

SECTION 260500 - ELECTRICAL, GENERAL PROVISIONS

PART 1 – GENERAL

1.1 FEES Unless specifically stated otherwise the Contractor/Vendor (herein Contractor) is responsible for paying all fees and obtaining all permits and licenses, arranging for, and coordinating all inspections as they relate to the performance of this work.

1.2 SCOPE OF WORK DOCUMENTS AND SPECIFICATIONS

- A. It is the responsibility of the Contractor to review all related documents, to perform the work contained therein.
- B. It is the responsibility of the Contractor to examine all specifications, documents, and site conditions and to schedule, coordinate, furnish and install the work in a neat and workmanlike manner with the proper materials and equipment required for a complete and working installation. In the event a conflict exists the better quality or higher quantity shall be provided.

1.3 DEFINITIONS

- A. Furnish – When used in the documents and/or specifications the word “furnish” is defined as to purchase a piece of equipment or material and to have that equipment/material transported to the project site (or other location as directed) to store and protect the equipment and material from damage and theft until put into service. All items to be furnished by the Contractor shall include any and all mounting hardware, supports, and accessories required for a complete installation and proper operation. Unless noted otherwise, when a piece of equipment or material is to be furnished by the Contractor it shall also be installed.
- B. Install – When used in the documents and/or specifications the word “install” is defined as to unload and transport to the installation point the equipment and/or material. Any and all mounting hardware required for a complete installation shall be included. Perform all operations required for proper installation, to include but in no way be limited to final adjustments, etc.
- C. Provide – When used in the documents and/or specifications the word “provide” is defined as to furnish and install complete and ready for use. This is to include any and all options, accessories, and mounting and installation hardware required for a complete and operating system element.

1.4 SCOPE

- A. Submission of a proposal and acceptance of the agreement or contract for executing the work of this section will be construed as evidence that the Contractor, any Subcontractors, Vendor and Supplier have carefully reviewed and read the documents and specifications and understand and accept all conditions implied or stated therein.
- B. Work described in these documents and specifications includes but is not limited to furnishing all labor, materials, supplies, equipment, junction boxes, pull boxes, pull wires, support materials, fuses, labels and incidental elements to perform all work required to include cutting, channeling, chasing, and demolition to install a complete and working system(s) in accordance with the documents and specifications. This shall include but is not limited to all required preparation work, the purchasing and storage of materials and equipment, and the coordination and planning required to furnish and install the system in a complete and workmanlike manner in accordance with specifications and documents and subject to terms and conditions of the contract. Unless noted otherwise these documents or in these specifications, all final connections are the responsibility of the Contractor.
- C. The work shall include but is not limited to furnishing the supervision, labor, materials, supplies and equipment for the complete and proper installation of:
 - 1. Fire Alarm System Replacement.
 - 2. Demolition of existing fire alarm system after new system is approved and operational.
- D. The Contractor shall obtain all permits, licenses, and approvals to perform the work as set forth in the documents and specifications.

1.5 CODES AND STANDARDS

- A. Documents referenced in this section are the latest revision or edition, unless otherwise specified. Applicable parts of the referenced documents are a part of this section as if fully included in this section.
- B. All work including methods, equipment, materials and installation shall meet or exceed the requirements of the codes and standards listed below.
- C. All materials, equipment, devices, and fixtures shall be labeled by Underwriter's Laboratories, Inc. (U.L.). Any material, equipment or device not labeled by U.L. will not be considered acceptable without written permission by the Engineer.

- D. Applicable Standards and Codes.
1. Codes: Conform with the requirements and the recommendations of the latest edition of the National Electrical Code, and all federal, state and local codes and ordinances. In conflicts between codes, the more stringent requirements shall govern.
 2. Standards: The Specifications and Standards of the following organizations are by reference made a part of these specifications, unless otherwise indicated in writing, comply with their requirements and recommendations wherever applicable. Materials, equipment and the installation shall meet or exceed the requirements of all local codes and requirements and the most current codes and standards listed below.
 - Underwriters' Laboratories, Inc. (U.L.)
 - Institute of Electrical and Electronic Engineers (IEEE)
 - National Electrical Code (NEC) 2017
 - Americans with Disabilities Act (ADA)
 - American National Standards Institute (A.N.S.I.)
 - American Society of Testing Materials (A.S.T.M.)
 - Electrical Testing Laboratories (E.T.L.)
 - Insulated Cable Engineers Association (I.C.E.A.)
 - National Bureau of Standard (N.B.S.)
 - International Building Code (IBC) 2018
 - National Electrical Manufacturer's Association (N.E.M.A.)
 - National Electrical Contractors Association (NECA)
 - All Federal, Local and State Codes and Ordinances
 - NFPA Codes
 - South Carolina School Facilities Planning and Construction Guide – Current Version
 3. Requirements of Regulatory Agencies: The requirements and recommendations of the Occupational Safety and Health Act are by reference made a part of these Specifications and all electrical Work shall comply with their requirements and recommendations wherever applicable.

PART 2 - PRODUCTS

2.1 BASIC MATERIALS

- A. All materials, equipment and devices are to be clean and in good condition.
- B. All materials shall meet the applicable provisions of Codes and Standards listed above.

- C. Substitution of any materials, equipment and devices shall not result in any increase in the cost of work. Substitution is only permitted with written approval by the Engineer and School District.
- D. Workmanship shall be in accordance with best practice and standards of the day.

2.3 SHOP DRAWINGS

- A. Contractor shall submit for review by the Engineer detailed shop drawings of all equipment and all material listed below. All submittal data under each specification section shall be submitted at one time. Partial submittals will not be reviewed by the Engineer. No material or equipment for which Engineer's review is required shall be delivered to the job site or installed until the Contractor has in his possession the reviewed and approved shop drawings for the particular material or equipment. The Contractor shall assemble, organize, prepare, and review for correctness shop drawings on all materials, equipment and fixtures and devices to be used. The Contractor shall furnish one (1) PDF electronic copy of shop. Shop drawings that are incorrectly submitted, contain errors or omissions, or not in the form and sequence specified shall be rejected as unapproved. Additional reviews of the shop drawings by the Engineer caused by errors or omissions or mistakes by the Contractor or his suppliers may result in additional charges for engineering services to the Contractor. The shop drawings shall be complete as described herein.
- B. Review of shop drawings in no way relieves the contractor of his responsibility of quantity, dimensions, weights, means and methods, or safety.
- C. At minimum shop drawings shall be submitted for:
 - 1. Fire Alarm System Replacement.
 - 2. Fireproofing and caulking. Submit UL System cutsheets for each application and floorplans keyed to each type of system indicating area of use for each rated system penetration. Contractor shall keep as-built drawings on-site and mark any penetrations and UL System used for each application and make available for review during inspections.

2.4 OPERATING AND MAINTENANCE MANUALS

- A. Provide owner with operation and maintenance manuals. Use multiple binders if a single binder would exceed 2.5" in thickness; arrange the data in the same sequence as the specification section; delete or mark through inapplicable data.
- B. Provide tab pages to separate each major item or closely related group of items with typed item names on the tabs. Supply a table of contents at the beginning of

each volume listing all items, the manufacturers and the name, address and phone number of the nearest authorized service representative.

- C. Manuals shall include the following, in addition to operation and maintenance instructions and parts lists:
 - 1. Fire Alarm System.

2.5 INSTRUCTION

- A. The Contractor shall provide time by responsible and knowledgeable representatives to fully instruct representatives of the using agency in the location, function and operation of devices and equipment installed under the electrical contract. The Electrical Contractor shall also instruct representatives of the using agency in the maintenance of all items of equipment for which an operation and maintenance manual is specified. Instructor representative man-hours furnished shall not be less than listed below, plus any additional time specified in other sections of electrical work:

- 1. Fire Alarm System 8 hours

PART 3 - EXECUTION

3.1 BASIC METHODS

- A. Provide electrical work in correct locations for each piece of equipment connected.
- B. Perform all work in a neat and workmanlike fashion in keeping with the best practices of the day and in compliance with all Federal, State and Local laws, ordinances and codes and the Specifications.

