

Addendum 02

TO	Bidders & Plan Centers				
FROM	Jeff Schott, P.E.				
PROJECT	Sherman County Fair Grounds Arena				
SUBJECT	Addendum 002				
DATE	9/10/2021	PROJECT #	2021-009	MEMO #	PM-03

THIS ADDENDUM DOES NOT CHANGE THE BID TIME & DATE. THE BID TIME AND DATE IS TUESDAY, SEPTEMBER 21, 2021, 2 PM Pacific Time..

Added documents:

- Spec section 28 00 10 Electronic Safety and Security Basic Requirements.
- Spec section 28 31 00 Addressable Fire Alarm

Revised documents:

N/A

Questions & Clarifications:

1. *Note 6 on C012 calls out a detail on 4/C043, but there is not detail?*
Should reference curb detail 3/C044.

2. Owner will remove trees and existing structures in pond area prior to construction.

3. Fire pump clarifications, minimum requirements.
 - a. 1000 GPM @ 75psi, Vertical turbine pump
 - b. 208 volt, 3 phase power, soft start.
 - c. Fire pump controller w/ provision for transfer switch
 - d. 6" flow meter
 - e. NFPA 20 compliant system including gauges, hose valve head w/caps and chains
 - f. Jockey pump, 208 3phase

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes basic design requirements and specifications for the fire alarm replacement.
- B. This Section contains requirements that pertain to all 28 00 00 Series sections, and includes the design basis, as well as requirements for submittals, quality assurance, product handling, record documents, project conditions, installation, testing, demonstrations and training.
- C. Within the appropriate section will be more specific information necessary for the construction of the systems required for this project.
- D. Provide all items, articles, materials, equipment, operations and/or methods listed, mentioned, shown and/or scheduled on the Drawings and/or in these Specifications, including all labor, supervision, services, permits, fees, and incidentals necessary and required to provide a complete and operable facility with complete systems as shown, specified, and required by applicable codes.
- E. The work shall include but not be limited to removing existing system, cable, head-end, and installing a code compliant system.

1.2 RELATED DOCUMENTS

- A. Provisions of the General Requirements, Supplementary Requirements, and Division 1 apply to the work specified in this section.
- B. All Division 28 Specifications

1.3 REFERENCES AND REGULATORY REQUIREMENTS

- A. National Fire Protection Association (NFPA)
- B. National Electric Code (NEC)
- C. Americans with Disabilities Act (ADA)
- D. Institute of Electrical and Electronics Engineers (IEEE)
- E. Underwriters Laboratories (UL)
- F. International Building Code (IBC)
- G. International Fire Code (IFC)
- H. Occupational Safety and Health Administration (OSHA)
- I. Authorities Having Jurisdiction (AHJ)
- J. Oregon Structural Specialty Code (OSSC)

1.4 REQUIREMENTS

A. Manufacturer

1. Have verified testing and documentation showing the parameters and abilities of the system as installed.
2. The system and its components must be manufactured by a company engaged in the manufacture of the specific equipment for a minimum of 3 years.
3. Must be listed in the approved manufacture listing within the appropriate section.

B. Contractor

1. Documented successful work experience of at least 10 facilities of equivalent size and technical requirements utilizing the equipment proposed to be used.
2. Have a designated Project Manager for the site with documented experiences from at least 5 other projects of similar size and technical difficulty.
3. Have enough trained installers to meet the schedule of the project, without causing delay.
4. Must be Licensed and Bonded.

C. System Installers

1. Shall have no less than 3 years of documented work experience on projects of equivalent size and technical difficulty. If you are using a Subcontractor their installers must meet the requirements, this is a requirement of the installer not the bidder.
2. "Experience" is defined as the completion of an operational system, with the system being successfully operated by the customer for its intended purpose for at least one year.
3. Must have current certification, from the Manufacturer, on the system to be installed so the customer may benefit from the best warranty available from the manufacturer.

D. Any errors made in the plans or specifications are to be brought to the attention of the architect to be resolved before construction begins.

E. All work done is to meet the Codes and requirements listed above. The most stringent having precedence over the others.

F. The equipment and material being submitted for this project shall be an "End-to-End Solution" for compatibility and warranty by manufacturer.

G. OR APPROVED EQUAL

1. In order to submit items for "approved equal" status there must first be a request on the plans or specifications stating "or approved equal" for that item or system.
2. The submittal for "approved equal" must be received prior to bidding with enough time to let ALL BIDDERS know a new item or manufacturer has been approved. This day and time will be at the architect discretion, they will determine the length of time prior to bidding that is required to share this information.
3. No items will be "approved as equal" after bidding without the architect's written approval.
4. Items cannot and will not be approved as equal during the submittal process. If an item is submitted and approved during the submittal process that is not listed as approved on the bid documents and there is not a record of being approved prior to bid, that does not make this item or manufacturer approved. The Contractor will still be liable for providing the equipment requested in the bid documents or that was "approved as equal" prior to bidding.

