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FIRE DETECTION AND ALARM - EXTENSION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section of the specifications includes the furnishing, installation, and connection of the fire alarm equipment to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control units, fire safety control devices, annunciators, power supplies, and wiring as shown on the drawings and specified.
- B. Fire alarm systems shall comply with requirements of the NFPA 72 and the Department of Veterans Affairs Fire Protection Design Manual (4th Edition) unless variations are specifically identified within these contract documents by the following notation: [VARIATION]. The design, system layout, document submittal preparation, and supervision of installation and testing shall be provided by a technician that is certified NICET level III or a registered fire protection engineer. The NICET certified technician shall be on site for the supervision and testing of the system. Factory engineers from the equipment manufacturer, thoroughly familiar and knowledgeable with all equipment utilized, shall provide additional technical support at the site as required by the Contracting Officer or his authorized representative. Installers shall have a minimum of two years experience installing fire alarm systems.
- C. Fire Alarm Systems shall be noncoded addressable systems, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only.
- D. The existing building fire alarm system is a Gamewell/FCI product that has an automatic digitized voice fire alarm signal with emergency manual voice override to notify occupants to evacuate. The digitized voice message shall identify the area of the building (smoke zone) from which the alarm was initiated.
- E. Alarm signals (by device), supervisory signals (by device) and system trouble signals (by device not reporting) shall be distinctly transmitted to the main fire alarm system control unit (located on plan drawings for each building).
- F. The main fire alarm control unit automatically transmits alarm signals to a listed central station using a digital alarm communicator transmitter in accordance with NFPA 72.

1.2 DEFINITIONS

- A. COR: Contracting Officer's Representative
- B. VA FPDM: Department of Veterans Affairs Fire Protection Design Manual
- C. LED: Light-emitting diode.
- D. NICET: National Institute for Certification in Engineering Technologies.
- E. PIV: Post Indicator Valve
- F. VCS: Voice Communications Systems

1.3 SCOPE

- A. All programming of the main fire alarm panel shall be provided by FireNet Systems Inc. Bidding contractors shall provide a separate line item cost for reprogramming of the space.

- B. A modified fire alarm system shall be designed and installed in accordance with the specifications and drawings. Device location and wiring runs shown on the drawings are for reference only unless specifically dimensioned. Actual locations shall be in accordance with NFPA 72, VA FPDM, and this specification.
- C. Basic Performance:
 - 1. Alarm and trouble signals from the building fire alarm control panel shall be digitally encoded by UL listed electronic devices onto a multiplexed communication system.
 - 2. Response time between alarm initiation (contact closure) and recording at the main fire alarm control unit (appearance on alphanumeric read out) shall not exceed five (5) seconds.
 - 3. The signaling line circuits (SLC) between building fire alarm control units shall be wired Style 7 in accordance with NFPA 72. Isolation shall be provided so that no more than one building can be lost due to a short circuit fault.
 - 4. Initiating device circuits (IDC) shall be wired Style C in accordance with NFPA 72.
 - 5. Signaling line circuits (SLC) within buildings shall be wired Style 4 in accordance with NFPA 72. Individual signaling line circuits shall be limited to covering 22,500 square feet of floor space or 3 floors whichever is less.
 - 6. Notification appliance circuits (NAC) shall be wired Style Y in accordance with NFPA 72.

1.4 DEFEND IN PLACE SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
 - 1. Smoke detectors.
 - 2. Manual fire alarm boxes.
- B. Fire-alarm signal shall initiate the following actions:
 - 1. Activate voice/alarm communication system.
 - 2. Identify alarm at fire-alarm control unit and remote annunciators.
 - 3. Transmit an alarm signal to the remote alarm receiving station.
 - 4. Unlock electric door locks in designated egress paths.
 - 5. Release fire and smoke doors held open by magnetic door holders.
 - 6. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
 - 7. Activate smoke-control system (smoke management) at firefighter smoke-control system panel.
 - 8. Close smoke dampers in air ducts of designated air-conditioning duct systems.
 - 9. Recall elevators to primary or alternate recall floors.
 - 10. Activate emergency lighting control.
 - 11. Activate emergency shutoffs for gas and fuel supplies.
 - 12. Record events in the system memory.
 - 13. Record events by the system printer.
- C. System trouble signal initiation shall be by one or more of the following devices and actions:
 - 1. Open circuits, shorts, and grounds in designated circuits.

