

JOINT BASE LEWIS - McCHORD DESIGN STANDARDS

SECTION 28 31 74 - INTERIOR FIRE DETECTION AND ALARM SYSTEM

Design Requirements

- a. Fire alarm panels, transceivers, and other sensitive electrical or electronic equipment shall be installed in dedicated electrical equipment rooms readily accessible to maintenance personnel independent of building occupants (i.e., space accessible from exterior of facility), not in mechanical spaces or other areas subject to excessive temperature and moisture.
- b. Minimum conduit size for all fire alarm and detection is 3/4 inch.
- c. Duct smoke detectors generally should only cause the AHU it serves to shut down and cause a supervisory signal to be announced at the FACP and be transmitted by transceiver. A general alarm condition at the FACP should not cause a global shut down of the H.V.A.C. system unless required by code as part of a smoke control system. ATRP requirements for global shut down of the H.V.A.C. system shall be accomplished via mushroom switch. All AHU's and H.V.A.C. systems that are shut down by duct smoke detectors, fire alarm conditions, or ATRP switches shall auto restart when the condition that caused the shutdown is cleared or reset. Manual reset of H.V.A.C. systems is not acceptable.
- d. All designs shall be reviewed, approved, stamped, and signed by the Fire Protection Specialist prior to submitting for government approval.
- e. Preliminary and Final Acceptance Testing shall be witnessed by the Fire Protection Specialist. The USACE representative and/or DPW representatives shall be invited to attend and witness, but are not required to be present.
- f. Final acceptance testing must be scheduled 7 to 10 days prior to day of testing.
- g. Smoke detectors shall be of the photo-electric type wherever possible, ionization type detectors will only be used where alternative detectors are not available or unsuitable for specific applications. Manufacturers of ionization detectors specified must provide for no cost disposal of their detectors.
- h. Addressable fire alarm panels shall display history of events on the panel display without additional software/hardware.
- i. Notification appliances in individual sleeping rooms of dormitories that sound with the general alarm shall silence with the general alarm silence function from the fire alarm panel.
- j. When device is mounted externally on brick or exterior surface, a rubber gasket shall be used (to reduce electrolysis and grounds). Conduit penetrations in the top of exterior mounted devices is not acceptable.
- k. All conduit penetrations shall be through the sides of transceiver enclosures, do not penetrate transceiver enclosures on top or bottom.
- l. All fire alarm transceivers must be listed or approved for use with the existing Monaco D-21M base reporting system.
- m. All threaded connections on the antenna mast shall have silicone seal added for water proofing the joint.
- n. Spare parts, manuals for fire alarm system, documentation showing mapping/tree of devices (showing the polling sequence), and all software/hardware required for programming/editing shall be turned over to JBLM DPW personnel at the time of project closeout. For software-based systems, a record copy of the site-specific software will be

delivered to the JBLM Fire Alarm Shop after all changes have been made from acceptance testing.

- o. When warranty is in effect, the Fire Alarm Contractor shall be required to respond (physically go to building in Alarm or Trouble), within 48 hours to an ALARM CONDITION and 72 hours to a TROUBLE CONDITION.
- p. Fire Alarm Remote Annunciators are not desired as part of the fire alarm system on JBLM. Unless specifically required by code.

SECTION 28 31 74

INTERIOR FIRE DETECTION AND ALARM SYSTEM
07/21

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless a specific document version or date is indicated, use criteria from the most current reference as of the date of solicitation or if amended, date of solicitation amendment.

AMERICAN SOCIETY OF CIVIL ENGINEERS

ASCE 7 Minimum Design Loads for Buildings and Other Structures

FM GLOBAL (FM)

FM APP GUIDE (updated on-line) Approval Guide
<http://www.approvalguide.com/>

INTERNATIONAL BUILDING CODES

IBC International Building Code

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41.1 Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits

IEEE C62.41.2 Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 7240-16 Fire Detection and Alarm Systems – Part 16: Sound System Control and Indicating Equipment

ISO 7240-19 Fire Detection and Alarm Systems – Part 19: Design, Installation, Commissioning and Service of Sound Systems for Emergency Purposes

Joint Base Lewis - McChord

JBLM Design Standards <http://www.lewis-mcchord.army.mil/designstandards/index1.htm>

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13 Installation of Sprinkler Systems

NFPA 13D	Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes
NFPA 13R	Installation of Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height
NFPA 14	Standard for the Installation of Standpipes and Hose Systems
NFPA 20	Standards for the Installation of Stationary Pumps for Fire Protection
NFPA 70	National Electrical Code
NFPA 72	National Fire Alarm and Signaling Code
NFPA 90A	Installation of Air Conditioning and Ventilating Systems
NFPA 101	Life Safety Code

UNDERWRITERS LABORATORIES (UL)

UL 1242	Standard for Electrical Intermediate Metal Conduit Steel
UL 1449	UL Standard for Safety Surge Protective Devices
UL 1638	Visual Signaling Appliances - Private Mode Emergency and General Utility Signaling
UL 1971	Signaling Devices for the Hearing Impaired
UL 2017	General-Purpose Signaling Devices and Systems
UL 2034	UL Standard for Safety Single and Multiple Station Carbon Monoxide Alarms
UL 228	Door Closers-Holders, With or Without Integral Smoke Detectors
UL 268	UL Standard for Safety Smoke Detectors for Fire Alarm Systems
UL 268A	Smoke Detectors for Duct Application
UL 346	Waterflow Indicators for Fire Protective Signaling Systems
UL 38	Manual Signaling Boxes for Fire Alarm Systems
UL 464	UL Standard for Safety Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories

UL 467	UL Standard for Safety Grounding and Bonding Equipment
UL 497B	Protectors for Data Communication Circuits
UL 5	UL Standard for Safety Surface Metal Raceways and Fittings
UL 514A	UL Standard for Safety Metallic Outlet Boxes
UL 514B	Conduit, Tubing and Cable Fittings
UL 521	UL Standard for Safety Heat Detectors for Fire Protective Signaling Systems
UL 6	Electrical Rigid Metal Conduit-Steel
UL 797	UL Standard for Safety Electrical Metallic Tubing - Steel
UL 864	UL Standard for Safety Control Units and Accessories for Fire Alarm Systems
UL Electrical Construction	Electrical Construction Equipment Directory
UL Directory A	Building Materials Directory
UL Directory B	Fire Protection Equipment Directory

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01	Structural Engineering
UFC 3-310-04	Seismic Design of Buildings
UFC 3-520-01	Interior Electrical Systems
UFC 3-600-01	Fire Protection Engineering for Facilities
UFC 3-601-02	Operations and Maintenance: Inspection, Testing, and Maintenance of Fire Protection Systems
UFC 4-010-06	Cybersecurity of Facility-Related Control Systems

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

47 CFR 15	Radio Frequency Devices
47 CFR 90	Private Land Mobile Radio Services

1.2 DEFINITIONS

Wherever mentioned in this specification or on the drawings, the equipment, devices, and functions shall be defined as follows:

- a. Interface Device: An addressable device that interconnects hard wired systems or devices to an analog/addressable system.
- b. Remote Fire Alarm Control Unit: A control panel, electronically remote from the Fire Alarm System Control Panel, that receives inputs from automatic and manual fire alarm devices, may supply power to detection devices and interface devices, may provide transfer of power to the notification appliances, may provide transfer of condition to relays or devices connected to the control unit, and reports to and receives signals from the Fire Alarm System Control Panel.
- c. Terminal Cabinet: A steel cabinet with locking, hinge-mounted door that terminal strips are securely mounted.

1.3 SCOPE

- a. This work includes completion of design and providing a new complete Fire Alarm System or modifying the existing Fire Alarm System as described herein for the buildings identified in the SOW. Include in the system wiring, conduit, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, alarm, and supervisory signal initiating devices, alarm notification appliances, supervising station fire alarm system transceiver, and other accessories and miscellaneous items required for a complete operating system even though each item is not specifically mentioned or described. Provide systems complete and ready for operation.
- b. Fire detection system shall be a designated seismic system in accordance with ICC, IBC, and ASCE 7. Importance factor I_p shall be equal to 1.5. Provide seismic protection for equipment in accordance with Section 26 05 48.00 10, UFC 3-600-01, JBLM Design Standards, NFPA 70, NFPA 72, and IBC. Provide special inspections in accordance with Section 01 45 35 CODE REQUIRED SPECIAL INSPECTIONS, STRUCTURAL OBSERVATIONS, TESTS AND PROCEDURES. Provide designated seismic system certification for the Fire Alarm System components listed in this section in accordance with ASCE 7. Comply with all applicable Special Inspector of Record requirements of UFC 3-301-01.
- c. Provide equipment, materials, installation, workmanship, inspection, testing, and training in strict accordance with the required and advisory provisions of NFPA 72, JBLM Design Standards and UFC 3-600-01. Submit plan view drawing showing device locations, terminal cabinet locations, junction boxes, other related equipment, conduit routing, wire counts, circuit identification in each conduit, and circuit layouts for all floors.
- d. Final quantity, system layout, and coordination are the responsibility of the Contractor.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval information only. The following shall be submitted in accordance with [Section 01 33 00 SUBMITTAL PROCEDURES](#):

Shop drawings, manufacturer's catalog data, back-up battery calculations, voltage drop calculations, preliminary system test procedures, final system test procedures, and contractor certifications, must be reviewed, approved, stamped, and signed by the [Fire Protection Specialist](#) prior to submitting for government approval per [UFC 3-600-01](#).

SD-02 Shop Drawings

Shop Drawings; G

Submit two hard copies and one electronic (.pdf) version of the Fire Alarm System Shop Drawings, no later than 21 days prior to the start of the Fire Alarm System installation.

Descriptive Index, Legend, and Schedules; G

System Layout; G

Point-to-Point Wiring Diagrams; G

Installation Details; G

System Operation Description; G

Sequence of Operations Matrix; G

Cybersecurity Interconnection Schedule; G

SD-03 Product Data

Materials and Equipment; G

The data shall be highlighted to show model, size, options, etc., that are intended for consideration. Data shall be adequate to demonstrate compliance with all contract requirements. In addition, a complete table of contents that includes equipment description, model number, and quantity shall be provided. Catalog data sheets shall also indicate U.L. Listing / FM approval and the country of manufacture.

Technical Data and Computer Software; G

Name Plates; G

Graphic Map; G

Submit a bond copy representation of the graphic map to be provided for approval prior to final graphic map being manufactured.

Spare Parts; G

Spare parts data shall be included for each different item of material and equipment specified.

Preliminary Tests Procedures; G

Proposed procedures for Preliminary Tests shall be approved by the government at least 14 days prior to the proposed start of the tests. Proposed date and time to begin Preliminary Tests, shall be submitted with the Preliminary Tests Procedures. Contractor to coordinate all tests with the [Fire Protection Specialist](#) and the USACE representative and/or the DPW representative.

Final Acceptance Test Procedures; G

Proposed procedures for Final Acceptance Test shall be approved by the government, no later than 14 days prior to the proposed start of the tests. Proposed date and time to begin Final Acceptance Test, shall be submitted with the Final Acceptance Test Procedures. Contractor to coordinate all tests with the [Fire Protection Specialist](#) and the USACE representative and/or the DPW representative.

SD-05 Design Data

Battery Calculations; G

Voltage Drop Calculations; G

SD-06 Test Reports

Megger Testing Report; G

Provide electronic copies (.pdf or WORD) of the completed Megger Testing for review and approval prior to [Preliminary System Acceptance Testing](#).

Loop Resistance Testing Report; G

Provide electronic copies (.pdf or WORD) of the completed Loop Resistance Testing for review and approval prior to [Preliminary System Acceptance Testing](#).

Audibility Test Report; G

Electronic copies (.pdf or WORD) of the completed Audibility Testing. Information shall either be presented on a floor plan drawing or in tabular form providing ambient and testing decibel (dB) scores for review and approval prior to [Preliminary System Acceptance Testing](#).

Preliminary Test Report; G

Electronic copies (.pdf) of the completed Preliminary Test Report, no later than 14 days after the completion of the Preliminary Tests.

Fire Protection Specialist Preliminary Test Report; G

Final Acceptance Test Report; G

Electronic copies (.pdf) of the completed Final Acceptance Tests Reports, no later than 14 days after the completion of the Final

Acceptance Tests.

SD-07 Certificates

Fire Protection Specialist Certification; G

The name and documentation of certification of the proposed [Fire Protection Specialists](#), no later than 14 days after the Notice to Proceed and prior to the submittal of the [Fire Alarm System](#).

Certification Letter by Fire Protection Specialist; G

Installer Certification; G

The name and documentation of certification of the proposed Fire Alarm System Installer.

Designer Certification; G

The name and documentation of certification of the proposed Fire Alarm System Designer.

Supervisor Certification; G

The name and documentation of certification of the proposed Fire Alarm System Supervisor.

Technician Certification; G

The name and documentation of certification of the proposed Fire Alarm System Technician.

Electrician Certification; G

The name and documentation of certification of the proposed Fire Alarm System Electrician.

Test Personnel Certification; G

The name and documentation of certification of the proposed Fire Alarm System Test Personnel.

Manufacturer's Representative Certification; G

The name and documentation of certification of the proposed Fire Alarm System Manufacturer's Representative.

Certificates of qualifications, as specified; G

Seismic Certification of Dedicated Seismic Systems; G

Cybersecurity Equipment Certification; G

Cybersecurity Installation Certification; G

SD-09 Field Reports

Inspection by Fire Protection Specialist; G

SD-10 Operation and Maintenance Data

Operation and Maintenance Instructions; G

Submit two hard copies and one electronic (.pdf) version of manuals listing step-by-step procedures required for system startup, operation, shutdown, and routine maintenance, at least 14 days prior to field training.

SD-11 Closeout Submittals

As-Built Drawings

As-built shop drawings, at least 14 days after completion of the Final Tests. The Fire Alarm System Drawings shall be updated to reflect as-built conditions after all related work is completed. Provide electronic drawings in AutoCAD format on a CD.

Warranty Letter

Dongle and Software

Spare Parts

Instruction of Government Employees; G

After final system acceptance testing has been approved by the government, propose an On-site Training schedule along with proposed date and time at least 14 days prior to the proposed start of On-site Training.