1.5 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

- A. Submit in accordance with Division 1 full technical and descriptive shop drawing data on proposed materials and equipment as detailed in each section.
 - 1. Include dimensions, wiring and block diagrams, conduit sizes, performance data, ratings, control sequences, and all other descriptive data necessary to describe the item proposed and its operating characteristics.
 - 2. Shop drawings need to be submitted as hard copy and electronic format. Electronic format shall be ACAD 2007 or later, using the same scale as used on the bid set.
 - 3. Symbols used on the Shop Drawings shall match the symbols used on the Bid Set.
 - 4. Coordinate with other applicable trades in submittal of shop drawings.
 - 5. Shop drawings shall detail space conditions to accommodate other concerned trades, subject to final review by the Architect.
- B. The Contractor shall verify that all equipment submitted can be delivered and installed within the time constraints of the construction period.
- C. Include the manufacturer, type, style, catalog number, complete specification, certified dimensions, and description of physical appearance for each item and option submitted. Reproduction of catalog data sheets shall be clean and legible to show all details, including gauge of metal used.
- D. Include only information on exact equipment to be installed, not general catalogs of the manufacturer. Where sheets show proposed equipment as well as other equipment, identify proposed equipment with rubber stamp arrow or similar concise method.
 - 1. Submit complete technical data necessary to evaluate the material and equipment. Include a complete technical specification for the submitted equipment, noting differences and adherence to this **Section**.
 - 2. Submittals need to be clear and concise requiring no interpretation by the Contractor to be clearly understood. Products to be used, within a system, shall be grouped within the submittals so the system can be clearly understood.
 - 3. Data sheets are to be submitted in a 3-Ring binder, separated by systems if a particular piece is to be used for multiple systems show it in each section.
- E. Submit with each copy a transmittal letter verifying that all included equipment submittals have been carefully considered for quality, dimensions, function, and have been coordinated with the Drawings and Specifications. Guarantee that proposed materials will meet or exceed the quality and function of those specified.
- F. Include wire run and connection diagrams for all signal and/or low voltage systems, including floor plans.
- G. Submittal Review: The submittal review process is a means to determine quality control. The action noted to be taken (or where conflicts with the contract documents are not noted) shall not be interpreted by the Contractor as automatic "change orders." Approval of the data for substitution and shop drawings shall not eliminate the Contractor's responsibility for compliance with Drawings or Specifications, nor shall it eliminate the responsibility for freedom from errors of any sort in the data discovered prior to or after the review process. Deviations, discrepancies, and conflicts between the submittals and the Contract Documents shall be called to the Architect's attention in writing at the time of transmittal of the data.
- H. Unless otherwise directed by Division 1, submittal data shall be in PDF format.

I. Samples

1. Provide Workstation outlet sample including faceplate, jacks, and proposed labeling.
2. Confirm acceptance of colors and design with architect prior to ordering.

J. Submit a list of at least 5 facilities of equal size and technical requirements utilizing the equipment submitted.

1. For each facility, list:
 - a. Name and location of facility.
 - b. Date of Occupancy by customer.
 - c. Representative to contact and telephone number.
 - d. Construction Manager or General Contractor.
 - e. Provide information on the installed locations with operational equipment.

K. Certifications

1. Copies of certifications held by employees for the system to be installed.
2. Certificates shall be from the manufacturer or facility that provided the training listing the employee who has successfully passed the program.

1.6 WARRANTY

- A. All work is to be performed in a manner so the customer may benefit from the most complete warranty available by the manufacturer.
- B. The installing company is to submit all paperwork, on behalf of the customer in the customer's name, to the appropriate manufacturer so the installed system is covered by warranty.
- C. A one-year warranty is to be provided by the installing contractor for hardware, cable and terminations. All work/cost required to replace a defective item is to be covered by the warranty.

1.7 OPERATING AND MAINTENANCE DATA

A. Operation and Maintenance Manual shall include:

1. Warranty information
2. Installing company name, address, and phone number
3. System operation manual
4. Manufacturers product information of all installed equipment, cable, etc.

B. Operation and Maintenance "record drawings" shall include:

1. Floor plan drawings shall be provided showing location of equipment and routing of conduit and cable.
2. Elevations for all equipment installed
3. Record drawings will be provided in CAD 2007 or later.

C. Maintenance and operating instructions on all systems.

D. Control wiring diagrams for all locking systems with each system identified.

- E. Certification from system manufacturers that systems are installed in accordance with manufacturer's recommendations and are functioning correctly at the time of final inspection.

1.8 QUALITY ASSURANCE

A. Design Requirements

1. Provide and install all related devices, equipment and appurtenances necessary to complete the work as a complete and fully operational system.
 2. All materials, hardware, and electronics are to be delivered to the site in the original packaging. Used or remanufactured material will not be allowed.
 3. All cabling shall be routed through dedicated concealed raceways unless otherwise indicated. All raceways shall be a minimum 1 inch unless otherwise noted. Size raceways and install conductors in accordance with the NEC, NFPA, and TIA/EIA.
 - a. EMT conduit with compression fittings may be utilized in all inaccessible areas unless otherwise required by code.
 - b. Rigid metal conduit with Liquid-tight Fittings shall be used in exposed exterior applications.
 - c. PVC conduits shall be used in underground applications; stub-ups shall be rigid metal conduit.
 - d. Rigid metal conduit shall be used in all interior accessible areas where concealed conduit requirements cannot be met. Submit drawings, diagrams and information to Customer's Representative for review prior to work.
 - e. All conduits shall terminate, whether in Pull-box or not, with the appropriate size End-fitting with a bushing to protect cable from abrasion.
 4. Mounting heights and accessibility to equipment requiring access by individuals with disabilities shall comply with ADA requirements.
 5. Outdoor enclosures shall be NEMA 4 rated
- B. Equipment specifications may not deal individually with every part, control, or device, which may be required to produce the equipment performance specified or as required to meet the equipment warranties. Include such items, as required, for a complete operational system, whether or not specifically indicated.
- C. All equipment contained in Division 28 Sections shall be compatible with current computer standards.
- D. If installation of equipment, raceways, cable trays and/or conduit is performed prior to coordination with other trades, which interferes with work of other trades, make necessary changes to correct the condition at no additional cost to the customer.
- E. If R&I (Removal and Installation) of existing equipment is needed. The awarded Contractor must test systems PRIOR to any removal. If any component is not working it needs to be brought to the attention of the onsite representative. If this is not accomplished, any component not working after install that was part of R&I, will be replaced with a new unit at no additional cost to the customer.
- F. All work and materials shall conform to all applicable local and state codes and all federal, state and other applicable laws and regulations. All clarifications and modifications which have been cleared with appropriate authorities are listed under the applicable sections. All electrical products shall bear the UL label.
- G. Whenever the requirements of the Specifications or Drawings exceed those of the applicable code or standard, the requirements of the Specifications and Drawings shall govern.