3.2 EQUIPMENT DELIVERY, STORAGE, INSTALLATION

- A. Where equipment is purchased by the Contractor to be installed in conformance with the contract documents, the Contractor shall follow the following procedure as it relates to delivery, storage, and installation:
 - 1. Coordinate delivery of equipment.
 - 2. Unload the equipment from delivery trucks.
 - 3. Inspect the equipment to assure correct make, model number, voltage, etc.
 - 4. Provide for safe handling and field storage up to the time of permanent placement in the project.

5. Provide for any and all field assembly and internal connection as may be necessary for proper operation.
6. Install in place including any and all required mounting supports, connectors, fittings, connections, and accessories required for complete system operation.

3.3 EQUIPMENT FOUNDATIONS, SUPPORTS AND MOUNTING

- A. All mountings for equipment racks are to be secured to structure and seismically braced to comply with Codes. Where additional structural members such as columns, beams, and the like are required to mount equipment, they shall be provided at no additional cost to the Owner.

3.4 MANUFACTURER'S VERIFICATION OF EQUIPMENT INSTALLATION AND START-UP

- A. System equipment that is purchased and installed/connected by the Contractor shall have an authorized manufacturer's representative inspect the installation to verify that the installation meets or exceeds all manufacturer's requirements and recommendations for proper operation.
- B. The authorized manufacturer's representative shall also start/energize the equipment and verify that the equipment/system is operating and functioning as required by these specifications and the manufacturer's requirements.
- C. The authorized manufacturer's representative shall also provide a letter indicating that the equipment/system is operating and functioning as required by these specifications and the manufacturer's requirements.

3.5 DAMAGES

- A. Repair of any damages to building, building contents and/or site due to acts of the Contractor during the construction and warranty period. The cost of repairing damage to building, building contents, and site during construction and guarantee period resulting from this work is a part of this contract.

3.6 WARRANTIES

- A. The warranty is one year from the date of occupancy Owner acceptance. This warranty includes the correction of any defects to the system(s) related to materials, equipment, workmanship and operation.

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- B. In addition, the Contractor is responsible for:
 - 1. The removal of any items not specified or approved.
 - 2. The proper operation of all systems in accordance with these documents.

- C. This warranty in no way supersedes any manufacturer's warranties.

END OF SECTION 260500

SECTION 260533 – BOXES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the contract including General and Special Conditions and General Requirements shall apply to all work under this Section.

1.2 SCOPE OF WORK

- A. Provide complete raceways systems, boxes and fittings for electrical systems as required.

1.3 RELATED WORK CONTAINED IN OTHER SECTIONS

- A. Related work in other sections:
 - 1. Electrical General Provisions Section 260500.
 - 2. All other electrical specification sections.

PART 2 – PRODUCTS

2.1 OUTLET, JUNCTION, AND PULL BOXES

- A. Cast Type Conduit Boxes, Outlet Bodies and Fittings
 - 1. Provide surface mounted outlet and junction boxes, in indoor locations, where exposed to moisture and in outdoor locations.
 - 2. Use Ferrous Alloy boxes and conduit bodies with Rigid Steel or IMC.
 - 3. Use Ferrous Alloy or cast aluminum boxes and conduit bodies with Electrical Metallic Tubing.
 - 4. Covers: Cast or sheet metal unless otherwise required.
 - 5. Tapered threads for hubs.
- B. Galvanized Pressed Steel Outlet Boxes
 - 1. General
 - a. Pressed steel, galvanized or cadmium-plated, minimum of four (4") inches, octagonal or square, with galvanized cover or extension ring as required.

- C. Sheet Steel Boxes Indoors
1. Boxes with a maximum side less than forty (40") inches in length and a maximum volume not exceeding 5,000 cubic inches shall be constructed of 14 USS gauge galvanized or powder coated sheet steel with riveted or welded 3/4 inch flanges at exterior corners.
 2. Boxes with a maximum side greater than forty (40") inches in length and a maximum volume exceeding 5,000 cubic inches shall be constructed of 12 USS gauge galvanized or powder coated sheet steel with riveted or welded 3/4 inch flanges at exterior corners.
 3. Boxes with a maximum side exceeding sixty (60) inches in length and a maximum volume exceeding 20,000 cubic inches shall either be constructed of 10 USS gauge powder coated painted or galvanized sheet steel or riveted 12 USS gauge powder coated painted or galvanized sheet steel riveted or welded to a 1-1/2 by 1-1/2" by 1/4" welded angle iron framework.
 4. Covers
 - a. Same gauge steel and type steel as box. Color and finish to match box.
 - b. Subdivide single covers so no section of cover exceeds fifty (50) pounds in weight.
 - c. Machine bolts, machine screws threaded into tapped holes, or sheet metal screws as required with a maximum spacing twelve (12") inches.
 5. Paint
 - a. Rust inhibiting primer
 - b. Light gray powder coated finish coat.
 - c. CRC or Rustoleum Cold Galvanizing paint for galvanized metal touchup.
 6. Where size of box is not indicated size per the National Electrical Code to permit pulling, racking and splicing of cables and conduit size entry as required.

PART 3 – APPLICATION

3.1 OUTLET, JUNCTION, AND PULLBOXES

- A. Provide outlet, junction, and pull-boxes as required for the complete installation of the system, and to facilitate proper pulling of wires and cables. J-boxes and pul-lboxes shall be sized per electrical code minimum. Boxes on empty conduit systems shall be sized based on the quantity, size and location of conduit entries.

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- B. Install boxes and covers for wiring devices so that the wiring devices will be installed with a vertical orientation unless otherwise noted on the drawings.
- C. The exact location of boxes, outlets and equipment is governed by structural components, fixed building systems and obstructions, or other equipment items. When and as required relocate outlets, boxes and conduit to accommodate the fixtures or equipment installed or to be installed under other divisions of the Contract. All installations shall be consistent and symmetrically located according to the room layout and installed so as not to interfere with other work or equipment. It is the responsibility of the Contractor to verify final location of outlets, panels equipment, etc., with existing conditions prior to installation.
- D. Boxes and outlets in the same wall are not to be installed back-to-back and "thru-wall" type boxes not permitted. Where possible and to minimize the transmission of sound provide a minimum of twelve (12") inch spacing for outlets shown on opposite sides of a common wall. Provide a minimum of twenty-four (24") inch horizontal spacing for outlets shown on opposite sides of a fire rated wall to maintain fire rating.
- E. Outlet boxes in finished ceilings or walls shall be fitted with appropriate covers, set flush with the finished surface. Where more than one switch or device is located at one point, use gang boxes and covers unless otherwise indicated.
- F. Sectional switch boxes or utility boxes will not be allowed.
- G. In masonry walls that will not be furred provide Series "GW" Steel City or equal tile boxes or a four (4") inch square box with tile ring.
- H. Where drywall is utilized provide plaster ring of the appropriate depth to allow for flush mounting of the device and plate.
- I. Provide outlet boxes of the type and size suitable for the specific application.
- J. Pull Box Spacing
 - 1. Provide pull boxes or the appropriate condulets so no individual conduit run contains more than the equivalent of three 90 degree bends (270 degrees total).
 - 2. For Conduit Sizes 1-1/4" and Larger.
 - a. Provide boxes to prevent cable or wire from being excessively twisted, stretched, or kinked or bent during installation.
 - b. Provide boxes for medium voltage cables so that maximum pulling tensions do not exceed the cable manufacturer's recommendations.
 - c. Provide support racks for boxes with multiple sets of conductors so that conductors do not rest on any metal work inside box.

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- K. Plug any unused openings or knockouts in boxes with appropriate closing plates or plugs approved for the purpose.
- L. Where metal tapping screws or any other types of fasteners, supports or braces that contain sharp edges or points that could damage conductor insulation have been used to assemble or mount boxes the Contractor shall file, grind or suitably eliminate the sharp points or edges before installation of conductors.