Manufacturer Certification Training for equipment installed; G

The Fire Alarm System Contractor shall be responsible for factory training of (2) JBLM fire alarm technicians either at JBLM or at the manufacturer's factory. This includes all costs associated with wages, training, travel, and per diem (lodging, meals, rental car, rental car gas, parking at airport, etc.). The number of days for factory training shall be determined by the manufacturer of the Fire Alarm Mass Notification system installed.

Training Plan; G

1.4.1 Combined Submittals

The Shop Drawings, Materials and Equipment, Battery Calculations, and Voltage Drop Calculations shall be submitted in the same package so they can be reviewed at the same time.

1.5 Technical Data and Computer Software

Technical Data and Computer Software (meaning technical data that relates to computer software) that are specifically identified in this project, and may be defined/required in other specifications, shall be delivered to the government as part of the complete and usable **Fire Alarm System**. Identify

data delivered by reference to the particular specification paragraph against which it is furnished. Data to be submitted shall include complete system, equipment, and software descriptions. Descriptions shall show how the equipment will operate as a system to meet the performance requirements of this contract. The data package shall also include the following:

- a. Identification of programmable portions of system equipment and capabilities.
- b. Description of system revision and expansion capabilities and methods of implementation detailing both equipment and software requirements.
- c. Provision of operational software data on all modes of programmable portions of the fire alarm and detection system.
- d. Description of [Fire Alarm Control Panel](#) equipment operation.
- e. Description of auxiliary and remote equipment operations.
- f. Library of application software.
- g. Operation and maintenance manuals.

1.6 [QUALITY CONTROL](#)

The contractor's QC shall ensure the installing contractor conducts a complete pre-acceptance test of 100% of the installed system to ensure it is fully functional and code compliant prior to scheduling the Preliminary System Acceptance Testing with the [Fire Protection Specialist](#). All pre-acceptance test results shall be submitted to the [Fire Protection Specialist](#), the USACE representative, and/or DPW representatives 14 days prior to scheduling the [Preliminary System Acceptance Testing](#) for review. In the event that [Preliminary System Acceptance Testing](#) fails due to the system not being ready or does not function properly, the Fire Alarm System Contractor shall be responsible for all fees associated with the [Fire Protection Specialist](#), the USACE representative, and/or DPW representatives attending the retest.

- a. In NFPA publications referred to herein, consider advisory provisions to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears; interpret reference to "Authority Having Jurisdiction" to mean JBLM Public Works Life Safety Systems Manager.
- b. The recommended practices stated in the manufacturer's literature or documentation shall be considered as mandatory requirements.
- c. Devices and equipment for fire alarm service shall be listed by [UL Fire Prot Dir](#) or approved by [FM APP GUIDE](#).
- d. Preliminary System Acceptance Testing shall only occur when the following conditions exist:
 - (1) All site compaction and grading shall be complete in addition to other site activities that vibrate the building.
 - (2) The building shall be substantially complete with little to no work involving gypsum wallboard, texturing, painting, carpentry,

flooring, concrete, etc. ongoing. The building shall be substantially cleaned with dust and trash removed from the building.

- e. Final System Acceptance Testing shall only occur when the following conditions exist:
 - (1) The site shall be substantially complete with landscaping being the only remaining work to be completed. The site shall have all compaction, grading, and asphalt work completed with the permanent fire access lane ready for use.
 - (2) The building shall be substantially complete with no work involving gypsum wallboard, texturing, painting, carpentry, flooring, concrete, etc. ongoing. The building shall be cleaned with dust, trash, and floor protection removed from the building.

1.7 FIRE PROTECTION SPECIALIST (QUALIFIED FIRE PROTECTION ENGINEER)

Work specified in this section shall be performed under the supervision of and certified by the [Fire Protection Specialist](#) (Qualified Fire Protection Engineer). The [Fire Protection Specialist](#) shall be an individual who is a registered professional engineer in the State of Washington and has NCEES licensing. The [Fire Protection Specialist](#) shall be regularly engaged in the design and installation of the type and complexity of system specified in the Contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months. Any individual, business, or firm engaged in the inspecting, testing, maintaining, designing, or servicing of fire and life safety systems and equipment shall be certified to perform these activities in accordance with the State of Washington. The [Fire Protection Specialist](#) shall not be a part of the specialty subcontractor design team and shall have no business relationships (owner, partner, operating officer, distributor, salesman or technical representative) with any construction subcontractors involved with the project or with any fire protection equipment device manufacturers, suppliers or installers for any such equipment provided as part of this project.

1.8 CONTRACTOR QUALIFICATIONS

1.8.1 Installer Certification

National Institute for Certification in Engineering Technologies (NICET) Level II certification with a minimum of two years of experience in the Fire Alarm Technology subfield of fire protection engineering technology. The Fire Alarm System installer shall be factory trained in the installation, adjustment, testing, and operation of Fire Alarm devices, cabinets and panels specified herein and on the drawings. Provide a copy of the NICET Certification for review and approval.

1.8.2 Designer Certification

System working plans and calculations shall be prepared and submitted for approval by an individual that has obtained National Institute for Certification in Engineering Technologies (NICET) Level III certification in the Fire Alarm Technology subfield of fire protection engineering technology in accordance with NFPA 72. Provide a copy of the NICET

Certification for review and approval.

1.8.3 Supervisor Certification

National Institute for Certification in Engineering Technologies (NICET) Level III certification with a minimum of (8) eight years of experience in the Fire Alarm Technology subfield of fire protection engineering technology shall oversee the installation of equipment and shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein. Provide a copy of the NICET Certification for review and approval.

1.8.4 Technician Certification

National Institute for Certification in Engineering Technologies (NICET) Level II certification with a minimum of (4) four years of experience in the Fire Alarm Technology subfield of fire protection engineering technology is required for the Fire Alarm System Technicians utilized to install and terminate Fire Alarm System devices, cabinets and panels. The Fire Alarm System technicians installing the equipment shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein. Provide a copy of the NICET Certification for review and approval.

1.8.5 Electrician Certification

National Institute for Certification in Engineering Technologies (NICET) Level II certification with a minimum of (2) two years of experience in the Fire Alarm Technology subfield of fire protection engineering technology shall be allowed to install wire, cable, conduit and backboxes for the Fire Alarm System. Provide a copy of the NICET Certification for review and approval.

1.8.6 Test Personnel Certification

Fire Alarm System Technicians with National Institute for Certification in Engineering Technologies (NICET) Level III certification in the Fire Alarm Technology subfield of fire protection engineering technology and licensed to perform this type of work in the State of Washington shall be required to test and certify the installation of the Fire Alarm System devices, cabinets and panels. The Fire Alarm System Technician testing the equipment shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein. Provide a copy of the NICET Certification for review and approval.

1.8.7 Manufacturer's Representative Certification

The Manufacturer's Representative shall be an employee of the manufacturer or manufacturer authorized dealer with necessary technical training on the Fire Alarm System being installed. Provide a copy of the Certification from the Manufacturer for review and approval.

1.9 SHOP DRAWINGS

The Fire Alarm System Shop Drawings shall conform to the requirements established for "Shop Drawings" as prescribed in [NFPA 72](#). Drawings shall include plan and elevation views demonstrating that the equipment will fit

the allotted spaces with clearance for installation and maintenance. Each set of drawings shall include the following:

- a. Submitted shop drawing size shall be ISO A1 (22x34).
- b. Each submittal drawing shall bear the NICET certification, designer's signature, and date of the signature. Submittal drawings not having this information will be returned without review by the [Fire Protection Specialist](#).
- c. Descriptive index of drawings in the submittal with drawings listed in sequence by drawing number. A legend identifying device symbols, nomenclature, conventions used, and wiring size and color code scheme.
- d. Floor plans drawn to a scale not less than 1/8" = 1'-0" which clearly shows data essential for proper installation of each system. Show plan view, wiring riser diagrams, and wiring details. Show locations of devices, equipment, risers, electrical power connections, and other details required to clearly describe the proposed arrangement.
- e. Gridlines horizontally and vertically shall be provided as part of the backgrounds.
- f. When the floor plan exceeds a single drawing, match lines shall be provided that indicate on which sheet the building continues.
- g. When the floor plan exceeds a single drawing, a key plan shall be provided that identifies which portion of the building is provided on that drawing and which drawings are used for other portions of the building.
- h. Interfacing with fire suppression control components must be clearly indicated on drawings. Solenoids must be FM approved for release by the releasing panel.
- i. Point-to-Point Wiring Diagrams showing the points of connection and terminals used for electrical field connections in the system, including interconnections between the equipment or systems which are supervised or controlled by the system. Diagrams must show connections from field devices to the Fire Alarm Control Panel and initiating circuits, switches, relays and terminals.
- j. Installation Details showing mounting information, wiring terminations of electrical field connections.
- k. System Operation Description and Action Matrix explaining how the system operates.
- l. One-line riser diagrams shall show all initiating, notification, and modules on the appropriate circuits and be provided with the following information:
 - (1) Each Initiation Devices shall be provided with the device address, room name, and room number in the order that devices are connected on each circuit. The device address shall match the device address indicated on the floor plan.

- (2) Each notification Appliance shall be provided with the circuit number and appliance address, room name, room number, appliance output (candela or watts) in the order that devices are connected on each circuit. Appliance address shall match the appliance address indicated on the floor plan
- (3) Monitor, Control, Relay, and Isolation modules shall be provided with module address, room name, and room number. Module address shall match the module address indicated on the floor plan.
- (4) Per NFPA 72, a riser diagram is required to show the type and number of system components/devices on each circuit and the number of conductors for each circuit. Since a circuit is defined in NFPA 72 as a connection path between locations, the riser diagram shall show the order that devices are connected.

m. Voltage Drop Calculations and Battery Calculations.

1.10 DELIVERY, STORAGE, AND HANDLING

All equipment delivered and placed in storage shall be housed in a manner to preclude any damage from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

1.11 KEYS

Keys and locks for equipment shall be identical and as follows:

- a. Master 211 key for buildings located on a Lewis Main.
- b. Master 211 key for buildings located on Lewis North.
- c. Master CAT30 key for buildings located on McChord Field.
- d. Local Operator Consoles (LOCs) are not permitted to be locked or lockable.

1.12 CYBERSECURITY

Provide a [Cybersecurity Interconnection Schedule](#) in accordance with 25 05 11 CYBERSECURITY FOR FACILITY-RELATED CONTROL SYSTEMS. Schedule must be coordinated with other work that will be interconnected to the Fire Alarm System, and interconnections must be approved by the Government before relying on them for system functionality. Provide [cybersecurity Equipment Certification](#) and [Cybersecurity Installation Certification](#).

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Submit annotated catalog data as required in the paragraph SUBMITTAL, in table format on the drawings, showing manufacturer's name, model, voltage, and catalog numbers for equipment and components. Also provide UL or FM listing cards for equipment provided.

2.1.1 Manufacturer

Fire Alarm System components shall be of current design, meet the "Buy America Act", and shall be in regular and current production at the time of Fire Alarm System installation. Provide design, materials, and devices for a protected premises Fire Alarm System, complete, conforming to NFPA 72, except as otherwise or additionally specified herein.

2.1.2 Standard Products

Provide materials, equipment, and devices that have been tested by a nationally recognized testing laboratory, such as UL or FM Approvals, and listed or approved for fire protection service when so required by NFPA 72 or this specification. Select material from one manufacturer, where possible, and not a combination of manufacturers, for any particular classification of materials. Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products.

2.2 NAMEPLATES

Major components of equipment shall have the manufacturer's name, address, type or style, model or serial number, catalog number, date of installation, installing Contractor's name and address, and the contract number provided on a new plate permanently affixed to the item or equipment. Major components include, but are not limited to, the following:

- a. Fire Alarm System Control Panel
- b. Transceiver
- c. Power Supplies
- d. Terminal Cabinets

2.3 GENERAL PRODUCT REQUIREMENT

All Fire Alarm System equipment shall meet the "Buy America Act" and listed for use under the applicable reference standards. Interfacing of Listed UL 864 or similar approved industry listing shall be done in a laboratory listed configuration, if the software programming features cannot provide a listed interface control. If a field modification is needed, such as adding equipment like relays, the manufacturer of the panels being same or different brand from manufacturer shall provide the installing contractor for review and confirmation by the installing contractor. As part of the submittal documents, provide this information.

2.4 SYSTEM OPERATION

The Addressable Interior Fire Alarm System shall be a complete, supervised, non-coded, analog/addressable system conforming to NFPA 72, UL 864, and UL 2017. The system shall be activated into the alarm mode by actuation of any alarm initiating device. The system shall remain in the alarm mode until the control panel is reset and restored too normal. The system may be placed in the alarm mode by local microphones, LOC, or remotely from authorized locations/users from the 911 center.

Submit data on each circuit to indicate that there is at least 25 percent spare capacity for notification appliances and 25 percent spare capacity for

initiating devices. Annotate data for each circuit on the drawings. Submit a complete description of the system operation on the drawings and a complete list of device addresses and corresponding messages.

2.4.1 Initiating Devices and Notification Appliances Circuits

- a. All Fire Alarm System Signaling Line Circuit (SLC) wiring circuits shall be class A.
- b. All Fire Alarm System initiating device wiring circuits shall be class A.
- c. All Fire Alarm System notification appliance wiring circuits shall be class A.
- d. All Fire Alarm System cabling shall be in conduit. Exposed cabling will not be allowed.
- e. The system shall operate in the alarm mode upon actuation of any alarm initiating device signal. The system shall remain in the alarm mode until the Fire Alarm System is reset.

2.4.2 Functions and Operating Features

The system shall provide the following functions and operating features:

- a. The Fire Alarm Control Panel shall provide power, annunciation, supervision, and control for the system. Addressable systems shall be microcomputer (microprocessor or microcontroller) based with a minimum word size of eight bits with sufficient memory to perform as specified.
- b. Provide class A wiring for networked components.
- c. For Class A circuits with conductor lengths of 10 feet or less, the conductors shall be permitted to be installed in the same raceway in accordance with NFPA 72.
- d. The visual notification appliances shall have the flash rates synchronized as required by NFPA 72.
- e. Provide electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control panel.
- f. Provide an audible and visual trouble signal to activate upon a single break or open condition, ground fault, or short circuit. The trouble signal shall also operate upon loss of primary power (AC) supply, absence of a battery supply, low battery voltage, or removal of alarm or supervisory panel modules. Provide a trouble alarm silence feature that shall silence the audible trouble signal, without affecting the visual indicator. A smoke sensor in the process of being verified for the actual presence of smoke shall not initiate a trouble condition.
- g. Alarm, supervisory, and/or trouble signals shall be automatically transmitted to the D-21M at the 911 Call Center.
- h. Alarm functions shall override trouble or supervisory functions.

