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END OF SECTION

SECTION: 01 30 00

ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Allowances are not included in the Lump Sum Base Bid.

~~A.~~B. Allowances have been set aside to complete elements of work that are within the intended scope of work, but which are not absolutely defined. Any and all unused portions of the stipulated Allowances amounts will not be paid to the Contractor and shall be deducted from the contract value at the completion of the project.

~~B.~~C. Use of allowance funds is for work, which, while considered to be within the original scope of work, could not have been reasonably anticipated based upon the information available at the time the cost estimate was established. Use of the fund is not to be construed as including upgrading or enlarging the Scope of the Project and is at the sole discretion of the Owner.

~~C.~~D. All price quotes and scopes of work requested by the Airport for each Allowance item of work, shall be provided to and approved by the Airport prior to the Contractor proceeding with the work. The Contractor shall provide price quote within seven (7) days of receipt of request by the Airport.

~~D.~~E. The Airport will approve an Allowance item of work by issuance of a Change Order prior to the Contractor proceeding. The Change Order will clearly define the Allowance item scope and agreed to amount.

~~E.~~F. Contract time extensions may not be executed under this process, but within the change order process. Any adjustment to the contract time shall be handled in accordance with Technical Specifications Section 01 32 16, Construction Progress Schedule.

1.2 RELATED SECTIONS

A. Not used

1.3 ALLOWANCE SCOPE

A. Unforeseen Conditions: This allowance provides a payment method for changes in the various work areas / phases or scope of work as directed by the Airport to mitigate unforeseen field conditions. The scope of work and associated compensation under this allowance includes, but is not limited to: additional demolition, relocation, or construction of necessary infrastructure to mitigate miscellaneous unforeseen conditions. Potential unforeseen items include obstructions to conduit pathways.

PART 2 - PRODUCTS
Not Used.

PART 3 - EXECUTION
Not Used.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. All price quotes and scopes of work requested by the Airport for each Allowance item of work, shall be provided to and approved by the Airport prior to the Contractor proceeding with the work.

4.2 PAYMENT

Payment will be made under:

ITEM		Allowance
A.	Remedy obstructions to conduit pathways	$100,000.00

END OF SECTION

SECTION 28 31 00

FIRE DETECTION AND ALERT NOTIFICATION SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

A. The Contractor shall secure, and pay for, as part of this contact agreement, the services of a qualified Fire Detection and Alert Notification Contractor to install monitor modules, control modules, manual pull stations, notification appliances, auxiliary power supply(s) (APS), and control panels that will connect to the Fire Alarm Control Panel (FACP) via data loop.

B. The extent of the fire detection and alert notification work is shown on the Contract Drawings and contained in the Specifications. This Fire Detection and Alert Notification Contractor shall review all other discipline/subcontractor drawings, specifications, and other documents to become cognizant of the entire extent of his/her work, which are not detailed on the drawings. Submission of a proposal shall be evidence that this Contractor has reviewed all of the Contract Documents and performed all necessary walk downs to determine the complete scope of work.

C. The Fire Detection and Alert Notification Contractor is directed to examine all Contract Drawings in detail. Failure of the Fire Detection and Alert Notification Contractor to examine all areas, which may require special considerations and misinterpretation of the Contract Documents resulting there from, shall be entirely his/her responsibility.

D. Fire detection and alert notification system components shall be installed as shown on the Contract Drawings with design criteria as specified in this Section. However, the Fire Detection and Alert Notification Contractor shall note that this specification requires that the Fire Detection and Alert Notification Contractor must prepare and submit drawings, system schematics and any other documents needed for the procurement of approvals and the provision of complete, functional and approved fire detection and alert notification system. As a result, the Contract Drawings and this Section serve the purpose of indicating design criteria for the Fire Detection and Alert Notification Contractor's use and guidance in preparing documents required to be submitted for review.

E. The Contract Drawings and specifications form complimentary requirements. Provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials necessary for a sound, secure, complete and approved installation. Completely coordinate work of this specification with work of other trades.