END OF SECTION 260533

SECTION 260535 – RACEWAYS

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS The general provisions of the contract including General and Special Conditions and General Requirements shall apply to all work under this Section.
- 1.2 SCOPE OF WORK Provide complete enclosed raceway systems, boxes and fittings for all electrical systems exceeding 48 volts. Provide open raceway systems for all other electrical systems.
- 1.3 RELATED SECTIONS
- A. Electrical, General Provisions Section 260500.
 - B. All other electrical specification sections.
- 1.4 STANDARDS Comply with the most recent applicable provisions and latest recommendations of the following except as modified by governing codes and by the Contract Documents,:
- 1. Rigid Steel Conduit
 - a. U.L. Standard UL-6
 - b. A.N.S.I. C80-1
 - c. Federal Specification WW-C-581E
 - 2. Intermediate Metallic Conduit
 - a. U.L. Standard UL-1242.
 - b. Federal Specification WW-C-581E
 - 3. Electrical Metallic Tubing
 - a. U.L. Standard UL-797
 - b. A.N.S.I. C80-3
 - c. Federal Specification WW-C-563
 - 4. Flexible Steel Conduit
 - a. U.L. Standard UL-1
 - 5. Liquid Tight Flexible Conduit
 - a. U.L. Standard UL-360
 - 6.. Non-Metallic Conduit
 - a. U.L. Standard UL-651
 - b. A.N.S.I. Standard F512
 - c. N.E.M.A. Standard TC-2
 - d. Federal Specifications GSA-FSS and W-C-1094-A

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7. Wireways and Auxiliary Gutters
 - a. U.L. Standard UL-870
8. Rigid Aluminum Conduit
 - a. A.N.S.I. C80.5

PART 2 - PRODUCTS

2.1 RACEWAY TYPES

- A. Standard Threaded Rigid Steel Conduit.
 1. Rigid conduit heavy wall galvanized.
 2. Threaded fittings
- B. Intermediate Metallic Conduit
 1. Light weight rigid steel threaded conduit galvanized.
 2. Threaded fittings.
- C. Electrical Metallic Tubing
 1. Continuous, seamless tubing, galvanized on the exterior with protective corrosion resistant coating on the interior.
 2. Couplings and connectors:
 - a. Indoor 1" and smaller shall be steel compression fittings.
 - b. Indoor 1-1/2" and larger shall be steel compression fittings
 - c. Outdoor shall be raintight steel compression fittings.
 3. Indent and set screw type fittings shall not be used.
 4. All connectors shall have insulated throat.
 5. Conduit installed in slab or concrete work shall have approved concrete tight fittings.
- D. Flexible Steel Conduit
 1. Single galvanized, continuous, interlocked metal strip of double-wrapped steel, forming smooth internal wiring channel.
 2. Having a maximum length: (six 6) feet.
 3. Provide connectors with insulating bushings.
 4. Fittings shall be steel squeeze-type.
- E. Liquid Tight Flexible Electrical Conduit
 1. Galvanized flexible steel conduit with water-tight plastic outer jacket.
 2. Cast malleable iron, stainless steel or galvanized steel body and gland nut, cadmium plated one-piece grounding bushing threaded to interior of conduit. A molded vinyl, sealing ring installed between the gland nut and bushing and nylon insulated throat.

- F. Non-Metallic Raceway
 - 1. Composed of schedule 40, sunlight resistant, gray, polyvinyl chloride suitable for 90 degrees C and manufactured in ten feet in lengths.
 - 2. All joints shall be solvent cemented in accordance with the recommendations of the manufacturer.
- G. Wireway and Auxiliary Gutters
 - 1. Ansi Gray Painted steel or galvanized steel.
 - 2. Lay-in type with removable covers.
 - 3. Provide all necessary elbows, tees, connectors, adapters, etc.
- E. Aluminum Conduit
 - 1. Aluminum conduit may be used with written approval from the engineer in certain applications. Otherwise do not use aluminum conduit unless specifically indicated on the drawings for special purposes.

2.2 LOCKNUTS AND BUSHINGS

- A. Locknuts shall be steel.
- B. All bushings shall be insulated. Nylon insulated metallic bushings shall be used for sizes 1" and larger. Plastic bushings may be used in 1/2" and 3/4" sizes.

PART 3 - EXECUTION

- 3.1 APPLICATION OF RACEWAYS Except as otherwise required by Code or modified by the drawings the following methods and applications shall be followed. Raceways not conforming must be removed by the Contractor and replaced with the specified material at the Contractors expense.
 - 1. Rigid Steel Conduit- Application: Where subject to mechanical injury, where specifically required and where required by codes.
 - 2. I.M.C. Conduit - Application: Same as standard threaded rigid steel conduit.
 - 3. E.M.T. Conduit - Applications: Use in every instance except where another material is specified. EMT shall not be used underground or in slab on grade.
 - 4. Flexible Steel - Applications: At dry type transformer or equipment raceway connections where sound and vibration isolation is required.
 - 5. Liquid-Tight Flexible Conduit - Applications: Use in areas exposed to moisture where flexible steel is unacceptable for connection to loads subject to movement and vibration. Use below all raised floor areas.

6. Non-Metallic Conduit - Application: Schedule 40 - Where specifically indicated on the drawings and for raceways in slab or below grade. All elbows shall be made with galvanized rigid steel. NON-METALLIC CONDUIT IS NOT PERMITTED WITHIN BUILDING.
7. Wireways and Auxiliary Gutters - Application: Where indicated on the Drawings or specifically approved in writing.

3.2 GENERAL APPLICATION INSTRUCTIONS

- A. Provide enclosed raceways for wiring systems over 48 volts. Provide open or closed raceway systems for all other electrical systems.
- B. 277/480 volt wiring shall be installed in separate raceway and independent of 120/208 volt wiring. Wiring of each type and system must be installed in separate raceways. Where installed in cable tray or wireway barriers or similar dividers approved for the purpose may be used to separate different voltage systems. Emergency system wiring shall be installed in separate raceway from normal power wiring.
- C. Provide grounding conductor in all raceways. Sizes as required by the Code or drawings.
- D. Install caps on raceways as soon as installed and remove only when wires are pulled. Securely tie embedded raceway in place prior to embedment. Lay out the work in advance to avoid excessive concentrations of multiple raceway runs.
- E. Locate raceways so that the structural integrity of the building or strength of structural members is unaffected and so as not to conflict with the services of other trades.
- F. One (1") inch or larger raceways are to be installed in or through structural members (beams, slabs, etc.) only when and in the manner accepted and approved by the Architect/Engineer in writing.
- G. Draw up couplings and fittings full and tight.
- H. Above-grade raceways shall comply with the following:
 1. Install raceways concealed where possible except at surface cabinets and for motor and equipment connection in electrical and mechanical rooms. Install a minimum of six (6") inches from data and communication wiring, flues, steam pipes, or other heated lines.
 2. Provide flashing and pitch pockets for waterproofing of raceways, outlets, fittings, and other raceways that penetrate the roof.

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3. Route all raceways parallel or perpendicular to building lines with right-angle turns and symmetrical bends. Raceway installed vertically shall be perpendicular (at a 90 degree angle) to a level horizontal plane.
4. Provide sleeves in forms for new concrete walls, floor slabs, and partitions for passage of raceways. Waterproof sleeved raceways as required.
5. Raceways shall not be run on roofs or exposed on the outside of the buildings unless specifically noted as exposed on the drawings or approved by the Architect/Engineer.
6. Provide raceway expansion joints for exposed and concealed raceways at building expansion joints and between buildings or structures and where required to compensate for raceway or building thermal expansion and contraction. Provide expansion fittings every 200 feet on outdoor conduit.
7. Provide a pull string in all spare or empty raceways. Allow three (3) feet of slack at each end and in each pull box. Secure each end so that it cannot be pulled into the raceway and place an identification tag on each end to identify the start and end points.
8. Support conduit using supports and fasteners approved for the purpose and per the National Electrical Code but at intervals not to exceed ten (10) feet with one support within three (3) feet of each coupling, box, fitting, or outlet box. Provide one support within three (3) feet of each elbow or bend.
9. Clear raceway of all obstructions and dirt prior to pulling in wires or cables.
10. All raceways for communications/data/etc cabling shall terminate within 6" of cable tray where available or cabling shall be supported with J-hooks as recommended by cabling manufacturer and application. Provide threaded connectors with plastic bushings at end of all raceways.

