SECTION 16000 – FIRE ALARM SYSTEM

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PART 1 - GENERAL

1.1 PROVISIONS INCLUDED

A. All of the Contract Documents, including the General and Supplementary Conditions, Division 1 and General Requirements, apply to the work of this Section.

B. Examine all drawings and criteria sheets and all other Sections of the specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other Trades affecting or affected by work of this Section. Cooperate with such Trades to ensure the steady progress of all work under the Contract.

1.2 DESCRIPTION:

A. Work of this Section shall include all labor, materials, tools, equipment, transportation, insurance, temporary protection, supervision and incidental items essential for proper installation and operation, even though not specifically mentioned or indicated on the drawings but which are usually provided or are essential for proper installation and operation of all systems indicated on the drawings and specified herein for 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, annunciators, and wiring as shown on the drawings and specified herein.

B. The specifications and drawings describe the minimum requirements that must be met by the Electrical Contractor for the installation of all work as shown on the drawings and as specified hereunder.

C. Furnish all labor, equipment, materials, and performance of operations in connection with replacement of the existing Fire Alarm System as indicated on drawings and as specified.

D. The following general systems and equipment shall be provided as a minimum but not be limited to the following:

1. New fire alarm system devices and controls.
2. Connections to HVAC systems.
3. Grounding.
4. Hoisting, Rigging, Setting of all Conduit, Raceways, Cable and Equipment.
5. Testing, Cleaning and Adjusting.
6. Fees, Permits, Royalties, Guarantees.
7. All Sales Tax must be included in the contractor's bid.
8. Firestopping, Smoke Proofing, Waterproofing.
9. Shop Drawings. Record Drawings. Coordination Drawings.
10. Connections to HVAC Controllers

11. Access Doors/Panels.
12. Boxes.
13. Conductors – 600VAC and 24VDC.
14. Conduit.
15. Hanger and Supports.
16. Surface Metal Raceway (SMR).
17. Fire Alarm Terminal Cabinet (FAT).
18. Solderless Lugs and Connectors.
19. Cutting, patching and finish painting.
20. Demolition of Existing Fire Alarm System.

E. Work includes the The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

F. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

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

H. 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 the installation shall be in compliance with the UL listing.

I. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final checkout and to ensure the systems integrity.

J. The building is not currently equipped with a sprinkler system. All references to supervisory signals, water flow switches, tamper switch requirements shall be provided for future sprinkler system connections.

1.3 THE CONTRACTOR

A. Electrical Contractor shall visit the site of the facility and base his bids from his own site examinations and estimates. Electrical Contractor shall not hold the C.R., the County or his agents or employees responsible for, or bound by, any schedule, estimate or of any plan thereof. Electrical Contractor shall study the Contract Documents included under this Contract to determine exactly the extent of work provided under this Contract, as well as to ascertain the difficulty to be encountered in performing the work, as shown on the drawings and outlined hereinafter in installing new equipment and systems and coordinating the work with the other Trades.

B. Electrical Contractor shall faithfully execute his work according to the terms and conditions of the Contract and specifications, and shall take all responsibility for and bear all losses resulting to him in the execution of his work.

C. Electrical Contractor shall be responsible for the location and performance of work provided under his Contract as indicated on the Contract Documents. All parties

employed directly or indirectly by the Contractor shall perform their work according to all the conditions as set forth in these specifications.

D. Electrical Contractor shall furnish all materials and do all work in accordance with these specifications, and any supplementary documents provided by the C.R. The work shall include everything shown on the drawings and/or required by the specifications as interpreted by the C.R., regardless of where such information is indicated. All work and materials furnished and installed shall be new and of the best quality and workmanship. Electrical Contractor shall cooperate with the C.R. so that no error or discrepancy in the Contract Documents shall cause defective materials to be used or poor workmanship to be performed.

1.4 DEFINITIONS

A. Words in the singular shall also mean and include the plural, wherever the context so indicates, and words in the plural shall mean the singular, wherever the context so indicates.

B. Wherever the terms “shown on drawings” are used in the specifications, they shall mean “noted”, “indicated”, “scheduled”, “detailed”, or any other diagrammatic or written reference made on the drawings.

C. Wherever the term “provide” is used in the specifications it will mean “furnish” and “install”, “connect”, “apply”, “erect”, “construct”, or similar terms, unless otherwise indicated in the specifications.

D. Wherever the term “material” is used in the specifications it will mean any “product”, “equipment”, “device”, “assembly”, or “item” required under the Contract, as indicated by trade or brand name, manufacturer’s name, standard specification reference or other description.

E. The terms “approved”, or “approval” shall mean the written approval of the C.R.

F. The term “specification” shall mean all information contained in the bound or unbound volume, including all “Contract Documents” defined therein except for the drawings.

G. The terms “directed”, “required”, “permitted”, “ordered”, “designated”, “prescribed”, and similar words shall mean the direction, requirement, permission, order, designation or prescription of the C.R.; the terms “approved”, “acceptable”, satisfactory”, and similar words shall mean approved by, acceptable or satisfactory to the C.R.; and, the terms “necessary”, “responsible”, “proper”, “correct”, and similar words shall mean necessary, reasonable, proper or correct in the judgment of the C.R..

H. “Concealed” means hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction or in crawl spaces.

I. “Exposed” means not installed underground or “concealed” as defined above.

J. “Electrical Contractor refers to the Contractor or his Contractors responsible for furnishing and installation of all work indicated on the Electrical Drawings and in the Electrical Specifications.

K. “C.R.” shall refer to the “County’s approved representative” and/or Engineer “M.J. Supranovicz Associates”.

L. "Construction Manager" shall refer to the Construction Manager for this project.

M.

N. "Other Work Contractor" (O.W.C.) refers to the Contractor or Contractors performing work under other Sections of the Contract Specifications or Other Contract.

