Addendum Cover Sheet

Project: Lawler Library HVAC System Replacement
Bid #: 1919241
Date: March 6, 2019

Owner: City of New Bedford
Contractor: Bidders
Distribution: All Bidders

Purchasing Director
City of New Bedford
133 William Street, Room 208
New Bedford, MA 02740

G | R | L | A
Gorman Richardson Lewis Architects

This Addendum forms part of the Construction Documents and modifies the original Bid Documents dated February 6, 2019. Acknowledge receipt of this Addendum in the space provided on the bid form.

Description of Work:

Additional information to Bid Documents dated February 6, 2019 regarding:
- Revised SECTION 00 11 00 ADVERTISEMENT
- Revised SECTION 26 00 00 ELECTRICAL
- Revised Drawing E0.1

List of Addendum Documents

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| 26 00 00                      | ELECTRICAL | Revisions including, but not necessarily limited to:
- 1.2 WORK TO BE PERFORMED
- 1.3 SYSTEM DESCRIPTION
- 1.5 ITEMS TO BE FURNISHED ONLY
- New Sections:
  - 1.20 PHASING, DEMOLITION AND MAINTAINING EXISTING SERVICES
  - 1.21 RETURN AIR PLENUM |
Attachment: Revised Drawing and Project Manual Sections

ARCHITECT

Issued By: _____________________________ 03/06/2019
George O'Neill Date
Gorman Richardson Lewis Architects
The City of New Bedford, the Awarding Authority, in conjunction with Department of Facilities and Fleet Management invites sealed bids for the **Lawler Library HVAC Replacement**, in accordance with Drawings and Specifications prepared by Gorman, Richardson, and Lewis Architects of Hopkington, MA. Bidding procedures shall be in accordance with all applicable portions of Massachusetts General Laws, Chapter 149 – Sections 44A to 44J, inclusive, Section 26 to 29 inclusive, and Chapter 30, Section 39F to 39M inclusive, and 39R of the General Laws of the Commonwealth of Massachusetts, as amended to date.

Project Value is estimated to be **$84,000.00**

The Work of this Contract is scheduled to be substantially completed no later than **August 28, 2019**

**Sealed Bids for the General Contract** will be received by the New Bedford Purchasing Department, 133 William Street, Room 208, New Bedford, Massachusetts, 02740 until **2:30 pm. on March 6, 2019 2:00 pm on March 11, 2019** at which time all bids will be publicly opened and read aloud. Included with General Bid shall be an Update Statement, DCAM Certification and 5% bid deposit.

Bid Documents will be available electronically and must be obtained by emailing Susan.Bruce@newbedford-ma.gov after January 6, 2019. A hard copy set of drawings and specifications shall be on file at the New Bedford Purchasing Department 133 William St # 208, New Bedford, MA 02740 for Contractor review.

General Bids must be submitted on the Form for General Bid included herein. The General Bids shall be completely filled in, signed, enclosed in an envelope, sealed and plainly marked with the project name. The General Bids shall be filed with the Owner at the New Bedford Purchasing Dept. location designated above accompanied by a bid deposit in the form of a bid bond or cash or a certified check on, or a treasurer's or cashier's check issued by, a responsible bank or trust company payable to the City of New Bedford in the amount of 5% of the bid.

Attention is directed to the minimum wage rates to be paid on the work as determined by the Commissioner of Labor and Industries under the provision of M.G.L. Chapter 149, Sections 26 and 27D inclusive. The Work of this Project shall require Minority/Women Owned Business participation pursuant to Chapter 193 of the Acts of 2004, and MGL Chapter 23A, Section 44 and MGL Chapter 7, Section 40N, as amended, and established as a policy by the City of New Bedford.

All bids shall remain in effect for thirty (30) days, Saturdays, Sundays and legal holidays excluded, after the opening of General Bids.

A **Non-mandatory Site Inspection** will be held on **Thursday, February 14, 2019, 9:30 a.m.** @ 745 Rockdale Avenue, New Bedford, MA.

The Owner reserves the right to waive any informalities and to reject any or all bids if it be in the public interest to do so.

Awarding Authority
City of New Bedford
Purchasing Department
Susan Bruce, Purchasing Agent
SECTION 26 00 00
ELECTRICAL

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1.4 DEFINITIONS
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ELECTRICAL

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to all of the Contract Documents, including the General and Supplementary Conditions and Bidding Requirements, Contract Forms, and General Conditions of the Contract which are all hereby made part of this section of the specification. The HVAC Contractor shall act as the General Contractor and the terms HVAC or General Contractor shall be one and the same.

B. The work of this Section provides and contains general information which is inherently made a part of each Section and applies to all work performed under this Contract.

C. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.

1.2 WORK TO BE PERFORMED

A. Work described herein shall be interpreted as work to be done by the Electrical Subcontractor. Work to be performed by other trades will be referenced to a particular contractor or subcontractor.

B. Provide all labor, materials, tools, and equipment, including scaffolding, to complete the installation of the electrical system. Install, equip, adjust, and put into operation the respective portions of the installation specified, and so interconnect various items or sections of work in order to form a complete and operating whole. The work shall consist of, but shall not necessarily be limited to, the following:

1. New breakers, disconnect switches, distribution equipment, motor controls, including feeders and subfeeders.

2. All raceway systems, including boxes, couplings, and fittings.

3. All branch circuit wiring systems, including wiring devices, plates, etc.

4. Connections for all building equipment, including mechanical, and the like.

5. All testing of equipment installed.

6. Any other item of work hereinafter specified or indicated on electrical drawings.

7. Demolition.

8. Disconnection and reconnection of existing rooftop, and other roof mounted Mechanical equipment for removal by the General Contractor.

9. Drilling, coring, cutting and patching of holes (where the largest dimension thereof does not exceed 12 inches) for electrical conduit systems, and equipment.


13. Provide Vibration Control and Seismic Restraints for all Electrical Systems conforming to the requirements of Massachusetts State Code.

14. Sealing of all penetrations through walls, slabs, partitions, which are not fire rated.

1.3 SYSTEM DESCRIPTION

A. The existing air handling units in the Mechanical Room and condenser units on the Roof shall be disconnected and **existing wiring removed back to source**, then the new equipment reconnected. The Contractor shall utilize existing wiring and existing circuit breakers.