END OF SECTION 260535

SECTION 283100 - VOICE EVACUATION FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Expandable emergency voice evacuation fire alarm system.

1.2 RELATED SECTIONS

- A. Section 260500 – Electrical General Provisions
- B. All other division 26 specifications.

1.3 REFERENCES

- A. National Fire Protection Association (NFPA):
 - 1. NFPA 70 – National Electrical Code (NEC).
 - 2. NFPA 72 – National Fire Alarm Code.
 - 3. NFPA 90A – Standard for the Installation of Air Conditioning and Ventilating Systems.
 - 4. NFPA 101 – Life Safety Code.
- B. International Fire Code
- C. International Building Code
- D. Underwriters Laboratories (UL):
 - 1. UL 268 – Standard for Smoke Detectors for Fire Alarm Signaling Systems.
 - 2. UL 864 – Standard for Control Units and Accessories for Fire Alarm Systems.
 - 3. UL 1971 – Standard for Signaling Devices for the Hearing Impaired.

1.4 SYSTEM DESCRIPTION

- A. A new intelligent reporting microprocessor-controlled fire detection and emergency voice alarm communication system shall be installed in accordance with the specifications and as indicated on the Drawings.
- B. Each Signaling Line Circuit (SLC) and Notification Appliance Circuit (NAC): Limited to only 80 percent of its total capacity during initial installation.
- C. Basic Performance:
 - 1. Signaling Line Circuits (SLC) Serving Addressable Devices.

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2. Initiation Device Circuits (IDC) Serving Non-addressable Devices Connected to Addressable Monitor Modules.
 3. Notification Appliance Circuits (NAC) Serving Strobes and Speakers.
 4. Single ground fault or open circuit on Signaling Line Circuit shall not cause system malfunction, loss of operating power, or ability to report alarm.
 5. Audio Amplifiers and Tone-Generating Equipment: Electrically supervised for normal and abnormal conditions.
 6. Speaker NAC Circuits: Arranged such that there is a minimum of 1 speaker circuit per fire alarm zone.
 7. Notification Appliance Circuits (NAC), Speaker Circuits, and Control Equipment: Arranged such that loss of any 1 speaker circuit will not cause loss of any other speaker circuit in system.
 8. Speaker Circuits:
 - a. Electrically supervised for open and short circuit conditions.
 - b. If short circuit exists on speaker circuit, it shall not be possible to activate that circuit.
 - c. Arranged for 70 VRMS and shall be power limited in accordance with NEC
 - d. 20 percent spare capacity for future expansion or increased power output requirements.
 9. Speaker Circuits and Control Equipment:
 - a. Arranged such that loss of any 1 speaker circuit will not cause loss of any other speaker circuit in system.
 - b. Systems utilizing “bulk” audio configurations shall not be acceptable.
- D. Basic System Functional Operation: When fire alarm condition is detected and reported by 1 of the system alarm initiating devices, the following functions shall immediately occur:
1. System Alarm LEDs: Flash.
 2. Local Piezo-Electric Signal in Control Panel: Sound at a pulse rate.
 3. 80-Character LCD Display: Indicate all information associated with fire alarm condition, including type of alarm point and its location within protected premises.
 4. Historical Log: Record information associated with fire alarm control panel condition, along with time and date of occurrence.
 5. System output programs assigned via control-by-event equations to be activated by particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
 6. Strobes flash synchronized continuously.
 7. Audio Portion of System: Sound 3 rounds of slow whoop tone followed by voice evacuation message and this scenario repeating or other message as approved by local authority until system is reset.
 8. Shut down all HVAC equipment. Not Applicable at this facility (BARD units).
 9. Provide for future interface with Intercom/PA Audio Enhancement System for shunt trip of system functions.

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10. Automatically notify the central station monitoring facility. Include any and all equipment required to accomplish this requirement. Any and all equipment shall comply with requirements of the monitoring facility as to automatic reporting.
11. Interface with Door Access Control System to open any automatic opening doors.
12. Release any secure doors, release any door hold open devices.
13. Provide interface with all smoke dampers and/or combination smoke/fire dampers to close when the space that the duct that contains the damper is in alarm. Coordinate operational functions with the authority having jurisdiction to comply with all codes and local/state/national requirements. Coordinate with existing conditions to determine the connections required and furnish and install any and all equipment required to control the damper.

E. Fire Alarm System Functionality:

1. Provide complete, electrically supervised distributed, networked analog/addressable fire alarm and control system, with analog initiating devices, integral multiple-channel voice evacuation, and fire fighter's phone system.
2. Fire Alarm System:
 - a. Consist of multiple-voice channels with no additional hardware required for total of 4 channels.
 - b. Incorporate multiprocessor-based control panel.
3. Voice, Data: Transmit over single pair of wires or fiber optic cable.
4. Control Panels: Capability to accept firmware upgrades via connection with laptop computer, without requirement of replacing microchips.
5. Each SLC Network Node: Capability of having integral DACT (digital alarm communicator transmitter) that can report events in either its region, or entire network to single central station monitoring account.
6. Control Panel: Capability of storing its entire program and allow installer to activate only devices that are installed during construction, without further downloading of system.
7. Password Protection: Each system shall be provided with 4 levels of password protection with up to 16 passwords.

1.5 SUBMITTALS

- A. Comply with Section 260500.
- B. Include sufficient information, clearly presented, to determine compliance with the specifications and the Drawings.
- C. Equipment Submittals:
 1. Cover Page: Indicate the following:
 - a. Project name and address.
 - b. Engineered systems distributor's name and other contact information.
 - c. Installing contractor's name and other contact information.

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- d. Date of equipment submittals. Indicate on revised submittals the original submittal date and revised submittal date.
2. Table of Contents: Lists each section of equipment submittal.
3. Scope of Work Narrative: Detail indented scope of work.
4. Sequence of Operations: Use matrix or written text format, detailing activation of each type of device and associated resulting activation of the following:
 - a. Control panel.
 - b. Annunciator panels.
 - c. Notification appliances.
 - d. Building fire safety functions, including (where applicable) door lock release, door holder release, HVAC unit shutdown, smoke evacuation system activation, and stair pressurization fan activation.
5. Bill of Material: Indicate for each component of system the following:
 - a. Quantity.
 - b. Model number.
 - c. Description.
6. SLC Circuit Schedule: Detail address and associated description of each addressable device. Clearly provide information that indicates number of both active and spare addresses.
7. Battery Calculations: Show load of each of, and total of, components of system along with standby and alarm times that calculations are based on. Show calculated spare capacity and size of intended battery.
8. Provide voltage drop calculations for each circuit of system.
9. Provide dB calculations for each space, based on NFPA 72 standard ambient dB criteria and indicate the calculated dB level for devices in that room. Provide recommended speaker wattages/settings to comply with Code dB level and intelligibility requirements and recommendations. This requirement may be provided at completion of project with actual readings in each space.

D. Shop Drawings:

1. Cover Page: Indicate the following:
 - a. Project name and address.
 - b. Engineered systems distributor's name and other contact information.
 - c. Installing contractor's name and other contact information.
 - d. Date of equipment submittals. Indicate on revised submittals the original submittal date and revised submittal date.
2. Floor Plans:
 - a. Provide separate floor plan for each floor.
 - b. If a floor plan must be split using match lines to fit on the page, provide match lines and match line references that refer to sheet number that shows area on opposite side of match line.
 - c. Prepare using AutoCAD.
 - d. Prepare to scale 1/8 inch = 1'-0", unless otherwise required by the Architect or Engineer.
 - e. Show equipment and device locations.