2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.

- D. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change 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 print out the final adjusted values on system printer.

1.5 RELATED DOCUMENTS AND WORK

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 1. Section 01 00 00 - General Requirements: Restoration of existing surfaces
 2. Section 01 33 23 - Submittals: Procedures for submittals
 3. Section 07 84 00 - Fire Stopping: Fire proofing wall penetrations
 4. Section 09 91 00 - Painting: Painting for equipment and existing surfaces
 5. Section 26 05 11 - Requirements for Electrical Installations
 6. Section 26 05 33 - Raceways and Boxes for Electrical Systems
 7. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables (600V and Below)
- C. Applicable Publications
 1. The publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. The publications are referenced in text by the basic designation only.
 2. National Fire Protection Association (NFPA):
 - a. 70-2014 National Electrical Code (NEC).
 - b. 72-2002 National Fire Alarm Code.
 - c. 90A-2002 Installation of Air Conditioning and Ventilating Systems.
 - d. 101-2003 Life Safety Code
 3. Department of Veterans Affairs Fire Protection Design Manual (4th Edition).
 4. Underwriters Laboratories, Inc. (UL):
 - a. 2000-2000 Fire Protection Equipment Directory
 5. Factory Mutual Research Corp (FM): Approval Guide, 2005 Edition
 6. American National Standards Institute (ANSI):
 - a. S3.41-1996 Audible Emergency Evacuation Signal
 7. International Code Council, International Building Code (IBC) 2003 Edition

1.6 SUBMITTALS

- A. General Submittal Requirements:

1. Submit 4 copies and 1 reproducible in accordance with Section 01 33 23 Submittals and Section 26 05 11 Requirements for Electrical Installations.
 2. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Engineer.
 3. Shop Drawings shall be prepared by persons with the following qualifications: NICET-certified fire-alarm technician, Level III minimum.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings:
1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
 2. Floor plans: Provide locations of all devices (with device number at each addressable device corresponding to control unit programming), Only those devices connected and incorporated into the final system shall be on these floor plans. Do not show any removed devices on the floor plans. Show all interfaces for all fire safety functions.
 3. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
- D. Certifications:
1. Together with the shop drawing submittal, submit the technician's NICET level III fire alarm certification. Include in the certification the names and addresses of the proposed supervisor of installation and the proposed performer of contract maintenance. Also include the name and title of the manufacturer's representative who makes the certification.
 2. Together with the shop drawing submittal, submit a certification from the manufacturer of each component (e.g., smoke detector) that the components being furnished are compatible with the control unit.
 3. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer that the wiring and connection diagrams meet this specification, UL and NFPA 72 requirements.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.
- C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Existing fire alarm system is Gamewell/FCI
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

1.8 PROJECT CONDITIONS

- A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
1. Notify Owner/Owner's Representative no fewer than 5 working days in advance of proposed interruption of fire-alarm service.
 2. Do not proceed with interruption of fire-alarm service without Owner/Owner's Representative written permission.}}

1.9 SOFTWARE SERVICE AGREEMENT

- A. FireNet to modify existing software agreement to include modifications based on this project's scope of work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following: Gamewell/FCI (No Substitutions)

2.2 EQUIPMENT AND MATERIALS, GENERAL

- A. All added equipment and components shall be new and the manufacturer's current model. All equipment shall be tested and listed by Underwriters Laboratories, Inc. or Factory Mutual Research Corporation for use as part of a fire alarm system. The authorized representative of the manufacturer of the major equipment shall certify that the installation complies with all manufacturer's requirements and that satisfactory total system operation has been achieved.