B. **Contractor to extend wiring as required for all equipment as needed.**

1.4 DEFINITIONS

A. Most terms used within the documents are industry standard. Certain words or phrases shall be understood to have specific meanings as follows:

1. **Provide:** Furnish and install completely connected up and in operable condition.
2. **Furnish:** Purchase and deliver to a specific location within the building or site.
3. **Install:** With respect to equipment furnished by others, install means to receive, unpack, move into position, mount and connect, including removal of packaging materials.
4. **Conduit:** Raceways of the metallic type which are not flexible. Specific types as specified.
5. **Connect:** To wire up, including all branch circuitry, control and disconnection devices so item is complete and ready for operation.
6. **Subject to Mechanical Damage:** Equipment and raceways installed exposed and less than eight feet above finished floor in mechanical rooms or other areas where heavy equipment may be in use or moved.

1.5 ITEMS TO BE FURNISHED ONLY

A. Furnish the following items for installation under designated sections.

1. None. **Duct smoke detectors and duct carbon monoxide detectors with sampling tube:** Section 230000 - HVAC.
2. **Access Panels:** Section 081113 – ACCESS DOORS AND FRAMES.

1.6 ITEMS TO BE INSTALLED ONLY

A. Install the following items furnished under designated sections.

1. None.

1.7 RELATED WORK

A. The following related work is to be performed under designated sections.

1. **Automatic Temperature Control:** SECTION 23 00 00 - HEATING, VENTILATING, AND AIR CONDITIONING.
1.8 CONTRACT COST BREAKDOWN

A. Submit a breakdown of contract price to aid Architect in determining value of work installed as job progresses.

1.9 CONTRACTOR'S REPRESENTATIVE

A. Retain a competent representative on the project.

1.10 COOPERATION

A. Work shall be carried on under usual construction conditions, in conjunction with other contractors work. Cooperate with other contractors, coordinate work and proceed in a manner as not to delay progress.

1.11 CODES, ORDINANCES, AND PERMITS

A. Codes and Ordinances:

1. All material and work provided shall be in accordance with all applicable codes including the following codes and standards as most recently amended.
   - Commonwealth of Massachusetts Building Code
   - State Department of Public Safety
   - NFPA 101 "Life Safety Code"
   - NFPA Standards
   - Standards of the Underwriters Laboratories (UL)
   - Occupational Safety and Health Act (OSHA)
   - Americans with Disabilities Act (ADA)
   - Energy Conservation Code
   - City of New Bedford

2. Where contract documents indicate more stringent requirements than codes, the contract documents shall take precedence.

B. Permits: Be responsible for filing documents, and securing of inspection and approvals. Pay permit fees. Refer to INSTRUCTIONS TO BIDDERS

1.12 ELECTRICAL ROOMS OR SPACES

A. Be responsible for ensuring that the dedicated space and clearances required in the NEC, Section 110-26 are maintained for all electrical equipment.
1.13 SUBMITTALS

A. Refer to Supplementary General Conditions for information relative to submission of shop drawings. Six (6) copies are required. No equipment for which review is required shall be installed prior to review, except at Contractor's own risk.

1.14 GUARANTEE

A. Keep work in repair without expense to Owner as far as concerns defects in workmanship or materials for a period of not less than one year from date of substantial completion.

1.15 ELECTRICAL CHARACTERISTICS

A. In general, and unless specifically indicated otherwise, all building service, heating, ventilating, air conditioning, and plumbing equipment shall be of the following characteristics.
   1. Motors up to and including 1/3 HP shall be suitable for 120 volts, one phase operation.
   2. Motors larger than 1/3 HP shall be suitable for 208 volts three phase operation.
   3. Electric heating equipment 1.5 KW and less shall be suitable for 120 volts single phase operation. Over 1.5 KW shall be 208 volt three phase.

1.16 RECORD DRAWINGS

A. Provide two (2) sets of black or blue line on white drawings to maintain and submit record drawings, one set shall be maintained at site and which shall be accurate, clear, and complete showing actual location of all equipment as installed. Record drawings shall be updated at least monthly. Record drawings shall show outlet from which homeruns are taken, and location of all junction boxes and access panels. These drawings shall be available to Architect/Engineer field representative.

B. Any addenda sketch and supplementary drawings issued during course of construction shall be attached to drawings.

C. At completion, submit an accurate checked set of drawings.

D. After approval of these drawings, photo reproductions of original tracings shall be revised to incorporate changes, including addenda sketches and supplementary drawings. Fitup drawings for tenant areas shall also be revised in the same manner. These "as-built" photo reproductions shall be certified as correct and delivered to the Architect along with two (2) sets of black line prints. Sepia reproducible are not acceptable.

1.17 TEMPORARY ELECTRICAL SUPPORT FACILITIES

A. All scaffolding, ladders, and other temporary construction shall be rigidly built in accordance with all local and state requirements, and shall be removed upon completion.
1.18 INSPECTIONS AND TESTS

A. Inspection: If inspection of materials installed shows defects, such defective work, materials, and/or equipment shall be replaced and inspection and tests repeated.

B. Tests: Make reasonable tests and prove integrity of work and leave electrical installation in correct adjustment and ready to operate. All panels and switchboards shall have phases balanced as near as practical. A consistent phase orientation shall be adhered to all terminations.

1.19 OWNER FURNISHED EQUIPMENT

A. None.

1.20 PHASING, DEMOLITION AND MAINTAINING EXISTING SERVICES

A. During the execution of the work, required relocation, and rerouting of existing equipment and systems in the existing building areas where new work is to be installed or new connections are scheduled to be made, shall be performed by the Electrical Subcontractor, as required by job conditions and as determined by the Architect in the field, to facilitate the installation of the new system, while demolition, relocation work or new tie-ins will be performed. Outages required for construction purposes shall be scheduled for the shortest practical periods of time, in coordination with the Owner’s designated representative, for specified, mutually agreeable periods of time, after each of which the interruption shall cease and the service shall be restored. This procedure shall be repeated to suit the Owner’s working schedule, as many times as required until all work is complete. Any outages of service shall be approved by the Owner, prior to commencing the work. No outages or shutdowns of service shall occur without the written authorization of the Owner prior to commencing the work. Give notice of any scheduled shutdowns, a minimum of two weeks in advance. Owner shall make their best effort to meet this request without adversely affecting the electric service to the existing building.