O. Signaling Line Circuit: A circuit or path over which multiple signals are transmitted and received:

P. Example: Circuits from FACP to Analog/Addressable devices.

Q. Notification Appliance Circuit: A circuit directly connected to a notification appliance.

R. Example: Circuits from FACP to notification appliances.

S. Initiating Device Circuit: A circuit to which automatic or manual signaling initiating devices are connected where the signal received does not identify the individual device operated.

T. Example: Circuits from FACP to non-addressable signal initiating device.

1.5 CODES, STANDARDS, AND REFERENCES

A. All materials and workmanship shall comply with all applicable Codes, Specifications, Local and State Ordinances, Industry Standards, and Local Fire Department Requirements.

B. In case of difference between Building Codes, State Laws, Local Ordinances and Industry Standards and the Contract Documents, the Electrical Contractor shall promptly notify the C.R. in writing of any such difference.

C. In case of conflict between the Contract Documents and the requirements of any Code or Authorities having jurisdiction, the most stringent requirements of the aforementioned shall govern and be adhered to.

D. Should the Electrical Contractor perform any work that does not comply with the requirements of the applicable Building Codes, State Laws, Local Ordinances and Industry Standards, he shall bear all costs arising in correcting the deficiencies, as approved by the C.R..

E. Applicable Codes and Standards shall include all State Laws, Local Ordinances, Fire Department Requirements, and the applicable requirements of the following accepted Codes and Standards, without limiting the number, as follows:

1. National Electrical Code.
2. Occupational Safety and Health Standards
3. Environmental Protection Agency
4. National Fire Protection Association
5. National Building Code (BOCA)
6. Department of Environmental Protection
7. Massachusetts Building Code
8. Massachusetts Electrical Code
9. Americans with Disabilities Act

F. In these specifications, references made to the following Industry Standards and Code Bodies are intended to indicate the latest volume or publication of the Standard. All equipment, materials, and details of installation shall comply with the requirements and latest revisions of the following Bodies, as applicable:
   1. ANSI American National Standards Institute
   2. ASTM American Society of Testing Materials
   3. AWG American Wire Gauge
   4. FM Factory Mutual Engineering Division
   5. NEMA National Electrical Manufacturers Association
   6. UL Underwriter's Laboratories

G. The Contractor for the work in his scope of work shall give all necessary notices, obtain all permits, pay all governmental taxes, fees, and other costs in connection with his work; file for necessary approvals with the jurisdiction under which the work is to be performed. Electrical Contractor shall obtain all required Certificates of Inspection for his respective work and deliver same to the C.R. before request for acceptance of his portion of work is made and before final payment.

1.6 SCOPE:

A. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.

B. Basic Performance:
   1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
   2. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style 7) as part of an addressable device connected by the SLC Circuit.
   3. Notification Appliance Circuits (NAC) shall be wired Class B (NFPA Style B) as part of an addressable device connected by the SLC Circuit.
   4. On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
   5. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.

1.7 COORDINATION OF WORK

A. Refer to General Conditions and Supplementary Conditions for this work

B. Locations of conduit and equipment shall be adjusted to accommodate the work with interferences anticipated and encountered. Electrical Contractor shall determine the exact routing and location of his respective systems prior to fabrication or installation.

C. The Contract Drawings are diagrammatic only intending to show general runs and continuity of circuits, equipment, terminals, and specialties and not necessarily showing all required offsets, details, and accessories and equipment to be connected. All work shall be accurately laid out with other Trades to avoid conflicts to obtain a neat and workmanlike installation which will afford maximum

accessibility for operation, maintenance and headroom. In case of conflict between conduit sizes shown on plans, details or diagrams, the larger conduit size shall be included under the Contract where such discrepancy occurs.

D. All work in tenant occupied spaces shall be prescheduled, in writing, with the C.R. prior to commencement of work therein.

1.8 GIVING INFORMATION

A. Electrical Contractor shall keep himself fully informed as to the shape, size, and position of all openings required for his apparatus and shall give information to Construction Manager / C.R. sufficiently in advance of the work so that all openings may be approved in advance.

1.9 EQUIPMENT AND MATERIALS

A. Equipment and materials shall be delivered to the site and stored in original sealed containers, suitable sheltered from the elements, but readily accessible for inspection by the C.R. until installed. All items subject to moisture damage such as controls shall be stored in dry, heated spaces.

B. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury and theft. At the completion of the work, equipment and materials shall be cleaned, polished thoroughly and turned over to the County in a condition satisfactory to the C.R.. Damage or defects developing before acceptance of the work shall be made good at the Electrical Contractor's expense.

C. Electrical Contractor shall make necessary field measurements to ascertain space requirements, for equipment and connections to be provided under his respective Trade and shall furnish and install such sizes and shapes of equipment to allow for the final installation to conform to the drawings and specifications.

D. The manufacturers listed within this specification have been preselected for use on this project. No submittal will be accepted from a manufacturer other than specified. Should the Contractor wish to propose a substitution during the bid period, such request shall be made in writing to the C.R., no less than five (5) working days, prior to bid date. If substitutions are deemed acceptable to the C.R., a written authorization will be issued by the C.R. to allow such substitution. The above requirement is mandatory.

E. Manufacturer's directions shall be followed completely in the delivery, storage, protection and installation promptly notify the C.R. in writing of any conflict between any requirements of the Contract Documents and the manufacturer's directions and shall obtain the C.R.'s written instructions before proceeding with the work. Should Electrical Contractor perform any work that does not comply with the manufacturer's directions or written instructions from the C.R., he shall bear all costs arising in correcting any deficiencies that should arise.

F. Electrical Contractor shall furnish and install all equipment, accessories, connections and incidental items necessary to fully complete the work under his Contract for use, occupancy and operation by the County.

G. Where equipment of the acceptable manufacturers require different arrangement or connections from those shown, it shall be the responsibility of Electrical Contractor to install the equipment to operate properly and in harmony with the original intent

of the drawings and specifications. When directed by the C.R., the Contractor shall submit drawings showing the proposed installation. If the proposed installation is approved, the Contractor shall make all necessary changes in all affected related work provided under other Sections including location of roughing-in connections by other Trades, conduit, supports, etc. All changes shall be made at no increase in the Contract amount or additional cost to the other Trades and/or County.