- H. The Drawings and Specifications are complementary. What is called for by one shall be as though called for by both.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All materials and equipment are to be delivered in the original manufacturer packaging and shall be of the latest design available from manufacturer.
- B. Provide and apply protective covering immediately upon receiving the products and maintain throughout the construction process.
- C. Protect materials stored on the job site, during construction, after installation, and until time of substantial completion.
- D. Keep products clean and dry, elevate equipment above ground and floor.
- E. Any material damaged, before time of substantial completion, is to be replaced at no cost to the customer.
- F. Equipment shall not be delivered to site more than 2 weeks prior to install by cabling Contractor.
- G. Location to store materials, on site, will be designated by General Contractor or Customer Representative depending on the project.

1.10 RECORD DOCUMENTS

- A. Electrical General Requirements provide complete schematic drawings depicting location of interface, number of conductors, types of connectors, and type of enclosure.

1.11 PROJECT CONDITIONS

- A. Active Services: Protect existing active services, water, gas, sewer, electrical, when encountered, against damage. If active services are encountered which require relocation, notify the Architect promptly in writing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable manufacturers
 - 1. Product line must be conformance with the specifications.
 - 2. Where manufacturers have been named, use one of those named.
 - 3. Manufacturers may be designated in the appropriate Section for the system involved.

2.2 MATERIALS

- A. Materials shall be of the proper designation and design for the area in which they are to be installed so as to be in compliance with all Standards and Codes i.e. plenum or OSP rated.
- B. All anchors used for the support of any equipment are to be of the appropriate design and load rating for that area as set by manufacturer recommendations.

PART 3 - EXECUTION

3.1 LAYOUT AND COORDINATION

- A. The Contractor shall inspect the job site prior to bidding and become familiar with existing conditions which will affect his work. The Drawings are diagrammatic indicating approximate location of outlets, lighting fixtures, electrical equipment, etc. Consult the Architectural, Structural and Mechanical Drawings to avoid conflicts with equipment, structural members, etc. When required, make all deviations from Drawings to make the work conform to the building as constructed, and to related work of others. Minor relocations ordered prior to installation may be made without added cost to the Owner.
- B. Obvious omissions from Drawings or Specifications or differences between Drawings and Specifications shall be called to the Architect's attention at least ten (10) days prior to the bid date for clarification. Failure to do so will be construed as the willingness of this Contractor to supply all necessary materials and labor required for the proper completion of this work in a manner approved by the Architect.
- C. Call to the attention of the Architect any error, conflict or discrepancy in Drawings and/or Specifications. Do not proceed with any questionable items of work until clarification of same has been made.
- D. Supplementary details and plans may be supplied as required and they will become a part of the Contract Documents.
- E. Work under this Division shall be conducted in a manner to cooperate with all other trades for proper installation of all items of equipment.
- F. Coordination of work with other crafts employed on the project is mandatory. Arrange work to reduce interruption of existing services to minimum. When interruptions are unavoidable, consult Architect and utilities involved and agree in writing, with copy to the Architect, upon a mutually satisfactory time and duration.
- G. Verify the physical dimensions of each item of electrical equipment to fit the available space and promptly notify the Architect prior to roughing-in if conflicts appear. Coordination of equipment to fit the available space and the access routes through the construction shall be the Contractor's liability.
- H. Locations of items shown on the Drawings as existing are partially based on record and other drawings which may contain errors. The Contractor shall verify the correctness of the information shown prior to rough-in or demolition and notify the Architect of any discrepancies.
- I. Coordinate all work and trim with carpet installers. Provide carpet plates on all carpet surfaces, complete as required.
- J. Install equipment such that code-required working clearances are maintained, and allow clearances for future maintenance.
- K. Coordinate installation of electrical conduit, boxes, fittings, anchors, and miscellaneous items to be concealed in precast concrete assemblies.

3.2 PROTECTION OF EQUIPMENT

- A. Protect materials stored on the job site. Protect equipment until time of Substantial Completion.
- B. Provide and apply protective material immediately upon receiving the products and maintain throughout the construction process.
- C. Failure to protect materials constitutes sufficient cause for rejection of the apparatus or material.
- D. Protect factory finish from damage during construction operations and until final acceptance. Restore finishes that become stained, scratched, or damaged.
- E. Protect existing equipment from any damage during the construction process.

3.3 INSTALLATION

- A. Install all devices and equipment in accordance with standards set by industry practice and manufacturer's requirements.
- B. Use only highly skilled and experienced workers certified by the manufacturer of the system involved.
- C. When change in location or size is required, obtain approval of Architect before making change.
- D. Do not make any changes without written approval of Architect.
- E. Provide to Division 16 installer all non-standard electrical boxes.
- F. Fill percentage: Conduit fill shall not exceed 40 percent.
- G. Install conductors, control and communications cables, coaxial cables, etc., for the work of this division according to code, standard, or manufacturer recommendations which ever is the most stringent.
- H. Provide installation, including connections, cable pulling, testing and interfacing of systems.
- I. Execute all work described in this specification and shown on drawings and all work dependent upon, and necessary to, complete finish of the work so described or shown, in a workmanlike manner using materials best adapted to purposes where such work or material is not specifically mentioned.
- J. Fire stopping is to be completed on all penetration occupied by material installed by Communications Contractor. Whether the penetration was made by the Contractor or for the Contractor, if your company is utilizing the sleeve or conduit you are responsible for the Fire-Stopping to meet the TIA/EIA Standards.

