

SECTION 28 31 00
FIRE DETECTION AND ALARM

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; alarm initiating devices, alarm notification appliances, control units, fire safety control devices, annunciators, power supplies, and wiring as shown on the drawings and specified. The fire alarm system shall not be combined with other systems such as building automation, energy management, and security.
- B. Fire alarm systems shall comply with requirements of the most recent VA FIRE PROTECTION DESIGN MANUAL and 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's Representative COR or his authorized representative. Installers shall have a minimum of 2 years' experience installing fire alarm systems.
- C. Fire alarm signals:
 - 1. Building(s) shall have a general evacuation fire alarm signal in accordance with ASA S3.41 to notify all occupants in the respective building to evacuate.
- D. Not Used.
- E. Not Used.

1.2 SCOPE

- A. Extend existing fire alarm system. Devices shall be 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 and this specification.

- B. 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.
- C. Existing fire alarm bells, chimes, door holders, 120VAC duct smoke detectors, valve tamper switches and waterflow/pressure switches may be reused only as specifically indicated on the drawings and provided the equipment:
 - 1. Meets this specification section
 - 2. Is UL listed or FM approved
 - 3. Is compatible with new equipment being installed
 - 4. Is verified as operable through contractor testing and inspection
 - 5. Is warranted as new by the contractor.
- D. Not Used.
- E. Existing reused equipment shall be covered as new equipment under the Warranty specified herein.
- F. Not Used.
- G. Basic Performance:
 - 1. Alarm and trouble signals from each 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 5 seconds.
 - 3. The signaling line circuits (SLC) between building fire alarm control units shall be wired Class B 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 Class B in accordance with NFPA 72.
 - 5. Signaling line circuits (SLC) within buildings shall be wired Class B in accordance with NFPA 72. Individual signaling line circuits shall be limited to covering 22,500 square feet (2,090 square meters) of floor space or 3 floors whichever is less.
 - 6. Notification appliance circuits (NAC) shall be wired Class B in accordance with NFPA 72.
- H. Existing Fire Protection:

1. Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately under construction, and temporarily for connections.
2. Provide fire watch for impairments more than 4 hours in a 24-hour period.
3. Request interruptions in accordance with Article, OPERATIONS AND STORAGE AREAS, and coordinate with COR or Government Designated Authority.
4. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the medical center.
 - a. Parameters for the testing and results of any tests performed shall be recorded by the medical center and copies provided to the COR.

1.3 RELATED WORK

- A. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Requirements for procedures for submittals.
- B. Section 07 84 00 - FIRESTOPPING. Requirements for fire proofing wall penetrations.
- C. Not Used.
- D. Not Used.
- E. Not Used.
- F. Not Used.
- G. Not Used.
- H. Not Used.
- I. Not Used.
- J. Not Used.
- K. Not Used.

1.4 SUBMITTALS

- A. General: Submit 5 copies 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 latest Release software and include all contractors information. Layering shall be by VA criteria as provided by the Contracting Officer Representative (COR). Bid drawing files on AutoCAD shall be provided to the Contractor at the pre-

construction meeting. The contractor shall be responsible for verifying all critical dimensions shown on the drawings provided by VA.

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 entire system, 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 door holder interface, elevator control interface, HVAC shutdown interface, fire extinguishing system interface, and all other fire safety interfaces. Show wiring Styles on the riser diagram for all circuits. Provide diagrams both on a per building and campus wide basis.
 4. Detailed wiring diagrams: Provide for control panels, modules, power supplies, electrical power connections, auxiliary relays and annunciators showing termination identifications, size and type conductors, circuit boards, LED lamps, indicators, adjustable controls, switches, ribbon connectors, wiring harnesses, terminal strips and connectors, spare zones/circuits, battery and battery calculations. Diagrams shall be drawn to a scale sufficient to show spatial relationships between components, enclosures and equipment configuration.
 5. Two weeks prior to final inspection, the Contractor shall deliver to the COR 3 sets of as-built drawings and one set of the as-built drawing computer files (using AutoCAD latest release) . As-built drawings (floor plans) shall show all new and/or existing conduit used for the fire alarm system.
- C. Manuals:
1. Submit simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals including technical data

sheets for all items used in the system, power requirements, device wiring diagrams, dimensions, and information for ordering replacement parts.