F. The Fire Detection and Alert Notification Contractor is directed to bring to the attention of the General Contractor and/or Fire Protection Engineer, in writing, any discrepancies, and/or matters as they may relate to codes, standards, and recommendation and/or job conditions. Failure of the Fire Detection and Alert Notification Contractor to do so prior to bidding shall indicate acceptance of all documents herein and all job conditions.

G. The Fire Detection and Alert Notification Contractor shall bring to the attention of the Fire Protection Engineer any conflicts between these drawings and codes or standards for resolution. The Fire Detection and Alert Notification Contractor shall not discuss these matters with the Building or Fire Official without the approval of the Fire Protection Engineer.

H. Should the Fire Detection and Alert Notification Contractor perform any work that does not comply with the requirements of the specifications and applicable Codes, Standards and References, they shall bear all costs arising in correcting the work to the satisfaction of the Fire Protection Engineer.

I. The Fire Detection and Alert Notification Contractor shall include costs in their estimate(s) to fully complete all renovation including all interconnecting, coordination and installation details and components and extending the system into and throughout all spaces. The Contractor shall also include costs for startup, pre-testing and acceptance testing, and for making all the systems fully operational, and for scope and design contingencies.

J. Provide contract cost breakdown in accordance with other sections of this specification and submit a breakdown of material and labor costs to aid the General Contractor and Fire Protection Engineer in determining the value of the work installed as the job progresses. The cost breakdown shall itemize categories of material and portions of systems to place a value on the work as it is installed. Unit cost on additional devices will be required as part of the contractors bid.

K. The Fire Detection and Alert Notification Contractor will be required to prepare detailed shop drawings as herein before specified. This information, in the form of a single "Package", shall be submitted to the General Contractor and Fire Protection Engineer for review and approval. Equipment within the "Package" shall bear approval or listing of a testing laboratory approved by the Texas State Board of Insurance, Fire Department and the Owner's Insurer prior to submission to Fire Protection Engineer for their review.

L. Give all notices, file all plans and other documents, obtain all permits and all licenses, pay all fees and obtain all approvals from all Authorities Having Jurisdiction as required to perform work in accordance with all requirements and with the Specifications and Contract Drawings, all of which are considered a part of these Contract Documents.

1.2 DESCRIPTION OF WORK

A. Provide all required labor, warranty labor, materials, equipment, system programming, testing, submittals and services necessary to modify the existing fire alarm system as hereinafter described, and as shown on the engineering drawings. The end result will be for a complete and operational fire detection and alert notification system.

1. Volume 1: The Conractor shall replace all existing horn/strobe and strobe only appliances with new strobe only appliances that conform to current DFW Design Criteria Manual requirements. Existing 24VDC Auxiliary Power Supplies (APS) will be replaced with new units to enable the continued synchronization of fire alarm strobes throughout the building.

2. Volume 2: The Contractor shall install a new air sampling smoke detector in the Main Electrical Room #123, which shall be supervised by the existing fire alarm system.

B. It is intended that the engineering drawings and specification shall describe and provide for a working installation complete in every detail and all items necessary for such complete installation shall be provided whether or not specifically mentioned herein or shown on the engineering drawings.

1.3 REFERENCES

A. All work shall be installed in accordance with all applicable codes and referenced design standards:

~~1. 2015 International Building Code with local amendments~~
~~2. 2015 International Fire Code with local amendments~~
~~3. 2015 International Mechanical Code with local amendments~~
~~4. 2016 NFPA 72, National Fire Alarm and Signaling Code~~
~~5. 2014 NFPA 70, National Electrical Code~~
~~6. 2013 NFPA 13, Sprinkler Systems~~

~~7.~~1. ADA - Americans with Disabilities Act
~~8.~~2. 2015 DFW Airport Design Criteria Manual and the Basis of Design Documents
~~9.~~3. UL standard 464, Audible Signal Appliances (horn appliances only), latest edition.
~~10.~~4. UL Standard1481, Power Supplies for Fire Protective Signaling Systems, latest edition.
~~11.~~5. UL Standard 1971, signaling Devices for the Hearing Impaired, latest edition.
~~12.~~6. Americans with Disabilities Act Accessibility Guidelines (ADAAG). 1990 edition.
~~13.~~7. Texas Accessibility Code, latest edition
~~14.~~8. American National Standards (ANSI) A117.7, Accessibility Code, latest edition.
~~15.~~9. UFAS-Uniform federal Accessibility Standards, latest edition.
~~16.~~10. Administrative Rules of the Texas Department of Licensing and Regulation 16 Texas Administrative Code, Chapter 74, latest edition-Elevators, Escalators and Related Equipment.