Supervisory functions shall override trouble functions.

- i. Programmed information shall be stored in non-volatile memory.
- j. The system shall be capable of operating, supervising, and/or monitoring both addressable and non-addressable alarm and supervisory devices.
- k. There shall be no limit, other than maximum system capacity, as to the number of addressable devices that may be in alarm simultaneously.
- l. Where the Fire Alarm System is responsible for initiating an action in another emergency control device or system, such as an H.V.A.C. system, the addressable fire alarm relay shall be in the vicinity of the emergency control device.
- m. An alarm signal shall automatically initiate the following functions:
 - (1) Transmission of an alarm signal to the D-21M in the 911 center.
 - (2) Visual indication of the device operated on the Fire Alarm System Control Panel. Indication on the Fire Alarm System Control Panel shall be by floor, zone or circuit, and type of device.
 - (3) Continuous actuation of all alarm notification appliances.
 - (4) Recording of the event via electronically in the history log of the Fire Alarm System Control Panel.
 - (5) Release of doors held open by electromagnetic devices.
 - (6) Release of power to electric locks (delayed egress locks) on doors that are part of the means of egress.
 - (7) Operation of a Photoelectric Smoke Detector in an elevator lobby or other location associated with the automatic recall of elevators, shall recall the elevators.
 - (8) Operation of a duct smoke sensor shall shut down the appropriate air handler in accordance with **NFPA 90A**.
 - (9) Operation of a sprinkler water flow switch serving an elevator machinery room or elevator shaft shall operate shunt trip circuit breaker(s) to shut down power to the elevator in accordance with **ASME A17.1/CSA B44**.
- p. A supervisory signal shall automatically initiate the following functions:
 - (1) Visual indication of the device operated on the Fire Alarm System Control Panel and sound the audible alarm at the panel.
 - (2) Transmission of a supervisory signal to the D-21M in the 911 center.
 - (3) Recording of the event electronically in the history log of the control unit.

- q. A trouble condition shall automatically initiate the following functions:
 - (1) Visual indication of the system trouble on the Fire Alarm System Control Panel and sound the audible alarm at the panel.
 - (2) Transmission of a trouble signal to the D-21M in the 911 center.
 - (3) Recording of the event in the history log of the control unit.
- r. The maximum permissible elapsed time between the actuation of an initiating device and its indication at the Fire Alarm System Control Panel is 10 seconds.
- s. The maximum elapsed time between the occurrence of the trouble condition and its indication at the Fire Alarm System Control Panel is 200 seconds.

2.5 FIRE ALARM CONTROL PANEL

Provide a complete [Fire Alarm System Control Panel](#) fully enclosed in a lockable steel cabinet as specified herein. Operations required for testing or for normal care and maintenance of the systems shall be performed from the front of the enclosure. If more than a single unit is required at a location to form a complete [Fire Alarm System Control Panel](#), the unit cabinets shall match exactly.

- a. Each control unit shall provide power, supervision, control, and logic for the entire system, utilizing solid state, modular components, internally mounted and arranged for easy access. Each control unit shall be suitable for operation on a 120 Volts A.C., 60 hertz, normal building power supply. Provide each panel with supervisory functions for power failure, internal component placement, and operation.
- b. Visual indication of alarm, supervisory, or trouble initiation on the [Fire Alarm System Control Panel](#) shall be by Liquid Crystal Display (LCD), Light Emitting Diode (LED), or similar means with a minimum of 80 characters.
- c. Provide secure operator console for initiating recorded messages, strobes and displays; and for delivering live voice messages. Provide capacity for at least eight pre-recorded messages. Provide the ability to automatically repeat pre-recorded messages. Provide a secure microphone for delivering live messages. Provide adequate discrete outputs to temporarily deactivate fire alarm audible notification, and initiate/synchronize strobes. Provide a complete set of self-diagnostics for controller and appliance network. Provide local diagnostic information display and local diagnostic information and system event log file.
- d. Provide secure operator console for initiating strobes and displays. Provide a complete set of self-diagnostics for controller and appliance network. Provide local diagnostic information display and local diagnostic information and system event log file.
- e. The [Fire Alarm System](#) shall be capable of supervising, audible, visual

and dry contact circuits. Provide audible signals to indicate any alarm, supervisory, or trouble condition. The alarm signals shall be different from the trouble signal.

- f. Provide a PAM-1 relay module to the Power Supplies that monitors supply voltage to the Notification Appliance Circuit (NAC) that is monitored by the [Fire Alarm System](#) as a trouble condition. PAM-1 relay module shall illuminate a red LED when in the normal mode of operation with the LED not illuminating when power is lost to one of the Notification Appliance Circuit (NAC) output circuits.
- g. The [Fire Alarm System](#) display shall indicate each of the following items that apply:
 - (1) Building Number
 - (2) POD Number
 - (3) Room Number
 - (4) Device Type
 - (5) Device Address

2.5.1 Cabinet

Install Fire Alarm System Control Panel components in cabinets large enough to accommodate all components and also to allow ample gutter space for interconnection of panels as well as field wiring. Provide prominent rigid plastic or metal identification plates for lamps, circuits, meters, fuses, and switches. The cabinet shall be provided in a sturdy steel housing, complete with back box, hinged steel door with cylinder lock, and surface mounting provisions.

2.5.2 Silencing Switches

2.5.2.1 Alarm Silencing Switch

Provide an [Alarm Silencing Switch](#) at the [Fire Alarm System Control Panel](#) that shall silence the audible and visual appliances. The [Alarm Silencing Switch](#) shall be overridden upon activation of a subsequent alarm. The sprinkler system waterflow alarm (electric bell) shall only be active while the waterflow/pressure switch - alarm is active and shall be silencable from the Fire Alarm System Control Panel to allow sprinkler system resetting without waterflow alarm operation prior to the Fire Alarm System being reset.

2.5.2.2 Supervisory and Trouble Silencing Switch

Provide [Supervisory and Trouble Silencing Switch](#) at the [Fire Alarm System Control Panel](#) that shall silence the audible trouble and supervisory signal, but not extinguish the visual indicator. The [Supervisory and Trouble Silencing Switch](#) shall be overridden upon activation of a subsequent alarm, supervision, or trouble condition. Audible trouble indication must resound automatically every 24 hours after the silencing feature has been operated.

2.5.3 Non-Interfering

Power and supervise each circuit such that a signal from one device does not prevent the receipt of signals from any other device. Circuits shall be manually reset by switch from the [Fire Alarm System Control Panel](#) after the initiating device(s) have been restored too normal.

2.5.4 [Outputs and Operational Modules](#)

All [Outputs and Operational Modules](#) shall be fully supervised with on-board diagnostics and trouble reporting circuits. Provide form "C" contacts for system alarm and trouble conditions. Provide circuits for operation of auxiliary appliance during trouble conditions.

2.5.5 [Memory](#)

Provide each control unit with non-volatile [Memory](#) and logic for all functions. The use of long-life batteries, capacitors, or other age-dependent devices shall not be considered as equal to non-volatile processors, PROMS, or EPROMS.

2.5.6 [Field Programmability](#)

Provide control units and control panels that are fully field programmable for control, initiation, notification, supervisory, and trouble functions of both input and output. The system program configuration shall be menu driven. System changes shall be password protected and shall be accomplished using personal computer based equipment. Any proprietary equipment and proprietary software in addition to site specific software needed by qualified technicians to implement future changes to the fire alarm system shall be provided as part of this contract to include factory training to use the software and access technical support provided by the factory.

2.5.7 [Input/Output Modifications](#)

The [Fire Alarm System Control Panel](#) shall contain features that allow the bypassing of input devices from the system or the modification of system outputs. These control features shall consist of a panel mounted keypad. Any bypass or modification to the system shall indicate a trouble condition on the [Fire Alarm System Control Panel](#).

2.5.8 [Resetting](#)

Provide the necessary controls to prevent the [Resetting](#) of any alarm, supervisory, or trouble signal while the alarm, supervisory or trouble condition on the system still exists.

2.5.9 [Instruction Card](#)

Provide a typeset printed or typewritten [Instruction Card](#) mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a conspicuous location observable from the [Fire Alarm System Control Panel](#). The [Instruction Card](#) shall show the steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions, normal, alarm, supervisory, and trouble. The [Instruction Card](#) shall be approved by the USACE representative and/or DPW representative.

2.5.10 History Logging

The control panel shall have the ability to store a minimum of 400 events in a log. These events shall be stored in a battery-protected memory and shall remain in the memory until the memory is downloaded or cleared manually. Resetting of the control panel shall not clear the memory.

2.5.11 Priority of Systems

- (1) Priority #1: The Fire Alarm System. Operation of the Fire Alarm System shall immediately override the following:
 1. Carbon Monoxide signal.
 2. Building PA, A/V, and Intercom Systems.
- (2) Priority #2: The Carbon Monoxide signal. Operation of the Carbon Monoxide signal shall immediately override the following:
 1. Building PA, A/V, and Intercom Systems.
- (3) Priority #3: The building PA, A/V, and Intercom Systems.
- (4) Lower priority items shall not override higher priority items.

2.6 SYSTEM MONITORING

2.6.1 Valves

Each valve affecting the proper operation of a fire protection system, including automatic sprinkler control valves, standpipe control valves, fire pump valves, isolating valves for pressure type water flow, valves at backflow preventers (whether supplied under this contract or existing), shall be electrically monitored to ensure its proper position. Provide each tamper switch with a separate address. Post indicating valves which are locked with a padlock and valves on backflow preventers installed in vaults which are locked with chain and padlock are exempt from electronic monitoring.

2.6.2 Independent Fire Detection System

Each existing independent smoke detection subsystem, kitchen fire extinguishing system, releasing system (e.g. AFFF), etc. shall be monitored for the appropriate alarm, trouble, and supervisory conditions. Provide each monitored condition with a separate address.

2.7 REMOTE ANNUNCIATORS

Do not provide a Remote Annunciator, JBLM does not allow Remote Annunciators to be installed.

2.8 OVERVOLTAGE AND SURGE PROTECTION

2.8.1 Signaling Line Circuit Surge Protection

For systems having circuits located outdoors, communications equipment shall be protected against surges induced on any signaling line circuit and shall

comply with manufacturer's instructions and NFPA 72. Cables and conductors, that serve as communications links, shall have surge protection circuits installed at each end that meet the following waveform(s):

- a. A 10 microsecond by 1000 microsecond waveform with a peak voltage of 1,500 volts and a peak current of 60 amperes.
- b. An 8 microsecond by 20 microsecond waveform with a peak voltage of 1,000 volts and a peak current of 500 amperes. Protection shall be provided at the equipment. Additional triple electrode gas surge protectors, rated for the application, shall be installed on each wireline circuit within 3 feet of the building cable entrance. Fuses shall not be used for surge protection.

2.8.2 Sensor Wiring Surge Protection

Digital and analog inputs and outputs shall be protected against surges induced by sensor wiring installed outdoors and as shown. The inputs and outputs shall be tested with the following waveforms:

- a. A 10 by 1000 microsecond waveform with a peak voltage of 1,500 volts and a peak current of 60 amperes.
- b. An 8 by 20 microsecond waveform with a peak voltage of 1,000 volts and a peak current of 500 amperes. Fuses shall not be used for surge protection.

2.8.3 Fire Alarm System Panels

All panels having 120 Volts A.C. power connections (**Fire Alarm System Control Panel, Power supplies, Monaco Transceiver**, etc.) shall be individually provided with surge protection from power surges in the electrical power source by a UL listed surge protection device in accordance with **UFC 3-520-01** Interior Electrical Systems.

2.9 ADDRESSABLE INTERFACE DEVICES

2.9.1 Addressable Monitor Modules

The system shall be capable of defining any module as an alarm module and report alarm trouble, loss of polling, or as a supervisory module, and reporting supervisory short, supervisory open or loss of polling such as water flow switches, valve supervisory switches, fire pump monitoring, independent smoke detection systems, relays for output function actuation, etc. **Monitor Modules** shall be UL or FM listed as compatible with the control panel. **Monitor Modules** shall provide address setting means compatible with the control panel's Signaling Line Circuit (SLC) supervision and store an internal identifying code. **Monitor Modules** shall contain an integral LED that flashes each time the monitor module is polled and is visible through the device cover plate. Manual Pull Stations with a **Monitor Module** in a common back box are not required to have an LED. Provide a **Monitor Module** within 3 feet of each remote power supply to monitor trouble conditions and provide unique identification for each power supply.

2.9.2 Addressable Control Modules

Control Modules shall be capable of operating as a relay (dry contact form

C) for interfacing the [Fire Alarm System Control Panel](#) with other systems, and to control door holders or initiate elevator fire service. [Control Modules](#) shall be UL or FM listed as compatible with the control panel. The control module shall have both an input and output address. The supervision shall detect a short on the supervised circuit and shall prevent power from being applied to the circuit. The control model shall provide address setting means compatible with the control panel's SLC supervision and store an internal identifying code. [Control Modules](#) shall contain an integral LED that flashes each time the [Control Module](#) is polled and is visible through the device cover plate. [Control Modules](#) shall be located in environmental areas that reflect the conditions to which they were listed.

2.9.3 Isolation Modules

Provide [Isolation Modules](#) to subdivide each signaling line circuit into groups of not more than 20 addressable devices between adjacent [Isolation Modules](#). Indicate location of [Isolation Modules](#) clearly on the one-line riser diagram and on the as-built drawings.

2.10 ELECTRIC POWER

2.10.1 Primary Power

[Primary Power](#) shall be 120 Volts A.C. service for the Fire Alarm System panels ([Control Panel](#), [Power Supply](#), [Monaco Transceiver](#), etc.) from the AC service to the building in accordance with [NFPA 72](#) and [UFC 3-520-01 INTERIOR ELECTRICAL SYSTEMS Section 3-2.7 Power for Fire Protection Systems](#). The breaker supplying power to the Fire Alarm System panels shall be red and provided with a red colored means of lockout. The electrical panel and breaker supplying Fire Alarm System panels shall be identified on the inside cover of each Fire Alarm System panel. Provide an electrical outlet within 3 feet of the [Fire Alarm System Control Panel](#) to provide power for programming laptop computer.

