ADDENDUM NUMBER 3 **July 11, 2025**

PROJECT: NEW DORMITORY FOR THE DAUPHIN ISLAND SEA LAB CAMPUS
FOR DAUPHIN ISLAND SEA LAB
GMC PROJECT NO. AMOB230181
DCM NO. 20240427

AD2-1 CLARIFICATIONS / RFI'S / RESPONSES:

1. Bidders shall acknowledge receipt of the Addendum in writing, as provided on the Acknowledgment Receipt.

2. A copy of the pre-bid meeting agenda/minutes as well as the sign in sheet are attached.

3. For clarification purposes, Vapor barrier shall have all of the following qualities:
   Vapor Retarder: Basis of Design: Stego Wrap Vapor Barrier 15 mils thick. ASTM E 1745, Class A
   1. Maintain permeance of less than 0.01 Perms as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
   2. Other performance criteria:
      a. Strength: ASTM E1745 Class A.
      b. Thickness: 15 mils minimum
   3. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1
   4. Use manufacturer compatible accessories.

4. Please provide detailed loading at each foundation, if available.
   RESPONSE: The foundations are detailed as shown and should be priced accordingly. The pile capacities are listed in the pile notes. Refer to the project structural drawings and specifications.

5. Specification 081100 indicates hurricane resistant doors to be Curries StormPro 361. However, hardware set 1 indicates 101B, 101C, 121A, 201A, and 201B to be "Tornado Doors." Door Schedule A6.01 indicates those exact doors to be FRP doors. Note 2 indicates doors to be "Exterior Hurricane Impact." No FRP specification is provided. We feel the intent is to provide hurricane rated FRP doors in lieu of tornado doors. Please advise if this is correct. If so, please issue a FRP door specification.
   RESPONSE: The Door Hardware Specifications Door Hardware Sets #1 and #11 are to be Exterior "HURRICANE" Impact Rated door hardware in lieu of Tornado hardware. Door Hardware Set #8 for Tornado Door 146 is to remain a TORNADO door hardware set.

6. Opening 103A is shown to have note 3 on A6.01. However, the door is not indicated to be fire rated.
   RESPONSE: Door 103A is located in a 1GS 1 hour fire rated wall partition and shall be provided with a 1 hour (60 minute) fire rated door and glazing system.

Goodwyn Mills Cawood
11 North Water Street
Suite 19290
Mobile, Alabama 36602
T 251.460.4006
F 251.460.4423

FASCIMILE TRANSMITTAL COVER SHEET

DATE: **July 11, 2025**

TO: **Doris Furr**

FROM: **Planholder**

PROJECT: **NEW DORMITORY FOR THE DAUPHIN ISLAND SEA LAB CAMPUS**
FOR DAUPHIN ISLAND SEA LAB
GMC PROJECT NO. AMOB230181

RE: **ADDENDUM NO. 3 AND ACKNOWLEDGEMENT OF RECEIPT OF ADDENDUM NO. 3**

ACKNOWLEDGEMENT OF RECEIPT:

PLEASE PRINT RECIPIENT'S NAME, FIRM, AND DATE RECEIVED.

THEN FAX BACK TO (251) 460-4423 or EMAIL doris.furr@gmcnetwork.com
FOR OUR RECORDS AND TO ACKNOWLEDGE YOUR RECEIPT OF THIS ADDENDUM.

_____

NAME *(PLEASE PRINT)*

_____

FIRM *(PLEASE PRINT)*

_____

DATE RECEIVED *(PLEASE PRINT)*

32 Pages to follow this page

7. Opening 146 indicates with notes 4, 17, and 18 on A6.01 to be FEMA rated. The door is shown to be wood. However, it is not possible to FEMA rate wood doors. Please see attached CECO cutsheet for a hollow metal door alternate.
   RESPONSE: The Tornado Shelter Student Lounge Door 146 (For Room 146) is to be a Metal Door that meets the full 2020 ICC-500 tested Tornado Door System and 90 minute fire rated. The CECO Storm Pro Surface Vertical Rod Exit Tornado Resistant Assembly UL Classified to ICC500-2020 is an approved equal door system.

8. Opening 113B and similar bifold opening; detail 9/10 on A6.02 indicates hollow metal frame. However, the door schedule does not indicate hollow metal frames in the materials column. Frame type F5 is indicated as "cased". We feel the intent is to provide a cased open "sheetrock opening" with no cased open hollow metal frame.
   RESPONSE: Door 113B and similar bifold openings are to have a hollow metal frame as shown in Detail 9 and Detail 10 on A6.02. The Door Schedule will be updated in a future addendum.

9. Hardware set 11 is scheduled for aluminum doors, and notes that doors may be "Tornado" rated. We feel the doors are to be hurricane rated.
   RESPONSE: The Door Hardware Specifications Door Hardware Set #11 are to be Exterior "HURRICANE" Impact Rated door hardware in lieu of Tornado hardware.

10. Please confirm that ALL of the interior columns are HSS 6x6x3/8. None of them are labeled on the plan drawing.
    RESPONSE: Yes, all columns are HSS6x6x3/8.

11. Per sheet A6.03, "W4", is an existing window to be salvaged and reused. Are these windows to be removed and re-installed? Or are they to remain in the opening during the duration of the project?
    RESPONSE: The Window Type W4 are Owner provided existing windows to be installed in the new building.

12. I've looked thru the specifications and it calls for UL and FM approved. Will this material be Buy America Act or can this be domestic or import material? (fire sprinkler material).
    RESPONSE: Buy America is not required.

13. We respectfully request permission to bid Draper Inc as equal to Section 122513 Window Roller Shades. Attached are product data sheets on Draper Model NEXD Manually Operated and Clutch operated flex shade. Also we will use Draper basic fabric color light gray 3 percent openness as specified
    RESPONSE: Substitution request is approved.

AD3-2 ISSUED SPECIFICATIONS:

1. Add Section 287800 Emergency Responder Radio Coverage in its entirety.
2. Specifications : 283100 Fire Alarm System – Replace the section in its entirety with the attached specification section 283100.