B. If there is a conflict between the applicable codes, referenced design standards, or local amendments and this specification, it is the Contractor's responsibility to immediately bring the conflict to the Fire Protection Engineer for resolution.

1.4 SYSTEM OPERATION

A. The fire detection and alert notification system substructure shall operate as follows: Initiation circuits shall meet the minimum requirements of Class B. Supervisory circuits shall meet the minimum requirements of Class B. Notification circuits shall meet the minimum requirements of Class B, Style 1. Signaling line circuits shall meet the minimum requirements of Class B. Auxiliary circuits, where not installed as signaling line circuits, shall meet the minimum requirements of a Class B notification circuit. Circuits for relay coil operation shall be 24 volt maximum with a separate or integral field collapsing diode.

C. The control panels and auxiliary power supplies shall receive their power from 120 volt AC dedicated branch circuits. The circuit disconnecting means shall have a red marking, shall be accessible only to authorized personnel, and shall be identified as "FIRE ALARM NOTIFICATION CIRCUIT". The 24 volt DC power for all system initiation, supervisory, notification and control circuits shall be provided by the Fire Detection and Alert Notification control panel power supplies or listed auxiliary power supplies.

D. Upon loss of building power, the entire system shall transfer to secondary within ten (10) seconds, and without loss of signals. The system shall operate under secondary power in normal or trouble conditions for twenty-four (24) hours and have sufficient power to support complete alarm condition operation for a subsequent fifteen (15) minutes of evacuation alarm operation at maximum connected load.

1.5 QUALITY ASSURANCE

A. All work shall meet the requirements of the Owner, Architect, Engineer and Authority Having Jurisdiction (AHJ).

B. All equipment and components shall be UL listed for the actual intended use, unless hereinafter specifically excluded from such a listing.

C. Installation and supervision of installation shall be in strict compliance with the requirements of the regulations, licenses, and permits for fire detection and alert notification system installers in this jurisdiction.

D. Installer must have been actively engaged in the business of selling, installing, and servicing fire detection and alert notification systems for at least five (5) years.

E. Installer must be registered with and licensed by the State of Texas as a Fire Alarm Contractor.

F. Installer must be an authorized representative of the Equipment Manufacturer (EM) and have technical factory training specifically for the system proposed.

G. The EM shall have a representative supervise the final connection of devices, wiring, and programming of the control panels. The EM representative shall be National Institute for Certification in Engineering Technologies (NICET) certified as Level II or higher Fire Alarm Protection / Fire Alarm Systems Engineering Technician.

1.6 REGULATORY REQUIREMENTS

A. All work shall meet the requirements of all applicable codes and referenced design standards.

B. No approvals or interpretations of the design documents shall be pursued except through the Engineer.

C. Any work performed prior to the satisfactory review of the shop drawings by the Engineer, approval by the AHJ, and determined to be noncompliant with the contract documents or applicable codes by the Owner or AHJ will be replaced at the Contractors' expense.

D. The system will not be acceptable until final testing and receipt of the Inspection and Testing Form has been obtained.

1.7 SUBMITTALS

A. The engineering drawings have been prepared using AutoCAD. These documents will be made available either in electronic or hard copy form. Utilization of these documents for the development of shop drawings and submittals does not relieve any responsibilities required herein.

B. In the submittals, the Contractor must clearly identify all areas and sections of this specification to which they take exception or are not capable of providing.

C. Submittals will be disapproved unless required equipment literature, calculations, and complete shop drawings are submitted together as one package for review.

D. The Fire Protection Engineer and Airport Fire Prevention Bureau shall review and recommend approval, disapproval, or other appropriate recommendations on the Contractor's submittals. This review is to verify conformance to the project specifications and design concepts expressed in the contract documents. The Contractor shall allow sufficient time to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of details and dimensions, or substantiating installation or performance of equipment and systems designed by the Contractor, all of which remain the Contractor's responsibility to the extent required by the contract documents. The Engineer's review shall not constitute approval of safety precautions of construction, means, methods, techniques, sequences of procedures, or approval of a specific assembly.