H. All equipment and materials required for installation under these specifications shall be new and without blemish or defect. Equipment and materials shall be products which will meet with the acceptance of the Authorities having jurisdiction over the work and as specified hereinbefore. Where such acceptance is contingent upon having the products listed or labeled by UL or other testing laboratory, the products shall be so listed or labeled. Where no specific indication as to the type or quality of material or equipment is indicated, a first class standard article shall be provided.

I. All equipment of one (1) type or system such as conduit, cable, Fire Alarm devices, shall be the product of one (1) manufacturer. This requirement is mandatory.

J. Equipment pre-purchased by the Construction Manager on behalf of the County or by the County if assigned to the Electrical Contractor shall be received, installed, etc., as if the equipment was purchased by the Electrical Contractor. All guarantees, service contracts, etc., shall be same as for all other equipment provided under this Contract.

1.10 USE OF PREMISES

A. The Electrical Contractor shall confine all apparatus, storage of materials and construction to the limits directed by the C.R. and he shall not encumber the premises with his materials. The Contractor shall be held responsible for repairs, patching, or cleaning arising from any unauthorized use of premises.

B. Notwithstanding any approvals or instructions which must be obtained by the Electrical Contractor from the C.R. in connection with use of the premises, the responsibility for the safe working conditions at the site shall remain the Contractor's responsibility and the C.R. or County shall not be deemed to have any responsibility or liability in connection therewith.

1.11 PROTECTION

A. Materials, conduit, lighting fixtures, etc., shall be properly protected and all conduit/raceway openings shall be temporarily closed so as to prevent obstruction and damage. Post notice prohibiting the use of all systems provided under the Electrical Contract, prior to completion of work and acceptance of all systems by County except otherwise instructed by C.R.. Take precautions to protect all materials furnished from damage and theft.

B. Electrical Contractor shall furnish, place, and maintain proper safety guards for the prevention of accidents that might be caused by the workmanship, materials, equipment, or electrical systems provided under his Contract.

1.12 DAMAGE TO OTHER WORK

A. Electrical Contractor shall be held responsible and shall pay for all damages caused by his work to the building structures, equipment, conduits, systems, etc., and all work and finishes installed under this Contract. Repair of such damage shall be done by the Electrical Contractor at the expense of the Contractor, to the C.R.'s satisfaction.

1.13 CORRECTION OF WORK

A. Electrical Contractor shall promptly correct all work provided under his Contract and rejected by the C.R. as defective, failing to conform to the Contract Documents, applicable codes or are of poor workmanship, whether observed before or after completion of work and whether or not fabricated, installed or completed.

1.14 EXTRA WORK

A. No claim for extra work will be allowed unless it is authorized by the C.R. before commencement of the extra said work.

1.15 TOUCH-UP PAINTING

A. All equipment and systems shall be thoroughly cleaned of rust, splatters, and other foreign matter of discoloration leaving every part of all systems in an acceptable prime condition. Electrical Contractor for the work under his Contract shall refinish and restore to the original condition all equipment which has sustained damage to the manufacturer's prime and finish coats of paint and/or enamel.

1.16 FIRESTOPPING AND SMOKEPROOFING

A. All conduits passing through concrete or masonry walls and partitions, shall have the space between the conduit and the sleeves packed to a minimum depth of 1" from one side or the other with wall/floor caulk, 3M Company Cat. #CP-25 Series. Care shall be exercised to compact the caulk fill deep enough to ensure approved firestopping without interfering with conduit movement. Caulk shall be installed around the perimeter of the conduit in such a manner as to ensure tightness and prevent migration of caulk.
B. Fire stopping shall be provided so as to maintain the fire rated integrity of the walls, floors or ceiling penetrated.

1.17 WATERPROOFING AND COUNTERFLASHING

A. Electrical Contractor shall provide all counterflashing of all conduit and equipment provided by him, which pierce roofs, walls and other weatherbarrier surfaces. Coordinate with County's Roofing Contractor.
B. All work shall be performed in a workmanlike manner to ensure weatherproof installation. Any leaks developed due to the Electrical Contractor's work shall be repaired at his expense, to C.R.'s satisfaction.
C. Conduit passing through slabs shall have the sleeve extended above floors as hereinafter specified to retain any water and the space between the conduit and sleeve caulked with lead wool. The top shall be sealed with lead and the bottom shall be sealed with monolastic caulking compound.
D. All cutting and patching required for the electrical work shall be performed by the electrical contractor.

1.18 MISCELLANEOUS IRON AND STEEL

A. Electrical Contractor shall provide all steel supports and hangers as shown on the drawings or required to support all equipment or materials provided under this Contract.
B. All supports shall be cut, assembled, welded and finished by skilled mechanics. Welds shall be ground smooth. Stands, brackets and framework shall be properly sized and strongly constructed.
C. Measurements shall be taken on the job and worked out to suit adjoining and connecting work. All work shall be performed by experienced metal-working mechanics. Members shall be straight and true and accurately fitted.