2.10.2 Secondary Power

Provide [Secondary Power](#) for system operation in the event of [Primary Power](#) failure. Transfer from [Primary Power](#) to [Secondary Power](#) or restoration from [Secondary Power](#) to [Primary Power](#) shall be automatic and shall not cause transmission of a false alarm.

2.10.2.1 Batteries

Provide 24 Volts D.C. sealed, maintenance-free, lead acid batteries as the source for [Secondary Power](#) for the [Fire Alarm System](#). [Batteries](#) shall contain suspended electrolyte. [Batteries](#) shall be maintained in a fully charged condition by means of a solid-state battery charger. Provide an automatic transfer switch to transfer the load from [Primary Power](#) to [Secondary Power](#) in the event of the failure of [Primary Power](#). Battery boxes shall not be mounted more than 48" above finished floor. Batteries equal to or exceeding 50 amp-hour shall not be mounted more than 36" above finished floor. [Batteries](#) shall be factory dated and installed within 12 months of the date of manufacturing.

2.10.2.2 Capacity

Battery size shall be of sufficient capacity to operate the Fire Alarm

System under supervisory and trouble conditions for a minimum of 72 hours followed by a minimum of 15 minutes of full load alarm.

2.10.2.3 Battery Calculations

Verify that **Secondary Power** capacity exceeds the supervisory and alarm power requirements. The starting voltage for all calculations to size the batteries shall be 24 Volts D.C..

- a. Substantiate the battery calculations for alarm and supervisory power requirements. Include ampere-hour demand requirements for each system component and for each panel component in compliance with **UL 864**.
- b. Provide complete battery calculations for both the alarm and supervisory power requirements. Submit ampere-hour requirements for each system component with the calculations.
- c. Provide **Voltage Drop Calculations** to indicate that sufficient voltage is available for proper operation of the system and all components, at the minimum rated voltage of 24 Volts D.C..

2.10.3 Battery Chargers

Provide a solid state, fully automatic, variable high/low charging rate battery charger. The charger shall be capable of providing 120 percent of the connected system load and shall maintain the batteries at full charge. In the event the batteries are fully discharged (20.4 Volts D.C.), the charger shall recharge the batteries back to 95 percent of full charge within 48 hours after a single discharge cycle as described in paragraph CAPACITY above. Provide pilot light to indicate when batteries are manually placed on a high rate of charge as part of the unit assembly if a high rate switch is provided.

2.11 INITIATION DEVICES

2.11.1 Manual Pull Stations

Provide metal or plastic, semi-flush mounted, double action, addressable **Manual Pull Stations** that are not subject to operation by jarring or vibration. **Manual Pull Stations** shall be equipped with screw terminals for each conductor. **Manual Pull Stations** that require the replacement of any portion of the device after activation are not permitted. **Manual Pull Stations** shall be finished in fire-engine red with molded raised lettering operating instructions of contrasting color. The use of a 211 key (Lewis Main and Lewis North) or Cat 30 key (McChord Field) shall be required to reset **Manual Pull Stations**. **Manual Pull Stations** shall have a separate screw terminal for each conductor.

2.11.2 Photoelectric Smoke Detectors

Provide addressable **Photoelectric Smoke Detectors** as follows:

- a. Provide analog/addressable **Photoelectric Smoke Detectors** utilizing the photoelectric light scattering principle for operation in accordance with **UL 268**. **Photoelectric Smoke Detectors** shall be listed for use with the **Fire Alarm System Control Panel**.

- b. Provide self-restoring type [Photoelectric Smoke Detectors](#) that do not require any readjustment after actuation at the [Fire Alarm System Control Panel](#) to restore them to normal operation. [Photoelectric Smoke Detectors](#) shall be UL listed as smoke-automatic fire sensors.
- c. Components shall be rust and corrosion resistant. Vibration shall have no effect on the detector's operation. Protect the detection chamber with a fine mesh metallic screen that prevents the entrance of insects or airborne materials. The screen shall not inhibit the movement of smoke particles into the chamber.
- d. Provide twist lock bases with sounder that produces a minimum of 90 dBA at 10 feet for the detector. [Photoelectric Smoke Detectors](#) shall maintain contact with their bases without the use of springs. Provide companion mounting base with screw terminals for each conductor. Terminate field wiring on the screw terminals. [Photoelectric Smoke Detectors](#) shall have a visual indicator to show actuation.
- e. [Photoelectric Smoke Detectors](#) installed in Dwelling Units shall have sounder bases that conform to the low frequency (520 Hz square pattern tone) requirements of [NFPA 72](#). [Photoelectric Smoke Detector](#) sounder bases shall produce a temporal three (T3) tone. Provide groups of not more than 20 sounder bases per circuit to maintain Class A cabling.
- f. [Photoelectric Smoke Detectors](#) shall not be installed in Dwelling Unit Kitchen areas.
- g. [Photoelectric Smoke Detectors](#) address shall identify the particular unit, its location within the system, and its sensitivity setting. Sensors shall be of the low voltage type rated for use on a 24 Volts D.C. system.
- h. An operator at the [Fire Alarm System Control Panel](#) shall have the capability to manually access the following information for each initiating device.
 - (1) Primary Status
 - (2) Device Type
 - (3) Present Average Value
 - (4) Present Sensitivity Selected
 - (5) Sensor Range (Normal, Dirty, etc.)
- i. Smoke Detectors shall be a Non-Latching condition for:
 - (1) Single Dwelling Unit Smoke Detector.
 - (2) Two Dwelling Unit Smoke Detectors not in Same Dwelling Unit or not in Adjacent Dwelling Units.
- j. Smoke Detectors shall be a Latching condition for:
 - (3) Two Dwelling Unit Smoke Detectors in Same Dwelling Unit or in Adjacent Dwelling Units

- (4) Any installation location outside of a Dwelling Unit.

2.11.3 Duct Smoke Detectors

Duct Smoke Detectors shall be furnished and installed where indicated and in accordance with NFPA 90A. Duct Smoke Detectors shall be photoelectric style as specified in paragraph Photoelectric Smoke Detectors and mounted in a special housing fitted with duct sampling tubes. Duct Smoke Detector circuitry shall be mounted in an enclosure exterior to the duct (It is not permitted to cut the duct insulation to install the Duct Smoke Detector directly on the duct). Duct Smoke Detectors shall automatically reset when the smoke condition clears. H.V.A.C. systems shall automatically restart when the Duct Smoke Detector no longer senses smoke. Duct Smoke Detectors shall be powered from the Fire Alarm System Control Panel. Activation of a Duct Smoke Detector shall be a supervisory condition (not a general alarm condition) and shall shut down only the affected air handling unit and smoke damper.

- a. The duct detector package shall conform to the requirements of NFPA 90A, UL 268A, and shall be UL listed for use in air-handling systems.
- b. The control functions, operation, reset, and bypass shall be controlled from the Fire Alarm System Control Panel.
- c. Duct Smoke Detectors shall be easily accessible for maintenance and testing. Lights to indicate the operation and alarm condition; and the test buttons shall be visible and accessible with the unit installed and the cover in place. Remote indicators shall be provided where required by NFPA 72 and UFC 3-600-01 and these shall be provided with a remote test station (switch). Remote test station shall be operable by either a key or a magnet.
- d. Remote lamps and switches as well as the affected fan units shall be properly identified in etched plastic placards. Detectors shall provide for control of auxiliary contacts that provide control, interlock, and shutdown functions specified in Section 23 09 23 to LONWORKS DIRECT DIGITAL CONTROL FOR H.V.A.C. AND OTHER BUILDING CONTROL SYSTEMS. Auxiliary contacts provide for this function shall be located within 3 feet of the controlled circuit or appliance. The detectors shall be supplied by the fire alarm system manufacturer to ensure complete system compatibility.
- e. Provide a shut-down bypass button on the Fire Alarm System Control Panel.

2.11.4 Heat Detectors

The alarm condition shall be determined by comparing sensor value with the stored values. Heat Detector spacing shall be rated in accordance with UL 521. Heat Detectors located in areas subject to moisture, exterior atmospheric conditions, or hazardous locations as defined by NFPA 70 shall be types approved for such locations. Heat Detectors shall be installed in Dwelling Unit Kitchen area and shall conform to the low frequency (520 Hz square pattern tone) sounder base requirements of NFPA 72. Heat Detector sounder bases shall produce a temporal three (T3) tone.

2.11.4.1 Combination Fixed-Temperature and Rate-of-Rise Heat Detectors

Combination Fixed-Temperature and Rate-of-Rise Heat Detectors shall be designed for outlet box mounting and supported independently of wiring connections. Addressable (not conventional) Heat Detectors shall be listed for Fixed Temperature and Rate-of-Rise function and shall have LED indication of alarm condition. Detector units located in boiler rooms, showers, or other areas subject to abnormal temperature changes shall operate on fixed temperature principle only. The UL 521 test rating for the Rate-of-Rise detectors shall be rated for 50 by 50 feet.

2.11.4.2 Rate Compensating Heat Detectors

Rate Compensating Heat Detectors shall be outlet box supported independently of wiring connections. Detectors shall be hermetically sealed and automatically resetting. The UL 521 test rating for Rate Compensating Heat Detectors shall be rated for 50 by 50 feet.

2.11.4.3 Fixed Temperature Heat Detectors

Fixed Temperature Heat Detectors shall be designed for outlet box mounting and supported independently of wiring connections. Fixed Temperature Heat Detectors shall be designed to detect high heat. The UL 521 test rating for the fixed temperature detectors shall be rated for 50 by 50 feet.

2.11.4.4 Connection to Fire Alarm System Control Panel

2.11.4.4.1 Self-Test Routines

Automatic Self-Test Routines shall be performed on each Heat Detector that will functionally check Heat Detector sensitivity electronics and ensure the accuracy of the value being transmitted. Any Heat Detector that fails this test shall indicate a trouble condition (with the Heat Detector location) at the Fire Alarm System Control Panel.

2.11.4.4.2 Operator Access

The Fire Alarm System Control Panel shall have the capability to manually access the following information for each Heat Detector:

- a. Primary status
- b. Device type
- c. Present Average Value
- d. Sensor range

2.11.4.4.3 Operator Control

An operator at the Fire Alarm System Control Panel shall have the capability to manually control the following information for each Heat Detector:

- a. Alarm Detection Sensitivity Values
- b. Enable or Disable the Point/Device

c. Control Heat Detector Relay Driver Output

2.11.5 Carbon Monoxide Detectors

Carbon Monoxide Detectors shall be listed to UL 2075 and be compatible with the Fire Alarm System Control Panel. Carbon Monoxide Detectors shall be 24 Volts D.C., Intelligent, Analog, and Addressable that has an "End-of-Life" timer that initiate a "Trouble" condition at the Fire Alarm System Control Panel. Carbon Monoxide Detectors shall have a maximum listed "Area of Coverage" of 2,000 square feet and shall be installed in accordance with NFPA 72. Carbon Monoxide Detectors installed in Dwelling Units shall conform to the low frequency (520 Hz square pattern tone) sounder base requirements of NFPA 720. Carbon Monoxide Detector sounder bases shall produce a temporal four (T4) tone. Carbon Monoxide Detectors shall be a Latching condition.

2.11.6 Multi-Sensor Detectors

Multi-Sensor Detectors shall contain Photoelectric Smoke Detector and Carbon Monoxide Detector elements in a single housing. Each detect shall be listed to initiate a fire alarm condition.

2.11.7 Temperature Sensors

Provide Temperature Sensors that consists of a bi-metal operating mechanism, featuring hermetically sealed precious metal contacts for both Normally Open (N.O.) and Normally Closed (N.C.). Temperature Sensors shall automatically reset for repetitive operation, eliminating the need for sensing element replacement. Temperature Sensors shall be highly resistant to vibration, corrosion, moisture, and vapors. Temperature Sensors shall be provided with screw terminals for easy installation.

2.12 NOTIFICATION APPLIANCES

2.12.1 Audible Notification Appliances (Horns)

Audible Notification Appliances shall conform to the applicable requirements of UL 464, NFPA 72 for Alarm System requirements, ISO 7240-16, IEC 60268-16, and UFC 3-600-01, except as specified herein. Surface mounted audible appliances shall be white or red as required.

- a. Where Audible Notification Appliances and Visual Notification Appliances are provided in the same location, they may be combined into a single unit. All inputs shall be polarized for compatibility with standard reverse polarity supervision of circuit wiring via the Fire Alarm System Control Panel.
- b. Audible Notification Appliances shall utilize screw terminals for termination of all field wiring.
- c. Audible Notification Appliances shall be connected into notification appliance circuits
- d. For a Fire Alarm System events, the audible appliances shall produce a temporal code 3 tone that is repeated until the control panel is reset or silenced.

- e. For a Carbon Monoxide events, the audible appliances shall produce a temporal code 4 tone that is repeated until the control panel is reset or silenced.
- f. All Audible Notification Appliances shall be synchronized.

2.12.2 Visual Notification Appliances (Strobes)

Visual Notification Appliances shall conform to the applicable requirements of UL 1971, NFPA 72, and the Architectural Barriers Act (ABA). Visual Notification Appliances shall have clear high intensity optic lens, xenon flash tubes, and output white light and be marked "FIRE" in red letters. The light pattern shall be disbursed so that it is visible above and below the Visual Notification Appliances and from a 90-degree angle on both sides of the Visual Notification Appliances. Visual Notification Appliance flash rate shall be 1 flash per second. Where more than two Visual Notification Appliances are located in the same room or corridor or field of view, provide synchronized operation. Visual Notification Appliances shall use screw terminals for all field wiring.

- g. Where Audible Notification Appliances and Visual Notification Appliances are provided in the same location, they may be combined into a single unit. All inputs shall be polarized for compatibility with standard reverse polarity supervision of circuit wiring via the Fire Alarm System Control Panel.
- h. Visual Notification Appliances shall utilize screw terminals for termination of all field wiring.
- i. Notification Appliance Circuits (NAC) shall be provided for the activation of strobe appliances.
- j. The strobe NAC Circuits shall provide at least 2 amps of 24 Volts D.C. power to operate horns and strobes.
- k. All Visual Notification Appliances shall be synchronized.