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- f. Show wiring information in point-to-point format.
 3. Title Block: Provide on each sheet and include, at a minimum, the following:
 - a. Project name.
 - b. Project address.
 - c. Sheet name.
 - d. Sheet number.
 - e. Scale of drawing.
 - f. Date of drawing.
 - g. Revision dates, if applicable.
 4. Control Panel: Provide sheet that details exterior and interior views of control panel and clearly shows associated wiring information.
 5. Annunciator Panels: Provide sheet that details exterior and interior views of annunciator panels and clearly shows associated wiring information.
- E. Certification: Submit with equipment submittals and shop drawings, letter of certification from major equipment manufacturer, indicating proposed engineered system distributor is an authorized representative of major equipment manufacturer.
- F. Project Record Drawings:
 1. Submit complete project record drawings within 14 calendar days after acceptance test.
 2. Project record drawings shall be similar to shop drawings but revised to reflect changes made during construction.
- G. Operation and Maintenance Manuals:
 1. Submit complete operation and maintenance manuals within 14 calendar days after acceptance test.
 2. Operation and maintenance manuals shall be similar to equipment submittals but revised to reflect changes made during construction.
 3. Include factory's standard installation and operating instructions.

1.6 QUALITY ASSURANCE

- A. Codes and Standards:
 1. NFPA: System shall comply with the following NFPA codes and standards:
 - a. NFPA 70.
 - b. NFPA 72.
 - c. NFPA 90A.
 - d. NFPA 101.
 - e. NFPA 750.
 - f. NFPA 5000.
 2. ADA: System shall conform to American with Disabilities Act (ADA).

3. The system shall comply with all applicable adopted International Code Series codes including IBC and IFC.
- B. To ensure reliability and complete compatibility, all items of fire alarm system, including control panels, power supplies, initiating devices, and notification appliances, shall be listed by Underwriters Laboratories Inc. (UL) and shall bear "UL" label.
- C. Fire Alarm Control Panel Equipment: UL-listed under UL 864 Ninth Edition.
- D. Equipment, Programming, and Installation Supervision:
 1. Provide services of approved distributor of Gamewell-FCI for equipment, programming, and installation supervision.
 2. Provide proof of factory training within 14 calendar days of award of the Contract.
- E. Software Modifications:
 1. Provide services of fire alarm manufacturer's factory-trained and authorized technician to perform system software modifications, upgrades, or changes.
 2. Provide use of all hardware, software, programming tools, and documentation necessary to modify fire alarm system software on-site.
 3. Modification includes addition and deletion of devices, circuits, zones, and changes to system operation and custom label changes for devices or zones.
 4. System structure and software shall place no limit on type or extent of software modifications on-site.
 5. Modification of software shall not require power-down of system or loss of system fire protection while modifications are being made.
- F. Fire Alarm installer shall be NICET Level 2, project manager shall be NICET Level 4.

1.7 COORDINATION

- A. Coordinate the Work of this section with the Work of other sections.

1.8 WARRANTY

- A. The Contractor shall provide a warranty, which covers defects in materials and workmanship for a period of one (1) year from the date of final acceptance. The warranty shall exclude vandalism, abuse, and acts of God beyond the control of the District or the manufacturer. A thumb drive with the maintenance and warranty documents along with as-builts and all other close-out documents shall be submitted before final acceptance.

- 1.9 Manufacturer's Seismic Qualification Certification: Submit certification that the fire alarm panel, accessories, and components will withstand seismic forces at location being installed Include the following:

1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the equipment when subjected to the seismic forces, and the unit will be fully operational after the seismic event."
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURER(S)

- A. Gamewell-FCI, 12 Clintonville Road, Northford, Connecticut 06472. Phone (203) 484-7161. Fax (203) 484-7118. Website: www.gamewell-fci.com.

Other acceptable manufacturers are Edwards and Simplex with submittal of prior approval submission meeting the requirements of this section.

- B. References to manufacturer's model numbers and other information is intended to establish minimum standards of performance, function, and quality.
- C. Substitute equipment proposed as equal to equipment specified shall meet or exceed requirements of this section. For equipment other than Gamewell-FCI E3 Series Expandable Emergency Evacuation Fire Alarm System, provide proof that such substitute equipment equals or exceeds features, functions, performance, warranty and quality of specified equipment. This proof shall be provided by submission of a copy of specification with each copy of the submittals that has had each paragraph marked as either compliant or non-compliant along with a letter from engineering manager or product manager at factory that certifies information presented as either compliant or non-compliant including a detailed explanation of each paragraph identified as non-compliant. In order to ensure that the Owner is provided with a system that incorporates required survivability features, this letter shall also specifically certify that the system is capable of complying with the test requirements of this section. **See "Invitation to Bid" section for Deadline for prior approvals. Any system other than Gamewell-FCI E3 Series requires submittal for prior approval. Permission to bid for all prior approvals will be issued in an addendum listing the vendor and manufacturer.**

2.2 FIRE ALARM SYSTEM

- A. Gamewell-FCI E3 Series Expandable Emergency Evacuation Fire Alarm System.
- B. Power Supply Module: Use latest technologies to provide power to fire alarm system and incorporate the following features:

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1. Power-saving switching technology using no step-down transformers.
2. 9-amp continuous-rated output to supply up to all power necessary under normal and emergency conditions.
3. Integral battery charger with capacity to charge up to 55 amp-hour batteries while under full load.

C. Batteries:

1. Sufficient capacity to provide power for entire system upon loss of normal AC power for a period of 24 hours with 15 minutes of alarm signaling at end of this 24-hour period, as required by NFPA 72, Local Systems. Provide 20 percent spare capacity as required by Code.

D. Functions of system shall have the following features as a minimum:

1. Microprocessor: Digital Signal Processor (DSP). Microprocessor shall monitor all system events and perform all system programs, for all control-by-event (CBE) functions. System program shall not be lost upon failure of both primary and secondary power. Programming shall support Boolean logic including AND, OR, NOT, TIMING functions for maximum flexibility.
2. Advanced Processing: System shall incorporate latest in digital signaling processing technology with supporting Boolean logic including AND, OR, NOT, TIME DELAY functions.
3. Microphone Input: On-board and allow for addition of local microphone, including speaker circuit control.
4. Signal Processing: System shall use advanced Digital Signal Processing (DSP) technology to allow maximum flexibility of digital audio and control capabilities and operation.
5. Field Programmable: System shall be capable of being fully programmed or modified by Field Configuration Program (FCP), to be downloaded via portable computer from any node in system.
6. Control-by-Event Programming (CBE): System shall be capable of programming using Boolean logic including AND, OR, NOT, COUNT, TIMING, and CALENDAR functions to provide complete programming flexibility.
7. Riser Wiring: All data, voice, and fire fighter phone riser shall transmit over single pair of twisted unshielded wire or fiber optic pair for all functions configured in Style 7 format. Any short or open in data, voice, or phone sections shall not affect transmission over remainder of network.
8. Style 7 Network: All communication between control panels and transponders shall be through supervised Style 7 token passing network. In event of single short, open, or ground, all system communication shall operate as normal and report fault. This protection shall incorporate all data, voice, and fire fighter phone transmissions. Upon single short, open, or ground of either system data, live voice, pre-recorded channels, or phone risers, the function of each of these items

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shall continue to operate. “Degrade” functionality shall not be acceptable. This shall be demonstrated at system acceptance.

E. LCD Display Module:

1. LCD Display: 80-character RS-485 based textual annunciator with capability of being mounted locally or remotely. Provides audible and visual annunciation of all alarms and trouble signals. Provide dedicated LEDs for:
 - a. AC Power On: Green.
 - b. Alarm: Red.
 - c. Supervisory: Yellow.
 - d. System Trouble: Yellow.
 - e. Power Fault: Yellow.
 - f. Ground Fault: Yellow.
 - g. System Silenced: Yellow.
2. 80-Character Alphanumeric Display: Provide status of all analog/addressable sensors, monitor and control modules. Display shall be liquid crystal type (LCD), clearly visible in dark and under all light conditions.
3. Panel shall contain 4 functional keys:
 - a. Alarm Acknowledge.
 - b. Trouble Acknowledge.
 - c. Signal Silence.
 - d. System Reset/Lamp Test.
4. Panel shall contain 3 configuration buttons:
 - a. Menu/Back.
 - b. Back Space/Edit.
 - c. OK/Enter.
5. Panel shall have 12-key telephone-style keypad to permit selection of functions.