AD3-3 ISSUED DRAWINGS:
N/A

AD3-4 ATTACHMENTS:

A. Addendum Acknowledgment Response

-END OF ADDENDUM-

PREPARED BY

Goodwyn Mills
Cawood
11 North Water
Street
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36602
T 251.460.4006
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PRE-BID CONFERENCE AGENDA/SUMMARY

FOR

DAUPHIN ISLAND SEA LAB
NEW DORMITORY FO THE DAUPHIN ISLAND SEA LAB CAMPUS
GMC PROJECT NO. AMOB230181
July 10, 2025 AT 10:00 A.M.

Note: *This Agenda is complimentary for general use as an outline and for discussion during this meeting. Any errors, omissions, or clarifications shall be communicated to the Architect for distribution. This Agenda does not attempt to be, nor represent, any recapitulation of Project requirements, and does not change or alter same in any respect; Changes, if any, will only be made by written Addendum.*

1. Welcoming remarks. Reminder to sign in on sheet being circulated

2. Name of Owner Representative's – **Dauphin Island Sea Lab**
Dr. John Valentine
David England
Shelley Stephens

Architect - **Goodwyn Mills Cawood, LLC**
Jim Walker – Project Manager
Brooke Rodriguez-Feo - Project Architect
Heather Beach-Interior Designer
Doris Furr - Administrative Assistant

3. Every General Contractor and every Subcontractor should read and be familiar with all the "front-end" documents and all of Division 1 of the Project Manual, in addition to the work they are bidding and must coordinate with. This project is an Alabama Division of Construction (DCM) Project. This project will follow the DCM Project inspection requirements.

4. **Bid time, date, place** - is indicated in the Advertisement for Bids; July 24, 2025 at 2:00 p.m., Dauphin Island Sea Lab at 101 Bienville Boulevard, Dauphin Island, AL 36528 in the classroom of Building 1, Administration Building on Albatross Street.
It is the Contractor's responsibility to make sure Bid is received prior to bid time or it will not be accepted.

5. Note that Advertisement and Instructions to Bidders should be read by each bidder. For insurance requirements refer to General Conditions of the Contract (DCM Form C-2) Article 37. A Certificate of Insurance evidencing all the minimum requirements must be provided to and accepted by Dauphin Island Sea Lab PRIOR to commencing on the contract.

6. Contractors shall use the Proposal Form included in Project Manual, copies of which are furnished to

each bidder with Bid Documents. Bids must include Attachment A to Proposal Form (Unit Prices) at Bid time and date. Only 1 copy is required to be submitted.

7. Bidders are required to provide a list (Attachment B to Proposal Form) of all proposed subcontractors, fabricators, and suppliers for the work. Said list must be provided with the proposal form or at the contractor's option no later than 24 hours after receipt of the bids.

8. Before submitting a bid for the Work, the bidders shall carefully examine the Bid Documents, visit the site, and satisfy themselves as to the nature and location of the Work, and the general and local conditions, including weather, the general character of the site and building, the character and extent of existing work within or adjacent to the site and any other work being performed thereon at the time of submission of their bids.

9. Addenda - Minutes of Pre-Bid Meeting, and any pertinent items discussed shall be issued as Addendum following the Pre-Bid Meeting (Addendum No. 1). Any further addenda necessary after the Pre-Bid Meeting will be issued to all plan holders. All Requests for Information (RFI's) shall be provided in writing for response.

10. Clarification will be made only by written Addenda sent to all prospective bidders. Questions and Clarifications must be submitted in writing 72 hours prior to bid.

11. When the Bid Documents identify three or more sources and the list of sources is not followed by "or approved equal" or similar wording, the bidder's proposal shall be based upon one of the identified sources, unless the bidder obtains "Pre-bid Approval" of another source. Approval of substitutions, if granted, shall not be effective until published by the Architect in an addendum to the Bid Documents. Requests for substitutions will not be considered 72 hours prior to bid.

12. If there is a conflict, discrepancy, or confusion between the existing conditions, plans and specifications for work, materials or equipment and the Contractor does not receive written clarification from the Architect prior to the opening of bids the Contractor shall include the better quality or greater quantity of work in his/her bid.

13. All information requested of the bidder on the Bid Form must be filled in. The form must be completed by typewriter or hand-printed in ink.

14. Bids shall be accompanied by a Bid Security equal to 5% (percent) of the total bid price, including the allowance, but in no event not more than $10,000.00. Bid Security shall be on the form of a Bid Bond or cashier's check payable Dauphin Island Sea Lab. No Bid Security is required on Bids less than $10,000.00.

15. Each bid shall be placed, together with a bid guaranty, in a sealed envelope. On the outside of the envelope the bidder shall write in large letters "Proposal", below which the bidder shall identify the Project and the Work bid on, the name of the bidder, the bidder's current general contractor's state license number, and Project No.: AMOB230181.

16. Performance Assurance and Insurance: The bidder to whom award is made shall provide a

Performance Bond equal to 100% of the total Contract Amount (including allowances) and a Labor and Material Bond equal to 100% of the total contract amount (including allowances). The accepted Bidder shall also provide insurance as required.
NO WORK IS TO BE PERFORMED UNTIL PROOF OF COMPLIANCE WITH THE INSURANCE REQUIREMENTS HAS BEEN RECEIVED BY DAUPHIN ISLAND SEA LAB.

17. Bids may be delivered in person or by mail if ample time is allowed for delivery.

18. Bids will be opened and read publicly at the time and place indicated in the Revised Advertisement for Bids.

19. Alternates are listed in the Bid Form in the order in which they shall cumulatively add to or deduct from the base bid for determining the lowest bidder.

20. Award of contract by Awarding Authority, ASAP after the opening of bids.

21. Proposals may be rejected if they contain any omissions, alterations of forms, additions not called for, conditional bids, alternate bids unless called for, incomplete bids, erasures, or irregularities of any kind.

22. Completion Time for Project: Base Bid Completion Time: 420 calendar days. Work is to commence within ten (10) calendar days from date of Notice to Proceed or Notice of Award.