2.12.3 Exterior Mounted Appliances

Any Notification Appliance mounted externally on the exterior surface shall be provided with a rubber gasket to reduce water penetration, electrolysis, and grounds. Conduit penetrations in exterior mounted Notification Appliances shall not be made through the top of the Notification Appliance backbox to prevent water intrusion.

2.13 INTERFACE TO THE BASE WIDE NETWORK

2.13.1 Radio Transceiver

The Radio Transceiver shall be bi-direction and meet all the requirements of paragraph, RADIO TRANSCEIVER AND INTERFACE PANELS as specified in this Specification Section. The Radio Transceiver utilized in the Fire Alarm System shall be capable of the following:

- a. Communication with the Joint Base Lewis McChord Emergency Command Center (JBECC) by automatic and manual poll/reply/acknowledge routines and to provide supervision of communication link and status changes.

- b. All monitored points/status changes are transmitted immediately and at programmed intervals until acknowledged by the Joint Base Lewis McChord Emergency Command Center (JBECC).
- c. Each transceiver shall transmit a unique identity code as part of all messages; the code is set by the user at the transceiver.

2.13.2 Secure Radio System

2.13.2.1 Communications Network

The **Communications Network** provides two-way signals between central control units and autonomous control units (individual building systems), and provide redundant (primary and backup) communication links.

2.13 .2.2 Radio Frequency Communications

Use of **Radio Frequency Communications** system shall comply with **National Telecommunications and Information Administration (NTIA)** requirements. The **Radio Frequency Communications** system shall be designed to minimize the potential for interference, jamming, eavesdropping, and spoofing. The proprietary supervising station receiving equipment is Monaco D-21M requiring a Monaco BTX or BTXM transceiver operating on frequency 139.6750 MHz for Lewis Main and Lewis North and frequency 142.8375 for McChord Field.

2.14 AUTOMATIC FIRE TRANSCEIVERS

2.14.1 Radio Transceiver and Interface Panels

Radio Transceivers and Interface Panels shall be compatible with proprietary supervising station receiving equipment. Each **Radio Transceivers and Interface Panel** shall be the manufacturer's recognized commercial product, completely assembled, wired, factory tested, and delivered ready for installation and operation. **Radio Transceivers and Interface Panels** shall be provided in accordance with applicable portions of **NFPA 72, Federal Communications Commission (FCC) 47 CFR 90** and **Federal Communications Commission (FCC) 47 CFR 15**. **Radio Transceivers and Interface Panel** electronics module shall be contained within the physical housing as an integral, removable assembly.

- a. Operation: Each **Radio Transceiver** shall operate from 120 Volts A.C. power. In the event of 120 Volts A.C. power loss, the **Radio Transceiver** shall automatically switch to battery operation. Switchover shall be accomplished with no interruption of protective service, and shall automatically transmit a trouble message. Upon restoration of ac power, transfer back to normal ac power supply shall also be automatic.
- b. Battery Power: **Radio Transceiver** standby battery capacity shall provide sufficient power to operate the **Radio Transceiver** in a normal standby status for a minimum of 72 hours and be capable of transmitting alarms during that period.
- c. The housing shall contain a lock that is keyed with a factory supplied key and lock. **Radio Transceiver** housing shall be factory painted with not less than two coats of a hard, durable, weatherproof enamel.

- d. Antenna for the **Radio Transceiver** shall be provided with a driving point impedance to match **Radio Transceiver** output. The antenna and antenna mounts shall be corrosion resistant and designed to withstand wind velocities of 100 mph. Do not mount antennas to any portion of the building roofing system or building metal siding. Protect the antenna from physical damage.

2.14.2 Zones Transmitted to the Base Receiving Station

The following **Zones shall be Transmitted to the Base Receiving Station** as separate zones from the **Radio Transceiver**:

- a. Sprinkler Water Flow - Alarm (One Zone per Riser)
- b. Manual Pull Stations - Alarm (One Zone per Floor)
- c. Smoke Detectors - Alarm (One Zone per Floor per Device Type)
- d. Smoke Detectors in Dwelling Units
 - (1) Single Dwelling Unit Smoke Detector - Supervisory (One Zone per Building)
 - (2) Two Dwelling Unit Smoke Detectors in Same Dwelling Unit or in Adjacent Dwelling Units - Alarm (One Zone per Floor)
- e. Duct Smoke Detectors - Supervisory
- f. Heat Detectors - Alarm (One Zone per Floor per Device Type)
- g. Fire Suppression System (ANSUL) - Alarm (One Zone per System)
- h. Sprinkler Valve Tamper - Supervisory
- i. Low Air for Dry Sprinkler System - Trouble
- j. High Air for Dry Sprinkler System - Trouble
- k. Low Nitrogen Purity - Trouble
- l. Disable Switch - Supervisory
- m. General Supervisory - Supervisory
- n. Common Trouble - Trouble
- o. Carbon Monoxide (CO) Detectors - Alarm
- p. Low Hangar Temperature - Supervisory
- q. Fire Pump Running - Alarm
- r. Fire Pump Trouble - Trouble
- s. Fire Pump Controller Trouble - Trouble
- t. Water Supply Level and Temperature - Trouble

- u. Low Pump Room Temperature - Trouble
- v. Electric Drive Fire Pump - Supervisory (One Zone for Each of the Following):
 - (1) Selector Switch in Position Other than Automatic
 - (2) Loss of Power
 - (3) Phase Reversal
 - (4) Pump Fail to Start
- w. Combustion Engine Drive Fire Pump (Note: in general, combustion engine driven fire pumps are not acceptable. JBLM prefers electric motor driven fire pumps) - Supervisory (One Zone for Each of the Following):
 - (1) Selector Switch in Position Other than Automatic
 - (2) Engine Over-speed
 - (3) Low Fuel
 - (4) Low Battery
 - (5) Engine Trouble (Low Oil, High Engine Temperature, Fail to Start, etc.)

2.14.3 Spare Zones

Provide Spare Zones in the Radio Transceiver panel for future use. The Spare Zones shall consist of connections from the Fire Alarm Mass Notification System Control Panel through the Radio Transceiver to the Joint Base Lewis McChord Emergency Command Center (JBECC). Each zone card contains the capability of transmitting (4) zones to the Base Receiving Station. Zone cards having unused zones not being transmitted to the Base Receiving Station shall be considered as a Spare Zone. The minimum quantity of Spare Zones shall be 1 and the maximum quantity of Spare Zones shall be 4.

2.15 CABLING

Provide Cabling materials under this section as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM with the additions and modifications specified herein. Cabling size shall be sufficient to prevent voltage drop problems. A fully discharged 24 Volts D.C. battery is defined as being at 20.4 Volts D.C. and the minimum voltage required to operate detectors and/or notification appliances is defined as being 16.0 Volts D.C. yielding a maximum voltage drop of 4.4 Volts D.C. in the calculation.

2.15.1 Signaling Line Circuit (SLC) Cabling

Signaling Line Circuit (SLC) Cabling shall be a minimum of No. 18 AWG copper cabling installed as Class A in conduit. Provide multiple signaling line circuits for each floor so that the failure of a single Signaling Line Circuit (SLC) shall not cause the facility to lose over 50 percent of the

devices installed.

2.15.2 Initiating Device Circuit Cabling

Initiating Device Circuit Cabling shall be a minimum of No. 16 AWG copper cabling installed as Class A in conduit.

2.15.3 Visual Notification Appliance Cabling

Visual Notification Appliance Cabling shall be a minimum of No. 16 AWG copper cabling installed as Class A in conduit.

2.15.4 Audible Notification Appliance Cabling

Audible Notification Appliance Cabling shall be a minimum of No. 16 AWG copper cabling installed as Class A in conduit.

2.15.5 Remote Test Station Cabling

Remote Test Station Cabling shall be a minimum of No. 16 AWG copper cabling installed as Class A in conduit.

2.15.6 Sounder Base Cabling

Sounder Base Cabling shall be a minimum of No. 16 AWG copper cabling installed as Class A in conduit and if not possible, Class B cabling in conduit will be acceptable.

2.15.7 Power Cabling

Power Cabling operating at 120 Volts A.C. shall be a minimum of No. 12 AWG copper cabling installed in conduit.

2.15.8 Power Limited Cabling

Acceptable Power Limited Cabling are FPL, FPLR, or FPLP as appropriate with red colored covering. Nonpower Limited cables shall comply with NFPA 70.

2.16 GRAPHIC MAP

Provide a full color graphical representation of the floor plan(s) that shall be installed directly adjacent to the Fire Alarm System Control Panel. The Graphics Map shall be a minimum of 11 inches by 17 inches in size, but shall be based upon the actual building footprint with all text being at a minimum of 1/8 inch in height. Multiple Graphic Maps shall be required for multi-story buildings.

2.16.1 Graphic Map Information

The Graphic Map shall include the following information at a minimum:

- a. Building Name(s) (and Numbers Where Applicable)
- b. Room Names and Numbers
- c. Doors

- d. Location of the Fire Alarm System Control Panel
- e. A "You Are Here"
- f. An Arrow Pointing at the Location of Where Graphics Map is Installed
- g. Show the Connections and System(s) being Monitored by the Fire Alarm System
- h. A "North" Arrow
- i. A System Legend at the top of the Graphic Map indicating the Following Applicable Systems:
 - (1) Fire Protection Sprinkler System Water Flow Switch(s)
 - (2) Fire Protection Sprinkler System Tamper Switch(s)
 - (3) Fire Protection Sprinkler System Pressure Switch(s)
 - (4) Suppression System Release Panel(s)
 - (5) Other Systems that would Typically Interface to the Fire Alarm System.

2.16.2 Graphic Map Material

The [Graphic Map](#) shall consist of the following:

- a. Be secured in a black anodized aluminum frame
- b. Lexan image
- c. Plexiglas outer cover to protect the Lexan image
- d. Standard Lexan background shall be white
- e. The Graphic Map shall be secured to a black frame
- f. Permanently fastened to the wall.

2.16.3 Graphic Map Installation

Provide a minimum of 6 inch of wall space between the [Graphic Map](#) and the [Fire Alarm System Control Panel](#). The top of the Graphic Map shall be level and installed at 60 inches above the finished floor, unless noted otherwise.

2.17 EQUIPMENT SIGNAGE

[Equipment Signage](#) shall have a white background with a minimum 2 inches high red letters unless indicated differently below, the use of a "Sharpie" to write information will not be allowed. Exterior wall mounted [Equipment Signage](#) shall be located at an elevation not exceeding 8 feet above exterior grade. [Equipment Signage](#) shall be provided for the following items:

- a. [Fire Alarm System Room](#): The room in which the Fire Alarm System Control Panel has been installed shall be provided with a metal or phenolic

sign that shall be placed on the exterior side of the door. The sign shall be a minimum of 16 inches long by 3 inches tall with and shall state "FIRE ALARM".

- b. **Fire Alarm System Room:** Paint a 3 inch wide red painted stripe on the floor a minimum of 36 inches in front and on both sides of the **Fire Alarm System Control Panel** and equipment
- c. **Fire Alarm System Room:** When the room in which the Fire Alarm System Control Panel has been installed has Carbon Monoxide detection, the exterior side of the door shall be provided with a metal or phenolic sign. The sign shall be a minimum of 16 inches long by 5 inches tall with and shall state "CARBON MONOXIDE DETECTION INSIDE".
- d. **Fire Alarm System Control Panel:** The Fire Alarm System Control Panel shall be provided with a phenolic sign on the exterior of the Fire Alarm System Control Panel. The sign shall be a minimum of 3 inches long by 2 inches tall with 1 inch high red text that states "FACP".
- e. **Power Supplies:** Each **Power Supply** shall be provided with a phenolic sign on the exterior of the **Power Supply**. The sign shall be a minimum of 3 inches long by 2 inches tall with 1 inch high red text that states "BPS-X" where "X" identifies the **Power Supply** number.
- f. **Radio Transceiver:** The **Radio Transceiver** shall be provided with a phenolic sign on the exterior of the **Radio Transceiver**. The sign shall be a minimum of 3 inches long by 2 inches tall with 1 inch high red text that states "XTMR".

2.18 FIRE/SMOKE WALL, CEILING, AND FLOOR ASSEMBLY MARKING AND IDENTIFICATION

Fire walls, fire barriers, fire partitions, smoke barriers, smoke partitions or any other wall, ceiling, or floor assembly required to have protected openings that are penetrated by Fire Alarm System conduits and equipment shall be provided with markings and identification in accordance with the IBC and NFPA 101. **Wall, Ceiling, and Floor Assembly Marking and Identification** shall meet the following criteria at a minimum:

- a. Be located in accessible concealed floor, floor/ceiling, or attic spaces.
- b. Be located within 15'-0" of the end of each wall.
- c. At intervals not exceeding 30'-0" measured horizontally along the wall or partition.
- d. Include lettering not less than 3" in height with a minimum 3/8" stroke in a contrasting color.
- e. Identify the wall type and its fire-resistance rating, as applicable.

2.19 SEISMIC SEPARATION AND BUILDING EXPANSION / SEPARATION ASSEMBLIES

The Fire Alarm System Contractor shall provide a **Seismic Separation Assembly or a Building Expansion / Separation Assembly** where the Fire Alarm System wiring crosses a seismic separation or building expansion /

separation joint. The [Seismic Separation Assembly or a Building Expansion / Separation Assembly](#) shall consist of a junction box at each side of a seismic separation or a building expansion / separation joint. Provide a section of flexible conduit and grounding bushings with #12 grounding cable to maintain continuity between junction boxes. Provide conduit and grounding cable of sufficient length to accommodate for the calculated building movement.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the [Fire Protection Specialist](#), the USACE representative, and/or DPW representatives of any discrepancy before performing the work.

3.2 FIRE PROTECTION RELATED SUBMITTALS

The [Fire Protection Specialist](#) shall prepare a list of the submittals from the Contract Submittal Register that relate to the successful installation of the [Fire Alarm System](#). The submittals identified on this list shall be accompanied by a letter of approval signed and dated by the [Fire Protection Specialist](#) when submitted to the Government.