1.19 PARTS LISTS AND INSTRUCTIONS FOR OPERATION AND MAINTENANCE

A. Electrical Contractor shall thoroughly instruct the County's Facilities Engineering and Fire Department Personnel, to the complete satisfaction of the C.R., in the proper operation of all systems and equipment provided by him. Electrical Contractor shall make arrangements, via the C.R., as to whom the instructions are to be given in the operation of the basic and auxiliary systems and the period of time in which they are to be given. The C.R. shall be completely satisfied that the County's Facilities Department has been thoroughly and completely instructed in the proper operation of all systems and equipment before final payment is made. If the C.R. determines that complete and thorough instructions have not been given by the Electrical Contractor to the County's representative, then the Electrical Contractor shall be directed by the C.R. to provide whatever instructions are necessary until the intent of this paragraph of the specification has been complied with.
B. Electrical Contractor shall submit to the C.R. for approval, the required typed sets (see General and Supplementary General Requirements), bound neatly in loose-leaf binders, of all instructions for the installation, operation, care and maintenance of all equipment and systems (including instructions for the ordering and stocking of spare parts for all equipment installed under this Contract). The lists shall include part numbers and suggested supplier. Each set shall also include an itemized list of component parts that should be kept on hand and where such parts can be purchased.
C. Information shall indicate possible problems with equipment and suggested corrective action. The manuals shall be indexed for each type of equipment. Each section shall be clearly divided from the other sections. A sub-index for each section shall also be provided. The methodology of setting-up the manuals shall be submitted to the C.R. and County for review prior to final submission of manuals.
D. The instructions shall contain information deemed necessary by the C.R. and include, but not limited to, the following:
    1. Introduction
    2. Explanation of Manual and its use.
    3. Summary description of the Electrical Systems.
    4. Purpose of Systems.
    5. System

6. Detailed description of all Systems.
7. Illustrations, schematics, block diagrams, catalog cuts, and other exhibits.
8. Operations
    a. Complete detailed, step-by-step, sequential description of all phases of operation for all portions of the systems, including start-up, shutdown, adjusting. Include all posted instruction charts.

E. Maintenance
1. Parts list and part numbers.
2. Maintenance, replacement charts and Electrical Contractor's recommendations for preventive maintenance.
3. Troubleshooting charts for systems and components.
4. Instructions for testing each type of part.
5. Recommended list of on-hand spare parts.
6. General or miscellaneous maintenance notes.

F. Manufacturer's Literature
1. Complete listing for all parts with names, addresses, and telephone numbers.
2. Care and operation.
3. All and only pertinent brochures, illustrations, drawings, cuts, bulletins, technical data, certified performance charts and other literature with the model actually furnished to be clearly and conspicuously identified.
4. Internal wiring diagrams and engineering data sheets for all items and/or equipment to be furnished.
5. Guarantee and warranty data.

1.20 MANUFACTURER`S REPRESENTATIVE

A. Electrical Contractor shall provide, at appropriate time or as directed by C.R., the on-site services of a competent factory trained Engineer of particular manufacturer of the fire alarm system to inspect, adjust and place in proper operating condition any and all items of same manufacturer. No additional compensation will be allowed for such services. A written report shall be issued by the particular manufacturer with his findings for the C.R.'s record.

1.21 CONNECTIONS TO ARCHITECTURAL, HVAC, PLUMBING, AND COUNTY FURNISHED EQUIPMENT

A. Electrical Contractor shall provide all wire, conduit and connections to equipment provided under other Sections of the specifications, as shown on the drawings and herein specified, including final connections to equipment as required to result in a complete system, fully operational. Coordinate location of all equipment with Construction Manager. Obtain installation diagrams and methods of installation of all equipment, from manufacturers. Follow instructions strictly. If additional information is required, obtain same from the C.R.

1.22 RECORD DRAWINGS

A. Electrical Contractor shall maintain current at the site a set of his drawings, on which he shall accurately show the actual installation of all work provided under his Contract indicating thereon any variation from the Contract Drawings, in accordance with the General Conditions (as amended) and Supplementary General Conditions. Changes whether resulting from formal change orders or other instructions issued by the C.R. shall be recorded. Include changes in sizes, location and dimensions of conduits, equipment, etc.

B. Electrical Contractor shall indicate progress by coloring-in various conduits and associated appurtenances exactly as they are erected. This process shall incorporate both the changes noted above and all other deviations from the original drawings whether resulting from job conditions encountered or from any other causes.

C. The marked-up and colored-up prints will be used as a guide for determining the progress of the work installed. They shall be inspected periodically by the County's Representatives and they shall be corrected immediately if found either inaccurate or incomplete. This procedure is mandatory.

D. At the completion of the job, these prints shall be submitted to the Construction Manager and then to the C.R. for final review and comment. The prints will be returned with appropriate comments and recommendations. These corrected prints together with corrected prints indicating all the revisions, additions and deletions of work, shall form the basis for preparing a set of Record Drawings.

E. The Contractor shall be responsible for generating as-built CAD documents in AutoCAD Release 2000 or later (DWG) format. Deliver three (three) compact disketts and two sets of prints to the C.R. for distribution to the County.

F. The C.R. shall issue to the Contractor via diskette or modem, a complete set of Design Documents in AutoCAD Release 2000 or later (DWG or DXF) format, for use in developing the required as-built CAD documents.

G. Included with the above shall be a complete drawing list and a standard layering system, which shall be required to be maintained within the as-built CAD documents.

H. The as-built CAD documents required shall be in addition to other requirements stated elsewhere.

1.23 PHASING, DEMOLITION AND MAINTAINING EXISTING SERVICES

A. During the execution of the work, required relocation of existing equipment and systems in the existing areas where new work and connections are schedule to be made, shall be performed as indicated on the drawings, as required by job conditions and as determined by the Construction Manager, in close cooperation with the County's representative to facilitate the installation of the new systems and completion of this Contract. The County will require the continuous operation of all existing systems, while demolition, relocation work or new tie-ins are being performed. Outages required for construction purposes shall be scheduled for the shortest practical periods of time, in coordination with the County's designated representative for specific, mutually agreeable periods of time, after each of which the interruption shall cease and service shall be restored. This procedure shall be repeated to suit the County's working schedule as many times as required until all work is completed.

B. Prior to deactivation and relocation, tie-in or demolition work, consult the drawings and arrange a conference with the C.R. and the County'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. Give notice to all parties, with a minimum of five (5) working days in advance.
C. Except as otherwise noted, all deactivation, etc., of systems designated to be demolished or made obsolete by new layout, shall be provided by the Electrical Contractor, as applicable, and all demolition, removal and disposal of demolished materials shall be performed by the Electrical Contractor.
D. The phasing of the work shall be performed in strict accordance with the Construction Manager's construction schedule. The new systems will be installed and completely commissioned prior to any demolition of the existing fire alarm system. Coordination requirements for temporary electricity or rerouting of existing services as required to accomplish the construction schedule.
E. In the event that fire alarm work will render the fire alarm system inoperable, the Contractor shall notify the C.R.. When such a shut down of the system occurs after normal working hours, the Contractor shall pay for a fire watch for such periods. The fire watch shall be provided at the Contractors expense and in accordance with the fire department's requirements.