B. Prior to any deactivation and relocation or demolition work, consult the drawings and arrange a conference with the Architect and the Owner’s representative in the field to inspect each of the items to be deactivated, removed or relocated. Care shall be taken to protect all equipment designated to be relocated and reused or to remain in operation and be integrated with the new systems.

C. Where existing outlets are to be reused and are cut off by the remodeling, they shall be reconnected to existing circuits as required by field conditions. Where existing outlets are to be abandoned, they shall be removed and blank plates installed. Each bidder shall, before submitting his bid, visit the site and make a thorough examination of the conditions in the existing buildings in order to determine the extent of the work to be done. Prior to disconnecting and removing panelboards, field confirm that it does not
service areas or circuits scheduled to remain.

D. All deactivation, relocation and temporary tie-ins of electrical systems and equipment shall be provided by the Electrical Subcontractor. All demolition and removal of electrical systems and equipment designated to be demolished shall be by the Electrical Subcontractor and removed by the General Contractor. Stack all demolished electrical materials except hazardous materials (lighting ballasts, fluorescent lamps) nearby for removal by the General Contractor. All hazardous electrical materials shall be legally disposed by the Hazmat Contractor. The Hazmat Contractor will remove lamps and ballasts from light fixtures.

E. The Owner reserves the right to inspect the material scheduled for removal and salvage any items he deems usable as spare parts.

F. Phasing
   1. The Electrical Subcontractor shall construct the subject in phases as directed by the Architect to suit the project progress schedule, as well as the completion date of the project.
   2. For additional information related to phasing, review the General Conditions and Supplementary Conditions and the Architectural drawings.
   3. The Facility will remain occupied during construction.

1.21 RETURN AIR PLENUM

A. All wiring systems in areas above hung ceiling that are return air plenums shall either be in conduit or shall be “UL Listed” Plenum rated cable.

PART 2 - PRODUCTS

2.1 GENERAL

A. Product specifications are written in such a manner so as to specify what materials may be used in a particular location or application and therefore do not indicate what is not acceptable or suitable for a particular location or application. As an example: non-metallic sheathed cable is not specified; therefore, it is not acceptable.

B. All material shall be new and shall be UL listed.

2.2 RACEWAYS AND FITTINGS

A. Raceways - General:
   1. No raceway shall be used smaller than 1/2” diameter and shall have no more than four (4) 90o bends in any one run, and where necessary, pull boxes shall be provided. Only rigid metal conduit or intermediate metal conduit is allowed for slab work. Cable systems, if allowed to be used by other sections of this specification, shall not be used exposed or in slabs, whether listed by "UL" for such use or not.
2. Rigid metal conduit conforming to, and installed in accordance with, Article 346 shall be heavy wall zinc coated steel conforming to American Standard Specification C80-1 and may be used for service work, exterior work, slab work, and below grade level slab, wet locations, and in penthouse for drops down to equipment from elevations above eight feet and also where raceway may be subject to mechanical damage.

3. Electrical Metallic Tubing (EMT), conforming to, and installed in accordance with, Article 348 shall be zinc coated steel, conforming to industry standards, may be used in masonry block walls, stud partitions, above furred ceilings, where exposed but not subject to mechanical damage, and shall be used for fire alarm work.

4. Surface metal raceways conforming to, and installed in accordance with, Article 352 may be used only where raceways cannot be run concealed, and then, if only specifically approved.

5. Flexible metal conduit shall be used for final connections to recessed lighting fixtures from above ceiling junction boxes and for final flexible connections to motors and other rotating or vibrating equipment. Liquid tight flexible metal conduit shall be used for the above connections which are located in moist locations. All flexible connections shall include an insulated grounding conductor.

6. Acceptable manufacturers:
   a. Pittsburgh Standard Conduit Company
   b. Republic Steel and Tube
   c. Youngstown Sheet and Tube Company
   d. Carlon
   e. Or Equal

7. Fittings:
   a. Provide insulated bushings on all raceways 1 inch diameter or larger.
   b. Manufacturer's standard fittings shall be used for raceway supports.
   c. Expansion Fittings: Expansion fittings shall be used where structural and concrete expansion joints occur and shall include a ground strap.
   d. Couplings for rigid metal and intermediate metal conduit shall be threaded type.
   e. Threadless fittings for EMT shall be watertight compression type (wet locations) or set-screw type (dry-locations). All fittings shall be concrete tight. No diecast fittings allowed except for raceways larger than 1 inch diameter.
   f. Cable supports in vertical raceways shall be of the split wedge type. Armored cable supports for vertical runs to be of wire mesh basket design.
   g. Wall entrance seals shall be equal to O.Z. Gedney type "WSK".
   h. Couplings, elbows and other fittings used with rigid nonmetallic conduit shall be of the solvent cemented type to secure a waterproof installation.
   i. Acceptable manufacturers:
      1) O.Z.
      2) Crouse Hinds
      3) Appleton
      4) EFCOR
      5) Steel City
      6) Or Equal
B. Outlets, Pull and Junction Boxes:

1. Outlets:
   a. Each outlet in wiring or raceway systems shall be provided with an outlet box to suit
      conditions encountered. Boxes installed in normally wet locations or surface
      mounted shall be of the cast-metal type having hubs. Concealed boxes shall be
      cadmium plated or zinc coated sheet metal type. Old work boxes with Madison
      clamps not allowed in new construction. Thru the wall boxes are not permitted.
   b. Acceptable manufacturers:
      1) Appleton
      2) Crouse Hinds
      3) Steel City
      4) RACO
      5) Or Equal

2. Pull and Junction Boxes: Where indicated on plans, and where necessary to terminate,
   tap off, or redirect multiple raceway runs or to facilitate conductor installation, furnish,
   and install appropriately designed boxes. Boxes shall be fabricated from code gauge
   steel assembled with corrosion resistant machine screws. Box size shall be as required
   by Code.
   a. Acceptable Manufacturers:
      1) Brasch
      2) Hoffman
      3) Keystone
      4) Lee Products Co.
      5) McKinstry Inc.
      6) Eldon Inc.
      7) Or equal