3.3 INSTALLATION REQUIREMENTS

Equipment, materials, workmanship, fabrication, assembly, erection, installation, examination, inspection, and testing shall be in accordance with the applicable provisions of [NFPA 72](#), [UFC 3-600-01](#), [JBLM Design Standards](#), and publications referenced therein. Carefully remove materials so as not to damage material which is to remain. Replace existing work damaged by the Contractor's operations with new work of the same construction.

3.4 INSPECTION BY FIRE PROTECTION SPECIALIST

The [Fire Protection Specialist](#) shall inspect the [Fire Alarm System](#) periodically during the installation to assure that the [Fire Alarm System](#) is being provided and installed in accordance with the contract requirements. The [Fire Protection Specialist](#), after completion of the [Fire Alarm System](#) inspection shall provide a site report within five working days that identifies the status of the installation and any corrections that are to be made to meet contract requirements. The site report is to be addressed to the General Contractor with a copy of the report being forwarded to the government representative acting as the Authority Having Jurisdiction.

3.5 INSTALLATION OF FIRE ALARM COMPONENTS

3.5.1 Fire Alarm System Control Panel

Locate the [Fire Alarm System Control Panel](#) in a climate-controlled room with direct access from the exterior of the facility. When the room containing the Fire Alarm System Control Panel does not have direct access from the exterior of the facility, a Rapid Entry Key Box shall be provided. Location must be government approved and comply with [JBLM Design Standards](#). Conductor terminations shall be labeled. Provide a drawing containing conductor,

conductor labels, conductor circuits, and conductor interconnection shall be permanently mounted in the [Fire Alarm System Control Panel](#). Mount the [Fire Alarm System Control Panel](#) so that the top of the can is no more than 72 inches above finished floor.

3.5.2 Monaco BTX Transceiver

Locate the [Monaco BTX Transceiver](#) in a climate-controlled room with direct access from the exterior of the facility if possible. Location must be government approved and comply with [JBLM Design Standards](#). Conductor terminations shall be labeled. Provide a drawing containing conductor, conductor labels, conductor circuits, and conductor interconnection shall be permanently mounted in the [Monaco BTX Transceiver](#). Mount the [Monaco BTX Transceiver](#) so the top of the can is no more than 60 inches above finished floor. The [Monaco BTX Transceiver](#) shall be located in the same room as the [Fire Alarm System Control Panel](#). All conduit penetrations shall be through the sides of [Monaco BTX Transceiver](#) enclosures, do not penetrate transceiver enclosures on top or bottom.

3.5.3 Power Supplies

Locate each [Power Supply](#) in a climate-controlled room. Conductor terminations shall be labeled. Provide a drawing containing conductor, conductor labels, conductor circuits, and conductor interconnection shall be permanently mounted in the [Power Supply](#). Mount the [Power Supply](#) so the top of the can is no more than 72 inches above finished floor. It is allowed to stack [Power Supplies](#) in a single location such that the top of the top can is no more than 72 inches above finished floor.

3.5.3.1 Remote Power Supplies

Provide a monitor module for each [Remote Power Supply](#) that is located within 3 feet of the [Remote Power Supply](#) to monitor the trouble contacts at any [Remote Power Supply](#) to uniquely identify the [Remote Power Supply](#) in a trouble condition.

3.5.4 Initiation Appliances

3.5.4.1 Manual Pull Stations:

Locate [Manual Pull Stations](#) as required by [UFC 3-600-01](#) and at each man door exit. Mount [Manual Pull Stations](#) so that their operating handles are 4 feet above the finished floor. Mount [Manual Pull Stations](#) so they are located on the latch side of the door and installed no farther than 5 feet from the exit door they serve, measured horizontally. Write the point address of the [Manual Pull Station](#) on the outside of the [Manual Pull Station](#) using a Sharpie marker or permanent stick on labels.

3.5.4.2 Smoke Detectors

Locate [Smoke Detectors](#) as required by [NFPA 72](#) and their listings on a 4 inch mounting box. [Smoke Detectors](#) installed on the ceiling shall not be less than 4 inches from a side wall to the near edge. [Smoke Detectors](#) located on the wall shall have the top of the detector at least 4 inches below the ceiling, but not more than 12 inches below the ceiling. In raised floor spaces, install the [Smoke Detectors](#) to protect 900 square feet per detector. Install [Smoke Detectors](#) no closer than 3 feet from air handling supply or

return grilles.

3.5.4.3 Heat Detectors

Locate [Heat Detectors](#) as required by [NFPA 72](#) and their listings on a 4 inch mounting box. [Heat Detectors](#) installed on the ceiling shall not be less than 4 inches from a side wall to the near edge. [Heat Detectors](#) located on the wall shall have the top of the detector at least 4 inches below the ceiling, but not more than 12 inches below the ceiling

3.5.4.4 Duct Smoke Detectors

Air sampling tubes installed in ducts 36 inches or less shall run the full width of the duct (within 1 inch of the opposite side of duct in which the [Duct Smoke Detectors](#) is installed). Air sampling tubes shall be provided with a permanent means of support. Air sampling tubes installed in ducts exceeding 36 inches shall run the full width of the duct and penetrate the opposite side of duct in which the [Duct Smoke Detectors](#) is installed.

3.5.4.5 Carbon Monoxide Detectors

Locate [Carbon Detectors](#) as required by [UFC 3-600-01](#), [NFPA 72](#) and their listings on a 4 inch mounting box. [Carbon Monoxide Detectors](#) installed on the ceiling shall not be less than 4 inches from a side wall to the near edge. [Carbon Monoxide Detectors](#) located on the wall shall have the top of the detector at least 4 inches below the ceiling, but not more than 12 inches below the ceiling. [Carbon Monoxide Detectors](#) shall be installed located in each room/space containing fuel burning appliance(s) and where H.V.A.C. equipment utilizes fuel burning equipment, one [Carbon Monoxide Detector](#) shall be installed downstream of the fuel burning equipment.et. [Carbon Monoxide Detectors](#) are not required in large open spaces having a ceiling greater than 12 feet (i.e., storage facilities, aircraft hangar bays, large industrial spaces, and similar spaces).

3.5.4.6 Multi-Criteria Detectors

Locate [Multi-Criteria Detectors](#) as required by [NFPA 72](#) and their listings on a 4 inch mounting box. [Heat Detectors](#) installed on the ceiling shall not be less than 4 inches from a side wall to the near edge. [Multi-Criteria Detectors](#) located on the wall shall have the top of the detector at least 4 inches below the ceiling, but not more than 12 inches below the ceiling

3.5.4.7 Sprinkler System Connections

Connect to [Sprinkler System Connections](#) (Water Flow Detectors, Pressure Switches, and Tamper Switches). The cover plates for [Monitor Modules](#) shall have their address written on them with a permanent stick on labels.

3.5.5 Notification Appliances

Locate [Notification Appliance](#) as required by [NFPA 72](#). Mount [Notification Appliance](#) on walls or ceilings to meet the intelligibility requirements of [UFC 4-021-01](#). If horn device extends into back-box, the box shall be a minimum size of 4 11/16 x 2 1/8 to prevent wire pinching.

3.5.5.1 Audible Notification Appliances

Wall mounted [Audible Notification Appliances](#) shall be mounted with the top of the Audible Notification Appliances not less than 90 inches above the finished floor or not more than 6 inches below the ceiling, whichever is lower.

3.5.5.2 Visual Notification Appliances

Wall mounted [Visual Notification Appliances](#) shall be mounted with the entire lens not less than 80 inches or more than 96 inches above the finished floor or not more than 6 inches below the ceiling, whichever is lower.

3.5.5.3 Combination Audible and Visual Notification Appliances

Wall mounted [Combination Audible and Visual Notification Appliances](#) shall be mounted with the entire lens not less than 80 inches or more than 96 inches above the finished floor or not more than 6 inches below the ceiling, whichever is lower.

3.5.5.4 Exterior Notification Appliance Devices

Exterior [Notification Appliance Appliances](#) shall be installed in accordance with manufacturer's instructions including ensuring the device has a properly installed gasket and weather Seals. Conduit penetrations in Exterior [Notification Appliance Appliances](#) shall not be made through the top of the Notification Appliance backbox to prevent water intrusion. Ensure all conduit and junction box connections are tight and Sealed, duct seal the wall penetration. Where possible, locate Exterior [Notification Appliance Appliances](#) under an overhang. Also install Exterior [Notification Appliance Appliances](#) within walk-in coolers, walk-in freezers, showers, and other area of high humidity with the penetration filled with self-expanding foam insulation.

3.6 SYSTEM FIELD WIRING

3.6.1 Wiring within Cabinets, Enclosures, and Junction Boxes

Provide wiring installed (dressed) in a neat and workmanlike manner and installed parallel with or at right angles to the sides and back of any [Cabinet, Enclosure, and Junction Box](#). Mark each terminal in accordance with the [wiring diagrams](#) of the system.

Indicate the following in the wiring diagrams.

- a. Point-to-point wiring diagrams showing the points of connection and terminals used for electrical field connections in the system, including interconnections between the equipment or systems that are supervised or controlled by the system. Diagrams shall show connections from field devices to the [Fire Alarm System Control Panel](#) and remote fire alarm control units, [Initiating Device Circuits](#), [Notification Appliance Circuits](#), switches, relays, and terminals.
- b. Complete riser diagrams indicating the wiring sequence of devices and their connections to the control equipment. Include a color code schedule for the wiring. Include floor plans showing the locations of devices and equipment.

3.6.2 Terminal Cabinets

Provide a terminal cabinet at the base of any circuit riser and on each floor at each riser. [Terminal Cabinet](#) size shall be appropriate for the size of the wiring to be connected. Conductor terminations shall be labeled and a drawing containing conductors, their labels, their circuits, and their interconnection shall be permanently mounted in the [Terminal Cabinet](#). The drawing can be folded up and inserted into a clear envelope that is to be attached to the inside of the [Terminal Cabinet](#). Minimum size of drawing is 8 inches by 8 inches. Only screw-type terminals are permitted.

3.6.3 Alarm Wiring

Voltages shall not be mixed in any junction box, housing, or device, except those containing power supplies and control relays. Provide all wiring in electrical metallic conceal conduit in finished areas of new construction and wherever practicable in existing construction. The minimum conduit size shall be 3/4 inch. The use of flexible conduit not exceeding a 6 foot length shall be permitted in initiating device or notification appliance circuits. Run conduit or tubing (rigid, IMC, EMT, FMC, etc. as permitted by [NFPA 72](#) and [NFPA 70](#) concealed unless specifically indicated otherwise.

3.6.4 Conductor Terminations

Conductors that are terminated, spliced, or otherwise interrupted in any [Cabinet, Enclosure, or Junction Box](#) shall be connected to screw-type terminal blocks. The use of wire nuts or similar devices is prohibited. Wiring shall conform to [NFPA 70 standards](#). Each conductor or cable shall be labeled using 3/16" Kroy brand or similar shrink wrap to provide a unique and specific designation. Label shall be computer printed, not hand written. Each [Terminal Cabinet, Power Supply, and Fire Alarm System Control Panel](#) shall contain a laminated drawing that indicates each conductor, its label, circuit, and terminal. The laminated drawing shall be neat, using 12 point lettering minimum size, and mounted within each [Terminal Cabinet, Power Supply, and Fire Alarm System Control Panel](#) so that it does not interfere with the wiring or terminals. Maintain existing color code scheme where connecting to existing equipment.

3.6.5 Conduit Separation Distances

Class A looped cabling installed vertically in concealed locations shall be provided with a minimum [Conduit Separation Distance](#) of 1 foot. Class A looped cabling installed horizontally in concealed locations shall be provided with a minimum [Conduit Separation Distance](#) of 4 feet. [Conduit Separation Distances](#) are not required when conduit is installed exposed.

3.7 DISCONNECTION AND REMOVAL OF EXISTING SYSTEM

To the maximum extent practical and as much as possible maintain existing fire alarm equipment fully operational until the new equipment has been tested and accepted by the [Fire Protection Specialist, the USACE representative, and/or DPW representatives](#). Once the new system is completed, tested, and accepted by the Government, it shall be placed in service and connected to the Joint Base Lewis McChord Emergency Command Center (JBECC).

- a. After acceptance of the new system by the [Fire Protection Specialist, the USACE representative, and/or DPW representatives](#), remove existing

equipment not connected to the new system, remove unused exposed conduit, and restore damaged surfaces. Remove the material from the site and dispose.

- b. Disconnect and remove the existing [Fire Alarm System](#).
- c. The government shall be given the option of salvaging any components of the existing [Fire Alarm System](#), and the contractor shall dispose of the remaining components.
- d. Properly dispose of [existing Fire Alarm System](#) outlet and junction boxes, wiring, conduit, supports, initiating devices, notification appliances, detectors, and other such items.

3.8 CONDUIT PENETRATIONS

Provide firestopping for holes at conduit penetrations through floor slabs, fire rated walls, partitions with fire rated doors, corridor walls, and vertical service shafts in accordance with [Section 07 84 00 FIRESTOPPING](#). Cutting of existing or new structural members for passage of conduits will not be permitted.

3.8.1 Non-Fire Rated Penetrations in Existing Construction

Conduits that must penetrate existing non-fire rated concrete walls, masonry walls, or concrete floors shall be core-drilled. All penetrations of existing wall, ceiling, or floor shall have the space between the existing wall, ceiling, or floor and the conduit patched, sealed, and painted to match the existing finish where the penetration occurs.

3.8.2 Fire Rated Penetrations in Existing Construction

Conduits that must penetrate existing fire rated concrete walls, masonry walls, or concrete floors shall be core-drilled. The space between the existing wall, ceiling, or floor and the conduit shall be firmly packed with mineral wool insulation. Seal space at both ends of the penetration with plastic waterproof cement which will dry to a firm but pliable mass. Where conduit penetrates fire walls, fire partitions, or fire floors the conduit shall be provided with a fire seal and fire stopped in accordance with [Section 07 84 00 FIRESTOPPING](#). The penetration shall be patched and sealed to maintain the fire rating of the wall, ceiling, or floor and painted to match the existing finish where the penetration occurs.