F. 4.3 inch Color Touch Screen Display Module:

1. Color Touch Screen Display: RS-485 based textual annunciator with capability of being mounted locally or remotely. Provides audible and visual annunciation of all alarms and trouble signals. Provide dedicated LEDs for:
 - a. AC: Green.
 - b. Fire Alarm: Red.
 - c. Hazard: Blue.
 - d. Supervisory: Yellow.
 - e. Trouble: Yellow.
 - f. Silenced: Yellow.
2. 4.3 inch Color Touch Screen Display: Provide status of all analog/addressable sensors, monitor and control modules. Display shall be liquid crystal type (LCD), clearly visible in dark and under all light conditions.
3. Panel shall contain 3 functional keys:
 - a. Menu.
 - b. Fire Drill.
 - c. System Reset.

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4. Panel shall contain 5 custom programmable function buttons for:
 - a. Alarm Acknowledge.
 - b. Trouble Acknowledge.
 - c. System Silence.
 - d. Fan Reset.
 - e. Lamp Test.
 - f. Other functions like output bypass, device enable/disable, device on/off.
 5. Systems that do not have a minimum of 200 characters (4 lines of 40 characters) are not acceptable.
- G. Intelligent Loop Interface: System shall be of multiprocessor design to allow maximum flexibility of capabilities and operation. Intelligent Loop Interface shall be capable of mounting in stand-alone enclosure or integrated with system as specified.
1. Field Programmable: System shall be capable of being programmed by Field Configuration Program (FCP), allowing programming to be downloaded via portable computer from any node on network.
 2. RS-232C Serial Output: Supervised RS-232C serial port shall be provided to operate remote printers and/or video terminals, accept downloaded program from portable computer, or provide 80-column readout of all alarms, troubles, location descriptions, time, and date. Communication shall be standard ASCII code operating from 1,200 to 115,200 baud rate.
 3. RS-485 Serial Output: Each loop interface shall incorporate RS-485 bus via ribbon harness for connection of modules inside same cabinet, and via 4-wire quick connector for connection of modules up to 3,000 feet from cabinet. RS-485 bus shall support up to 16 ASM-16 auxiliary switch modules, 6 LCD-E3 main annunciators, and 5 LCD-7100 annunciators.
 4. Control-by-Event (CBE) Program: Loop interface shall be capable of programming using Boolean logic including AND, OR, NOT, and TIMING functions to provide complete programming flexibility.
 5. Alarm Verification: Smoke detector alarm verification shall be standard option while allowing other devices such as manual stations and sprinkler flow to create immediate alarm. This feature shall be selectable for smoke sensors that are installed in environments prone to nuisance or unwanted alarms.
 6. Alarm Signals: All alarm signals shall be automatically latched or “locked in” at control panel until operated device is returned to normal and control panel is manually reset. When used for sprinkler flow, “SIGNAL SILENCE” switch may be bypassed, if required by AHJ.
 7. Electrically Supervised:
 - a. Each SLC and NAC circuit shall be electrically supervised for opens, shorts, and ground faults. Occurrence of fault shall activate system trouble circuitry, but shall not interfere with proper operation of other circuits.
 - b. Yellow “SYSTEM TROUBLE” LEDs shall light and system audible sounder shall steadily sound when trouble is detected in system. Failure of power, open or short circuits on SLC or NAC circuits, disarrangement in system wiring, failure of microprocessor or any identification module, or

system ground faults shall activate this trouble circuit. Trouble signal shall be acknowledged by operating "TROUBLE ACKNOWLEDGE" switch. This shall silence sounder. If subsequent trouble conditions occur, trouble circuitry shall resound. During alarm, all trouble signals shall be suppressed with exception of lighting yellow "SYSTEM TROUBLE" LEDs.

8. Drift Compensation – Analog Smoke Sensors: System software shall automatically adjust each analog smoke sensor approximately once each week for changes in sensitivity due to effects of component aging or environment, including dust. Each sensor shall maintain its actual sensitivity under adverse conditions to respond to alarm conditions while ignoring factors which generally contribute to nuisance alarms. System trouble circuitry shall activate, display "DIRTY DETECTOR" and "VERY DIRTY DETECTOR" indications and identify individual unit that requires maintenance.
9. Analog Smoke Sensor Test: System software shall automatically test each analog smoke sensor a minimum of 3 times daily. Test shall be recognized functional test of each photocell (analog photoelectric sensors) and ionization chamber (analog ionization sensors) as required annually by NFPA 72. Failure of sensor shall activate system trouble circuitry, display "Test Failed" indication, and identify individual device that failed.
10. Off-Premises Connection:
 - a. Fire Alarm System: Connect via Digital Alarm Communicator Transmitter (DACT) and telephone lines or cellular dialer (per AHJ requirements) to central station or remote station. Panel shall contain disconnect switch to allow testing of system without notifying fire department.
11. Central Station Option: Fire alarm control panel shall provide integral Digital Alarm Communicator Transmitter (DACT) for signaling to central station. DACT shall contain "Dialer-Runaway" feature preventing unnecessary transmissions as result of intermittent faults in system and shall be Carrier Access Code (CAC) compliant, accepting up to 20-digit central station telephone numbers. Fire department shall be consulted as to authorized central station companies serving municipality. Fire alarm system shall transmit both alarm and trouble signals, with alarm having priority over trouble signal. Contractor shall be responsible for all installation charges and Owner will be responsible for line lease charges.
12. Redundant History Log: Each Loop Interface board shall contain full 4100 event history log supporting local and network functions. If a main processor or network node is lost the entire log shall be accessible at any other Loop Interface board.
13. LEDs Indicator and Outputs: Each Loop Interface shall incorporate as a minimum the following diagnostic LED indicators:
 - a. Power: Green.
 - b. Alarm: Red.
 - c. Supervisory: Yellow.
 - d. General Trouble: Yellow.
 - e. Ground Fault: Yellow.
 - f. Transmit: Green.
 - g. Receive: Green.

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14. Auxiliary Power Outputs: Each Loop Interface shall provide the following supply outputs:
 - a. 24 VDC non-resettable, 1 amp. maximum, power limited.
 - b. 24 VDC resettable, 1 amp. maximum, power limited.
15. Microprocessor: Loop interface shall incorporate 32-bit RISC processor. Isolated “watchdog” circuit shall monitor microprocessor and upon failure shall activate system trouble circuits on display. Microprocessor shall access system program for all control-by-event (CBE) functions. System program shall not be lost upon failure of both primary and secondary power. Programming shall support Boolean logic including AND, OR, NOT, TIME DELAY functions for maximum flexibility.
16. Auto Programming: System shall provide for all SLC devices on any SLC loop to be pre-programmed into system. Upon activation of auto programming, only devices that are present shall activate. This allows for system to be commissioned in phases without need of additional downloads.
17. Environmental Drift Compensation: System shall provide for setting Environmental Drift Compensation by device. When detector accumulates dust in chamber and reaches unacceptable level but yet still below allowed limit, control panel shall indicate maintenance alert warning. When detector accumulates dust in chamber above allowed limit, control panel shall indicate maintenance urgent warning.
18. NON-FIRE Alarm Module Reporting: Non-reporting type ID shall be available for use for energy management or other non-fire situations. NON-FIRE point operation shall not affect control panel operation nor shall it display message at panel LDC. Activation of NON-FIRE point shall activate control by event logic, but shall not cause indication on control panel.
19. 1-Man Walk Test:
 - a. System shall provide both basic and advanced walk test for testing entire fire alarm system. Basic walk test shall allow single operator to run audible tests on panel. All logic equation automation shall be suspended during test and while annunciators can be enabled for test, all shall default to disabled state. During advanced walk test, field-supplied output point programming shall react to input stimuli, such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch input. Advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device, and wiring operation/verification.
 - b. Test feature is intended to provide for certain random spot testing of system and is not intended to comply with requirements of testing fire alarm systems in accordance with NFPA 72, as it is impossible to test all functions and verify items such as annunciation with only 1 person.
20. Signaling Line Circuits: Each loop interface module shall provide communication with analog/addressable (initiation/control) devices via 2 signaling line circuits. Each signaling line circuit shall be capable of being wired Class B, Style 4 or Class A, Style 6. Circuits shall be capable of operating in NFPA Style 7 configuration when equipped with isolator modules between each module type device and

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isolator sensor bases. Each circuit shall communicate with a maximum of 99 analog sensors and 98 addressable monitor/control devices. Unique 40-character identifier shall be available for each device. Devices shall be of the Velocity series with capability to poll 10 devices at a time with a maximum polling time of 2 seconds when both SLCs are fully loaded.