2.3 CONDUCTORS

A. All conductors shall be a minimum size of #12 AWG except for control wiring where #14
   AWG may be used. For all normal/emergency and/or emergency only circuits, and also
   where distance from panelboard to first outlet exceeds 80’, #10 AWG shall be minimum size
   wire allowed. All feeder and branch circuit conductor shall be color coded as follows:
   1. 208Y/120V Phase A Black
   2. 208Y/120V Phase B Red
   3. 208Y/120V Phase C Blue
   4. Grounded Conductor 120/208 White
   5. Equipment Ground 120/208 Green
   6. Isolated Ground 120/208 Green with Orange Trace

B. All conductors not installed in accordance with color scheme shall be replaced. All
   conductors larger than #6 AWG must be identified with colored tape.
C. Connections throughout the entire job shall be made with solderless type devices.
   1. For #10 AWG and smaller: spring type.
   2. For #8 AWG and larger: circumferential compression type.
   3. Acceptable manufacturers:
      a. 3M "Scotchlock"
      b. IDEAL "Wingnut"
      c. BURNDY
      d. MAC
      e. Or equal
   4. Any splices made up in ground mounted pull boxes shall be resin cast waterproof type or waterproof pressure type.

D. Conductors shall be copper, soft drawn, and annealed of 98% conductivity. Conductors larger than #10 AWG shall be stranded; #10 AWG and smaller shall be solid. Conductors shall be insulated for 600 volts and be of following types:
   1. All conductors shall have heat/moisture resistant thermoplastic insulation type THHN/THWN (75°C) except as follows:
      a. In sizes #1 AWG and larger: Crosslinked polyethylene insulation type XHHW (75°C - 90°C) may be used.
      b. Fire alarm system conductors shall be #14 AWG, type THHN, solid. Color coding of fire alarm conductors shall be in accordance with fire codes.
      c. Fixture whips #16AWG type "SF".

E. Stranded conductors for all wiring systems except fire alarm will be allowed if installed and terminated as specified under Execution Section.

F. Acceptable manufacturers:
   1. American Wire & Cable
   2. Cerro
   3. Cornish
   4. Crescent
   5. Essex
   6. Okonite
   7. Or equal

2.4 SLEEVES, INSERTS, AND OPENINGS

A. Sleeves: Provide sleeves of proper sizes for all openings required in concrete floors and walls. Sleeves passing through floors shall be set with top of sleeve 1" above finished floor. Core drilling will also be acceptable if in accordance with any structural standards. Any unsleeved openings shall be waterproofed.
2.5 ELECTRICAL POWER EQUIPMENT

A. Motor Controls - Manual and magnetic:
   1. Individually-mounted magnetic starters shall be NEMA rated across-the-line type with thermal overload on each phase, single-speed, two-speed, or reduced voltage start as indicated.
   2. Manual motor starters shall have pilot lights and shall be furnished with thermal overloads on each phase.

B. Motors: Each motor shall have disconnect switch and starter provided under this section. Starters which are a part of "factory assembled" control panel will be provided under section supplying equipment to be controlled but connected under this section.
   1. Provide motor terminal boxes for each motor not furnished with same.

C. Disconnect Switches:
   1. Disconnect (safety) switches shall conform to industrial standards of NEMA, be UL listed and shall be heavy duty type, quick-make, quick-break type with interlocking cover mechanism and provisions for padlocking switch handle in "OFF" position. Three pole toggle switches are not acceptable as substitute for disconnect switches.

D. Fuses:
   1. Provide a complete set of fuses for each item of fusible type equipment. Fusible equipment furnished by other contractors will be complete with fuses, unless noted otherwise on electrical drawings.

2.6 ELECTRICAL SYSTEM CONTROLS AND INSTRUMENTS

A. Provide a complete power system consisting of branch circuits, motor disconnect switches, pushbutton stations, motor starters, and other devices to connect up and leave in operating condition each piece of electrically operated equipment provided either under this section or other Divisions.

B. All control wiring not indicated in the electrical specifications or not shown on electrical drawings will be provided by Temperature Control Subcontractor.
   1. Than 15 percent of their rated lamp life has been used.

2.7 FIRE ALARM AND DETECTION SYSTEM

A. Description:
   1. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), auxiliary control devices, and wiring as shown on the drawings and specified herein.
   2. The fire alarm system shall comply with requirements of latest NFPA Standard 72 for
3. The fire alarm manufacturer shall be of the highest caliber and insist on the highest quality. The system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

4. The FACP and peripheral devices shall be manufactured 100 percent by a single U.S. manufacturer (or division thereof).

5. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and shall be in compliance with the UL listing.

6. Each designated zone shall transmit separate and different alarm, supervisory and trouble signals to the FACP.

7. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the system's integrity.

B. Scope:

1. An intelligent reporting, microprocessor controlled fire detection and system shall be installed in accordance with the specifications and drawings.

2. Basic Performance:
   a. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded onto NFPA Style 7 (Class A) Signaling Line Circuits (SLC).
   b. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D).
   c. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z).
   d. Digitized electronic signals shall employ check digits or multiple polling.
   e. Power for initiating devices and notification appliances must be from the main fire alarm control panel, the transponder to which they are connected or to a Field Charging Power Supply (FCPS).
   f. A single ground or open on any system signaling line circuit, initiating device circuit, or notification appliance circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
   g. Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.

3. Basic System Functional Operation:
   When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
   a. The FACP alarm LED on the FACP shall flash.
   b. A local piezo-electric signal in the FACP control panel shall sound.
   c. The 80-character LCD display on the local FACP node and on the intelligent network display shall indicate all information associated with the fire alarm condition, including the type of alarm point, and its location within the protected premises.
   d. Printing and history storage equipment shall log the information associated with the fire alarm control panel condition, along with the time and date of occurrence.
e. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated on either local outputs or points located on other network nodes.

4. Software Modifications:
   a. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
   b. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm network on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

5. Certifications:
   a. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer and trained on network applications. Include names and addresses in the certification.

C. Applicable Publications:

The publications listed below form a part of this specification. The publications are referenced in text by the basic designation only.