23. At the time the Contractor duly awarded the Bid receives the signed Contract and the Notice to Proceed, he shall submit a Schedule of Work Progress to the Architect which reasonably reflects the amount of time required for each Phase of Work and the deadline by which it can be expected that such phase of the Work shall be completed. This Schedule should accurately reflect the date for Substantial Completion, and take into consideration any reasonable contingencies.

24. A Schedule of Values should be provided with the breakdown of material and breakdown of labor for each line item. This will help processing pay applications quicker.

25. The Contractor shall be responsible for all project safety. Neither the Architect nor the Owner will be responsible for the Contractor's safety precautions, means, methods, techniques, sequences, or procedures. Contractor's personnel responsible for safety shall be OSHA certified. Safety barricades for project, including equipment and storage areas, part of contractors means, methods, techniques, sequences, procedures; cost of any type fencing, barricades, etc. necessary shall be incidental to project.

26. Parking for Contractors and their Subs and workers: Shall be coordinated with the Owner.

27. Traffic Control:
- Coordinate all construction activities with parties having jurisdiction.
- Particular attention shall also be paid to vehicular and pedestrian traffic and routing of such during project.

28. Meetings: Owner / Architect / Contractor Bi-weekly (OAC) Progress Meeting to be held per project requirements.

-Pre-Construction Conference will be held once a Contractor has been awarded the project and contract signed.

29. Per DCM's May 29, 2012 bulletin Guidance on Act 2012-491 Amending the Alabama Immigration Law: "Contractors (including architects and engineers) will …be required to enroll in the E-Verify program and to provide documentation of enrollment in the E-Verify program with their contracts or agreements."

30. Liquidated Damages: Per General Conditions of the Contract; Article 49

31. Goodwyn Mills Cawood, LLC (Project Architect). Address and telephone numbers: 11 North Water Street, Suite 19290, Battle House Tower, Mobile, AL 36602, Phone: (251) 460-4006, Fax (251) 460-4423.
Project Manager: Jim Walker, AIA
Email: jim.walker@gmcnetwork.com
brooke.rodriguezfeo@gmcnetwork.com
doris.furr@gmcnetwork.com

31. Closing remarks / questions.

GMC

NEW DORMITORY FOR DAUPHIN ISLAND SEA LAB
DAUPHIN ISLAND SEA LAB

GMC PROJECT NO.: AMOB230181
PRE-BID SIGN IN SHEET
Thursday, July 10, 2025

Matt Lomax — Rogers & Willard — 251-300-0449 — lcooke@rogerswillard.com

NAME	COMPANY	GC #	PHONE	EMAIL
Ben Matthes	Matthes Parker	56778	334-209-1269	estimating@MatthesParker.com
Ireland Stewart	White-Spunner		251-477-3744	Ireland.Stewart@white-spunner.com
Madison Gall	White-Spunner		251-588-4031	estimating@White-Spunner.com
Caleb Nichols	HCC	20245	205-657-8176	CNichols@harrison-const.com
Will Maguire	HCC	20245	251-232-3897	WMaguire@harrison-const.com
Stewart Kaye	Rabren General Contractors		334-319-5293	StewartKaye@rabren.com
Lucas Nolan	Ben M. Radcliff		251-525-6652	lucas@benradcliff.com
Shelley Stephens	DISL			
John Valentine	DISL			
David England	DISL			
Jack Veasey	Persons Services		251-395-5620	jveasey@personsservices.com
Josh Dindo	Bienville CS		251-721-1128	Josh@bienvillecs.com
DAVID ENGLAND	DISL			
Chase Boyce	Rolin		251-554-3769	chase@rolinbuilds.com
~~John~~ Valentine	DISL		251-861-2141	jvalentine@disl.edu

Traylor Henry — Rolin const. — 251-709-2579 — Estimating@rolinbuilds.com
Tommy Blackmon — Maint. Manager — 251-455-0545
Troy McBride — DISL — 251-472-1791

SECTION 283100

FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the fire alarm system. The system is to be an addressable fire alarm system with devices as required and shown on the plan documents.

B. As mandated by Alabama State Law, Attachment A to this specification section shall be applicable to the installation of the Fire Alarm System.

1.2 DEFINITIONS

A. FACP: Fire alarm control panel.

B. LED: Light-emitting diode.

C. NAC: Notification Appliance Circuit.

D. NICET: National Institute for Certification in Engineering Technologies.

E. SLC: Signaline Line Circuit.

F. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.3 SYSTEM DESCRIPTION

A. This Section includes the fire alarm system. The system is to be an addressable fire alarm system with voice evacuation and devices as required and shown on the plan documents.

1.4 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70.

B. Comply with NFPA 72.

C. Comply with NFPA 101.

D. Comply with Underwriters Laboratories Inc.

E. Fire alarm signal initiation shall be by one or more of the following devices:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.

F. Fire alarm signal shall initiate the following actions:

1. Alarm notification appliances shall operate continuously.
2. Identify alarm at the FACP and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Switch heating, ventilating, and air-conditioning equipment controls to fire alarm mode.
5. Record events in the system memory.
6. Record events by the system printer where provided.

G. System trouble signal initiation shall be by one or more of the following devices or actions:

1. Duct mounted smoke detectors.
2. Open circuits, shorts and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.
3. Opening, tampering, or removal of alarm-initiating and supervisory signal-initiating devices.
4. Loss of primary power at the FACP.
5. Ground or a single break in FACP internal circuits.
6. Abnormal ac voltage at the FACP.
7. A break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at the FACP or annunciator.

H. System Trouble and Supervisory Signal Actions: Ring trouble bell and annunciate at the FACP and remote annunciators. Record the event on system printer.

I. Air Handling Units: Air handling units shall shut down only in the area where the fire is detected or the area actually alarmed (floor above and below). Other air handling equipment shall remain on line. This shall not supercede any code requirements.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, specifications and installation instructions for each type of device provided.

B. Calculations:

1. Battery size calculations.
2. NAC circuit cable voltage drop calculations

C. Qualification Data: For installer.

D. Submittals to Authorities Having Jurisdiction: In addition to distribution requirements for submittals specified in Division 1 Section "Submittals," make an identical submittal to authorities having jurisdiction. To facilitate review, include copies of annotated Contract Drawings as needed to depict component locations. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Engineer for review.