- a. Wiring diagrams shall have their terminals identified to facilitate installation, operation, expansion and maintenance.
- b. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.
- c. Include complete listing of all software used and installation and operation instructions including the input/output matrix chart.
- d. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate, inspect, test and maintain the equipment and system. Provide all manufacturer's installation limitations including circuit length limitations.
- e. Complete listing of all digitized voice messages.
- f. Provide standby battery calculations under normal operating and alarm modes. Battery calculations shall include the magnets for holding the doors open for one minute.
- g. Include information indicating who will provide emergency service and perform post contract maintenance.
- h. Provide a replacement parts list with current prices. Include a list of recommended spare parts, tools, and instruments for testing and maintenance purposes.
- i. A computerized preventive maintenance schedule for all equipment. The schedule shall be provided on disk in a computer format acceptable to the VAMC and shall describe the protocol for preventive maintenance of all equipment. The schedule shall include the required times for systematic examination, adjustment and cleaning of all equipment. A print out of the schedule shall also be provided in the manual. Provide the disk in a pocket within the manual.
- j. Furnish manuals in 3 ring loose-leaf binder or manufacturer's standard binder.
- k. A print out for all devices proposed on each signaling line circuit with spare capacity indicated.

2. Two weeks prior to final inspection, deliver 4 copies of the final updated maintenance and operating manual to the COR.
 - a. The manual shall be updated to include any information necessitated by the maintenance and operating manual approval.
 - b. Complete "As installed" wiring and schematic diagrams shall be included that shows all items of equipment and their interconnecting wiring. Show all final terminal identifications.
 - c. Complete listing of all programming information, including all control events per device including an updated input/output matrix.
 - d. Certificate of Installation as required by NFPA 72 for each building. The certificate shall identify any variations from the National Fire Alarm Code.
 - e. Certificate from equipment manufacturer assuring compliance with all manufacturers installation requirements and satisfactory system operation.

D. 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 year from the date of acceptance of the entire installation by the Contracting Officer.

1.6 GUARANTY PERIOD SERVICES

- A. Complete inspection, testing, maintenance and repair service for the fire alarm system shall be provided by a factory trained authorized representative of the manufacturer of the major equipment for a period of 1 year from the date of acceptance of the entire installation by the Contracting Officer.
- B. Contractor shall provide all necessary test equipment, parts and labor to perform required inspection, testing, maintenance and repair.
- C. All inspection, testing, maintenance and permanent records required by NFPA 72, and recommended by the equipment manufacturer shall be provided by the contractor. Work shall include operation of sprinkler system alarm and supervisory devices as well as all reused existing equipment connected to the fire alarm system. It shall include all interfaced equipment including; elevators, HVAC shutdown, and extinguishing systems.
- D. Maintenance and testing shall be performed in accordance with NFPA 72. A computerized preventive maintenance schedule shall be provided and shall describe the protocol for preventive maintenance of equipment. The schedule shall include a systematic examination, adjustment and cleaning of all equipment.
- E. Non-included Work: Repair service shall not include the performance of any work due to improper use, accidents, or negligence for which the contractor is not responsible.
- F. Service and emergency personnel shall report to the Engineering Office or their authorized representative upon arrival at the hospital and again upon the completion of the required work. A copy of the work ticket containing a complete description of the work performed and parts replaced shall be provided to the VA Contracting Officer's Representative COR or his authorized representative.
- G. Emergency Service:
 - 1. Warranty Period Service: Service other than the preventative maintenance, inspection, and testing required by NFPA 72 shall be considered emergency call-back service and covered under the warranty of the installation during the first year of the warranty period, unless the required service is a result of abuse or misuse by the Government. Written notification shall not be required for emergency warranty period service and the contractor shall respond as outlined

in the following sections on Normal and Overtime Emergency Call-Back Service. Warranty period service can be required during normal or overtime emergency call-back service time periods at the discretion of the Contracting Officer's Representative COR or his authorized representative.

2. Normal and overtime emergency call-back service shall consist of an on-site response within 2 hours of notification of a system trouble.
3. Normal emergency call-back service times are between the hours of 7:30 a.m. and 4:00 p.m., Monday through Friday, exclusive of federal holidays. Service performed during all other times shall be considered to be overtime emergency call-back service. The cost of all normal emergency call-back service for year 1 shall be included in the cost of this contract.
4. Overtime emergency call-back service shall be provided for the system when requested by the Government. The cost of the first 40 manhours per year of overtime call-back service during year 1 of this contract shall be provided under this contract. Payment for overtime emergency call-back service in excess of the 40 manhours per year requirement will be handled through separate purchase orders. The method of calculating overtime emergency call-back hours is based on actual time spent on site and does not include travel time.
5. The contractor shall maintain a log at each fire alarm control unit. The log shall list the date and time of all examinations and trouble calls, condition of the system, and name of the technician. Each trouble call shall be fully described, including the nature of the trouble, necessary correction performed, and parts replaced.