1. National Fire Protection Association (NFPA) - USA:
   - No. 72 National Fire Alarm Code
   - No. 70 National Electric Code
   - No. 101 Life Safety Code

2. Underwriters Laboratories Inc. (UL) - USA:
   - No. 50 Cabinets and Boxes
   - No. 268 Smoke Detectors for Fire Protective Signaling Systems
   - No. 864 Control Units for Fire Protective Signaling Systems
   - No. 268A Smoke Detectors for Duct Applications
   - No. 521 Heat Detectors for Fire Protective Signaling Systems
   - No. 228 Door Closers-Holders for Fire Protective Signaling Systems
   - No. 464 Audible Signaling Appliances
No. 38  Manually Actuated Signaling Boxes
No. 346  Waterflow Indicators for
  Fire Protective Signaling Systems
No. 1481  Power supplies for Fire
  Protective Signaling Systems
No. 1076  Control Units for Burglar Alarm
  Proprietary Protective Signaling Systems
No. 1971  Visual Notification Appliances

3. Local and State Building Codes.
4. All requirements of the Authority Having Jurisdiction (AHJ).

D. Approvals:
1. The system must have proper listing and/or approval from the following nationally
   recognized agencies:
   - UL  Underwriters Laboratories Inc.
   - FM  Factory Mutual
   - MEA  Material Equipment Acceptance (NYC)
   - CSFM  California State Fire Marshal
2. The fire alarm control panel, shall meet the modular labeling requirements of
   Underwriters Laboratories, Inc. Each subassembly, including all printed circuits, shall
   include the appropriate UL modular label. Systems which do not include modular labels
   which may require return to the manufacturer for system upgrades, and are not
   acceptable.

E. Equipment and Material - General:
1. All equipment and components shall be new, and the manufacturer's current model.
   The materials, appliances, equipment and devices shall be tested and listed by a
   nationally recognized approvals agency for use as part of a protected premises
   protective signaling (fire alarm) system. The authorized representative of the
   manufacturer of the major equipment, such as control panels, shall be responsible for
   the satisfactory installation of the complete system.
2. All equipment and components shall be installed in strict compliance with each
   manufacturer's recommendations. Consult the manufacturer's installation manuals for
   all wiring diagrams, schematics, physical equipment sizes, etc. before beginning system
   installation. Refer to the riser/connection diagram for all specific system
   installation/termination/wiring data.
3. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held
   firmly in place. (e.g., detectors shall not be supported solely by suspended ceilings).
   Fasteners and supports shall be adequate to support the required load.

F. Conduit and Wire:
1. Conduit:
   a. Conduit shall be in accordance with the National Electrical Code (NEC), local and
      state requirements.
   b. Conduit fill shall not exceed 40 percent of interior cross sectional area where three
      or more cables are contained within a single conduit.
c. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760.

d. Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

e. Conduit shall not enter any FACP, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.

f. Conduit shall be 3/4 inch (19.1 mm) minimum.

2. Wire:
   a. All fire alarm system wiring must be new, unless specified herein.
   b. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 16 AWG (1.02 mm) for initiating device circuits and signaling line circuits, and 14 AWG (1.32 mm) for notification appliance circuits.
   c. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR).
   d. Wiring used for the SLC multiplex communication loop shall be twisted and shielded unless specifically excepted by the fire alarm equipment manufacturer.
   e. All field wiring shall be completely supervised.

3. Terminal Boxes, Junction Boxes and Cabinets:
   a. All boxes and cabinets shall be UL listed for the intended purpose.

4. Initiating circuits shall be arranged to serve like categories (manual, smoke, waterflow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

5. The FACP shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution Panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The FACP cabinet shall be grounded securely to either a cold water pipe or grounding rod.

G. Fire Alarm Control Panel:
   1. Fire alarm control panel shall be Autocall 4007, Notifier, EST, or equal. Each shall contain a microprocessor based central processing unit (CPU). The FACP shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, transponders, local and remote operator terminals, and other system controlled devices.

   2. Node Capacity and General Operation:
      a. Each node shall provide, or be capable of, expansion to 250 intelligent addressable devices. FACP shall support (3) isolated intelligent loops.
b. Each FACP node shall include a full featured operator interface control and
annunciation panel which shall include a backlit Liquid Crystal Display (LCD),
individual, color coded system status LEDs, and an alpha-numeric keypad for field
programming and control of the node.

c. All programming or editing of the existing programming the system shall be
achieved without special equipment or interrupting the alarm monitoring functions
of the fire alarm control panel.

d. Each FACP node shall provide the following features:

<table>
<thead>
<tr>
<th>Function</th>
<th>Feature</th>
</tr>
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<tbody>
<tr>
<td>Block Acknowledge</td>
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<td>Day/Night Sensitivity</td>
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<td>Security Monitor</td>
<td>Points Walk Test</td>
</tr>
<tr>
<td>Alarm Verification</td>
<td>Maintenance Alert</td>
</tr>
</tbody>
</table>

3. Loop Interface Board (LIB):

a. Loop interface boards shall be provided to monitor and control each of the Signaling
Line Circuit (SLC) loops in the network node. The loop interface board shall contain
its own microprocessor and shall be capable of operating in local mode in the case
of a failure in the main CPU of the control panel. In local mode, the loop interface
board shall detect alarms and activate output devices on its own SLC loop.

b. The LIB shall not require any jumper cuts or address switch settings to initialize SLC
Loop operations.

c. The loop interface board shall provide power to, and communicate with, all of the
intelligent detectors and addressable modules connected to its SLC Loop over a
single pair of wires. This SLC Loop shall be capable of operation as NFPA Style 4,
Style 6, or Style 7.

d. The LIB shall be able to drive two Style 4 SLC loops, each up to 10,000 feet in length,
for an effective loop span of 20,000 feet.

e. The loop interface board shall receive analog information from all intelligent
detectors and shall process this information to determine whether normal, alarm, or
trouble conditions exist for that particular detector. The loop interface board
software shall include software to automatically adjust and compensate for dust
accumulation to maintain detector performance as it is affected by environmental
factors. The analog information may also be used for automatic detector testing and
for the automatic determination of detector maintenance requirements.
f. The LIB shall communicate with each intelligent addressable detector and addressable module on its SLC loop and verify proper device function and status. Communication with up to 250 intelligent devices shall be performed every six seconds or less.