1.24 CONTINUITY OF EXISTING ELECTRICAL CIRCUITS

A. The Electrical Contractor shall maintain electric service to all existing electrical circuits passing through the areas being renovated under this Contract and feeding electrical equipment in other areas of the existing building.
B. Any existing circuits passing through the areas being renovated under this Contract that interfere with new work shall be relocated by the Electrical Contractor.

1.25 BASIC SYSTEM FUNCTIONAL OPERATION

A. When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:
   1. The system alarm LED on the system display shall flash.
   2. A local piezo electric signal in the control panel shall sound.
   3. A backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
   4. Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.
   5. 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 (notification appliances and/or relays) shall be activated.

1.26 SUBMITTALS

A. General:
   1. Email copies of all submittals in Acrobat PDF format to the Engineer for review.

2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from Gamewell or Fire Control Systems (FCI) may be substituted for the specified equipment as long as the minimum standards are met.
3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment. Each item to be provided shall be clearly marked by the contractor on each submittal page, failure to submit as such will result in un processed submittals being returned to the contractor for resubmission.
4. Disposition of shop drawings shall not relieve the electrical Contractor from the responsibility for deviations from drawing or specifications, unless he has submitted, in writing, a letter itemizing or calling attention to such deviations at time of submission and secured written approval from the Engineer, nor shall such disposition of shop drawings relieve the Electrical Contractor from responsibility for errors in shop drawings or schedules.

B. Shop Drawings: Shop drawings shall include, but shall not be limited to, the following:
1. Boxes
2. Cabinets
3. Conductors
4. Conduit
5. Surface Metal Raceway (SMR)
6. Hanger and Supports
7. Fire Alarm Control Panel
8. Fire alarm initiating devices
9. Fire alarm interface modules
10. Fire alarm signal units
11. Battery sizing calculations
12. Fire alarm cable
13. Details of the fire alarm panels with all the electrical equipment laid out with dimensions, code clearances, etc., indicated shall be submitted with the equipment shop drawings.
14. Fire alarm sequence of operation
15. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
16. Clearly mark shop drawings to indicate exact item or portion thereof that will be furnished for this project. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, dimensions, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

C. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

D. Software Modifications

1. 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.
2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system 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.

E. Certifications:

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

1.27 GUARANTEE

A. Attention is directed to provisions of the General Requirements and Supplementary General Conditions regarding guarantees and warranties for work under this Contract.

B. Manufacturers shall provide their standard guarantees for work under the Electrical Trades. However, such guarantees shall be in addition to and not in lieu of all other liabilities which the manufacturer and Contractor may have by law or by other provisions of the Contract Documents.

C. All materials, items of equipment, and workmanship furnished under the Electrical Section shall carry the standard warranty against all defects in material and workmanship. Any fault due to defective or improper material, equipment, workmanship or design which may develop shall be made good, forthwith, by and at the expense of the Electrical Contractor for the work under his Contract, including all other damage done to areas, materials and other systems resulting from this failure.

D. Electrical Contractor shall guarantee that all elements of the systems which are to be provided under his Contract, are of sufficient capacity to meet the specified performance requirements as set forth herein or as indicated.

E. Upon receipt of notice from the County of failure of any part of the systems or equipment during the guaranteed period, the affected part or parts shall be replaced by the Contractor for his respective work.

F. Electrical Contractor shall furnish, before the final payment is made, a written guarantee covering the above requirements.

G. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.28 POST CONTRACT MAINTENANCE:

A. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.

B. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

C. Maintenance and testing shall be as required by NFPA 72, 2010 edition, chapter 10 and/or as required by the AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance. The schedule shall include:

1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, and all accessories of the fire alarm system.
2. Each circuit in the fire alarm system shall be tested semiannually.
3. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 Chapter 10.

1.29 POST CONTRACT EXPANSIONS:

A. The contractor shall have the ability to provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.

B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable modules equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).

C. The quotation shall include installation, test labor, and labor to reprogram the system for this 10% expansion. If additional FACP hardware is required, include the material and labor necessary to install this hardware.

D. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the FACP and at each intelligent addressable device. Do not include the cost of conventional peripherals or the cost of initiating

devices or notification appliances connected to the addressable monitor/control modules.

E. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

1.30 APPLICABLE STANDARDS AND SPECIFICATIONS:

A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.
   1. National Fire Protection Association (NFPA) - USA:
      a. No. 72 National Fire Alarm Code
      b. No. 101 Life Safety Code
      c. Underwriters Laboratories Inc. (UL) - USA:
      d. No. 268 Smoke Detectors for Fire Protective Signaling Systems
      e. No. 864 Control Units for Fire Protective Signaling Systems
      f. No. 268A Smoke Detectors for Duct Applications
      g. No. 521 Heat Detectors for Fire Protective Signaling Systems
      h. No. 464 Audible Signaling Appliances
      i. No. 38 Manually Actuated Signaling Boxes
      j. No. 1971 Visual Notification Appliances
   2. Local and State Building Codes.
   3. All requirements of the Authority Having Jurisdiction (AHJ).

1.31 APPROVALS:

A. The system shall have proper listing and/or approval from the following nationally recognized agencies:

B. UL Underwriters Laboratories Inc

C. The fire alarm control panel shall meet UL Standard 864 (Control Units) and UL Standard 1076 (Proprietary Burglar Alarm Systems).

1.32 DEMOLITION

A. After the new fire alarm system has been installed, tested and approved by the AHJ, the existing fire alarm system shall be demolished in its entirety.