H. Not Used.

1.7 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 and the latest editions of these publications shall be applicable.
- B. National Fire Protection Association (NFPA):
NFPA 13.....Standard for the Installation of Sprinkler
Systems, 2019 edition

- NFPA 14Standard for the Installation of Standpipes and
Hose Systems, 2019 edition
- NFPA 20.....Standard for the Installation of Stationary
Pumps for Fire Protection, 2019 edition
- NFPA 70.....National Electrical Code (NEC), 2020 edition
- NFPA 72.....National Fire Alarm Code, 2019 edition
- NFPA 90A.....Standard for the Installation of Air
Conditioning and Ventilating Systems, 2018
edition
- NFPA 101.....Life Safety Code, 2018 edition
- C. Underwriters Laboratories, Inc. (UL): Fire Protection Equipment
Directory
- D. Factory Mutual Research Corp (FM): Approval Guide, 2007-2011
- E. American National Standards Institute (ANSI):
S3.41.....Audible Emergency Evacuation Signal, 1990
edition, reaffirmed 2008
- F. International Code Council, International Building Code (IBC), 2009
edition.
- G. VA fire protection design manual June 2021

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. 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 manufacturers' requirements and that satisfactory
total system operation has been achieved.

2.2 CONDUIT, BOXES, AND WIRE

- A. Conduit shall be in accordance with this specification 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 3/4-inch (19 mm) minimum.
 - 4. Fire alarm conduits shall be factory painted "RED".

5. All fire alarm boxes, pull boxes, cover plates shall be factory painted "RED" and shall be labeled "Fire Alarm".

B. Wire:

1. Wiring shall be in accordance with NEC article 760, this specification, 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.
2. Not Used.
3. Not Used.
4. Not Used.

C. Terminal Boxes, Junction Boxes, and Cabinets:

1. Shall be galvanized steel in accordance with UL requirements.
2. All boxes shall be sized and installed in accordance with NFPA 70.
3. 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 (19 mm) 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.

2.3 NOT USED.

2.4 NOT USED.

2.5 NOT USED.

2.6 NOT USED.

2.7 ALARM NOTIFICATION APPLIANCES

- A. Not Used.
- B. Not Used.
- C. Strobes:

1. Xenon flash tube type minimum 15 candela in toilet rooms and 75 candela in all other areas with a flash rate of 1 HZ. Strobes

shall be synchronized where required by the National Fire Alarm Code (NFPA 72).

2. Backplate shall be red with 1/2 inch (13 mm) permanent red letters. Lettering to read "Fire", be oriented on the wall or ceiling properly, and be visible from all viewing directions.
3. Each strobe circuit shall have a minimum of 20 percent spare capacity.
4. Strobes may be combined with the audible notification appliances specified herein.
5. Strobe shall have 15, 35, 75, 90, 110, 150 and 170 candelas and shall be field adjustable.

D. Not Used.

2.8 NOT USED.

2.9 NOT USED.

2.10 NOT USED.

2.11 NOT USED.

2.12 NOT USED.

2.13 SPARE AND REPLACEMENT PARTS

A. Provide spare and replacement parts as follows:

1. Fire alarm strobes - 1

B. Not Used.

C. Spare and replacement parts shall be in original packaging and submitted to the COR.

D. Not Used.

E. Provide to the VA, all hardware, software, programming tools, license and documentation necessary to permanently modify the fire alarm system on site. The minimum level of modification includes addition and deletion of devices, circuits, zones and changes to system description, system operation, and digitized evacuation and instructional messages.

2.14 INSTRUCTION CHART:

A. Provide typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame with a backplate. Install the frame in a conspicuous location observable from each control unit where operations are performed. The card shall show those steps to be taken by an operator when a signal is received under all conditions, normal, alarm, supervisory, and trouble. Provide an additional copy with the binder for the input output matrix for the

sequence of operation. The instructions shall be approved by the COR before being posted.