3.4 TESTING AND DEMONSTRATION

- A. Tests
 - 1. Notify customer's representative in writing, in advance of testing to prevent delays in construction schedules.
 - 2. Test all systems and place in proper and specified working order prior to demonstration of the systems.

3. Test system grounds to demonstrate that the ground resistance does not exceed the requirements of the Transient Voltage Surge Suppression (TVSS) or the National Electric Code (NEC).
4. Perform tests, as required, by authorities having jurisdiction over the site.
5. Testing shall be in the presence of the customer's designated representatives, Contractor, and representatives of the authorities having jurisdiction.

B. Verification of Performance

1. Prior to acceptance of the work, the System Integrator/Installer shall demonstrate to the customer, designated representatives, Contractor, and representatives of the authorities having jurisdiction, all subsystems, features and functions of the system, and shall instruct the customer in the proper operation and event sequences of the system.
2. Demonstrate each system and subsystem. The demonstration is to consist of not less than the following:
 - a. Designate actual location of each component of a system or subsystem and demonstrate its function and its relationship to other components within the system.
 - b. Demonstrate the systems and subsystems operations by actual "START-STOP/ON-OFF/OPEN-CLOSE" cycling showing how to work controls, how to reset devices, how to replace fuses and emergency operating/operations procedures.
 - c. Demonstrate communication, signaling and door control equipment/devices by actual operation of such devices.

C. Demonstration

1. System Integrator/Installer shall furnish the necessary trained personnel to perform the demonstration and instructions or arrange to have the manufacturer's representatives present to assist with the demonstrations. Training time shall include, as a minimum, the total time determined by the sum of the times specified in each Section, for performing the prescribed demonstrations/training.
2. System Integrator/Installer shall arrange with the customer's designated representative the date and times for performing the demonstrations. The customer will select date and time for demonstration.
3. Comply with requirements for Systems Demonstrations in each Section.

3.5 INSPECTIONS

- A. At the completion of the project and prior to final acceptance of the work, provide evidence of final inspections and approvals to the customer, as required by the authorities having jurisdiction.

3.6 CUSTOMER TRAINING

A. Include

1. Train Operations and Maintenance Personnel in use and maintenance of systems provided under this section.
2. Train maintenance staff in troubleshooting and maintenance of each system.
3. Provide copies of technical manuals, including function and operational circuit and operational circuit characteristics and schematic diagrams, for each system and system components.

B. Training sessions

1. Shall be conducted by instructors certified in writing by manufacturer of specific system
 2. Conduct sessions for not less than four-hour periods during normal working hours, i.e., Monday through Friday, 8:00 AM to 5:00 PM.
 3. Training session schedules shall conform to requirements of customer.
 4. Submit schedules to the customer for approval not less than two weeks prior to training session.
 5. Do not schedule training sessions for different systems concurrently.
 6. Give 20 hours of instruction on each system to the customer to assure that personnel are fully trained.
- C. Instruct operating staff in proper operation, including hands-on training.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. The provisions of the General Requirements, Supplementary Requirements, and Division 1 apply to the work specified in this Division.
- B. The requirements of this section apply to the Fire Alarm and Detection System.
- C. Provide all items, articles, materials, equipment, operations and/or methods listed, mentioned, shown and/or scheduled on the Drawings and/or in these Specifications, include all design, labor, supervision, services, permits, fees, and incidentals necessary and required to provide a complete and operable facility with a complete system required by applicable codes. Provide all labor, materials, and perform such other services necessary and reasonable incidental to the design and installation of a monitoring system, required by the Authority Having Jurisdiction.
- D. The fire alarm and detection system is a deferred submittal system, to be completed by the Contractor in permit ready form. The fire alarm devices shown on the plans and described in the specification are provided to assist the Contractor in their design process to provide a code compliant (at minimum) system.

1.2 SCOPE OF WORK

- A. [This section to be completed by Engineer. Detailed description of system goals, operational requirements including unique sequence of operations, working hours, and other PROJECT SPECIFIC items should be included that are not clearly addressed in other sections of this document.]

1.3 ACCEPTABLE EQUIPMENT AND SERVICE PROVIDERS

- A. Manufacturers: Siemens, EST, Notifier, Gamewell-FCI, Silent Knight, Hochiki, or approved equal.
- B. Being listed as an acceptable Manufacturer in no way relieves obligation to provide all equipment and features in accordance with these specifications.
- C. The equipment and service provider shall be a nationally recognized company specializing in fire alarm and detection systems. This provider shall employ factory trained and NICET Level II, Level III, and Level IV certified technicians, and shall maintain a service organization within 50 miles of this project location. The equipment and service provider shall have a minimum of 10 years experience in the fire protective signaling systems industry.

1.4 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this section.
- B. The work covered by this section is to be coordinated with related work as specified elsewhere in the specifications. Requirements of the following sections apply:
 - 1. Division 26: "Basic Electrical Materials and Methods."

2. Division 26: "Wiring Methods."
3. Division 21: "Fire Protection".
4. Division 23: "HVAC Systems".

C. The system and all associated operations shall be in accordance with the following:

1. National Fire Protection Association (NFPA)
2. National Electric Code (NEC)
3. Americans with Disabilities Act (ADA)
4. Institute of Electrical and Electronics Engineers (IEEE)
5. Underwriters Laboratories (UL)
6. International Building Code (IBC)
7. International Fire Code (IFC)
8. Occupational Safety and Health Administration (OSHA)
9. Authorities Having Jurisdiction (AHJ)
10. Oregon Structural Specialty Code (OSSC)