B. All existing fire alarm system conduit, wiring, boxes, peripheral devices shall be removed. Where devices are removed and it is not feasible to remove embedded raceways and flush boxes they shall be abandoned in place. Install blank face plate over existing boxes.

C. The area around removed devices and equipment shall be patched and/or refinished to match existing surfaces.

D. Ceiling tiles needing replacement will be provided and installed by the County. EC shall keep a record of all tile types and locations needing replacement to be turned over to the C.R.

E. Prior to the removal of any equipment or devices the County will indicate what equipment it wishes to retain, store where and as directed. All else shall become the property of the contractor and removed from the site.

F. Before the existing fire alarm system is out of service cover all new devices so there is no confusion over what devices are active.

1.33 UNIT PRICING

A. provide Add or Deduct pricing/costs for the County's and the C.R.'s consideration. Prices shall be complete with all overhead, profit, equipment costs, labor, insurance, taxes, etc., so that if the County exercises his option to delete or add scope of work, the resultant Add or Delete price will be inclusive.

B. Provide unit prices for the listed items. These prices are to include the device, outlet/backbox, installation, 20 feet of conduit, 80 feet of wire, programming, and any other required installation requirements.

UP-1. Specified spot type smoke detector including base

UP-2. Specified duct smoke detector

UP-3. Specified spot type heat detector including base

UP-4. Point addressable manual station

UP-5. Point addressable monitor module

UP-6. Point addressable control module

UP-7. ADA horn/strobe

UP-8. Magnetic door holder

UP-9. Remote alphanumeric annunciator

UP-10. Remote notification appliance power supply

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL, GENERAL:

A. 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 protective signaling system, meeting the National Fire Alarm Code.

B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.

C. 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.

2.2 CONDUIT AND WIRE:

A. Conduit:

1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
2. Where required, all wiring shall be installed in conduit or surface metal raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
3. 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 760-55.
4. Wiring for 24 volt DC 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.
5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
6. Conduit shall be 3/4-inch (19.1 mm) minimum.

B. Wire:

1. All fire alarm system wiring shall be new.
2. 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 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. 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).
5. Wiring used for the multiplex communication circuit (SLC) shall be twisted and unshielded and support a minimum wiring distance of 12,500 feet. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit.
6. All field wiring shall be electrically supervised for open circuit and ground fault. T-taps on any circuit wiring is not acceptable.

C. Terminal Boxes, Junction Boxes and Cabinets:

D. All boxes and cabinets shall be UL listed for their use and purpose.

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

F. The fire alarm control panel shall be connected to a separate dedicated 120 volt branch circuit breaker, maximum 20 amperes. This circuit breaker shall be painted red, have handle locking device and labed “FIRE ALARM”. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.

G. Surface Raceways

1. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.
2. Surface Nonmetallic Raceways: 2-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color.
3. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.3 MAIN FIRE ALARM CONTROL PANEL (FACP)

A. The NOTIFIER Model NFS-320 fire alarm control panel is considered in compliance with these specification requirements.

B. The FACP shall contain a microprocessor based Central Processing Unit (CPU) and power supply in an economical space saving single board design. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system controlled devices.

C. Operator Control

1. Acknowledge Switch:
    a. Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the LCD display to the next alarm or trouble condition.
    b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.

D. Alarm Silence Switch:

1. Activation of the alarm silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.

E. Alarm Activate (Drill) Switch:

1. The Alarm Activate switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.

F. System Reset Switch:
   1. Activation of the System Reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.

G. Lamp Test:
   1. The Lamp Test switch shall activate all local system LEDs, light each segment of the liquid crystal display and display the panel software revision for service personal.

H. System Capacity and General Operation
   1. The control panel or each network node shall provide, or be capable of 318 intelligent/addressable devices.
   2. The control panel or each network node shall include Form-C alarm, trouble, supervisory, and security relays rated at a minimum of 2.0 amps @ 30 VDC.
   3. It shall also include four Class B (NFPA Style Y) or Class A (NFPA Style Z) programmable Notification Appliance Circuits.
   4. The Notification Appliance Circuits shall be programmable to synchronize with System Sensor, Gentex and Wheelock Notification Appliances.
   5. The system shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color coded system status LEDs, and an alphanumeric keypad with easy touch rubber keys for the field programming and control of the fire alarm system.
   6. The system shall be programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes.
   7. The system shall allow the programming of any input to activate any output or group of outputs. Systems that have limited programming (such as general alarm), have complicated programming (such as a diode matrix), or require a laptop personal computer are not considered suitable substitutes.

I. The FACP shall support up to 20 logic equations, including "and," "or," and "not," or time delay equations to be used for advanced programming. Logic equations shall require the use of a PC with a software utility designed for programming.

J. The FACP shall provide the following features:
   a. Drift compensation to extend detector accuracy over life. Drift compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.
   b. Detector sensitivity test, meeting requirements of NFPA 72, Chapter 7.
   c. Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.
   d. Nine sensitivity levels for alarm, selected by detector. The alarm level range shall be .5 to 2.35 percent per foot for photoelectric detectors and 0.5 to 2.5 percent per foot for ionization detectors. The system shall also

support sensitive advanced detection laser detectors with an alarm level range of .03 percent per foot to 1.0 percent per foot. The system shall also include up to nine levels of Prealarm, selected by detector, to indicate impending alarms to maintenance personnel.

e. The ability to display or print system reports.

f. Alarm verification, with counters and a trouble indication to alert maintenance personnel when a detector enters verification 20 times.

g. PAS presignal, meeting NFPA 72 3-8.3 requirements.

h. Rapid manual station reporting (under 3 seconds) and shall meet NFPA 72 Chapter 1 requirements for activation of notification circuits within 10 seconds of initiating device activation.

i. Periodic detector test, conducted automatically by the software.

j. Self optimizing pre-alarm for advanced fire warning, which allows each detector to learn its particular environment and set its prealarm level to just above normal peaks.

k. Cross zoning with the capability of counting: two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.

l. Walk test, with a check for two detectors set to same address.

m. Control-by-time for non-fire operations, with holiday schedules.

n. Day/night automatic adjustment of detector sensitivity.

o. Device blink control for sleeping areas.