21. Notification Appliance Circuits: 2 independent NAC circuits shall be provided on ILI-MB, polarized and rated at 2 amperes DC per circuit, individually over current protected and supervised for opens, grounds, and short circuits. They shall be capable of being wired Class B, Style Y or Class A, Style Z.
22. Alarm Dry Contacts: Provide alarm dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system alarm occurs.
23. Supervisory Dry Contacts: Provide supervisory dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system supervisory condition occurs.
24. Trouble Dry Contacts: Provide trouble dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system trouble occurs.

H. Auxiliary Switch Module:

1. Each auxiliary switch module has 16 programmable push-button switches.
2. Each push-button switch has 3 associated status LEDs (red, yellow, and green), configurable to indicate any combination of functions.
3. Flexible switch configurations to allow flexible set-up of phone, speaker, and auxiliary function circuits.
4. An insertable label to identify function of each switch and LEDs combination.
5. Provide capability to communicate with up to 16 ASM-16 modules locally, up to 3,000 feet from main panel.
6. Specialty modules that only perform 1 task such as speaker, phone, or auxiliary shall not be acceptable.

I. Microphone Assembly: Include the following items:

1. Mounting cabinet which occupies 1 module location on inner door of panel.
2. Interconnect cable for connection of microphone.
3. 1 noise canceling microphone with push-to-talk button.

J. Network Graphic Annunciator (NGA): Network able, 1/4 VGA, touch-screen annunciator with the following characteristics:

1. Custom Graphics: Panel shall permit uploading of custom bit-mapped graphic to display screen. Graphic shall display when all systems are normal.
2. Intuitive Functions: In alarm or trouble condition, annunciator shall display only information pertaining to event, including control switches.
 - a. Trouble Condition: Display shall indicate cause of trouble. Only controls available to operator shall be Acknowledge and Reset functions.
 - b. Alarm Condition: Display shall indicate cause of alarm. Only controls available to operator shall be Acknowledge, Silence, and Reset functions.

2.3 PRINTERS

- A. Provide option for external printer connection.

2.4 SURGE PROTECTION

- A. The incoming power supplies to all control panels or other devices requiring power shall be protected with integral surge protection device, which protects the circuit in line-neutral, line-ground, and neutral-ground modes. The devices shall be listed under UL1449 and NFPA approved for use with fire alarm systems.
- B. Provide surge protection for conductors between buildings and mobile units.

2.5 SUPPLEMENTAL NOTIFICATION APPLIANCE CIRCUIT

- A. Supplemental Notification Appliance Circuit shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24-volt power. HPF24 shall include the following features:
 - 1. Integral Charger: Charge up to 18.0 amp-hour batteries and support 60-hour standby.
 - 2. 2 Input Triggers. Input trigger shall be Notification Appliance Circuit (from fire alarm control panel) or relay.
 - 3. Surface-mount back box.
 - 4. Ability to delay AC fail delay in accordance with applicable NFPA requirements.
 - 5. Power limited circuitry in accordance with applicable UL standards.
 - 6. Operates as sync follower or a sync generator.

2.6 SYSTEM PERIPHERALS

- A. Addressable Devices – General:
 - 1. Provide address-setting means using rotary-decimal switches.
 - 2. Use simple to install and maintain decade-type (numbered 0 to 9) address switches by using standard screwdriver to rotate 2 dials on device to set address. Devices which use binary address set via dipswitch packages, handheld device programmer, or other special tools for setting device address shall not be acceptable.
 - 3. Detectors: Analog and addressable. Connect to fire alarm control panel's Signaling Line Circuits.
 - 4. Addressable Thermal and Smoke Detectors: Provide 2 status LEDs. Both LEDs shall flash under normal conditions, indicating detector is operational and in regular communication with control panel, and both LEDs shall be placed into steady illumination by control panel, indicating alarm condition has been detected. If required, flashing mode operation of detector LEDs can be programmed off via fire control panel program.

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5. Fire Alarm Control Panel: Permit detector sensitivity adjustment through field programming of system. Sensitivity can be automatically adjusted by panel on time-of-day basis.
 6. Using software in INCC Command Center, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. Detectors shall be listed by UL as meeting calibrated sensitivity test requirements of NFPA 72, Chapter 7.
 7. Detectors shall be ceiling-mounted and shall include separate twist-lock base with tamper-proof feature.
 8. Following bases and auxiliary functions shall be available:
 - a. Standard base with remote LED output.
 - b. Sounder base rated at 85 dBA minimum.
 - c. Form-C relay base rated 30 VDC, 2.0 A.
 - d. Isolator base.
 9. Detectors shall provide test means whereby they will simulate alarm condition and report that condition to control panel. Such test shall be initiated at detector itself by activating magnetic switch or initiated remotely on command from control panel.
 10. Detectors shall store internal identifying type code that control panel shall use to identify type of device (ION, PHOTO, THERMAL).
- B. Addressable Manual Stations:
1. Manual Fire Alarm Stations: Non-code, non-break glass type, equipped with key lock so they may be tested without operating handle.
 2. Operated Station: Visually apparent, as operated, at a minimum distance of 100 feet (30.5 m) from front or side.
 3. Stations shall be designed so after actual activation, they cannot be restored to normal except by key reset.
 4. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on cover. The word FIRE shall appear on front of stations in raised letters, 1.75 inches (44 mm) or larger.
 5. Addressable manual stations shall, on command from control panel, send data to panel representing state of manual switch and addressable communication module status.
- C. Intelligent Thermal (Heat) Detectors: Intelligent addressable devices rated at 135 degrees F (58 degrees C) and have rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. Connect via 2 wires to fire alarm control panel signaling line circuit.
- D. Intelligent Photoelectric Smoke Detectors: Intelligent addressable photoelectric smoke detector and shall connect with two wires to the fire alarm control panel signaling line circuit (SLC). The detectors shall use photoelectric (light-scattering) principal to measure smoke density and shall, on command from control panel, send data to panel representing analog level of smoke density.

E. Intelligent Multi-Criteria Acclimating Detectors:

1. Addressable device designed to monitor a minimum of photoelectric and thermal technologies in single-sensing device. Include ability to adapt to its environment by utilizing built-in microprocessor to determine its environment and choose appropriate sensing settings. Allow wide sensitivity window, with no less than 1 to 4 percent per foot obscuration. Utilize advanced electronics that react to slow smoldering fires and thermal properties within single sensing device.
2. Microprocessor: Capable of selecting appropriate sensitivity levels based on environment type it is in, such as office, manufacturing, or kitchen, and then have ability to automatically change setting as environment changes, as when walls are moved or as occupancy changes.
3. Intelligent multi-criteria detection device shall include ability to combine signal of thermal sensor with signal of photoelectric signal to react hastily in event of fire situation. Include inherent ability to distinguish between fire condition and false alarm condition by examining characteristics of thermal and smoke sensing chambers and comparing them to database of actual fire and deceptive phenomena.

F. Intelligent Fire/Carbon Monoxide Detectors:

1. The detector shall be comprised of four sensing elements, including a photoelectric (light-scattering) particulate sensor, an electrochemical CO sensor, a daylight-filtered infrared (IR) sensor and solid-state thermal sensor(s) rated at 135°F (57.2°C). The device shall be able to indicate distinct smoke and heat alarms.
2. The advanced multi-criteria detection device shall include the ability to combine the signal of the photoelectric signal with other sensing elements in order to react quickly in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a nuisance alarm condition. The detector shall be capable of selecting the appropriate sensitivity levels based on the environment type (office, manufacturing, kitchen, etc.) in which it is installed, and then have the ability to automatically change the setting as the environment changes.
3. The CO detector component shall be capable of a functional gas test using a canned test agent to test the functionality of the CO sensing cell.
4. The detector shall indicate CO trouble conditions, including six months of sensor life remaining and sensor life has expired. The detector shall indicate a combined signal for any of the following: low chamber trouble, thermistor trouble, CO self-test failure, IR self-test failure, and freeze warning.
5. The Fire/CO Detector shall be used with the B200S Intelligent Sounder Base capable of temporal 4 tones.