E. Shop Drawings:

1. Shop Drawings shall be prepared by persons with the following qualifications:

   a. Trained and certified by manufacturer in fire alarm system design.

   b. Fire alarm certified by NICET, minimum Level III.

2. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
3. Device Address List: Coordinate with final system programming.
4. System riser diagram with device addresses, conduit sizes, and cable and wire types and sizes.
5. Wiring Diagrams: Power, signal, and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show wiring color code.
6. Duct Smoke Detectors: Performance parameters and installation details for each detector, verifying that each detector is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
7. Voice/Alarm Signaling Service: Equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.

8. Floor Plans: Submit a “point-to-point” wiring diagram showing the connections to equipment and terminal cabinets, indicate the equipment numbers, terminal numbers, wire numbers, address numbers, and wire colors. Include the connections for the mechanical systems. The submittal shall be made for approval prior to the installation of wiring in the raceway. Indicate final outlet locations showing address of each addressable device, conduit sizes and cable and wire types and sizes.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For fire alarm system to include in emergency, operation, and maintenance manuals. Comply with NFPA 72, Appendix A, recommendations for Owner's manual. Include abbreviated operating instructions for mounting at the FACP.

H. Documentation:

1. Approval and Acceptance: Provide the "Record of Completion" form according to NFPA 72 to Owner and Engineer.
2. Record of Completion Documents: Provide the "Permanent Records" according to NFPA 72 to Owner and Engineer. Format of the written sequence of operation shall be the optional input/output matrix.

   a. Hard copies on paper to Owner and Engineer.
   b. Electronic media may be provided to Engineer.

1.6 O & M DATA SUBMITTALS

A. Submit manufacturer's maintenance data including parts lists. Include these data, a copy of approval submittals (product data & shop drawings) in O&M manual.

B. Comply with NFPA 72, Appendix A, recommendations for Owner's manual. Include abbreviated operating instructions for mounting at the FACP.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project. The fire alarm system shall be installed by a state certified fire alarm system installation contractor. The fire alarm system installation contractor shall have an unlimited electrical license (Type EC) or a fire alarm specialty license (Type EF).

1. The fire alarm contractor shall be an experienced firm regularly engaged in the layout and installation of automatic fire alarm systems. The contractor shall have successfully completed

the installation, testing, and warranty of systems of the scope of the largest system on this project at least one year prior to bid, and have regularly engaged in the business of fire alarm systems contracting continuously since.

2. The fire alarm contractor shall have been NICET Level III certified, and certified by an approved equipment manufacturer to perform installation, testing, adjustment, maintenance, and repair on the approved manufacturer's equipment prior to the date of bid. The proposed fire alarm contractor shall commence no work on the project until he furnishes evidence, satisfactory to the aforementioned certifications and receives notice to proceed with the installation from the Engineer.
3. Firms shall have a factory authorized service organization and stock spare parts.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use. All equipment shall be UL listed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Basis of Design: FACP will be a new Edward EST IO1000 or approved equal.
2. Wire and Cable:
    a. Comtran Corporation.
    b. Helix/HiTemp Cables, Inc.; a Draka USA Company.
    c. Rockbestos-Suprenant Cable Corporation; a Marmon Group Company.
    d. West Penn Wire/CDT; a division of Cable Design Technologies.

2.2 FACP

A. General Description:

1. Modular, power-limited design with electronic modules, UL 864 listed.
2. Addressable initiation devices that communicate device identity and status.
    a. Smoke sensors shall additionally communicate sensitivity setting.
    b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
3. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at the FACP and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, two lines of 40 characters each, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

C. Electronic Loop Controller: Electronic Loop Controller shall be provided in each Fire Alarm Control Panel, to interface between the main panel, expansion modules, and the Analytical Microprocessor-based Detectors and modules. No electronic loop controller shall be loaded to more than 50% of the maximum allowable number of devices which can be connected to the electronic loop.

D. Circuits:

1. Signaling Line Circuits: NFPA 72, Class B.
2. Notification-Appliance Circuits: NFPA 72, Class B.
3. Actuation of alarm notification appliances, emergency voice communications where provided and annunciation shall occur within 10 seconds after the activation of an initiating device.
4. Electrical monitoring for the integrity of wiring external to the FACP for mechanical equipment shutdown and magnetic door-holding circuits is not required, provided a break in the circuit will cause doors to close and mechanical equipment to shut down.

E. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm verification" signal at the FACP.
2. Activate a listed and approved "alarm verification" sequence at the FACP and the detector.
3. Record events by the system printer.
4. Sound general alarm if the alarm is verified.
5. Cancel FACP indication and system reset if the alarm is not verified.

F. Notification-Appliance Circuit: Operation shall sound in a temporal pattern, complying with ANSI S3.41 60 beats per minute, march-time pattern. All visual appliances shall be synchronized. Do not load any NAC more than 75% of its rated amperage.

G. Power Supply for Supervision Equipment: Supply for audible and visual equipment for supervision of the ac power shall be from a dedicated dc power supply, and power for the dc component shall be from the ac supply.

H. Alarm Silencing, Trouble, and Supervisory Alarm Reset: Manual reset at the FACP and remote annunciators, after initiating devices are restored to normal.

1. Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.

I. Walk Test: A test mode to allow one person to test alarm and supervisory features of initiating devices. Enabling of this mode shall require the entry of a password. The FACP and annunciators shall display a test indication while the test is underway. If testing ceases while in walk-test mode, after a preset delay, the system shall automatically return to normal.

J. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and control of changes in those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and make a print-out of the final adjusted values on the system printer.

K. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, trouble, and supervisory signals to a remote alarm station through an internet protocol digital alarm communicator and transmitter.

1. Notification-Appliance Circuits: NFPA 72, Class B.
2. Status Annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters' two-way telephone communication zones.
3. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.

