each call path shall be tested at:**
	+ Typical ambient background noise levels at call station and master station
	+ **Active fire alarm background noise levels at call station and master station**
* System testing shall include verified acceptable call quality:
	+ From each call station to each master station
	+ From each call station to external constantly attended station, using voice circuit configured for remote attended station access
* Each call station shall be tested to verify proper pre-recorded message unique to each call station is played before initiating two-way voice communication with master station or external constantly attended station.

Documentation

General

Upon completion of the installation, provide project documentation to the Engineer for review.

Documentation shall include the items detailed in the sub-sections below.

Operation and Maintenance Manuals

Submit quantities required by Division 1 and Section 26 05 00.

Provide documents in electronic format (Adobe Acrobat .pdf) and, when requested, hard copy.

At minimum, O&M Manuals shall include:

* Wiring risers
* Approved Submittals

Warranty

This Contractor shall guarantee the following for a period of two (2) years from date of substantial completion of this work:

* All provided materials and equipment
* Installation of all equipment, hardware, wiring and related components.

Warranties shall include labor, materials, and travel time.

END OF SECTION