3.8.3 Non-Fire Rated Penetrations in High Moisture Spaces in Existing Construction

Conduits that must penetrate existing non-fire rated concrete walls, masonry walls, or concrete floors shall be core-drilled. All existing wall, ceiling, roof, or floor penetrations through high moisture areas (showers, coolers, freezers, exterior walls) shall be firmly packed with mineral wool insulation. Seal space at both ends of the penetration with plastic waterproof cement which will dry to a firm but pliable mass. The space between the existing wall, ceiling, roof, or floor and the conduit shall be patched, sealed, and painted to match the existing finish where the penetration occurs.

3.8.4 Non-Fire Rated Penetrations in New Construction

Conduits that must penetrate new non-fire rated concrete walls, masonry walls, concrete floors, shall be provided with a core-drilled. The space between the wall, ceiling, or floor and the conduit shall be patched, sealed, and painted where the penetration occurs.

3.8.5 Fire Rated Penetrations in New Construction

Conduits that must penetrate new fire rated concrete walls, masonry walls, or concrete floors shall be core-drilled. The space between the existing wall, ceiling, or floor and the conduit shall be firmly packed with mineral wool insulation. Seal space at both ends of the penetration with plastic waterproof cement which will dry to a firm but pliable mass. Where conduit penetrates fire walls, fire partitions, or fire floors the conduit shall be provided with a fire seal and fire stopped in accordance with [Section 07 84 00 FIRESTOPPING](#). The penetration shall be patched and sealed to maintain the fire rating of the wall, ceiling, or floor and painted to match the existing finish where the penetration occurs.

3.8.6 Non-Fire Rated Penetrations in High Moisture Spaces in New Construction

Conduits that must penetrate new non-fire rated concrete walls, masonry walls, or concrete floors shall be core-drilled. All new wall, ceiling, roof, or floor penetrations through high moisture areas (showers, coolers, freezers, exterior walls) shall be firmly packed with mineral wool insulation. Seal space at both ends of the penetration with plastic waterproof cement which will dry to a firm but pliable mass. The space between the new wall, ceiling, roof, or floor and the conduit shall be patched, sealed, and painted to match the existing finish where the penetration occurs.

3.9 PAINTING

All [Fire Alarm System](#) junction/back boxes, covers and couplings shall be factory painted red in unfinished areas (i.e. above ceilings, mechanical rooms, etc.). In finished areas, conduit, junction/back boxes, covers and couplings can be painted to match the room finishing in finished areas. The inside cover of the junction box must be identified as "fire alarm" and the conduit must have painted red bands 3/4 inch wide at 20 foot intervals and on both sides of a floor, wall, or ceiling penetration. Painting shall comply with [Section 09 90 00 PAINTS AND COATINGS](#) and [UFC 3-600-01](#) requirements.

3.10 SPECIAL INSPECTIONS AND SEISMIC CERTIFICATION

Special Certification Requirements for Designated Seismic Systems Certifications shall be provided in accordance with Section 13.2.2 of ASCE 7 for designated seismic systems assigned to Seismic Design Categories C through F as follows:

- a. Active mechanical and electrical equipment that must remain operable following the design earthquake ground motion shall be certified by the manufacturer as operable whereby active parts or energized components shall be certified exclusively on the basis of approved shake table testing in accordance with Section 13.2.5 or experience data in

accordance with Section 13.2.6 unless it can be shown that the component is inherently rugged by comparison with similar seismically qualified components.

- a. Evidence demonstrating compliance with this requirement shall be submitted for approval to the authority having jurisdiction after review and acceptance by a registered design professional

3.10.1 Statement of Special Inspections

Where special inspection or testing is required by Section 1705 of the IBC, the registered design professional in responsible charge shall prepare a statement of special inspections in accordance with Section 1704.3.1 for submittal by the applicant in accordance with Section 1704.2.3.

Exception: The statement of special inspections is permitted to be prepared by a qualified person approved by the building official for construction not designed by a registered design professional.

3.10.2 Content of Statement of Special Inspections

In accordance with Section 1704.3.1 of the IBC, the statement of special inspections shall identify the following:

- a. The materials, systems, components and work required to have special inspection or testing by the building official or by the registered design professional responsible for each portion of the work.
- b. The type and extent of each special inspection.
- c. The type and extent of each test.
- d. Additional requirements for special inspection or testing for seismic or wind resistance as specified in Sections 1705.11, 1705.12 and 1705.13.
- e. For each type of special inspection, identification as to whether it will be continuous special inspection, periodic special inspection, or performed in accordance with the notation used in the referenced standard where the inspections are identified.

3.10.3 Designated Seismic Systems

In accordance with Section 1705.12.4 of the IBC, the special inspector shall examine designated seismic systems requiring seismic qualification in accordance with Section 13.2.2 of ASCE 7 and verify that the label, anchorage or mounting conforms to the certificate of compliance.

3.11 AUDIBILITY TESTING

Audibility testing of the [Fire Alarm System](#) shall be accomplished in accordance with [NFPA 72](#). Use commercially available test instrumentation to measure audibility scores. Use the mean value of at least three readings to compute the audibility scores at each test location following the specific requirements for audibility tests below:

- a. Verify audibility decibel (dB) scores after installation.

- b. Ambient Condition: Take decibel (dB) readings in each room to establish the minimum audibility decibel (dB) scores required.
- c. Audibility Readings: Audibility decibel (dB) scores shall be a minimum of 15 decibel (dB) above the average ambient sound level or a minimum of 5 decibels (dB) above the maximum sound level having a duration of at least 60 seconds, whichever is greater.
- d. Audibility Readings: Audibility decibel (dB) scores shall be a maximum of 30 decibels (dB) above the average ambient sound level.
- e. Take audibility testing decibel (dB) scores shall be taken at the head level applicable for most personnel in the space under normal conditions (e.g., standing, sitting, sleeping, as appropriate).

3.12 TESTING PRIOR TO PRELIMINARY TESTS

Upon completion of each of the following tests, the Contractor shall submit results for review and approval by the [Fire Protection Specialist](#), the USACE representative, and/or DPW representatives prior to submitting [Preliminary Test Procedures](#).

3.12.1 Megger Testing

Provide formatted test results from [Megger Testing](#). [Megger Testing](#) shall be conducted with all devices removed from the circuits. The test results shall indicate the numerical values obtain during testing and shall not consist of pass/fail check boxes. Circuits with 300 volt insulation shall be tested at a minimum of 250 Volts D.C. and circuits with 600 volt insulation shall be tested at a minimum of 500 Volts D.C. Minimum duration of each [Megger Test](#) shall be 30 Seconds to allow for sufficient saturation. Acceptable test results shall be values greater than 100 MΩ.

3.12.2 Loop Resistance Testing

Provide formatted test results from [Loop Resistance Testing](#). [Loop Resistance Testing](#) shall be conducted with all devices removed from the circuits. The test results shall indicate the numerical values obtain during testing and shall not consist of pass/fail check boxes. Acceptable test results shall be values less than 10Ω.

3.12.3 Audibility Testing

Provide formatted test results from [Audibility Testing](#). [Audibility Test](#) results shall indicate the decibel (dB) scores obtain during testing in addition to the room name, room number, location within the room test scores were taken, the ambient decibel (dB) scores, and shall not consist of pass/fail check boxes.

3.13 PRELIMINARY ACCEPTANCE TESTING PROCEDURES

[Preliminary Acceptance Testing Procedures](#) shall include detailed step-by-step outline for each test and the expected test results to be performed at [Preliminary Acceptance Testing](#) and shall be on its own page in the [Preliminary Acceptance Testing Procedures](#). The [Preliminary Acceptance Testing Procedures](#) shall list all components of the installed system such as

Fire Alarm System Control Panel functions, initiating devices and circuits, notification appliances and circuits, signaling line devices and circuits, control devices/equipment, batteries, transmitting and receiving equipment, power sources/supply, annunciators, special hazard equipment, emergency communication equipment, interface equipment, Guard's Tour equipment, and transient (surge) suppressors. The Preliminary Acceptance Testing Procedures shall identify the sequence of testing, time estimate for each test, and sample test data forms. The test data forms shall be in a check-off format (pass/fail with space to add applicable test data; similar to the blank copies of the Material & Test Certificate forms in NFPA 72). Preliminary Acceptance Testing Procedures shall include the following information.

- a. Identify the NFPA Class of all Initiating Device Circuits (IDC), Notification Appliance Circuits (NAC), and Signaling Line Circuits (SLC).
- b. Identify each test required by NFPA 72 Test Methods and required test herein to be performed on each component, and describe how this test shall be performed.
- c. Identify each component and circuit as to type, location within the facility, and unique address within the installed system. Provide necessary floor plan sheets showing each component location, test location, and alphanumeric address.
- d. Identify all test equipment and personnel required to perform each test.
- e. The test data forms shall record the test results from each test conducted.
- f. Provide space to identify the date and time of each test. Provide space to identify the names and signatures of the individuals conducting and witnessing each test.

3.13.1 Minimum System Tests

Test the system in accordance with the procedures outlined in NFPA 72 and UFC 3-600-01. The following tests that would be applicable to the project's Scope of Work are as follows:

- a. Test secondary power of all enclosures (Fire Alarm System Control Panel, Power Supplies, and Monaco Transceiver). Verify, by test, the secondary power system (back-up batteries) is capable of operating the system for the time period and in the manner specified for Fire Alarm System operation. The Fire Alarm System battery draw test shall consist of 72 hours of supervisory duration immediately followed by 15 minutes of alarm at the maximum connected load. Voltage readings of all batteries shall be taken after primary power is disconnected from the system, after 72 hours of supervisory duration, and after the 15 minutes of alarm.
- b. Verify that all notification appliances (horns and strobes) are operational under Alarm operation of the Fire Alarm System.
- c. Each circuit shall be tested for open, short, ground conditions by disconnecting a single device from the circuit. If there is a failure

with any of these conditions, then the circuit test will be redone by removing each device on the circuit one at a time. While the device is removed during the circuit testing, the cabling shall be verified for Class A installation by verifying operation of the device upstream and downstream of the removed device.

- d. Test each initiating device for proper operation and response at the control unit.
- e. Verify each initiating device is provided with the correct device label that matches "As-Built" floor plan drawings, "As-Built" one-line riser diagram drawings, and the screen on the [Fire Alarm System Control Panel](#). This also includes the testing of all monitor, control, relay, and isolation modules.
- f. Smoke detectors shall be tested in accordance with [NFPA 72](#) and manufacturer's recommended calibrated test method. Canned smoke shall be used for testing of smoke detectors, the use of magnets for testing is prohibited. Smoke detector sensitivity shall be tested during the Preliminary System Acceptance Testing. Disconnect the verification feature for smoke detectors during tests to minimize the amount of smoke needed to activate the detector.
- g. Testing of duct smoke detectors shall comply with the requirements of [NFPA 72](#). Monometer testing of duct smoke detector sample tubes shall be performed. Canned smoke shall be used for testing of duct smoke detectors, the use of magnets for testing is prohibited. Remote test stations for duct smoke detectors shall be tested by use of a keyed switch or magnet.
- h. Testing of heat detectors shall comply with the requirements of [NFPA 72](#).
- i. Testing of carbon monoxide detectors shall comply with the requirements of [NFPA 72](#).
- j. Verify that the control unit is in the normal condition as detailed in the manufacturer's O&M manual.
- k. Test the [Fire Alarm System](#) for specified functions in accordance with the project specifications and the manufacturer's O&M manual.
- l. Test the [Fire Alarm System](#) circuits for transient stray voltage.
- m. Determine that the system is operable under trouble conditions as specified.
- n. Visually inspect wiring.
- o. Test the battery charger output.
- p. Measure the current in circuits to ensure there is the calculated spare capacity for the circuits.
- q. Measure voltage readings for circuits to ensure that voltage drop is not excessive.

- r. Measure the voltage drop at the most remote appliance (based on wire length) on each notification appliance circuit.
- s. Test connections to other systems such as elevator shunt-trip feature, cooking hood suppression system, fire protection tamper, flow, and pressure switches, fire pump controllers, door holders, fire fighter's telephone, etc.
- t. Verification of enclosure key type and identification.
- u. Verification of electrical panel and breaker identified on enclosures match electrical panel and breaker.
- v. Verification breaker serving fire alarm equipment is red in color and provided with a red colored means of lockout.
- w. Verify operation of the transceiver (correct zones received and transmitted) and antenna system (forward and reflective signal strengths) and installation of lightening arrestor.
- x. Verify that red-line drawings are accurate, that the one-line riser diagram matches installation, and amplifier loading is not exceeded.
- y. Verify audible notification device (horns) tap settings and visual notification appliances (strobes) candela rating matches "As-Built" drawings.

3.14 PRELIMINARY TESTING PREPARATORY MEETING

A [Preparatory Meeting](#) may be held at the site to discuss the expectations and requirements of the [Preliminary System Acceptance Test](#) by reviewing the [Preliminary Test Procedures](#). The necessity of a [Preparatory Meeting](#) will be decided upon by the USACE representative and/or DPW representative that would be attending the [Preliminary System Acceptance Testing](#). The [Preparatory Meeting](#) shall involve the General Contractor, the sprinkler system contractor, and the USACE representative and/or DPW representative.

3.15 PRELIMINARY TESTS

[Preliminary Acceptance Testing](#) shall be performed in accordance with the approved [Preliminary Test Procedures](#). Furnish instruments and personnel required for [preliminary Acceptance Testing](#). The [Fire Alarm System](#) shall be tested to assure that equipment and components function as intended. [Preliminary Acceptance Testing](#) shall be witnessed by the [Fire Protection Specialist](#) and the Prime Contractors QC Representative. The USACE representative and/or DPW representatives shall be invited to attend and witness the [Preliminary Acceptance Test](#), but are not required to be present. Upon completion of specified tests, the Contractor shall complete certificates as specified in paragraph SUBMITTALS.

3.16 PRELIMINARY TEST REPORTS

Upon completion of specified preliminary tests, the Contractor shall complete the [Material & Test Certificates](#) as specified in paragraph SUBMITTALS. A [Preliminary Test Report](#) that provides an overview of all testing performed, results, and items needing corrections prior to [Final Acceptance Test](#) shall be provided to the government for review and approval. The installing contractor shall provide a [Preliminary Test Report](#)

to the government for review and approval that shall not be signed.