1.5 SYSTEM DESCRIPTION

- A. General: Provide a complete, non-coded, addressable, microprocessor-based fire alarm system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein.
- B. Software: The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary. The system shall be capable of 100% on-site programming to accommodate system expansion and facilitate changes in operation. All programming shall be capable of being accomplished via the front panel and via a lap top computer. All software operations shall be stored in a non-volatile programmable memory within the FACP. Loss of primary and secondary power shall not erase the instructions stored in memory.
- C. The ability for selective input/output control functions based on alarm grouping is to also be incorporated in the resident software programming of the system.
- D. History Logs: The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. Separate alarm, supervisory and trouble logs shall be provided.
1. The control panel shall have the ability to store a minimum of one hundred (100) events in an alarm log plus a minimum of three hundred (300) events in a separate trouble log and a minimum of one hundred (100) events in a supervisory log. These events shall be stored in a battery protected random access memory (RAM). Real time and date shall accompany all history event recording.
 2. History logs shall be capable of being viewed separately or shall be selectable for viewing as a combined history log that displays both alarm and trouble events in chronological order.
- E. Remote Access:
1. The system shall be fully programmable from the front panel display
 2. A personal computer or technician's laptop, configured with terminal emulation software shall have the ability to access the FACP for diagnostics, maintenance reporting, programming and information gathering.

- F. Required Functions: The following are required system functions and operating features:
1. Priority of Signals: Fire alarm events have highest priority. Subsequent alarm events are queued in the order received and do not affect existing alarm conditions. Priority Two, Supervisory and Trouble events have second-, third-, and fourth-level priority, respectively. Signals of a higher-level priority take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all events regardless of priority or order received.
 2. Noninterfering: The activation of an addressable device does not prevent the receipt of signals from subsequent activations.
 3. Transmission to an approved Supervising Station: Automatically route alarm, supervisory, and trouble signals to an approved supervising station service provider, under another contract.
 4. Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated at the FACP and the remote annunciator, indicating the type of device, the operational state of the device (i.e alarm, trouble or supervisory) and shall display the custom label associated with the device.
 5. General Alarm: A system general alarm shall include:
 - a. Indication of alarm condition at the FACP and the annunciator(s).
 - b. Identification of the device/zone that is the source of the alarm at the FACP and the annunciator(s).
 - c. Operation of audible and visible notification appliances until silenced at FACP.
 - d. Audible Alarm Notification shall operate as a Temporal Code pattern.
 - e. Closing doors normally held open by magnetic door holders.
 - f. Unlocking designated doors.
 - g. Shutting down supply and return fans serving zone where alarm is initiated.
 - h. Closing smoke dampers on system serving zone where alarm is initiated.
 - i. Initiation of smoke control sequence.
 - j. Transmission of signal to the supervising station.
 - k. Initiation of elevator Phase I functions (recall, shunt trip, illumination of indicator in cab, etc.) in accordance with ASME/ANSI A17.1, when specified detectors or sensors are activated, as appropriate.
 6. Supervisory Operations: Upon activation of a supervisory device such as a [fire pump power failure,][low air pressure switch, and][none] tamper switch, the system shall operate as follows:
 - a. Activate the system supervisory service audible signal and illuminate the LED at the FACP and the graphic annunciator.
 - b. Pressing the Supervisory Acknowledge key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.
 - c. Record the event in the FACP historical log.
 - d. Transmission of supervisory signal to the supervising station.
 7. Alarm Silencing: If the "Alarm Silence" button is pressed, all audible alarm signals shall cease operation except the fire sprinkler bell.
 8. System Reset
 - a. The "System Reset" button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps ("IN PROGRESS", "RESET COMPLETED") as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for re-alarmed the system. The display message shall indicate "ALARM PRESENT, SYSTEM RESET ABORTED."
 - b. Should an alarm condition continue, the system will remain in an alarmed state.

9. Manual Control: Manual controls shall be supervised so that an "off normal" position of any switch shall cause an "off normal" system trouble. The "off normal" status shall be clearly identified in plain-language on the FACP alphanumeric display.
 - a. Manual Bypass Control: The ability to perform a manual bypass of selected automatic functions shall be provided.
 - b. Circuit Enable/Disable Control: The system shall have provisions for disabling and enabling each circuit individually for maintenance or testing purposes.
10. WALKTEST: The system shall have a one person test feature. Enabling the one person test feature at the FACP shall activate the "One Person Testing" mode of the system as follows:
 - a. The city circuit connection and suppression release circuits shall be bypassed for the testing group.
 - b. Control relay functions associated to the testing group shall be bypassed.
 - c. The FACP shall indicate a trouble condition.
 - d. The alarm activation of any initiation device in the testing group shall cause the audible notification appliances to sound a code to identify the device.
 - e. The control panel shall automatically reset itself after signaling is complete.
 - f. Any momentary opening of an initiating or notification appliance circuit wiring shall cause the audible signals to sound for 4 seconds indicating the trouble condition.

G. Analog Smoke Sensors:

1. Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The FACP shall determine the condition of each sensor by comparing the sensor value to the stored values.
2. Environmental Compensation: The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.
3. Programmable Sensitivity: Photoelectric Smoke Sensors shall have 2 sensitivity levels ranging from 2.5% or 3.7%, programmed and monitored from the FACP.
4. Sensitivity Testing Reports: The FACP shall provide sensor reports that meet NFPA 72 calibrated test method requirements. The reports shall be viewed on a Maintenance Terminal CRT Display or printed for annual recording and logging of the calibration maintenance schedule.
5. The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to automatically indicate when a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate if a sensor is close to a trouble reporting condition and will be indicated on the FACP as "ALMOST DIRTY." This condition provides a means to alert maintenance staff of a sensor approaching dirty without creating a trouble in the system. If this indicator is ignored and the second level is reached, a "DIRTY SENSOR" condition shall be indicated at the FACP and subsequently a system trouble is reported [to the Supervising Station][none]. The sensor base LED shall glow steady giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. If a "DIRTY SENSOR" is left unattended, and its average value increases to a third predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control unit.
6. The FACP shall continuously perform an automatic self-test on each sensor that will check sensor electronics and ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition.