L. Service Modem: Ports shall be RS-232 for system printer and for connection to a dial-in terminal unit.

M. The system shall allow remote access to the FACP for programming changes and system diagnostic routines. Access by a remote terminal shall be by encrypted password algorithm.

N. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines and trouble signal shall be powered by the 24-V dc source.

1. The alarm current draw of the entire fire alarm system shall not exceed 80 percent of the power-supply module rating.
2. Power supply shall have a dedicated fused safety switch for this connection at the service entrance equipment. Paint the switch box red and identify it with "FIRE ALARM SYSTEM POWER."

O. Secondary Power: 24-V dc supply system with batteries and automatic battery charger and an automatic transfer switch.

1. Batteries: Shall be capable of providing power to the system for a minimum of 24 hours.
2. Battery and Charger Capacity: Comply with NFPA 72.

P. Surge Protection:

1. Install surge protection on normal ac power for the FACP and its accessories.
2. Install surge protectors recommended by FACP manufacturer. Install on all system wiring external to the building housing the FACP.
3. Install surge protection inside the FACP on all incoming and outgoing initiating, notification and control circuits.

Q. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.3 EMERGENCY RESPONDER BOOSTER

Standalone Bi-directional amplifier for emergency responder radio enhancement shall meet all of the requirements of the International Fire Code Section 510.

1. Battery systems used for emergency power source shall be contained in a NEMA 3R.
2. The equipment shall have FCC or other radio licensing authority certification and be suitable for public safety use prior to installation.
3. When a donor antenna exists, isolation shall be maintained between the donor antenna and all inside antennas to not less than 20dB greater than the system gain under all operating conditions.
4. Bi-Directional Amplifiers (BDA's) used in emergency responder radio coverage systems shall have oscillation prevention circuitry.

The installation of the amplification system or systems that operate on or provide the means to cause interference on any emergency responder radio coverage networks shall be approved by the fire code official.

2.4 SPEAKERS

A. All speakers shall operate on 25 VRMS or with field selectable output taps from 0.25 to 2.0 Watts.

B. Speakers in corridors and public spaces shall produce a nominal sound output of 84 dBA at 10 feet (3m).

C. Frequency response shall be a minimum of 400 HZ to 4000 HZ.

D. The back of each speaker shall be sealed to protect the speaker cone from damage and dust.

2.5 MANUAL FIRE ALARM BOXES

A. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. Mounted on recessed outlet box; if indicated as surface mounted, provide manufacturer's surface back box. Mount 48" AFF to top of device.

1. Single-action mechanism requiring one action to initiate an alarm, pull lever type with integral addressable module, arranged to communicate manual-station status (normal, alarm, trouble) to the FACP.
2. Double-action mechanism requiring two actions to initiate an alarm, pull lever type. With integral addressable module, arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.
3. Station Reset: Key- or wrench-operated switch.
4. Indoor Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation. Provide on all manual fire alarm stations.

2.6 SYSTEM SMOKE DETECTORS

A. General Description:

1. UL 268 listed, operating at 24-V dc, nominal.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
3. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for

connection of building wiring. Removal of the respective detector shall not affect electronic loop communications with other detectors on that loop.

4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
5. Integral Visual-Indicating Light: LED type.
6. In the event of a loss of communications of the smoke detector with the Electronic Loop Controller, the smoke detector will automatically revert to the "Standalone Conventional" operation, and Fire Alarm / Life Safety system functions shall not be compromised.
7. Shall be capable of transmitting pre-alarm and alarm signals to the Fire Alarm Control Panel via the Electronic Loop Controller. It shall be possible to program Fire Alarm Control Panel activity and response to each of the following signal levels: Normal, Pre-Alarm, Alarm, Trouble, Detector need cleaning.
8. Shall contain an environmental compensation algorithm, which identifies and sets ambient "Environmental Thresholds" continually and periodically. In this manner, the environmental impact of temperature, humidity, environmental contaminates as well as detector aging shall be automatically monitored. This process shall employ digital compensation techniques to adapt the detector to both long term and short-term changes in the environment in which they are installed. The microprocessor shall monitor this environmental compensation value and alert the system operator when the detector 80% of the allowable environmental compensation value. Differential sensing algorithms shall maintain a constant differential between selected detector sensitivity and the derived base line sensitivity that the detector has sensed in its environment. The base line sensitivity information shall be automatically and periodically updated and permanently stored in the detector.
9. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.

    a. Rate-of-rise temperature characteristic shall be selectable at the FACP for 15 or 20 deg F (8 or 11 deg C) per minute.
    b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at the FACP to operate at 135 or 155 deg F (57 or 68 deg C).
    c. Provide a minimum of 5 levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Sensor: LED or infrared light source with matching silicon-cell receiver.
2. Detector Sensitivity: Between 1.0 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.

C. Duct Smoke Detectors:

1. Photoelectric Smoke Detectors:

a. Sensor: LED or infrared light source with matching silicon-cell receiver.

b. Detector Sensitivity: Between 1.0 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.

2. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.

a. Duct Housing Enclosure: UL listed for use with the supplied detector.

3. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
4. Integral Visual-Indicating Light: LED type. Provide remote status and alarm indicator and test station where indicated.
5. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
6. Each sensor shall have multiple levels of detection sensitivity.
7. Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.
8. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit. Shall be addressable.

2.7 HEAT DETECTORS

A. General: UL 521 listed.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or rate-of-rise of temperature that exceeds 15 deg F (8 deg C) per minute, unless otherwise indicated.

1. Mounting: Plug-in base, interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

2.8 NOTIFICATION APPLIANCES

A. Description: Equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.

B. Visible Alarm Devices: Xenon strobe lights listed under UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output: 75 candela synchronized flash outputs. In rooms exceeding 30'X30', a 110 candela strobe shall be used to comply with visual coverage.
2. Strobe Leads: Factory connected to screw terminals.

C. Voice/Tone Speakers:

1. UL 1480 listed.
2. 520 Hz.
3. High-Range Units: Rated 2 to 15 W.
4. Low-Range Units: Rated 1 to 2 W.
5. Mounting: Flush mounted; bidirectional as indicated.
6. Matching Transformers: Tap range matched to the acoustical environment of the speaker location.