G. Intelligent Duct Smoke Detectors:

1. In-Duct Smoke Detector Housing: Use on-board intelligent photoelectric detector, which provides continuous analog monitoring and alarm verification from panel.
2. When sufficient smoke is sensed, alarm signal is initiated, and appropriate action taken to shut down or change over air handling systems to help prevent rapid distribution of toxic smoke and fire gases throughout areas served by duct system.

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3. Duct Smoke Detectors Mounted Above Ceiling or Otherwise Obstructed from Normal View: Provide with remote alarm indicator in ceiling or space below unit.
 4. Each Detector: Install in either supply side or return side duct in accordance with local mechanical code and per mechanical plans and specifications.
 5. Provide remote test switch and alarm indicator for each detector. These shall be ceiling mounted directly below unit where ceiling is 12ft. or lower. Or wall mounted at the entrance to the space containing the units at 10ft. above finished floor. Remote status indicators shall have a keyed "Test" and "Normal" position as well as a "Power" and "Alarm" LED. Label all remote test switches with respect to its associated unit.
- H. LCD Display Remote Annunciator:
1. Furnish and install as indicated on the Drawings a remote serial annunciator, Model LCD-7100. Annunciator shall provide 80-character display, which shall duplicate all information on basic system display, including any network nodes its host panel is annunciating, with exception of menus. Contain the following function keys:
 - a. Alarm Acknowledge.
 - b. Trouble Acknowledge.
 - c. Signal Silence.
 - d. System Reset/Lamp Test.
 - e. System Drill Test.
 2. Key Lock: Enable switches only when placed in "ON" position, with exception of Trouble Acknowledge, which is used to silence local trouble audible sounder. Annunciator shall contain the following LEDs:
 - a. Alarm.
 - b. Supervisory.
 - c. System Trouble.
 - d. Power Fault.
 - e. System Silenced.
 3. Mount on standard 3-gang surface or flush electrical box.
 4. Each ILI-MB-E3/ILI95-MB-E3: Accommodate up to 5 remote LCD-7100 annunciators which shall be located up to 3,000 feet from control panel.
- I. Speakers:
1. Operate on 70 VRMS or with field-selectable output taps from 0.5 to 2.0 watts.
 2. Speakers in Corridors and Public Spaces: Produce nominal sound output of 84 dBA at 10 feet (3 m).
 3. Frequency Response: Minimum of 400 Hz to 4,000 Hz.
 4. Back of Each Speaker: Sealed to protect speaker cone from damage and dust.
- L. Strobes:
1. Compliance: ADA and UL 1971.
 2. Maximum Pulse Duration: 0.2 second.
 3. Strobe Intensity: UL 1971.

4. Flash Rate: UL 1971.
5. Strobe Candela Rating: Determine by positioning selector switch on back of device.

M. Speaker/Strobes:

1. Operate on 70 VRMS or with field-selectable output taps from 0.5 to 2.0 watt
2. Speakers in Corridors and Public Spaces: Produce nominal sound output of 84 dBA at 10 feet (3 m).
3. Frequency Response: Minimum of 400 Hz to 4,000 Hz.
4. Back of Each Speaker: Sealed to protect speaker cone from damage and dust.
5. Audibility: NFPA 72.
6. Maximum Pulse Duration: 0.2 second.
7. Strobe Intensity: UL 1971.
8. Flash Rate: UL 1971.
9. Strobe Candela Rating: Determine by positioning selector switch on back of device.

2.7 INTEGRATED SECURITY AND ACCESS CONTROL AND AUTOMATIC DOORS

The building is provided with an access control system for select doors. Provide all connections, hardware, programming etc for interface with system. This shall include but is in no way limited to door locks, door hold-open devices and request-to-exit devices. Coordinate with the District's provider for activation of the fire alarm release feature on all door control units for all electronically controlled egress doors except for those doors that do not limit egress under normal operation.

2.8 PA/INTERCOM AUDIO ENHANCEMENT SYSTEMS

Provide an addressable output module for future interface with a PA/Intercom System so that future systems can be silenced on fire alarm system alarm condition.

2.9 HVAC SYSTEMS INTERFACES

Furnish programmable, form-c, dry-contact closures in addressable output (relay) modules for the proper operation of the mechanical system shut down.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and surfaces to receive fire alarm system.
 1. Notify Architect and Engineer of conditions that would adversely affect installation or subsequent use.

2. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

- A. Install fire alarm system in accordance with NFPA 72, NFPA 70, state and local codes, manufacturer's instructions, and as indicated on the Drawings.
- B. Conceal conduit, junction boxes, and conduit supports and hangers in finished areas. Conceal or expose conduit, junction boxes, and conduit supports and hangers in unfinished areas.
- C. Do not install smoke detectors before system programming and test period. If construction is ongoing during this period, take measures to protect smoke detectors from contamination and physical damage.
- D. Flush-mount fire detection and alarm system devices, control panels, and remote annunciators in finished areas. Flush-mount or surface-mount fire detection and alarm system devices, control panels, and remote annunciators in unfinished areas.
- E. Ensure manual stations are suitable for surface mounting or semi-flush mounting as indicated on the Drawings. Install not less than 42 inches, nor more than 48 inches, above finished floor measured to operating handle.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide the service of competent, factory-trained technician authorized by manufacturer to technically supervise and participate during pre-testing and acceptance testing of system.
- B. Testing:
 1. Conduct complete visual inspection of control panel connections and test wiring for short circuits, ground faults, continuity, and insulation before energizing cables and wires.
 2. Close each sprinkler system control valve and verify proper supervisory alarm at INCC Command Center.
 3. Verify activation of flow switches.
 4. Open initiating device circuits and verify that trouble signal actuates.
 5. Open signaling line circuits and verify that trouble signal actuates.
 6. Open and short notification appliance circuits and verify that trouble signal actuates.
 7. Ground initiating device circuits and verify response of trouble signals.
 8. Ground signaling line circuits and verify response of trouble signals.
 9. Ground notification appliance circuits and verify response of trouble signals.
 10. Check alert tone and prerecorded voice message to alarm notification devices.
 11. Check installation, supervision, and operation of intelligent smoke detectors.

12. Introduce on system each of the alarm conditions that system is required to detect. Verify proper receipt and proper processing of signal at INCC Command Center and correct activation of control points.
13. Consult manufacturer's manual to determine proper testing procedures when system is equipped with optional features. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality, and similar.

C. Acceptance Testing:

1. Before installation shall be considered completed and acceptable by AHJ, a complete test using as a minimum, the following scenarios shall be performed and witnessed by representative approved by Engineer. Monitoring company and/or fire department shall be notified before final test in accordance with local requirements.
2. Contractor's job foreman, in presence of representative of manufacturer, representative of Owner, and fire department shall operate every installed device to verify proper operation and correct annunciation at control panel.
3. Open signaling line circuits and notification appliance circuits in at least 2 locations to verify presence of supervision.
4. When testing has been completed to satisfaction of both Contractor's job foreman and representatives of manufacturer and Owner, a notarized letter co-signed by each attesting to satisfactory completion of said testing shall be forwarded to Owner and fire department.
5. Leave fire alarm system in proper working order and, without additional expense to Owner, replace defective materials and equipment provided within 5 years from date of final acceptance by the owner.

3.4 DEMONSTRATION

- A. Provide instructions as required for operating the fire alarm system.
- B. Provide hands-on demonstrations of the operation of fire alarm system components and functions.
- C. Include not less than 8 hours of instruction for Owner. Training to be coordinated with Owner at a time convenient for Owner.
- D. Provide Record of Completion to Engineer described by NFPA 72.
- E. Provide document box per NFPA 72 with memory stick containing copy of programming and all record drawings and approved submittals.

END OF SECTION 283100