4. Enclosures:
   a. Control panels shall be housed in UL listed cabinets suitable for semi-flush mounting. Cabinets shall be corrosion protected, given a rust-resistant prime coat, and the manufacturer's standard finish.
   b. The back box and door shall be constructed of .060 steel with provisions for electrical conduit connections into the sides and top.
   c. The door shall provide a key lock and include a transparent opening for viewing all indicators. For convenience, the door shall have the ability to be hinged on either the right or left-hand side.
   d. The control unit shall be modular in structure for ease of installation, maintenance, and future expansion.

5. FACP nodes shall be designed so that it permits continued local operation of remote transponders under both normal and abnormal network communication loop conditions. This shall be obtained by having transponders operate as local control panels upon loss of network communication.

6. FACP nodes shall be modular in construction to allow ease of servicing. Each CPU and transponder shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems, which require use of external programmers or change of EPROMs are not acceptable.

7. The CPU and associated equipment are to be protected so that they will not be affected by voltage surges or line transients including RFI and EMI.

8. FACP Power Supplies:
   a. Main power supplies shall operate on 120 VAC, 60Hz, and shall provide all necessary power for the FACP.
   b. Each main supply shall provide 3.0 amps of usable notification appliance power, using a switching 24 VDC regulator.
   c. The main power supply shall be expandable for additional notification appliance power in 3.0 ampere steps.
   d. Each main power supply shall provide a battery charger for 60 hours of standby using dual-rate charging techniques for fast battery recharge. It shall charge 55 Amp hour batteries within a 48 hour period.
   e. The supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults on sensitive addressable modules.
   f. It shall provide meters to indicate battery voltage and charging current.
   g. The main power supply shall be power-limited per 1995 UL864 requirements.
9. System Circuit Supervision:
   a. Each FACP node shall supervise all circuits to intelligent devices, transponders, annunciators and peripheral equipment and annunciate loss of communications with these devices. The FACP CPU shall continuously scan the above devices for proper system operation and upon loss of response from a device shall sound an audible trouble, indicate which device or devices are not responding and print the information on the printer.
   b. Sprinkler system valves, standpipe control valves, PIV, and main gate valves shall be supervised for off-normal position.

10. Field Wiring Terminal Blocks:
    a. For ease of service, all wiring terminal blocks shall be the plug-in type and have sufficient capacity for 18 to 12 AWG wire. Fixed terminal blocks are not acceptable.

11. Operators Terminal:
    Provide the following functions in addition to any other functions required for the system.
    a. Acknowledge (ACK/STEP) Switch:
       1) Activation of the control panel Acknowledge switch in response to a single new Alarm and/or trouble condition shall silence the local panel piezoelectric signal and change the system alarm or trouble LED from flashing mode to steady-ON mode. If additional new alarm or trouble conditions exist or are detected and reported in the system, depression of this switch shall advance the 80-character LCD display to the next alarm or trouble condition.
       2) Depressing the acknowledge switch shall also silence all remote annunciator piezo sounders.
    b. Signal Silence Switch:
       1) Activation of the signal silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm activation. The selection of notification circuits and relays which are silenceable by this switch shall be fully field programmable within the confines of all applicable standards.
    c. System Reset Switch:
       1) Activation of the system reset switch shall cause all local electronically-latched initiating devices, software zones, output devices and circuits, to return to their normal condition.
       2) If an alarm condition(s) still exists, or if they reoccur in the system after system reset switch activation, the system shall then resound the alarm conditions.
    d. System Test Switch:
       1) Activation of the system test switch shall initiate an automatic test of all intelligent/addressable detectors in the local system. The system test shall activate the electronics in each intelligent sensor, simulating an alarm condition and causing the transmission of the alarm condition from that sensor to the fire alarm control panel. The fire alarm control panel shall interpret the data from each sensor installed in the system. A report summarizing the results of this test shall be displayed automatically on the system LCD and on any CRTs or printers in the system.
e. Lamp Test Switch:
   1) Activation of the lamp test switch shall sequentially turn on all LED indicators, system liquid crystal display and local piezo signal, and then automatically return the fire alarm control panel to the previous condition.

12. Field Programming:
   a. The system shall be programmable, configurable and expandable in the field without the need for special tools or electronic equipment and shall not require field replacement of electronic integrated circuits.
   b. All local FACP node programming shall be accomplished through the FACP keyboard or through the video display terminal.
   c. All field defined programs shall be stored in non-volatile memory.
   d. The programming function shall be enabled with a password that may be defined specifically for the system when it is installed. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level is used for status level changes such as zone disable or manual on/off commands. A second (higher-level) is used for actual change of program information.

13. Specific System Operations:
   a. Smoke Detector Sensitivity Adjust: Means shall be provided for adjusting the sensitivity of any or all analog intelligent detectors in the FACP node from each system keypad or from the keyboard of the video terminal. Sensitivity range shall be within allowed UL limits.
   b. Alarm Verification: Each of the intelligent addressable detectors in the system may be independently selected and enabled for alarm verification. Each FACP shall keep a count of the number of times each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
   c. System Point Operations:
      1) All devices in the FACP node may be enabled or disabled through the local keypad or video terminal.
      2) Any FACP node output point may be turned on or off from the local system keypad or the video terminal.
   d. Point Read: The FACP node shall be able to display the following point status diagnostic functions without the need for peripheral equipment. Each point will be annunciated for the parameters listed:
      1) Device Status
      2) Device Type
      3) Custom Device Label
      4) Software Zone Label
      5) Device Zone Assignments
      6) Detector Analog Value
      7) All Program Parameters
   e. System Status Reports: Upon command from a password-authorized operator of the system, a status report will be generated, and printed, listing all local FACP system status.
f. System History Recording and Reporting: Each FACP node shall contain a history buffer that shall be capable of storing a minimum of 400 system events. Each local activation will be stored and time and date stamped with the actual time of the activation, until an operator requests that the contents be either displayed or printed. The contents of the history buffer may be manually reviewed, one event at a time, and the actual number of activations may also be displayed and or printed.

g. The history buffer shall use non-volatile memory. Systems which use volatile memory for history storage are not acceptable.

h. Automatic Detector Maintenance Alert: Each FACP node shall automatically interrogate each intelligent system detector and shall analyze the detector responses over a period of time.

i. If any intelligent detector in the system responds with a reading that is below or above normal limits, then the system will enter the trouble mode, and the particular intelligent detector will be annunciated on the system display, network display and printed on the optional system printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.