2.9 REMOTE ANNUNCIATOR

A. Description: Duplicate annunciator functions of the FACP for alarm, supervisory, and trouble indications. Also duplicate manual switching functions of the FACP, including acknowledging, silencing, resetting, and testing. Owner Furnished, and Contractor installed.

1. Mounting: Flush cabinet, NEMA 250, Class 1.

B. Display Type and Functional Performance: Alphanumeric display same as the FACP. Controls with associated LEDs permit acknowledging, silencing, resetting, and testing functions for alarm, supervisory, and trouble signals identical to those in the FACP.

2.10 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Listed and labeled according to UL 632.

B. Functional Performance: Unit receives an alarm, supervisory, or trouble signal from the FACP, and automatically captures one or two telephone lines and dials a preset number for a remote central station. When contact is made with the central station(s), the signal is transmitted. The unit supervises up to two telephone lines. Where supervising 2 lines, if service on either line is interrupted for longer than 45 seconds, the unit initiates a local trouble signal and transmits a signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. When telephone service is restored, unit automatically reports that event to the central station. If service is lost on both telephone lines, the local trouble signal is initiated.

C. Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.

D. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.11 WIRE AND CABLE

A. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with NFPA 70, Article 760.

B. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG. Color shall be red.

C. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 14 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Detector Mounting:

1. Smooth ceiling spacing shall not exceed 30 feet.
2. Spacing of heat detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas, shall be determined according to Appendix A in NFPA 72.
3. Spacing of heat detectors shall be determined based on guidelines and recommendations in NFPA 72.

B. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of the duct. Locate detectors not closer than 3 feet (1 m) from air-supply diffuser or return-air opening.

C. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

D. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

E. NAC Devices: Install 80" AFF to bottom of strobe lens if wall mounted. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Ceiling mounted devices shall be coordinated with all other trades work.

F. Device Location-Indicating Lights: Locate in public space near the device they monitor.

G. FACP: Surface mount with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

H. VE: Surface mount with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

I. Annunciator: Install with top of panel not more than 72 inches (1830 mm) above the finished floor.

3.2 WIRING INSTALLATION

A. Install wiring according to the following:

1. NECA 1.
2. TIA/EIA 568-A.

B. Wiring Method: Install wiring in metal raceway according to Division 16 Section "Raceways and Boxes."

1. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable. Minimum raceway size for all fire alarm circuits is 3/4".

C. Wiring Method:

1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
2. Signaling Line Circuits: Power-limited fire alarm cables may be installed in the same cable or raceway as signaling line circuits.

D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved pressure-type terminal blocks

E. Cable Taps: Not allowed.

F. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

G. Color coding shall comply with [Owner] Standards.

a. Horns = Red +/ Black -
b. Strobes (if separate) = White +/ Purple -
c. Alarms = Blue +/ Yellow -
d. A/C Ventilation = Shut Down Brown +/ Orange -
e. Magnetic Doors = Pink +/ Grey -
f. Misc. Circuits = Violet +/ Tan -

H. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum 1-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 16 Section “Basic Electrical Materials and Methods” & “Cable Identification.”

B. Install instructions frame in a location visible from the FACP.

C. Label power-supply circuit breaker "FIRE ALARM."

3.4 GROUNDING

A. Ground the FACP and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to the FACP.

3.5 FIELD QUALITY CONTROL

A. Training: Submit a letter verifying that Owner training has been received by factory representative.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

C. Perform the following field tests and inspections and prepare test reports:

1. Before requesting final approval of the installation, submit a written statement using the form for Record of Completion shown in NFPA 72.
2. Perform each electrical test and visual and mechanical inspection listed in NFPA 72. Certify compliance with test parameters. All tests shall be conducted under the direct supervision of a NICET technician certified under the Fire Alarm Systems program at Level III.

    a. Include the existing system in tests and inspections.

3. Visual Inspection: Conduct a visual inspection before any testing. Use as-built drawings and system documentation for the inspection. Identify improperly located, damaged, or nonfunctional equipment, and correct before beginning tests.
4. Testing: Follow procedure and record results complying with requirements in NFPA 72.

    a. Detectors that are outside their marked sensitivity range shall be replaced.

5. Test and Inspection Records: Prepare according to NFPA 72, including demonstration of sequences of operation by using the matrix-style form in Appendix A in NFPA 70.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the fire alarm system, appliances, and devices.

END OF SECTION

SECTION 28 78 00

EMERGENCY RESPONDER RADIO COVERAGE SYSTEM

PART 1 - GENERAL

1.1 INITIAL RADIO SIGNAL SURVEY (INCLUDE IN BASE BID)

A. Include all costs in base bid for the Fire Alarm Contractor to conduct a radio signal survey immediately after building structure is complete, and prior to ceiling installation to determine signal coverage and strength of the municipality's emergency responder radio (public safety) system inside the project facility.

B. Conduct a survey using a RF Spectrum Analyzer, a calibrated, system-compatible radio or another suitable instrument with traceable certificate of calibration to analyze the RF signal strength. Both inbound and outbound signal strength shall be determined, measured, calculated and documented as required by code and AHJ. Survey shall be performed by FCC GROL certified technicians. Survey shall include measurements at a minimum of 20 readings per floor or 1,600SF if the floor area exceeds 32,000SF and in all critical areas or as otherwise directed by AHJ.

C. Survey report and drawing indicating measurements at each frequency band of interest shall be submitted to the AHJ for review. The report shall clearly indicate all areas that do not meet a minimum of -95dBm nominal uplink or downlink signal at 100% or a Delivered Audio Quality (DAQ) of 3.0.

D. If measured levels determined to be insufficient, a complete Emergency Responder Radio Coverage (ERRC) system shall be provided in accordance with these specifications below. Cost for the system and installation will be paid through allowance.

E. Contractor shall be responsible for scheduling survey so that all of the following is completed prior to the installation of ceilings:
   1. Conduct initial survey
   2. Submit survey results and report to the AHJ for review and determination of system requirements
   3. Provide system design and submit shop drawings to architect and AHJ for review

1.2 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2100 – Allowances, for cash allowances affecting this section.