H. Fire Suppression Monitoring:

1. Water flow: Activation of a water flow switch shall initiate general alarm operations.
 2. Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.
 3. WSO: Water flow switch and sprinkler valve tamper switch shall be capable of existing on the same initiating zone. Activation of either device shall distinctly report which device is in alarm on the initiating zone.
- I. Audible Alarm Notification: By horns in areas as indicated on drawings.
- J. Power Requirements:
1. The control panel shall receive AC power via a dedicated fused disconnect circuit.
 2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal AC power in a normal supervisory mode for a period of 24 hours with 5 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.
 3. All circuits requiring system-operating power shall be 24 VDC and shall be individually fused at the control panel.
 4. The incoming power to the system shall be supervised so that any power failure will be indicated at the control panel. A green "power on" LED shall be displayed continuously while incoming power is present.
 5. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be indicated at the control panel.
 6. The system shall support 100% of addressable devices in alarm operated at the same time, under both primary(AC) and secondary (battery) power conditions.
 7. Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.

1.6 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract.
- B. Product data sheets for system components highlighted to indicate the specific products, features, or functions required to meet this specification. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.
- C. Wiring diagrams from manufacturer.
- D. Shop drawings showing system details including location of FACP, all devices, circuiting and details of graphic annunciator.
- E. System power and battery charts with performance graphs and voltage drop calculations to assure that the system will operate in accordance with the prescribed backup time periods and under all voltage conditions in accordance with UL and NFPA standards.
- F. System operation description including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. A list of all input and output points in the system shall be provided with a label indicating location or use of IDC, SLC, NAC, RAC, Sensor, and auxiliary control circuits.

- G. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction. Include copies of shop drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, make resubmissions, if required, to make clarifications or revisions to obtain approval.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A factory authorized installer is to perform the work of this section.
- B. Each and every item of the Fire Alarm System shall be listed under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label.

1.8 EXTRA MATERIALS

- A. General: Furnish extra materials, packaged with protective covering for storage, and identified with labels clearly describing contents as follows:
- B. Break Rods for Manual Stations: Furnish quantity equal to 15 percent of the number of manual stations installed; minimum of 6 rods.
- C. Notification Appliances: Furnish quantity equal to 10 percent of each type and number of units installed, but not less than one of each type.
- D. Smoke Detectors or Sensors, Fire Detectors, and Flame Detectors: Furnish quantity equal to 10 percent of each type and number of units installed but not less than one of each type.
- E. Detector or Sensor Bases: Furnish quantity equal to 2 percent of each type and number of units installed but not less than one of each type.
- F. Sensor Bases: Furnish quantity equal to 2 percent of the number of units of each type installed but not less than one of each type.

PART 2 - PRODUCTS

2.1 FIRE ALARM CONTROL PANEL (FACP)

- A. General: Comply with UL 864, "Control Units and Accessories for Fire Alarm Systems".
- B. The following FACP hardware shall be provided:
 - 1. Power Limited base panel with red cabinet and door, 120 VAC, 60 HZ, input power.
 - 2. 100 Addressable point capacity inclusive of inputs and outputs in any combination.
 - 3. Two (2) Class B, Style Y Notification Appliance Circuits (NAC; rated 2A @ 24VDC, resistive).
 - 4. Two form "C" Auxiliary Output Circuits (rated 2A @ 24VDC, resistive), operation is programmable for trouble, alarm, supervisory or other selective control operations. Provide capability for switching up to ½ A @ 120VAC, inductive loads.
 - 5. Battery Meter Module, provides ammeter and voltmeter for power supply monitoring at front panel display.
- C. The FACP shall support one (1) RS-232-C ports.

- D. Supervised serial communication channel for control and monitoring of remotely located LCD/LED annunciators.
- E. Common Event DACT
- F. Cabinet: Lockable steel enclosure. Arrange panel so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single panel is required to form a complete control panel, provide exactly matching modular panel enclosures.
- G. Alphanumeric Display and System Controls: Panel shall include an 40 character LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands.

2.2 REMOTE LCD ANNUNCIATOR

- A. Provide Remote LCD Annunciator(s) as required with the same "look and feel" as the FACP operator interface. The Remote LCD Annunciator shall use the same Primary Acknowledge, Silence, and Reset Keys, Status LEDs and LCD Display as the FACP.
- B. Annunciator shall have super-twist LCD display with two lines of 40 characters each. Annunciator shall be provided with three (3) programmable LEDs (two selectable as red or yellow; one selectable as green or yellow).
- C. Under normal conditions the LCD shall display a "SYSTEM IS NORMAL" message and the current time and date.
- D. Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory or Trouble) shall flash. The unit audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.
- E. The LCD shall display the following information relative to the abnormal condition of a point in the system:
 - 1. 40 character custom location label.
 - 2. Type of device (e.g., smoke, pull station, waterflow).
 - 3. Point status (e.g., alarm, trouble).
- F. Operator keys shall be key switch enabled to prevent unauthorized use. The key shall only be removable in the disabled position. Acknowledge, Silence and Reset operation shall be the same as the FACP.

2.3 EMERGENCY POWER SUPPLY

- A. General: Components include battery, charger, and an automatic transfer switch.
- B. Battery: Sealed lead-acid type. Provide sufficient capacity to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 4 hours. Following this period of operation on battery power, the battery shall have sufficient capacity to operate all components of the system, including all notification appliances in alarm or supervisory mode for a period of 5 minutes.

2.4 ADDRESSABLE MANUAL PULL STATIONS

- A. Description: Addressable single- or double-action type, red LEXAN, with molded, raised-letter operating instructions of contrasting color. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.