H. Addressable Devices – General:
   1. Addressable devices shall use simple to install and maintain decade (numbered 1 to 10) type address switches.
   2. Addressable devices which use a binary address setting method, such as a Dip switch, are difficult to install and subject to installation error. This type of device is not an allowable substitute.
   3. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the FACP signaling line circuit.
   4. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.
   5. Smoke detector sensitivity shall be set in the fire alarm control panel and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted by the panel on a time-of-day basis.
   6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
   7. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Base shall include a relay base and an isolator base designed for Class A applications.
8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.

9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

10. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.

11. A magnetic test switch shall be provided to test each detector for 100 percent obscuration, reported to the FACP.

12. Addressable devices shall provide address-setting means using decimal switches and shall also store an internal identifying code that the control panel shall use to identify the type of device. LED(s) shall be provided that shall flash under normal conditions, indicating that the device is operational and is in regular communication with the control panel.

13. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100 percent of the alarm threshold.

I. Pull Box (manual station):
   1. Pull boxes shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key. Stations shall be of the double action type.
   2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
   3. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.
   4. Stations shall be suitable for surface mounting or semiflush mounting as shown on the plans, and shall be installed not less than 42 inches, nor more than 48 inches above the finished floor.

J. Intelligent Photoelectric Smoke Detector:
   1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density. The LED for alarm shall be continuously illuminated red under an alarm condition, a flashing LED is not acceptable.

K. Thermal Detectors:
   1. Thermal detectors shall be rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute.
L. Photoelectric Smoke Detector (Non-Addressable):
   1. The detectors shall use the photoelectric (light-scattering) principle to measure smoke density and shall on command from the control panel, send data to the panel representing the analog level of smoke density.

M. Duct mounted carbon monoxide detector:
   1. Manufactured by Air Products and Controls Model SL-701 or Equal
   2. Product Specifications

   **Voltages available:** 230VAC, 115VAC, 24VAC, 24VDC

   **APPROVALS**
   Electrochemical Carbon Monoxide Sensor is a UL Recognized component in accordance with the requirements of UL2034. Also meets EN50291 requirements. SL-2000 Series Duct Smoke Detector Fire Alarm Certifications referenced side one: UL & CUL Listed (UL268A, UROX, UROX7) File # S2829 CSFM Listed (3240-1004:105); MEA Accepted (73-92-E, VOL. 27)

   **SAMPLING TUBES**
   Provide required length for duct coordinate with HVAC drawings
   - Sectional sampling tube
   - Metal sampling tube for 6” to 2.5’ duct width
   - Metal sampling tube for 2.5’ to 5.0’ duct width
   - Metal sampling tube for 5.0’ to 10.0’ duct width

   **ACCESSORIES**
   - MSR-50/CO remote accessory
   - TG-701 aerosol test gas
   - T-PB power supplies
   - WP-2000 weatherproof enclosure
   (All available from Air Products and Controls Inc.)

   **POWER REQUIREMENTS**

<table>
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<tr>
<th>Input Power</th>
<th>Standby Current</th>
<th>Alarm Current</th>
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</thead>
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<tr>
<td>24VAC</td>
<td>55mA</td>
<td>190mA</td>
</tr>
<tr>
<td>24VDC</td>
<td>14mA</td>
<td>68mA</td>
</tr>
<tr>
<td>115VAC</td>
<td>22mA</td>
<td>32mA</td>
</tr>
<tr>
<td>230VAC</td>
<td>12mA</td>
<td>18mA</td>
</tr>
</tbody>
</table>

   **RELAY CONTACT RATING:**

   - **Alarm Contacts**
     - Resistive load: 2 sets form “C” rated at 10 Amps @ 115VAC
   - **Trouble Contacts**
     - Resistive load: 1 set form “A” rated at 2 Amps
     - Resistive load: 1 set form “C” rated at 10 Amps @ 115VAC

   **AIR VELOCITY**
   100 to 4,000 ft. /min.

   **AMBIENT TEMPERATURE**
   32ºF to 158ºF (0ºC to 70ºC)
HUMIDITY 10% to 85% RH Non-Condensing / Non-Freezing
WIRING Solid or stranded: #12 to #22 AWG terminals
MATERIAL Grey plastic back box, clear plastic cover (Makrolon 94V-0)
Do not expose to corrosive atmospheres.
DIMENSIONS 13 ½” L x 4 ½” W x 2 ¼” D
MAX. NET WT.: 2 ½ lbs.
HARDWARE 7” exhaust tube, FAST Tube starter sampling tube, sampling tube end cap, mounting template, and mounting hardware included.

N. Addressable Dry Contact Monitor Module:
1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLC loops.
2. The monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box.
3. The IDC zone may be wired for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch x 1-1/4 inch x 1/2 inch. This version need not include Style D or an LED.

O. Two Wire Detector Monitor Module:
1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
2. The two-wire monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box or with an optional surface backbox.
3. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

P. Addressable Control Module:
1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contact relay.
2. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.
3. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to ensure that 100 percent of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.
4. Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, UL listed remote power supply.

5. The control module shall be suitable for pilot duty applications and rated for a minimum of .6 amps at 30 VDC.

Q. Isolator Module:
   1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. At least one isolator module shall be provided for each floor or protected zone of the building.
   2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
   3. The isolator module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
   4. The isolator module shall mount in a standard 4-inch deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

R. Batteries and External Charger:
   1. Battery:
      a. Batteries shall be 12 volt, Gell-Cell type.
      b. The battery shall have sufficient capacity to power the fire alarm system for not less than 60 hours plus 10 minutes of alarm upon a normal AC power failure.
      c. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills and leakage shall not be required.

S. LCD Alphanumeric Display Annunciator:
   1. The alphanumeric display annunciator shall be a supervised, back-lit LCD display containing a minimum of 80 characters for alarm annunciation in clear English text.
   2. The LCD annunciator shall display all alarm and trouble conditions from either the network node or complete network, via the INA.
   3. Up to 32 LCD annunciators may be connected to a specific (terminal mode) EIA 485 interface. LCD annunciators shall not reduce the annunciation capacity of the system. Each LCD shall include vital system wide functions such as, system acknowledge, silence and reset.
   4. LCD display annunciators shall mimic the local control panel 80 character display or network annunciator and shall not require special programming.