K. The FACP shall be capable of coding main panel node notification circuits in March Time (120 PPM), Temporal (NFPA 72 A-2-2.2.2). Two stage operation shall allow 20 Pulses Per Minute (PPM) on alarm and 120 PPM after 5 minutes or when a second device activates. Canadian Dual stage is the same as Two-Stage except will only switch to second stage by activation of Drill Switch 3 or 5 minute timer. The panel shall also provide a coding option that will synchronize specific strobe lights designed to accept a specific "sync pulse."

L. Central Microprocessor

1. The microprocessor shall be a state-of-the-art, high speed, 16-bit RISC device and it shall communicate with, monitor and control all external interfaces. It shall include an EPROM for system program storage, Flash memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.

2. The microprocessor shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Control-by-event equations shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.

3. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.

4. A special program check function shall be provided to detect common operator errors.
5. An auto-program (self-learn) function shall be provided to quickly install initial functions and make the system operational.
6. For flexibility and to ensure program validity, an optional Windows(TM) based program utility shall be available. This program shall be used to off-line program the system with batch upload/download, and have the ability to upgrade the manufacturers (FLASH) system code changes. This program shall also have a verification utility, which scans the program files, identifying possible errors. It shall also have the ability to compare old program files to new ones, identifying differences in the two files to allow complete testing of any system operating changes. This shall be in incompliance with the NFPA 72 requirements for testing after system modification.

M. System Display

1. The system shall support an 80 character display. The display shall include an 80-character backlit alphanumeric Liquid Crystal Display (LCD) and a full PC style QWERTY keypad.
2. The display shall provide all the controls and indicators used by the system operator:
    a. The 80-character display shall include the following operator control switches: ACKNOWLEDGE, ALARM SILENCE, ALARM ACTIVATE (drill), SYSTEM RESET, and LAMP TEST.
3. The display shall annunciate status information and custom alphanumeric labels for all intelligent detectors, addressable modules, internal panel circuits, and software zones.
4. The display shall also provide Light-Emitting Diodes. The 80-character display shall provide 12 Light-Emitting-Diodes (LEDs), that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM WARNING, SECURITY ALARM, SUPERVISORY SIGNAL, SYSTEM TROUBLE, DISABLED POINTS, ALARM SILENCED, Controls Active, Pre-Discharge, Discharge and Abort.
5. The display shall provide a QWERTY type keypad. The 80-character display keypad shall be an easy to use QWERTY type keypad, similar to a PC keyboard. This shall be part of the standard system and have the capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.
6. The system shall support the display of battery charging current and voltage on the 80-character LCD display.

N. Signaling Line Circuits (SLC)

1. The FACP shall support one SLC. Each SLC interface shall provide power to and communicate with up to 159 intelligent detectors (ionization, photoelectric or thermal) and 159 intelligent modules (monitor or control) for a loop capacity of

318 devices. SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 (Class A or B) wiring.

2. CPU shall receive analog information from all intelligent detectors to be processed to determine whether normal, alarm, prealarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

O. Serial Interfaces

1. The system shall include two serial EIA-232 interfaces. Each interface shall be a means of connecting UL Listed Information Technology Equipment (ITE) peripherals.
2. The system shall include an EIA-485 port for the serial connection of optional annunciators and remote LCD displays.

P. The EIA-485 interface may be used for network connection to a proprietary-receiving unit.

Q. Enclosures:

1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
2. The back box and door shall be constructed of 0.060 steel with provisions for electrical conduit connections into the sides and top.
3. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be site configured for either right or left hand hinging.

R. Power Supply:

1. A high tech off-line switching power supply shall be available for the fire alarm control panel or network node and provide 6.0 amps of available power for the control panel and peripheral devices.
2. Provisions will be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies.
3. Positive-Temperature-Coefficient (PTC) thermistors, circuit breakers, or other over-current protection shall be provided on all power outputs. The power supply shall provide an integral battery charger for use with batteries up to 55 AH or may be used with an external battery and charger system. Battery arrangement may be configured in the field.
4. The power supply shall continuously monitor all field wires for earth ground conditions, and shall have the following LED indicators:
    a. Ground Fault LED
    b. AC Power Fail LED
    c. NAC on LED (4)

5. The main power supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.
6. The main power supply shall provide a battery charger using dual-rate charging techniques for fast battery recharge and be capable of charging batteries up to 200 AH.
7. All circuits shall be power-limited, per UL864 requirements.

2.4 SPECIFIC SYSTEM OPERATIONS

A. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.

B. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification delay shall be programmable from 5 to 30 seconds and each detector shall be able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

C. Point Disable: Any addressable device or conventional circuit in the system may be enabled or disabled through the system keypad.

D. Point Read: The system shall be able to display or print the following point status diagnostic functions:
   1. Device status
   2. Device type
   3. Custom device label
   4. View analog detector values
   5. Device zone assignments
   6. All program parameters
   7. System Status Reports:

E. Upon command from an operator of the system, a status report will be generated and printed, listing all system status.

F. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 800 events. Up to 200 events shall be dedicated to alarm and the remaining events are general purpose.

G. Systems that do not have dedicated alarm storage, where events are overridden by non-alarm type events, are not suitable substitutes. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time, or printed in its entirety. The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable substitutes.

H. Automatic Detector Maintenance Alert:
   1. The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any

intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display, and printed on the optional 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.

I. Pre-Alarm Function:

1. The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.

J. The fire alarm control panel shall include a walk test feature. It shall include the ability to test initiating device circuits and notification appliance circuits from the field without returning to the panel to reset the system. Operation shall be as follows:

1. Alarming an initiating device shall activate programmed outputs, which are selected to participate in walk test, for 3 seconds.
2. Introducing a trouble into the initiating device shall activate the programmed outputs for 8 seconds.
3. All devices tested in walk test shall be recorded in the history buffer.