3.16.1 Fire Protection Specialist Preliminary Test Report

The [Fire Protection Specialist](#) shall generate a [Preliminary System Acceptance Test Report](#) (on company letterhead) summarizing all [Preliminary System Acceptance Testing](#) performed along with the test results and a summary of items requiring corrections from [Preliminary System Acceptance Testing](#) prior to [Final System Acceptance Testing](#). The [Fire Protection Specialist Preliminary Test Report](#) shall be addressed to and sent to the General Contract for corrections and to the government representative acting as the Authority Having Jurisdiction for their records.

3.17 FINAL ACCEPTANCE TESTING PROCEDURES

[Final Acceptance Testing Procedures](#) shall include detailed step-by-step outline for each test and the expected test results to be performed at [Final Acceptance Testing](#) and shall be on its own page in the [Final Test Procedures](#). The [Final Acceptance Testing Procedures](#) shall list all components of the installed system such as [Fire Alarm System Control Panel](#) functions, initiating devices and circuits, notification appliances and circuits, signaling line devices and circuits, control devices/equipment, batteries, transmitting and receiving equipment, power sources/supply, annunciators, special hazard equipment, emergency communication equipment, interface equipment, Guard's Tour equipment, and transient (surge) suppressors. The [Final Acceptance Testing Procedures](#) shall identify the sequence of testing, time estimate for each test, and sample test data forms. The test data forms shall be in a check-off format (pass/fail with space to add applicable test data; similar to the blank copies of the [Material & Test Certificate](#) forms in [NFPA 72](#)). [Final Acceptance Testing Procedures](#) shall include the following information.

- a. Test secondary power of all enclosures ([Fire Alarm System Control Panel](#), [Power Supplies](#), and [Monaco Transceiver](#)). Verify, by test, the secondary power system (back-up batteries) is capable of operating the system for the time period and in the manner specified for [Fire Alarm System](#) operation. The [Fire Alarm System](#) battery draw test shall consist of 72 hours of supervisory duration immediately followed by 15 minutes of alarm at the maximum connected load. Voltage readings of all batteries shall be taken after primary power is disconnected from the system, after 72 hours of supervisory duration, and after the 15 minutes of alarm.
- b. Verify that all notification appliances (horns and strobes) are operational under Alarm operation of the [Fire Alarm System](#).
- c. Each circuit shall be tested for open, short, ground conditions by disconnecting a single device from the circuit. If there is a failure with any of these conditions, then the circuit test will be redone by removing each device on the circuit one at a time. While the device is removed during the circuit testing, the cabling shall be verified for Class A installation by verifying operation of the device upstream and downstream of the removed device.
- d. Test each initiating device for proper operation and response at the control unit.

- e. Verify each initiating device is provided with the correct device label that matches "As-Built" floor plan drawings, "As-Built" one-line riser diagram drawings, and the screen on the [Fire Alarm System Control Panel](#). This also includes the testing of all monitor, control, relay, and isolation modules.
- f. Smoke detectors shall be tested in accordance with [NFPA 72](#) and manufacturer's recommended calibrated test method. Canned smoke shall be used for testing of smoke detectors, the use of magnets for testing is prohibited. Smoke detector sensitivity shall be tested during the Preliminary System Acceptance Testing. Disconnect the verification feature for smoke detectors during tests to minimize the amount of smoke needed to activate the detector.
- g. Testing of duct smoke detectors shall comply with the requirements of [NFPA 72](#). Monometer testing of duct smoke detector sample tubes shall be performed. Canned smoke shall be used for testing of duct smoke detectors, the use of magnets for testing is prohibited.
- h. Testing of heat detectors shall comply with the requirements of [NFPA 72](#).
- i. Testing of carbon monoxide detectors shall comply with the requirements of [NFPA 72](#).
- j. Verify that the control unit is in the normal condition as detailed in the manufacturer's O&M manual.
- k. Test the [Fire Alarm System](#) for specified functions in accordance with the project specifications and the manufacturer's O&M manual.
- l. Test the [Fire Alarm System](#) circuits for transient stray voltage.
- m. Determine that the system is operable under trouble conditions as specified.
- n. Visually inspect wiring.
- o. Test the battery charger output.
- p. Measure the current in circuits to ensure there is the calculated spare capacity for the circuits.
- q. Measure voltage readings for circuits to ensure that voltage drop is not excessive.
- r. Measure the voltage drop at the most remote appliance (based on wire length) on each notification appliance circuit.
- s. Test connections to other systems such as elevator shunt-trip feature, cooking hood suppression system, fire protection tamper, flow, and pressure switches, fire pump controllers, door holders, fire fighter's telephone, etc.
- t. Verification of enclosure key type and identification.
- u. Verification of electrical panel and breaker identified on enclosures

match electrical panel and breaker.

- v. Verification breaker serving fire alarm equipment is red in color and provided with a red colored means of lockout.
- w. Verify operation of the transceiver (correct zones received and transmitted) and antenna system (forward and reflective signal strengths) and installation of lightening arrestor.
- x. Verify that red-line drawings are accurate, that the one-line riser diagram matches installation, and amplifier loading is not exceeded.
- y. Verify audible notification device (horns) tap settings and visual notification appliances (strobes) candela rating matches "As-Built" drawings.
- z. Verify that software control and data files have been entered or programmed into the FACP. Hard copy and digital flash drive records of the software shall be provided to the Contracting Officer after completion of Final System Acceptance Testing.

3.18 FINAL TESTING PREPARATORY MEETING

A [Preparatory Meeting](#) may be held at the site to discuss the expectations and requirements of the [Final System Acceptance Test](#) by reviewing the [Final Test Procedures](#). The necessity of a [Preparatory Meeting](#) will be decided upon by the USACE representative and/or DPW representative and JBLM Fire Prevention Representative that would be attending the [Final System Acceptance Testing](#). The [Preparatory Meeting](#) shall involve the General Contractor, the sprinkler system contractor, and the USACE representative and/or DPW representative.

3.19 FINAL ACCEPTANCE TESTING

[Final Acceptance Testing](#) shall be performed in accordance with the approved [Final Test Procedures](#). Furnish instruments and personnel required for [Final Acceptance Testing](#). The [Fire Alarm System](#) shall be tested to assure that equipment and components function as intended. [Final Acceptance Testing](#) shall be witnessed by the [Fire Protection Specialist](#) and the Prime Contractors QC Representative. The USACE representative and/or DPW representatives and JBLM Fire Prevention Representative shall be invited to attend and witness the [Final Acceptance Test](#), but are not required to be present. Upon completion of specified tests, the Contractor shall complete certificates as specified in paragraph SUBMITTALS. A backcheck inspection of deficiencies found during [Preliminary System Acceptance Testing](#) will be conducted to verify corrections have been made. The contractor shall provide a complete demonstration of the operation of the system. The contractor shall provide copies of the current [as-built drawings](#) and certificates of tests previously conducted at the [Preliminary System Acceptance Test](#). The installation shall not be considered accepted until identified discrepancies have been corrected and test documentation is properly completed and received.

3.20 FINAL TEST REPORTS

Upon completion of specified final acceptance tests, the Contractor shall complete the [Material & Test Certificates](#) as specified in paragraph SUBMITTALS. [Final Test Report](#) shall be provided by the installing

contractor to the government for review and approval. The Contractor's [Final Test Report](#) shall be signed by the installing contractor, [Fire Protection Specialist](#), and government representative acting as the Authority Having Jurisdiction.

3.20.1 Certification Letter

The [Fire Projection Specialist](#) shall certify in writing (on company letterhead) that the [Fire Alarm System](#) performs as intended, has been installed in accordance with the contract requirements, and is ready to be put into service. The [Certification Letter](#) shall be addressed to and sent to the government representative acting as the Authority Having Jurisdiction for their records.

3.21 CLOSEOUT SUBMITTALS

The [Fire Alarm System Contractor](#) shall submit the following items for JBLM records, review, and approval prior to any [Operations and Maintenance Instructions](#) or [On-Site Training](#).

- a. [As-Built Drawings](#)
- b. [Warranty Letter](#)
- c. [Spare Parts](#)
- d. [Operation and Maintenance \(O&M\) Instructions](#)
- e. [Instruction of Government Employees](#)

3.22 INSTRUCTION OF GOVERNMENT EMPLOYEES

3.22.1 Instructor

Include in the project the services of an instructor, who has received specific training from the manufacturer for the training of other persons regarding the inspection, testing, and maintenance of the system provided. The instructor shall train the Government employees designated by the USACE representative and/or DPW representatives in the care, adjustment, maintenance, and operation of the [Fire Alarm System](#). Each instructor shall be thoroughly familiar with all parts of this installation. The instructor shall be trained in operating theory as well as in practical O&M work. Submit the instructor's information and qualifications including the training history.

3.22.2 Required Instruction Time

Provide up to 8 hours of instruction after final acceptance of the system. The instruction shall be given during regular working hours on such dates and times as are selected by the Contracting Officer.

3.22.3 Technical Training

Equipment manufacturer or a factory representative shall provide Certification Training for Equipment Installed, Dongle, and Software that shall allow for classroom instruction as well as individual hands on programming, troubleshooting and diagnostics exercises at the equipment

manufacturer's training facility.. This factory training shall occur within 3 months of Final System Acceptance Testing. Training shall be made available to all available JBLM fire alarm technicians.

Provide training courses for the operations and maintenance staff. Conduct the system operation training in the building where the system is installed. The system maintenance, expansion, and modification training shall consist of on site and/or off site class room training as necessary to qualify two government operations and maintenance technicians to perform all levels of maintenance, expansions, and modifications to the [Fire Alarm System](#), hardware, software, and components. This training will include (and turn over to the government) all proprietary licenses, site specific software, and tools to perform the required tasks. All specialized equipment and/or training to program, edit existing program, add or delete devices, etc. shall be provided as part of the fire alarm system.

3.23 TECHNICAL DATA AND COMPUTER SOFTWARE

Provide, in manual format, lesson plans, operating instructions, maintenance procedures, and training data for the training courses. The operations training shall familiarize designated government personnel with proper operation of the installed system. The maintenance training course shall provide the designated government personnel adequate knowledge, test equipment, dongles or software keys, passcodes and access to factory technical support required to diagnose, repair, maintain, and expand functions inherent to the system.

3.24 OPERATION AND MAINTENANCE INSTRUCTIONS

The contractor shall submit [Operation and Maintenance Instructions](#) prior to performing [On-Site Training to the government](#) representative acting as the Authority Having Jurisdiction for approval. Manuals shall include the manufacturer's name, model number, parts list, and tools that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment. Each service organization submitted shall be capable of providing 4-hour onsite response to a service call on an emergency basis.

Submit 3 copies of the Operation and Maintenance Instructions, indexed and in booklet form. The Operation and Maintenance Instructions shall be a single volume or in separate volumes, and may be submitted as a Technical Data Package. Manuals shall be approved prior to training. The [Fire Alarm System Operation and Maintenance Instructions](#) shall include:

- a. "Manufacturer Data Package as specified in [Section 01 78 23 OPERATION AND MAINTENANCE DATA](#).
- b. Include as built drawings in hard copy and electronic format in AutoCAD that show the exact run of conduit, quantity of wires, wire color code, location of every initiating device, signaling device, module, and any major junction boxes or power supplies. The as built drawings will also show loop number and the address of each device or module for the addressable system.
- c. Operating manual outlining step-by-step procedures required for system

startup, operation, and shutdown. The manual shall include the manufacturer's name, model number, service manual, parts list, and complete description of equipment and their basic operating features.

- d. Maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The manuals shall include conduit layout, equipment layout and simplified wiring, and control diagrams of the system as installed.
- e. The manuals shall include complete procedures for system revision and expansion, detailing both equipment and software requirements.
- f. Software delivered for this project shall be provided on a thumb drive and installed inside the FACP, and installed on a labeled CD and attached to the O&M manual.
- g. Printouts of configuration settings for all devices.
- h. Routine maintenance checklist. The routine maintenance checklist shall be arranged in a columnar format. The first column shall list all installed devices, the second column shall state the maintenance activity or state no maintenance required, the third column shall state the frequency of the maintenance activity, and the fourth column for additional comments or reference. All data (devices, testing frequencies, etc.) shall comply with [UFC 3-601-02](#).

3.25 ON-SITE TRAINING

3.25.1 Technical Plan

The Contractor shall submit a [Training Plan](#) for review and approval by the USACE representative and/or DPW representatives prior to that start of [On-Site Technical Training](#).

3.25.2 Technical Training

The Contractor shall conduct a training course for operation and maintenance personnel as designated by the Contracting Officer. Training shall be provided for a period of not less than 8 hours up to a maximum of 40 hours during normal working time. Training shall start after the system is functionally complete and after Final Acceptance Test. The [On-Site Training](#) shall cover all of the items contained in the approved [Operating and Maintenance Instructions](#). Provide (1) copy of the [On-Site Training](#) on a DVD to the following:

- a. JBLM Fire Department.
- b. DPW Public Works.
- c. JBLM Fire Alarm Shop.

3.26 EXTRA MATERIALS

3.26.1 Interchangeable Parts

Spare parts furnished shall be directly interchangeable with the corresponding components of the installed system. Spare parts shall be

suitably packaged and identified by nameplate, tagging, or stamping. Spare parts shall be delivered to [DPW Fire Alarm Shop](#) at the time of the [Final System Acceptance Testing](#).

3.26.2 Spare Parts

Furnish three (3) or 10 percent rounded up to the next whole number (whichever is fewer) of the following spare parts and accessories:

- a. Fuses for each fused circuit.
- b. Each type of notification appliance in the system (e.g. horns, strobes, combination horn/strobes, sounder bases, etc.).
- c. Each type of initiating device included in the system (e.g. smoke detector, heat detector, carbon monoxide detector, manual pull station, etc.).
- d. Each type of system components (e.g. bases for detectors, magnetic door holders, monitor modules, relay modules, control modules, isolation modules, etc.).
- e. Lockable and labeled spare parts cabinet with sufficient volume to house the required spare parts that shall be installed in the same room as the [Fire Alarm System Control Panel](#).

3.26.3 Special Tools

A list of special tools, test equipment required for maintenance and testing, software, connecting cables, dongles, codes and passwords, and proprietary equipment, necessary for the maintenance, testing, adding and deleting devices, and reprogramming of the [equipment](#) shall be furnished [DPW Fire Alarm Shop](#) prior to the [Final System Acceptance Testing](#).

-- End of Section --