T. Audio/Visual Unit (Xenon Strobe):
   1. Combination horn strobe units - Provide Truealert Non-Addressable 75 Cd, Red Sync. Two Wire. Comprised of a 24 VDC Xenon Flash Tube entirely solid state. The unit shall require a sync. Control module. Provide True 75 Cd from all axis.

U. Provide UL listed digital dialer in accordance with local fire department requirements. Coordinate programming with local fire department.

V. Exterior Strobe-Light:
   1. Provide wall mounted, 24 v.d.c. Strobe, color Red with WRR wall bracket.

W. Key Box:
   1. Proved key repository box equal to Supra Safe 2HSR with tamper switch or as required by Fire Department.

X. Provide clear plastic covers with local audible alarm for all pull stations as indicated on drawings.

Y. Field Quality Control
   1. Manufacturer’s Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
   2. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:
      a. Factory trained and certified.
      b. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified.
      c. International Municipal Signal Association (IMSA) fire alarm certified.
      d. Certified by a state or local authority.
      e. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.
   3. Pretesting: Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.
   4. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.
   5. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72.
   6. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.
8. Final Test, Certificate of Completion, and Certificate of Occupancy:
   a. Test the entire system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy.

Z. Training
   1. Provide 4 hours training with manufacturer’s and owner’s representative.

PART 3 - EXECUTION

3.1 WORK COORDINATION AND JOB OPERATIONS

A. Equipment shall not be installed in congested and possible problem areas without first coordinating installation of same with other trades.

3.2 PLANS AND SPECIFICATIONS

A. Plans:
   1. Drawings showing layout of electrical systems indicate approximate location of raceways outlets and apparatus. Runs of feeders and branch circuits are schematic and are not intended to show exact routing. Final determination as to routing shall be governed by structural conditions and other obstructions.

B. Specifications:
   1. Specifications supplement drawings and provide specifics pertaining to methods and material to be used.

3.3 IDENTIFICATION

A. Equipment shall be marked for ease of identification as follows.
   1. Provide screw-on nameplates on switchboards, panelboards, F.A. terminal cabinets, starters, and disconnect switches. Nameplates to be of black phenolic with white engraving. For starters and disconnect switches lettering shall be minimum of 1/4” high.
   2. Space neatly typed directory cards listing circuit designations shall be fastened inside the cover of panelboards. Spare circuits shall be penciled.
   3. Wiring device plates on devices connected to normal-emergency circuits shall be red in color.
   4. All conductors in boxes larger than standard outlet boxes, in all wireways, trench headers, etc. shall be grouped logically and be identified.
   5. Grounding conductors and neutrals shall be labeled in panels, wireways, etc. as to circuits associated with.

3.4 PROTECTION AND CLEANUP

A. Protection:
   1. Materials and equipment shall be suitably stored and protected from weather.
3.5 PORTABLE OR DETACHABLE PARTS

A. Retain possession of and be responsible for spare parts, portable and detachable parts, and other removable portions of installation including fuses, keys, locks, blocking clips, inserts, lamps, instructions, drawings, and other devices or materials that are relative to and necessary for proper operation and maintenance of the system until final acceptance, at which time such parts shall be installed or turned over to the Owner, as the case may be.

3.6 SAFETY PRECAUTIONS

A. Provide proper guards, signage, and other necessary construction required for prevention of accidents and to insure safety of life and property. Remove any temporary safety precautions at completion.

3.7 WORKMANSHIP AND INSTALLATION METHODS

A. Work shall be installed in first-class manner consistent with best current trade practices. Equipment shall be securely installed plumb and/or level. Flush-mounted outlet boxes shall have front edge flush with finished wall surface. No electrical equipment shall be supported by work of other trades. Cable systems shall be supported and not draped over ducts and piping or laid on ceiling suspension members. Lighting fixtures shall be installed to agree with Architects reflected ceiling plans.

B. Supports:
   1. Support work in accordance with best industry practice and by use of standard fittings.

C. Fastenings:
   1. Fasten electric work to building structure in accordance with the best industry practice.

D. General Raceway Installation:
   1. Install the various types of raceways in permitted locations as previously specified. All raceways shall be run concealed. Consult Architect for instruction for raceways which must be exposed in public spaces.

3.8 BRANCH CIRCUITS

A. Provide all branch circuit wiring and outlets for a complete and operating system. The system shall consist of insulated conductors connected to the panelboards and run in raceways or as cable systems if permitted under products section, as required to the final outlet and shall include outlet boxes, supports, fittings, receptacles, plates, fuses, etc.

3.9 FIREPROOFING AND WATERPROOFING

A. Fireproof and waterproof all openings in slabs and walls.
3.10 CUTTING AND PATCHING

A. All cutting of surfaces, including core drilling of walls and slabs, shall be done by Electrical Subcontractor. Openings through new wall surfaces will be provided by General Contractor if Electrical Subcontractor gives suitable notice as erection of surface proceeds. If suitable notice is not given, Electrical Subcontractor shall then be responsible for cost of corrective work required.

3.11 MECHANICAL SYSTEM COORDINATION

A. The Mechanical System Subcontractor will be providing various items of mechanical services equipment and control apparatus. In general, Electrical Subcontractor shall connect up power wiring to this equipment. Equipment provided by Mechanical System Subcontractors will include built-in disconnecting means and over current protection unless shown otherwise on drawings. This does not include terminal boxes.

3.12 DISTRIBUTION EQUIPMENT TESTING

A. All individual motor starters, panelboards, motor controls, motor control centers, and feeder conductors, shall be tested in accordance with the following. In general, all tests shall be done in accordance with the latest version of Acceptance Testing Specifications of the International Electrical Testing Association.

B. Magnetic Starters:
   1. Visual inspection to determine:
      a. Shipping damage.
      b. Proper bussing and contactor sizes.
      c. Correct overload relay heater ratings. Any incorrectly sized overloads shall be replaced by the contractor who originally provided same.
   2. Electrical Testing:
      a. Electrical operation of control relays, timing relay, and contactor coils.
      b. Insulation resistance test on all current carrying bus to ground and between phases.
      c. Calibration check of overload heater to ascertain tripping point and time delay at 300% of heater rating.

END OF SECTION