B. All requirements of this Section shall be included in the Contract Sum/ Price except the specific items listed in the following enumerated paragraph(s).
   1. Allowance No. 05 – Emergency Responder Radio Coverage System: This Allowance includes furnishing and installing an Emergency Responder Radio Coverage System if required following testing of the completed facility. The cost for testing of the

facility to determine if the system will be required shall be included in the Contract Sum/ Price.

1.3 SCOPE (SEE ALLOWANCES)

A. The contractor shall design, furnish, install, and warranty a complete Emergency Responder Radio Coverage (ERRC) system. The installed system shall include all hardware, bi-directional amplifiers, band-pass filters, surge suppressors, lightning protection, UPS, transmission lines, power cabling, antennas, and other components necessary for a complete operational system as specified and as acceptable to the local authorities having jurisdiction.

B. Equipment manufacturer name and model numbers specified are provided to establish quality of equipment and system operational features. Any proposed substitution of equipment from that specified must be approved by the Architect within ten (10) days prior to bid date.

C. The entire system shall be guaranteed for a period of one (1) year from the date of final acceptance of the installation and the Contractor shall repair or replace defective equipment, during this period, at no cost to the owner.

D. Entire system shall be verified and approved by local AHJ to comply with all emergency responder radio network requirements including signal strength and frequency range.

1.4 DEFINITIONS

A. BDA: Bi-Directional Amplifier is a two-way signal booster that is used to amplify band-selective or multi-band RF signals in the uplink, to the base station and in the downlink from the base station to subscriber devices for enhanced signals and improved coverage.

B. DAS: Distributed Antenna System is a network of separate antenna nodes connected to a common transport medium.

C. ERRC: Emergency Responder Radio Coverage System is a complete in-building radio communication system that brings wireless signals into a structure from outside, amplifies those signals with a signal booster (BDA), and then evenly distributes the amplified signals throughout a structure via a Distributed Antenna System (DAS). The system also amplifies signals originating inside the building and transmits them outside.

D. Donor Antenna: Antenna that receives and transmits signal to radio system outside of facility.

1.5 STANDARDS

A. The system shall comply with all requirements of the latest edition of each of the following codes and standards. The latest edition of these codes and standards form a

part of this specification:
1. U.L. Standard 2524.
2. International Fire Code Section 510
3. NFPA 1221
4. NFPA 72
5. All requirements of local Fire Department, Building Department and all other authorities having jurisdiction (AHJ)

1.6 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For headend and distribution system. Include plans, elevations, sections, details and attachments to other work.
1. Show fabrication and installation details for equipment.
2. Functional Block Diagram: Show single-line interconnections between components for headend and distribution system. Show cable types and sizes.
3. Dimensioned Plan and Elevations of Headend Equipment: Show access and workspace requirements.
4. Wiring Diagrams: For power, signal, and control wiring and transmission cable, include cross connects, taps, and other connections cords.

C. Design Calculations: Calculate signal attenuation budget and show calculated line and equipment losses for the system based on the functional block diagram, to show that proposed system layout can be expected to perform up to specification. Calculate signal strength from sources to endpoints. Allowable losses between components and user interface shall be used to determine size and type of cable.

D. Coordination Drawings: Include dimensioned plan and elevation views of components and enclosures. Show access and workspace requirements.

E. Equipment List: Include each piece of equipment and include model number, manufacturer, serial number, location, and date of original installation. Insert testing record of each piece of adjustable equipment, listing name of person testing, date of test, and description of as-left set points.

F. Field quality-control reports.

G. Operation and Maintenance Data: For headend and distribution system to include in emergency, operation, and maintenance manuals.

H. Contract shall submit set of all drawings and product data to permitting agencies as required. These final design documents shall be prepared under the supervision of an engineer licensed in the state where the work is to be performed, engaged/employed by the system vendor, and must bear the engineer's licensure seal with signature and date.

I. Any permits necessary for the installation of the work shall be obtained prior to the commencement of the work. All permit costs and inspection fees shall be included.

PART 2 - PRODUCTS

2.1 RADIO FREQUENCY (RF) BDA-BASED SIGNAL BOOSTER SYSTEMS

A. In-building signal booster systems shall receive and re-transmit the entire uplink/downlink frequency band utilized by the regional emergency service provider(s). The contractor shall confirm with the regional emergency service provider(s) as to the specific frequencies used by the various agencies. This system shall be state-of-the-art, operating bi-directionally and in full duplex. The system shall be fully compatible with and function on Locality's Public Safety Radio System.

B. BDA shall be capable of providing in building coverage for all the cellular networks as identified by the owner.

C. Signal boosters (BDA)
1. Shall have Nema Type 4 enclosure
2. Shall be UL2524 listed
3. Shall be FCC certification.
4. Provide standby battery system capable of maintaining the system operational for a minimum of 12 hours or 2 hours if supplied by emergency generator circuit. Batteries system shall be completely enclosed in Nema Type 4 enclosure.
5. Signal Boosters shall have oscillation suppression circuitry to protect the public safety radio system in case of system malfunction or other causes. The oscillation suppression circuit shall not disable the system operation. Systems that automatically disable the signal booster upon oscillation detection shall not be allowed
6. Signal Boosters shall have uplink noise suppression function to eliminate uplink noise while in standby (i.e. no radio transmission from within a building).
7. Include relays as required for monitoring system with fire alarm system.

D. DAS Antennas shall be architectural, dome or flush type where located in public areas. Stick type antennas are acceptable where located in back-of-house spaces. Finish shall be white unless directed otherwise by architect in submittal review.

E. A dedicated supervised monitoring panel shall be provided next to the fire alarm panel / annunciator or other location as designated by AHJ to annunciate the status of all signal booster locations. The monitoring panel shall provide visual and labeled indication of the following for each signal booster:
1. Normal AC power
2. Signal booster trouble
3. Antenna Failure
4. Loss of normal AC power

5. Failure of battery charger
6. Low battery capacity

F. Completed installations (including cabling) shall comply with all applicable codes and standards, including County Building and Electrical Codes, NFPA, ANSI, NEC, OSHA, EIA, IEEE, R-56, etc., as well as the FCC Rules and Regulations, as applicable. Equipment provided shall be UL listed and FCC type accepted for this specific application. Compliance to codes and standards shall extend to include proper grounding, bonding and surge.