K. Signal Silence Operation

1. The FACP shall have the ability to program each output circuit (notification, relay, speaker etc) to deactivate upon depression of the signal silence switch.

L. Non-Alarm Input Operation

1. Any addressable initiating device in the system may be used as a non-alarm input to monitor normally open contact type devices. Non-alarm functions are a lower priority than fire alarm initiating devices.

2.5 SYSTEM COMPONENTS:

A. Strobe lights shall meet the requirements of the ADA, UL Standard 1971, be fully synchronized, and shall meet the following criteria:

1. The maximum pulse duration shall be 2/10 of one second.
2. Strobe intensity shall meet the requirements of UL 1971.
3. The flash rate shall meet the requirements of UL 1971.

B. Alphanumeric LCD Type Annunciator (see unit pricing):

1. The alphanumeric display annunciator shall be a supervised, remotely located back-lit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text.
2. The LCD annunciator shall display all alarm and trouble conditions in the system.
3. An audible indication of alarm shall be integral to the alphanumeric display.
4. The display shall be UL listed for fire alarm application.

5. The annunciator shall connect to a separate, dedicated "terminal mode" interface. This is a two-wire loop connection and shall be capable of distances to 6,000 feet. Each terminal mode LCD display shall mimic the main control panel.

C. All interfaces and associated equipment are to be protected so that they will not be affected by voltage surges or line transients consistent with UL standard 864.

D. Universal Digital Alarm Communicator Transmitter (UDACT).

1. The UDACT is an interface for communicating digital information between a fire alarm control panel and an UL-Listed central station.
2. The UDACT shall be compact in size, mounting in a standard module position of the fire alarm control cabinet. Optionally, the UDACT shall have the ability for remote mounting, up to 6,000 feet from the fire alarm control panel. The wire connections between the UDACT and the control panel shall be supervised with one pair for power and one pair for multiplexed communication of overall system status. Systems that utilize relay contact closures are not acceptable.
3. The UDACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to three different telephone numbers.
4. The UDACT shall be completely field programmable from a built-in keypad and 4 character red, seven segment display.
5. The UDACT shall be capable of transmitting events in at least 15 different formats. This ensures compatibility with existing and future transmission formats.
6. Communication shall include vital system status such as:
7. Independent Zone (Alarm, trouble, non-alarm, supervisory)
8. Independent Addressable Device Status
9. AC (Mains) Power Loss
10. Low Battery and Earth Fault
11. System Off Normal
12. 12 and 24 Hour Test Signal
13. Abnormal Test Signal (per UL requirements)
14. interface Communications Failure
15. Phone Line Failure

E. Field Wiring Terminal Blocks

1. For ease of service all panel I/O wiring terminal blocks shall be removable, plug-in types and have sufficient capacity for #18 to #12 AWG wire. Terminal blocks that are permanently fixed are not acceptable.

F. Printer

1. If specified on the drawings, the printer shall provide hard-copy printout of all changes in status of the system and shall time-stamp such printouts with the current time-of-day and date. The printer shall be standard carriage with 80-characters per line and shall use standard pin-feed paper. The printer shall be enclosed in a separate cabinet suitable for placement on a desktop or table. The printer shall communicate with the control panel using an interface complying

with Electrical Industries Association standard EIA-232D. Power to the printer shall be 120 VAC @ 60 Hz.

2. The system shall have a strip printer capable of being mounted directly in the main FACP enclosure. Alarms shall be printed in easy-to-read RED, other messages, such as a trouble, shall be printed in BLACK. This printer shall receive power from the system power supply and shall operate via battery back-up if AC mains are lost. The strip printer shall be UL 864 listed.

2.6 SYSTEM COMPONENTS - ADDRESSABLE DEVICES

A. Addressable Devices - General

1. Addressable devices shall use simple to install and maintain decade, decimal address switches. Devices shall be capable of being set to an address in a range of 001 to 159.
2. Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute.
3. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.
4. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash green 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 red 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. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. The panel on a time-of-day basis shall automatically adjust sensitivity.
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. Bases shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 7 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. Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.
12. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.
13. Addressable modules shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box. An optional surface mount Lexan enclosure shall be available.

B. Addressable Manual Fire Alarm Box (manual station)

1. Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They 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.
2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
3. Manual fire alarm boxes 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 (44 mm) or larger.

C. 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.

D. Intelligent Thermal Detectors

1. Thermal detectors shall be intelligent addressable devices 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. It shall connect via two wires to the fire alarm control panel signaling line circuit.

E. Intelligent Duct Smoke Detector

1. The smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.
2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

F. 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 SLCs.

2. The IDC zone shall be suitable 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.
3. 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 (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.

G. 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.
2. 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.
3. Audio/visual power shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised UL listed remote power supply.
4. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

H. Addressable Relay Module

1. Addressable Relay Modules shall be available for HVAC control and other building functions. The relay shall be form C and rated for a minimum of 2.0 Amps resistive or 1.0 Amps inductive. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

I. Isolator Module

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. 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 segment or branch. 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. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
3. The isolator module shall not require 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 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.

J. BATTERIES:

1. The battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.

2. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.
3. If necessary to meet standby requirements, external battery and charger systems may be used.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Where concealment of conduit is not possible due to construction restraints, surface metal raceway (SMR) shall be utilized. Install SMR in such a manner so as to minimize the amount of raceway required.

C. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

D. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

E. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.2 TEST:

A. The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.

B. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

C. Open initiating device circuits and verify that the trouble signal actuates.

D. Open and short signaling line circuits and verify that the trouble signal actuates.

E. Open and short notification appliance circuits and verify that trouble signal actuates.

F. Ground all circuits and verify response of trouble signals.

G. Check presence and audibility of tone at all alarm notification devices.

H. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.

I. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

J. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3 FINAL INSPECTION:

A. At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

3.4 INSTRUCTION:

A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

*** END ***