2.3 CONDUIT, BOXES, AND WIRE

- A. Conduit shall be in accordance with Section 16111, CONDUIT SYSTEMS and as follows:
1. All new conduits shall be installed in accordance with NFPA 70.
 2. Conduit fill shall not exceed 40 percent of interior cross sectional area.
 3. All new conduits shall be ¾-inch minimum.
- B. Wire:
1. All existing wiring that is not reused shall be removed after new wiring installed in conduit or raceway and the new system is fully functional.
 2. Wiring shall be in accordance with NEC article 760, Section 26 0521 and as recommended by the manufacturer of the fire alarm system. All wires shall be color coded. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG for initiating device circuits and 14 AWG for notification device circuits.
 3. Addressable circuits and wiring used for the multiplex communication loop shall be twisted and shielded unless specifically exempted by the fire alarm equipment manufacturer in writing.

C. Terminal Boxes, Junction Boxes, and Cabinets:

1. Shall be galvanized steel in accordance with UL requirements.
2. All new boxes shall be sized and installed in accordance with NFPA 70.
3. New and existing covers shall be repainted red in accordance with Section 09 9100 Painting and shall be identified with white markings as "FA" for junction boxes and as "FIRE ALARM SYSTEM" for cabinets and terminal boxes. Lettering shall be a minimum of ¼-inch high.
4. Terminal boxes and cabinets shall have a volume 50 percent greater than required by the NFPA 70. Minimum sized wire shall be considered as 14 AWG for calculation purposes.
5. Terminal boxes and cabinets shall have identified pressure type terminal strips and shall be located at the base of each riser. Terminal strips shall be labeled as specified or as approved by the COR.

2.4 FIRE ALARM CONTROL UNIT (EXISTING)

2.5 STANDBY POWER SUPPLY (EXISTING)

2.6 ALARM NOTIFICATION APPLIANCES

- A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling line circuit, 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, equipped for mounting as indicated and with screw terminals for system connections.
 2. Utilize existing local circuit with spare capacity.
- B. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch-high letters on the lens and visible from all viewing directions. Flash rate shall be 1 Hz, with synchronization where required by NFPA 72.
1. Rated Light Output: 15/30/75/110 cd, selectable in the field.
 2. Mounting: Ceiling mounted unless otherwise indicated.
 3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
 4. Flashing shall be in a temporal pattern, synchronized with other units.
 5. Strobe Leads: Factory connected to screw terminals.
 6. Mounting Faceplate: Factory finished, white.
- C. VCS Speakers:
1. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
 2. Nominal Dimension: 8-inch diameter cone-type
 3. Operate on either 25VRMS or 70.7 VRMS
 4. Output taps: 0.5W to 2.0W
 5. Speakers shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.
 6. Frequency Response: 400 Hz to 4000 Hz
 7. Mounting: Flush, unless noted otherwise.

8. Matching Transformers: Tap range matched to acoustical environment of speaker location.
9. Color: White

D. Voice/Tone Notification Appliances:

1. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
2. High-Range Units: Rated 2 to 15 W.
3. Low-Range Units: Rated 1 to 2 W.
4. Mounting: Flush, unless noted otherwise.
5. Matching Transformers: Tap range matched to acoustical environment of speaker location.

2.7 ALARM INITIATING DEVICES

A. System Smoke Detectors

1. General

- a. Comply with UL 268; operating at 24-V dc, nominal.
- b. Detectors shall be four (4) -wire type.
- c. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
- d. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
- e. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
- f. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.
- g. Provide remote indicator lamps and identification plates where detectors are concealed from view. Locate the remote indicator lamps and identification plates flush mounted on walls so they can be observed from a normal standing position.
- h. Detectors shall provide a visual trouble indication if they drift out of sensitivity range or fail internal diagnostics. Detectors shall also provide visual indication of sensitivity level upon testing. Detectors, along with the fire alarm control units shall be UL listed for testing the sensitivity of the detectors.
- i. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
 - 1) Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.
 - 2) Photoelectric detectors shall be factory calibrated and shall be settable at fire-alarm control unit to operate at 3.0 plus or minus 0.25 percent obscuration per foot.