G. All cabling shall be plenum rated.

2.2 DESIGN REQUIREMENTS:

A. The system shall provide digital signal strength coverage over 95% area on each floor/level of the equipped building, or in specific areas defined by Locality in a Scope of Work document for a particular building or site. Critical areas shall have 99% floor area coverage.

B. Systems shall provide a minimum digital and analog overage of Circuit Merit (CM) 3 and Delivered Audio Quality (DAQ) 3.0, with a reliability factor of 95%.

C. Antenna isolation shall be maintained between the donor antenna and all inside antennas (D.A.S.) to a minimum of 20dB under all operating conditions

D. A Coverage Acceptance Test shall be executed prior to final acceptance of an installed system. Coverage acceptance testing shall be based on audio quality performance in evenly spaced test grids in the defined service areas. A minimum of 20 tests will be taken per floor/level. Total number of test grids will be determined by the Owner, based on the size of the space per floor/level.

E. Design and appearance will be of “finished” construction, i.e. shall be concealed and/or unobtrusive in finished areas. DAS antennas shall be located in back-of-house areas where possible. If required to be located in visible public aeras, antennas shall be architectural, low-profile type and located in corridors where possible. Unless indicated otherwise, wire mold and surface conduit installations will not be acceptable unless approved in writing by the Architect in advance.

2.3 MANUFACTURER

A. Equipment shall be as manufactured by Simplex, Notifier or EST or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wiring shall be in strict accordance with the National Electrical Code and all state and

local regulations. Wiring shall be installed in accordance with manufacturer's wiring diagrams and shall test free from ground, opens and short circuits.

B. All connections shall be made under the direct supervision of a qualified technician.

C. Contractor shall provide dedicated power circuits as required for system operation. Where an emergency distribution system is provided, radio coverage system power shall be connected to the emergency branch.

D. All vertical riser cabling shall be installed in conduit within a 2-hour fire rated enclosure.

E. All copper circuits routed between or outside of buildings shall be provided with a surge protection device at each end.

F. Securely mount donor antenna on roof and aim towards direction of public safety city repeater antenna. All mounting and penetrations shall be coordinated with roofing contractor.

G. Contractor shall provide all devices and cabling as required to monitor system with building Fire Alarm System in accordance with all applicable code requirements.

H. Refer to Specification Section 27 05 00 for additional installation requirements.

I. During initial installation, each system shall be optimized to perform in accordance with the specifications set forth in the system design, manufacturer's specifications and FCC regulations. The contractor shall ensure that uplink and downlink levels are properly set and consistent with design expectations. The contractor shall further ensure that noise and spurious products are held within limits set forth in the system design, manufacturer's specifications and FCC regulations. Prior to system acceptance, for each active BDA, booster amplifier, etc., the contractor shall submit a Proof of Performance certification, that lists the design expectations, actual measurements, and if applicable, FCC specifications for the followingparameters:
   1. Worst case BDA uplink input level, in dBm.
   2. Worst case BDA uplink output level, in dBm.
   3. BDA downlink input level, in dBm.
   4. BDA downlink output level, in dBm.
   5. Noise and spurious products, BDA uplink output, in dBc.
   6. Noise and spurious products, BDA downlink output, in dBc.

J. The original Proof of Performance report shall be submitted to Owner's project manager, and a copy of the Proof of Performance report shall be affixed to its associated equipment.

3.2 WARRANTY

A. The contractor shall provide a full one-year warranty to cover installation and all

equipment, software, and components; the warranty shall commence upon the Owner's final acceptance of the facility. Under warranty coverage, the successful contractor shall provide same business day response time for system malfunctions.

B. The contractor shall perform optimization of each system during the initial warranty period, sixty (60) to ninety (90) days prior to warranty expiration. This optimization task is separate from the initial optimization performed during system installation. The contractor shall include pricing for annual system optimization to be included as part of post-warranty maintenance. Actual scope of work for annual optimization and maintenance will vary on a case-by-case basis, but typically will consist of the following:
   1. Optimize the system to perform in accordance with the specifications set forth in the system design, manufacturer's specifications and FCC regulations.
   2. Ensure that uplink and downlink levels are properly set and are consistent with design specifications.
   3. Ensure that noise and spurious products are held within limits set forth in the system design, manufacturer's specifications and FCC regulations.

C. Update the Proof of Performance records for the system, listing the design expectations, actual measurements, and if applicable, FCC specifications for the following parameters:
   1. Worst case BDA uplink input level, in dBm.
   2. Worst case BDA uplink output level, in dBm.
   3. BDA downlink input level, in dBm.
   4. BDA downlink output level, in dBm.
   5. Noise and spurious products, BDA uplink output, in dBc.
   6. Noise and spurious products, BDA downlink output, in dBc.

D. The updated Proof of Performance report shall be submitted to the Owner, and a copy of the updated Proof of Performance report shall be affixed to its associated equipment.

E. Visually inspect outside antenna installation. Correct any issues found with the antenna mounting hardware, grounding system, or outside cabling.

F. Visually inspect inside BDA or booster amplifier equipment installation. Correct any issues found with RF cabling, electrical connection, or equipment mounting.

G. Clean equipment fans, filters and other ventilation system components.

H. Inspect and replace any defective indicator lights.

I. Test battery system performance for proper fallback to battery power and the duration of battery operation.

J. Test fault reporting system for proper operation and reporting of system faults.

K. Submit a written Preventive Maintenance Report to the Owner, listing the results of the optimization and preventive maintenance effort. The report shall include the Proof of

Performance report for active RF components, and details of any other discrepancies found and corrective actions taken.

L. All as-built drawings shall be submitted to the Owner at completion, which shall include antenna system layout and all associated hardware, along with specification sheets. Include RF measurements taken.

END OF SECTION 28 78 00