2.5 SMOKE SENSORS

- A. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:
 - 1. Factory Nameplate: Serial number and type identification.
 - 2. Operating Voltage: 24 VDC, nominal.
 - 3. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.
 - 4. Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.
 - 5. Each sensor base shall contain an LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the sensor base LED shall be on steady.
 - 6. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.
 - 7. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a "Wrong Device" trouble condition.
 - 8. The sensor's electronics shall be immune from nuisance alarms caused by EMI and RFI.
 - 9. Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.
 - 10. Removal of the sensor head for cleaning shall not require the setting of addresses.
- B. Type: Smoke sensors shall be photoelectric or combination photoelectric / heat type.
- C. Bases: Relay output, sounder and isolator bases shall be supported alternatives to the standard base.
- D. Duct Smoke Sensor: The detector is to be Photoelectric type.
 - 1. If possible the detector and housing will be a one-piece design. The housing and detector separate is allowed if a one-piece unit is not available.
 - a. The duct detector housing shall be supplied with a clear cover so the presence of smoke can be monitored.
 - b. Shall be supplied with either a magnetic test feature or an injection tube for device testing.
 - c. Designed to operate with air velocity in the range of 300-4000fpm.
 - d. Coordinate with mechanical plans for duct size and provide the appropriate length of sampling tubes.
 - e. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.

2. Detectors of either design will be provided with relays to connect to the fire alarm panel and DDC panel, as well as connect to a remote status LED.
3. Remote status LED will display the detector status exactly the same as the detector. The remote status LED is to indicate the detector is operational, in trouble mode, or in alarm.
 - a. The remote status LED is required if the duct detector is over 10' off the finished floor or is not visible because of a drop ceiling.
 - b. Verify exact location to mount the remote status LED with the local AHJ prior to installation.

2.6 HEAT SENSORS

- A. Thermal Sensor: Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as indicated.
- B. Thermal sensor shall be of the epoxy encapsulated electronic design. It shall be thermistor-based, rate-compensated, self-restoring and shall not be affected by thermal lag.
- C. Sensor fixed temperature sensing shall be independent of rate-of-rise sensing to operate at 135-deg F. Sensor rate-of-rise temperature detection shall operate 15-deg F per minute.

2.7 ADDRESSABLE CIRCUIT INTERFACE MODULES

- A. Addressable Circuit Interface Modules: Arrange to monitor or control one or more system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of waterflow, valve tamper, non-addressable devices, and for control of AHU systems.
- B. Addressable Circuit Interface Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their operating power from the signaling line circuit or a separate two wire pair running from an appropriate power supply, as required.
- C. All Circuit Interface Modules shall be supervised and uniquely identified by the control unit. Module identification shall be transmitted to the control unit for processing according to the program instructions. Modules shall have an on-board LED to provide an indication that the module is powered and communicating with the FACP. The LEDs shall provide a troubleshooting aid since the LED blinks on poll whenever the peripheral is powered and communicating.

2.8 STANDARD ALARM NOTIFICATION APPLIANCES

- A. Horn: Piezoelectric type horn shall be listed to UL 464. The horn shall have a minimum sound pressure level of 85 dBA @ 24VDC. The horn shall mount directly to a standard single gang, double gang or 4" square electrical box, without the use of special adapter or trim rings.
- B. Visible/Only: Strobe shall be listed to UL 1971. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. V/O appliance shall be provided with selective minimum flash intensities of 15cd, 30cd, 75cd and 110cd. Provide a visible indication inside the strobe lens to indicate the listed candela rating of the specific Visible/Only appliance.

- C. Audible/Visible: Combination Audible/Visible (A/V) Notification Appliances shall be listed to UL 1971 and UL 464. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. The A/V appliance shall be provided with selective minimum flash intensities of 15cd, 30cd, 75cd and 110cd. Provide a visible indication inside the strobe lens to indicate the candela rating of the specific strobe. The horn shall have a minimum sound pressure level of 85 dBA @ 24VDC. The audible/visible enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings.
- D. Notification Appliance Circuit provides synchronization of strobes at a rate of 1Hz and operates horns with a Temporal Code Pattern operation. The circuit shall provide the capability to silence the audible signals, while the strobes continue to flash, over a single pair of wires. The capability to synchronize multiple notification appliance circuits shall be provided.
- E. Accessories: The Contractor shall furnish any necessary accessories.

2.9 NAC POWER EXTENDER

- A. The NAC Power Extender panel shall be a stand-alone panel capable of powering a minimum of 4 notification appliance circuits. Notification appliance circuits shall be [Class B, Style Y] [Class A, Style Z] rated at 2 amps each. Panel shall provide capability to be expanded to 8 notification appliance circuits.
- B. The internal power supply & battery charger shall be capable of charging up 12.7 Ah batteries internally mounted or 18Ah batteries mounted in an external cabinet.
- C. The NAC extender panel may be mounted close to the host control panel or can be remotely located.
- D. When connected to a fire alarm control panel one or two standard notification appliance circuits from the main control panel may be used to activate all the circuits on the NAC power extender panel.
- E. Alarms from the host fire alarm control panel shall signal the NAC power extender panel to activate. The panel shall monitor itself and each of its NACs for trouble conditions and shall report trouble conditions to the host panel.

2.10 Document Storage Box

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.
- B. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:
 - 1. Factory trained and certified personnel.
 - 2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level II certified personnel.

3. Personnel licensed or certified by state or local authority.

3.2 WIRING INSTALLATION

- A. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction (and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC).
- B. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.
- C. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.