2. Photoelectric Smoke Detectors:

- a. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
 - b. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - 1) Primary status.
 - 2) Device type.
 - 3) Present average value.
 - 4) Present sensitivity selected.
 - 5) Sensor range (normal, dirty, etc.).
3. Manual Fire Alarm Boxes
- a. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; clearly labeled "FIRE"; shall show visible indication of operation; and shall be semi-recessed mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
 - b. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit. (Provide single action for all areas unless noted otherwise on plan drawings)
 - c. 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 fire-alarm control unit.
 - d. Stations identified as key operated only shall have a single standardized lock and key separate from the control equipment.
 - e. Station Reset: Key- or wrench-operated switch.
 - f. 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.
 - g. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Installation shall be in accordance with NFPA 70, 72, 90A, and 101 and the VA FPDM as shown on the drawings, and as recommended by the major equipment manufacturer. Fire alarm wiring shall be installed in conduit. All conduit and wire shall be installed in accordance with Section 16111 "CONDUIT SYSTEMS," Section 16127 "CABLES, LOW VOLTAGE," and all penetrations of smoke and fire barriers shall be protected as required by Section 07270 "FIRESTOPPING SYSTEMS."
- B. All new conduits, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. All existing accessible fire alarm conduit not reused shall be abandoned in place and labeled "SPARE".

- C. All fire detection and alarm system devices shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- D. Audible Alarm-Indicating Devices: Install ceiling mounted devices as shown on plan drawings, and adhering to the requirements of the applicable codes and standards referenced in this specification.
- E. Visible Alarm-Indicating Devices: Install ceiling mounted devices as shown on plan drawings, and adhering to the requirements of the applicable codes and standards referenced in this specification.
- F. Speakers shall be ceiling mounted and fully recessed in areas with suspended ceilings. Speakers shall be wall mounted and recessed in finished areas without suspended ceilings. Speakers may be surface mounted in unfinished areas.
- G. Ceiling mounted strobes shall extend below the finished ceiling in which it is installed, and shall be visible in all directions with no obstructions adjacent to it. Locate and mount to maintain a minimum 36 inches clearance from side obstructions.
- H. Smoke- or Heat-Detector Spacing:
 - 1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
 - 2. Smooth ceiling spacing shall not exceed 30 feet.
 - 3. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A in NFPA 72.
 - 4. HVAC: Locate detectors not closer than 5 feet from air-supply diffuser or return-air opening.
 - 5. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.
- I. 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.
- J. Manual pull stations shall be installed not less than 42 inches or more than 48 inches from finished floor to bottom of device and within 60 inches of a stairway or an exit door unless noted otherwise on drawings.

3.2 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section Requirements for Electrical Installations.
- B. Install framed instructions in a location visible from fire-alarm control unit.

3.3 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.4 TESTS

- A. Provide the service of a NICET level III, competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of

the adjustments and tests for the system. Make all adjustments and tests in the presence of the COR.

- B. When the systems have been completed and prior to the scheduling of the final inspection, furnish testing equipment and perform the following tests in the presence of the COR. When any defects are detected, make repairs or install replacement components, and repeat the tests until such time that the complete fire alarm systems meet all contract requirements. After the system has passed the initial test and been approved by the COR, the contractor may request a final inspection.

1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
 - b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
3. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
4. Test the insulation on all installed cable and wiring by standard methods as recommended by the equipment manufacturer.
5. Open each new alarm initiating and notification circuit to see if trouble signal actuates.
6. Test new audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
7. Test new audible appliances for the private operating mode according to manufacturer's written instructions.
8. Test new visible appliances for the public operating mode according to manufacturer's written instructions.
9. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

3.5 FINAL INSPECTION AND ACCEPTANCE

- A. At the final inspection a factory trained representative of the manufacturer of the major equipment shall repeat the tests in Article 3.5 TESTS and those required by NFPA 72. In addition the representative shall demonstrate that the systems function properly in every respect. The demonstration shall be made in the presence of a VA representative.

- END OF SECTION -