2.15 CONDUIT FITTINGS

- A. Electrical metallic tubing fittings:
 - 1. Fittings shall meet the requirements of UL 514B and ANSI/ NEMA FB1.
 - 2. Only steel or malleable iron materials are acceptable.
 - 3. Couplings and connectors: Concrete tight and rain tight, with connectors having insulated throats. Use gland and ring compression type couplings and connectors for conduit sizes 50 mm (2 inches) and smaller. Use set screw type couplings with four set screws each for conduit sizes over 50 mm (2 inches). Use set screws of case-hardened steel with hex head and cup point to firmly seat in wall of conduit for positive grounding.
 - 4. Indent type connectors or couplings are prohibited.
 - 5. Die-cast or pressure-cast zinc-alloy fittings or fittings made of "pot metal" are prohibited.

2.16 CONDUIT SUPPORTS

- A. Parts and hardware: Zinc-coat or provide equivalent corrosion protection.
- B. Individual Conduit Hangers: Designed for the purpose, having a pre-assembled closure bolt and nut, and provisions for receiving a hanger rod.
- C. Multiple conduit (trapeze) hangers: Not less than 38 mm by 38 mm (1-1/2 by 1-1/2 inch), 12 gage steel, cold formed, lipped channels; with not less than 9 mm (3/8 inch) diameter steel hanger rods.
- D. Solid Masonry and Concrete Anchors: Self-drilling expansion shields, or machine bolt expansion.

2.17 OUTLET, JUNCTION, AND PULL BOXES

- A. UL-50 and UL-514A.
- B. Cast metal where required by the NEC or shown and equipped with rustproof boxes.
- C. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- D. Metal Floor Boxes: Cast or sheet metal, semi-adjustable, rectangular.
- E. Sheet metal boxes: Galvanized steel, except where otherwise shown.
- F. Flush mounted wall or ceiling boxes shall be installed with raised covers so that front face of raised cover is flush with the wall.

Surface mounted wall or ceiling boxes shall be installed with surface style flat or raised covers.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Provide fire alarm devices per NFPA 72, VA fire protection design manual and connect all devices to new or existing fire alarm control panel.
- B. Not Used.
- C. 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 applicable codes, and all penetrations of smoke and fire barriers shall be protected as required by Section 07 84 00, FIRESTOPPING.
- D. All conduits, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas.
- E. All new and reused exposed conduits shall be painted in accordance with Section 09 91 00, PAINTING to match surrounding finished areas and red in unfinished areas.
- F. All existing accessible fire alarm conduit not reused shall be removed.
- G. Existing devices that are reused shall be properly mounted and installed. Where devices are installed on existing shallow backboxes, extension rings of the same material, color and texture of the new fire alarm devices shall be used. Mounting surfaces shall be cut and patched in accordance with Section 01 00 00, GENERAL REQUIREMENTS, Restoration, and be re-painted in accordance with Section 09 91 00, PAINTING as necessary to match existing.
- H. All fire detection and alarm system devices, control units and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas. Exact locations are to be approved by the COR.
- I. Not Used.
- J. Strobes shall be flush wall mounted with the bottom of the unit located 80 inches (2,000 mm) above the floor or 6 inches (150 mm) below

ceiling, whichever is lower. Locate and mount to maintain a minimum 36 inches (900 mm) clearance from side obstructions.

K. Not Used.

L. Not Used.

M. Not Used.

N. Not Used.

O. Not Used.

P. Not Used.

Q. Conduit INSTALLATION, GENERAL

1. Install conduit as follows:

- a. In complete runs before pulling in cables or wires.
- b. Flattened, dented, or deformed conduit is not permitted. Remove and replace the damaged conduits with new undamaged material.
- c. Assure conduit installation does not encroach into the ceiling height head room, walkways, or doorways.
- d. Cut square with a hacksaw, ream, remove burrs, and draw up tight.
- e. Mechanically continuous.
- f. Independently support conduit at 2.4 m (8 foot) on center. Do not use other supports i.e., (suspended ceilings, suspended ceiling supporting members, lighting fixtures, conduits, mechanical piping, or mechanical ducts).
- g. Support within 300 mm (12 inches) of changes of direction, and within 300 mm (12 inches) of each enclosure to which connected.
- h. Close ends of empty conduit with plugs or caps at the rough-in stage to prevent entry of debris, until wires are pulled in.
- i. Conduit installations under fume and vent hoods are prohibited.
- j. Secure conduits to cabinets, junction boxes, pull boxes and outlet boxes with bonding type locknuts. For rigid and IMC conduit installations, provide a locknut on the inside of the enclosure, made up wrench tight. Do not make conduit connections to junction box covers.
- k. Do not use aluminum conduits in wet locations.
- l. Unless otherwise indicated on the drawings or specified herein, all conduits shall be installed concealed within finished walls, floors and ceilings.