3.3 FIELD QUALITY CONTROL

- A. Certificate of Compliance: Complete and submit to the project engineer in accordance with NFPA 72, paragraph 1.7.2.
- B. Field-Testing General:
 1. Prior to any testing or programming verify numbering scheme, room names, and other means of identifying addressable devices prior to testing and labeling. The Owner will be given a minimum of one week notice prior to the Contractor requiring to have the numbering scheme requested by the Owner.
 2. Each addressable analog smoke detector shall be individually field tested prior to installing the device at its designated location to ensure reliability after shipment and storage conditions. A dated log indicating correct address, type of device, sensitivity and initials of the technician performing test - using test equipment specifically designed for that purpose - shall be prepared and kept for final acceptance documentation. After testing, the detection devices and base shall be labeled with the system address, date and initials of installing technician. Labeling shall not be visible after installation is complete.
 3. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Tests shall check for stray voltage not to exceed 1 volt AC/DC unless otherwise specified by the manufacturer. Resistance, current and voltage readings shall be made as work progresses.
 4. All test equipment, instruments, tools and labor required to conduct the system tests shall be made available by the installing Contractor.
 5. In addition to the testing specified to be performed by the installing Contractor, the installation shall be subject to test by the acceptance inspector.
- C. Final Acceptance Testing:
 1. Testing shall be in accordance with NFPA72 and this specification.
 2. A final As-built Function Matrix shall be prepared by the installing Contractor referencing each alarm input to every output function affected as a result of an alarm, trouble or supervisory condition on that input. In the case of outputs programmed using more complex logic functions involving "any," "or," "not," "count," "time," and "timer" statements; the complete output equation shall be referenced in the matrix.

3. The installing Contractor prior to testing shall prepare a complete listing of all device labels for alphanumeric annunciator displays and logging printers.
4. The acceptance inspector shall use the system record drawings during the testing procedure to verify operation as programmed. In conducting the tests, the acceptance inspector shall request demonstration of any or all input and output functions. The items tested shall include but not be limited to the following:
 - a. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:
 - 1) Open, shorted and grounded intelligent analog signaling line circuit.
 - 2) Open, shorted and grounded network signaling line circuit.
 - 3) Open, shorted and grounded conventional initiating device circuits.
 - 4) Intelligent device removal.
 - 5) Primary power or battery disconnected.
 - 6) Incorrect device address.
 - 7) Printer trouble, off line or out of paper.
 - 8) Loss of data communications between system control panels.
 - 9) Loss of data communications between system annunciators.
 - b. System evacuation alarm indicating appliances shall be demonstrated as follows:
 - 1) All alarm notification appliances actuate as programmed.
 - 2) Audibility and visibility at required levels.
 - c. System indications shall be demonstrated as follows:
 - 1) Correct message display for each alarm input, at the control panel, each remote alphanumeric LCD display.
 - 2) Correct annunciator light for each alarm input, at each annunciator and color graphic terminal.
 - 3) Correct printer logging for all system activity.
 - d. System on-site and/or off-site reporting functions shall be demonstrated as follows:
 - 1) Correct alarm custom message display, address, device type, date and time transmitted for each alarm input.
 - 2) Correct trouble custom message display, address, device type, date and time transmitted for each alarm input.
 - 3) Trouble signals received for disconnect.
 - e. Secondary power capabilities shall be demonstrated as follows:
 - 1) System primary power shall be disconnected for a period of time as specified herein. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period as specified.
 - 2) System primary power shall be restored for forty-eight hours and system-charging current shall be normal trickle charge for a fully charged battery bank.
 - 3) System battery voltages and charging currents shall be checked at the fire alarm control panel using the test codes and displayed on the LCD display.
5. In the event of system failure to perform as specified and programmed at the discretion of the acceptance inspector, the test shall be terminated.
 - a. The installing Contractor shall retest the system, correcting all deficiencies and providing test documentation to the acceptance inspector.
 - b. In the event that software changes are required during the testing, the system manufacturer to compare the edited program with the original shall furnish a utility program. This utility shall yield a printed list of the changes and all system functions, inputs and outputs affected by the changes. The items listed by this program shall be the minimum acceptable to be retested before calling for resumption of the testing. The printed list and the printer log of the retesting shall be submitted before scheduling of the testing.

- c. The acceptance inspector may elect to require the complete testing to be performed again if modifications to the system hardware or software warrant complete retesting.
- D. Notify Owner representative one week prior to all system testing days so they may witness tests.
- E. Documentation:
 - 1. System documentation shall be furnished to the Owner and shall include but not be limited to the following:
 - a. Provide cut sheets for all equipment installed during construction. If multiple items are shown on one page indicate exactly which item was installed. Provide this information in hard copy and on CD with the record drawings.
 - b. System record drawings and wiring details including one set of reproducible hard copy, as well as, drawings on CD (compact disks) in a both CAD (or compatible program) and PDF.
 - c. System operation, installation and maintenance manuals.
 - d. Written documentation for all logic modules as programmed for system operation with a matrix showing interaction of all input signals with output commands.
 - e. Documentation of system voltage, current and resistance readings taken during the installation and testing.
 - f. System program “hard copy” showing system functions, controls and labeling of equipment and devices. Also provide a CD with system file.
- F. Test Equipment: The Contractor shall furnish to the Owner all test equipment as required to program the field analog devices, specifically an intelligent device programmer-tester or a calibrated smoke generator with power source.
- G. Warranty/Services: The Contractor shall warrant the entire system against system hardware and electrical defects including programming software defects for a period described in the contract general conditions, but not less than one year. This period shall begin upon satisfactory completion and certification of final acceptance testing of the system. Contractor shall provide to Owner a letter stating the start-date and end-date of warranty period. In addition, the Contractor shall also provide an updated list of name(s) and phone number(s) for normal and off-hours contacts necessary to respond to warranty issues. Response to warranty notification shall require a reply within 24 hours of initial contact.

3.4 TRAINING

- A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel as specified below.
 - 1. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of 8 hours' training.
 - 2. Schedule training with the Owner at least seven days in advance.

END OF SECTION