

**SECTION 28 31 00**  
**FIRE DETECTION AND ALARM**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section of the specifications directs the contractor in the furnishing, installation, and connection of the fire alarm equipment to form a complete system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, fire safety control devices, annunciators, and wiring as shown on the drawings and as specified.
- B. Fire alarm systems shall comply with requirements of NFPA 72 unless variations to NFPA 72 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 five years experience installing fire alarm systems.
- C. Alarm signals (by device) and system trouble signals (by device) shall be distinctly transmitted to the main fire alarm system control unit located in the Operators Area of Building 1 and at all Graphic User Interfaces (GUI). GUIs shall provide system control as well as supervision without the use of maps that require ongoing updates.
- E. GUI and/or FACP locations are as follows, with hierarchy of systems listed:
  - 1. Operators Area of Building 1 (Primary: FACPs, GUI, and annunciators)
- F. The main fire alarm control unit shall automatically transmit alarm signals to a listed central station using a digital alarm communicator transmitter in accordance with NFPA 72.

## 1.2 SCOPE

- A. All existing fire alarm equipment, wiring, devices and sub-systems that are not shown to be reused shall be removed. All existing fire alarm conduit not reused shall be removed unless cast in place.
- B. A new fire alarm system shall be designed and installed in accordance with this specification and the contract drawings. All new devices shall be the same manufacturer and type as the existing fire alarm system. Final device locations and wiring runs are the contractor's responsibility and shall be verified.
- C. Basic Performance
  - 1. Initiating device circuits (IDC) shall be wired Class B.
  - 2. Signaling line circuits (SLC) within building shall be wired Class B, Style 4.
  - 3. Notification appliance circuits (NAC) shall be wired Class B.

## 1.3 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS: Restoration of existing surfaces.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES: Procedures for submittals.
- C. Section 07 84 00, FIRESTOPPING: Fire proofing wall penetrations.
- D. Section 09 91 00, PAINTING: Painting for equipment and existing surfaces.
- E. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements for items which are common to other Division 26 sections.
- F. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits and boxes for cables/wiring.
- G. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW: Cables/wiring.)

## 1.4 SUBMITTALS

- A. General: Submit 4 copies and 1 reproducible in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES, and Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

B. Drawings:

1. Prepare drawings using AutoCAD 2005 (or earlier) software and include all contractors' information. Layering shall be by V.
2. Floor plans: Provide locations of all devices (with device number at each addressable device corresponding to control unit programming), appliances, panels, equipment, junction/terminal cabinets/boxes, risers, electrical power connections, individual circuits and raceway routing, system zoning; number, size, and type of raceways and conductors in each raceway; conduit fill calculations with cross section area percent fill for each type and size of conductor and raceway. 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. Riser diagrams: Provide, for the new devices, the number, size and type of riser raceways and conductors in each riser raceway and number of each type device per floor and zone. Show wiring Styles on the riser diagram for all circuits.
4. Two weeks prior to final inspection, the Contractor shall deliver to the Resident Engineer (RE) one (1) set of reproducible electronic as-built drawings and one (1) set of the as-built drawing computer files (using AutoCAD 2005 or earlier). As-built drawings (floor plans) shall show all new and existing conduit used for the fire alarm system.

C. Certifications:

1. Together with the shop drawing submittal, submit the technician's NICET level III fire alarm certification as well as certification from the control unit manufacturer that the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. 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 either the control unit manufacturer or 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.

#### **1.5 WARRANTY**

- A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of one (1) year from the date of acceptance of the entire installation by the Contracting Officer.

#### **1.6 APPLICABLE PUBLICATIONS**

- A. 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.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and VA Specification Sections, apply to this Section.
- C. Provide a system conforming to the requirements of the following publications including all amendments to these publications. Criteria from the following standards shall be used in the development of the fire alarm system replacement:
  1. NFPA 70, National Electric Code (NEC), 2008 Edition;
  2. NFPA 72, National Fire Alarm Code, 2007 Edition;
  3. NFPA 101, Life Safety Code (LSC), 2006 Edition; and
  4. Uniform Federal Accessibility Standards (UFAS), 1984 Edition.
5. Underwriter's Laboratories, Inc. ("UL") equipment standards:
  - a. "UL" 268, Standard for Smoke Detectors for Fire Alarm Signaling Systems Smoke Detectors.
  - b. "UL" 864, Standard for Control Units for Fire-Protective Signaling Systems Control Panels.
  - c. "UL" 1424, Standard for Cables for Power-Limited Fire-Alarm Circuits.
  - d. "UL" 1425, Standard for Cables for Non-Power-Limited Fire-Alarm Circuits.

- e. "UL" 1711, Standard for Amplifiers for Fire Protective Signaling Systems.

## **PART 2 - PRODUCTS**

### **2.1 EQUIPMENT AND MATERIALS, GENERAL**

- A. All equipment and components shall be new and the manufacturer's current model. All equipment shall be tested and listed by Underwriters Laboratories, Inc. 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 manufacturers' requirements and that satisfactory total system operation has been achieved.
- B. Equipment shall be provided with a barcoding system for every device for addressing and maintenance purposes.

### **2.2 CONDUIT, BOXES, AND WIRE**

- A. Conduit shall be in accordance with Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS and as follows:
  - 1. All new and reused conduit shall be installed in accordance with NFPA 70.
  - 2. Conduit fill shall not exceed 40 percent of interior cross sectional area.
  - 3. All new conduit shall be 3/4 inch minimum.
- B. Wire:
  - 1. All existing wiring shall be removed and new wiring installed concealed in construction or installed in conduit or raceway.
  - 2. Wiring shall be in accordance with NEC article 760, Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW), 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 appliance circuits.
  - 3. Addressable circuits shall be twisted and shielded unless specifically accepted 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 and reused 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 91 00, 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 3/4 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 RE.