2. Conduit Bends:

- a. Make bends with standard conduit bending machines.

- b. Conduit hickey shall be used for slight offsets, and for straightening stubbed out conduits.
 - c. Bending of conduits with a pipe tee or vise is prohibited.
 3. Fire alarm conduit shall be factory painted red (a red "top-coated" conduit from the conduit manufacturer shall be used in lieu of painted conduit) in accordance with the requirements of this specification.
 4. Furred or Suspended Ceilings and in Walls:
 - a. Conduit for conductors 600 volts and below:
 - 1) Rigid steel, IMC, rigid aluminum, or EMT. Different type conduits mixed indiscriminately in the same system is prohibited.
 - b. Align and run conduit parallel or perpendicular to the building lines.
 - c. Tightening set screws with pliers is prohibited.
- R. CONDUIT SUPPORTS, INSTALLATION
 1. Safe working load shall not exceed 1/4 of proof test load of fastening devices.
 2. Use pipe straps or individual conduit hangers for supporting individual conduits. Maximum distance between supports is 2.5 m (8 foot) on center.
 3. Support multiple conduit runs with trapeze hangers. Use trapeze hangers that are designed to support a load equal to or greater than the sum of the weights of the conduits, wires, hanger itself, and 90 kg (200 pounds). Attach each conduit with U-bolts or other approved fasteners.
 4. Support conduit independently of junction boxes, pull boxes, fixtures, suspended ceiling T-bars, angle supports, and similar items.
 5. Fasteners and Supports in Solid Masonry and Concrete:
 - a. Existing Construction:
 - 1) Steel expansion anchors not less than 6 mm (1/4 inch) bolt size and not less than 28 mm (1-1/8 inch) embedment.
 - 2) Power set fasteners not less than 6 mm (1/4 inch) diameter with depth of penetration not less than 75 mm (3 inches).
 - 3) Use vibration and shock resistant anchors and fasteners for attaching to concrete ceilings.

6. Hollow Masonry: Toggle bolts are permitted.
7. Bolts supported only by plaster or gypsum wallboard are not acceptable.
8. Metal Structures: Use machine screw fasteners or other devices specifically designed and approved for the application.
9. Attachment by wood plugs, rawl plug, plastic, lead or soft metal anchors, or wood blocking and bolts supported only by plaster is prohibited.
10. Chain, wire, or perforated strap shall not be used to support or fasten conduit.
11. Spring steel type supports or fasteners are prohibited for all uses except: Horizontal and vertical supports/fasteners within walls.
12. Vertical Supports: Vertical conduit runs shall have riser clamps and supports in accordance with the NEC and as shown. Provide supports for cable and wire with fittings that include internal wedges and retaining collars.

S. BOX INSTALLATION

1. Boxes for Concealed Conduits:
 - a. Flush mounted.
 - b. Provide raised covers for boxes to suit the wall or ceiling, construction and finish.
2. In addition to boxes shown, install additional boxes where needed to prevent damage to cables and wires during pulling in operations.
3. Remove only knockouts as required and plug unused openings. Use threaded plugs for cast metal boxes and snap-in metal covers for sheet metal boxes.
4. Outlet boxes in the same wall mounted back-to-back are prohibited. A minimum 600 mm (24 inch), center-to-center lateral spacing shall be maintained between boxes).
5. Stencil or install phenolic nameplates on covers of the boxes identified on riser diagrams; for example: "SIG-FA JB No. 1".

3.2 TYPICAL OPERATION

- A. Operation shall match existing fire alarm system order of operation. Devices added as part of this project shall be added to nearby existing fire alarm circuit without modifying system operation.

3.3 NOT USED.

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 meets all contract requirements. After the system has passed the initial test and been approved by the COR, the contractor may request a final inspection.
- C. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
 - 1. Test the insulation on all installed cable and wiring by standard methods as recommended by the equipment manufacturer.
 - 2. Not used.
 - 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.

3.5 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 software problems 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 COR.

Robley Rex VA Medical Center
ASU PACU Safety Improvements
Louisville, Kentucky 40206

December 14, 2022
100% Construction Documents
Project No: 603-22-601
10-11

3.6 NOT USED.

PART 4 - SCHEDULES

4.1 SMOKE ZONE DESCRIPTIONS: NOT USED

4.2 DIGITIZED VOICE MESSAGES: NOT USED

4.3 LOCATION OF VOICE MESSAGES: NOT USED

---END---