### **2.3 MANUFACTURERS/PRODUCT LINES**

- A. The fire alarm system shall match the existing system, Gamewell-FCI.
- B. Field devices shall be addressed by numerical selection at the device or by barcoding. Proprietary addressing hardware shall not be required.

### **2.4 ALARM INITIATING DEVICES**

- A. Smoke Detectors:
  1. Smoke detectors shall be UL listed for use with the fire alarm control unit being furnished.
  2. Smoke detectors shall be addressable type complying with applicable UL Standards for system type detectors. Smoke detectors shall be installed in accordance with the manufacturer's recommendations and NFPA 72.
  3. Detectors shall have an indication lamp to denote an alarm condition. 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.
  4. All spot type and duct type detectors installed shall be of the photoelectric type.
  5. Photoelectric detectors shall be factory calibrated and readily field adjustable. The sensitivity of any photoelectric detector shall be factory set at 3.0 plus or minus 0.25 percent obscuration per foot.

6. 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.

## **2.5 ADDRESS REPORTING INTERFACE DEVICE**

- A. Shall have unique addresses that reports directly to the building fire alarm panel.
- B. Shall be configurable to monitor normally open or normally closed devices for both alarm and trouble conditions.
- C. Shall have terminal designations clearly differentiating between the circuit to which they are reporting from and the device that they are monitoring.
- D. Shall be UL listed for fire alarm use and compatibility with the panel to which they are connected.
- E. Shall be mounted in weatherproof housings if mounted exterior to a building.

## **2.6 SUPERVISORY DEVICES**

- A. Duct Smoke Detectors:
  1. Duct smoke detectors shall be provided and connected by way of an address reporting interface device. Detectors shall be provided with an approved duct housing mounted exterior to the duct, and shall have perforated sampling tubes extending across the full width of the duct (wall to wall). Detector placement shall be such that there is uniform airflow in the cross section of the duct.
  2. Interlocking with fans shall be provided in accordance with NFPA 90A and as specified hereinafter under Part 3.2, "TYPICAL OPERATION".
  3. Provide remote indicator lamps, key test stations and identification nameplates (e.g. "DUCT SMOKE DETECTOR AHU-X") for all duct detectors. Locate key test stations in plain view on walls or ceilings so that they can be observed and operated from a normal standing position.
  4. Sampling tubes penetrating stainless steel ductwork as identified by the contract drawings and/or the VA shall be of hospital grade stainless steel.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION:**

- A. Installation shall be in accordance with NFPA 70, 72, 90A, and 101 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 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS , Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW), and all penetrations of smoke and fire barriers shall be protected as required by Section 07 84 00, FIRESTOPPING.
- 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 removed.
- C. All new or reused exposed conduit shall be painted in accordance with Section 09 91 00, PAINTING to match surrounding finished areas and red in unfinished areas.
- D. All fire detection and alarm system devices and control units shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas. Exact locations to be approved by the RE.

#### **3.2 TYPICAL OPERATION**

- A. Activation of any smoke detector shall cause the following operations to occur:
  - 1. Operate the emergency voice communication system in the zone of alarm, with a message identifying the zone of alarm to all other zones. For sprinkler protected buildings, flash strobes continuously only in the zone of alarm.
  - 2. Continuously sound atemporal pattern general alarm and flash all strobes on the floor in alarm for a minimum of 5 minutes or until reset at the local fire alarm control unit in the Operators Area of Building 1.
  - 3. Unlock the electrically locked exit doors within the zone of alarm.
  - 4. Release only the magnetic door holders for the zone from which the alarm was initiated after the alert signal.
  - 5. Release door locks for locked doors for the zone from which the alarm was initiated after the alert signal.



- B. Activation of a initiating device, as listed above, in an adjacent smoke zone to the first alarm zone will be treated as a new fire event, and will cause the events listed above to occur.
- C. Activation of a second initiating device, as listed above, in the same zone as the first device will not initiate a new alarm, but will appear at the fire alarm control unit and GUI.
- D. Operation of a smoke detector at a corridor door used for automatic closing shall also release only the magnetic door holders on that floor.

### **3.3 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 RE.
- 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 RE. When any defects are detected, make repairs or install replacement components, and repeat the tests until such time that the complete fire alarm system meets all contract requirements. After the system has passed the initial test and been approved by the RE, the contractor may request a final inspection.
  - 1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
  - 2. Test the insulation on all installed cable and wiring by standard methods as recommended by the equipment manufacturer.
  - 3. Open each alarm initiating and notification circuit to see if trouble signal actuates.
  - 4. Ground each alarm initiation and notification circuit and verify response of trouble signals.

### **3.4 FINAL INSPECTION AND ACCEPTANCE**

- A. Prior to final acceptance a minimum 30 day "burn-in" period shall be provided. The purpose shall be to allow equipment to stabilize and potential installation and equipment malfunctions to be identified and corrected. During this diagnostic period, all system operations and malfunctions shall be recorded. Final acceptance will be made upon

successful completion of the "burn-in" period and where the last 14 days is without a system or equipment malfunction.

- B. At the final inspection a factory trained representative of the manufacturer of the major equipment shall repeat the tests in Article 3.3 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.

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