E. Prior to release of equipment for shipment or installation, submit to the Fire Protection Engineer, DFW ITS Life Safety Department and Airport Fire Prevention Bureau the following:

1. Five (5) sets of shop drawings in addition to the specific quantity required for this project. Three (3) sets of shop drawings to the Fire Protection Engineer and Airport Fire Prevention Bureau, one (1) set to DFW ITS Life Safety Department, and one (1) electronic set

(AutoCAD) copy/file to the Fire Protection Engineer. The three (3) sets of shop drawings for the Airport Fire Prevention Bureau shall be hard, bond type paper. Submittal must be comprehensive of the entire project, complete in all detail, and include, but not be limited to, the following:

a. Floor plans showing equipment placement, point to point wiring, wiring types and sizes, conduit types and sizes, wiring and raceway routes, and proposed mounting methods for conduit and backboxes. Floor plans shall be AutoCAD generated.
b. Sequence of Operations (Event Matrix) to include a detailed description of the operation of each system function for all possible alarm conditions.
c. Riser diagram showing typical wiring connections for each type of device and module.
d. Supervisory and alarm current calculations for primary power and emergency battery sizing of all control panels and auxiliary power supplies.

    1) Battery calculations shall list the type of devices and modules, quantities, amperage draw for standby and alarm conditions for each device, the total amperage draw for each panel, and each panel's battery amp/hour rating.
    2) The calculated load shall be the design load (summation of current at end of circuit), including all required spare capacity.
    3) The battery capacity used to meet the calculated load shall be a maximum of eighty (80) percent of the amp/hour listed by the manufacturer.

e. A complete list of all proposed alphanumeric descriptions and their associated point address and circuit number.
f. Voltage drop calculations for all notification appliance circuits.

    1) Calculations shall follow the voltage drop calculation criteria as outlined in NFPA 72 and UL 864.
    2) Calculations shall use the worst case operating voltage of each control panel or power supply as a starting voltage. The starting voltage shall be 20.4 VDC, unless written documentation is provided confirming that the specific control panel or power supply is capable of maintaining a voltage higher than 20.4 VDC.
    3) Calculations shall use the lowest operating voltage of the notification appliances and the associated increased current draw. The lowest operating voltage shall be the UL standard operating voltage of 16 VDC, unless approved otherwise by the Fire Protection Engineer.

2. Three (3) sets of manufacturer's literature on all system equipment and system conductors in addition to the specific quantity required for this project.

    a. Literature shall include specification and description of recommended supporting methods, enclosures or boxes, and wiring connections.
    b. The exact components to be utilized on this specific project shall be indicated, by highlighting or arrows, on each data sheet of the equipment literature.

3. One (1) copy each of the qualifications and authorization of the representative of the EM.
4. The Owner, Owner's Representative, or design firms retained by the Owner shall not be responsible for any additional costs resulting from replacement of equipment or materials not reviewed prior to installation.

F. After complete review and approval of the shop drawings by the Fire Protection Engineer and Airport Fire Prevention Bureau, the Contractor shall submit all required drawings, manufacturers' literature, calculations and any other materials required by the AHJ to obtain a permit to the

appropriate party for review.

G. Forward to the Fire Protection Engineer, in writing, any comments from the AHJ or the Insurance Underwriter within five (5) working days after the receipt of their comments.

1.8 PROJECT RECORD DOCUMENTS

A. The Contractor shall provide and maintain on site an up-to-date record set of approved shop drawing prints which shall be marked to show each and every change made to the fire detection and alert notification system from the original approved shop drawings. This shall not be construed as authorization to deviate from or make changes to the shop drawings approved by the Fire Protection Engineer without written instructions from the Fire Protection Engineer in each case. This set of drawings shall be issued only as a record set. These drawings shall be made available to the Owner, or the Owner's Representative, upon request.

B. The Contractor shall continually document software and programming changes. This documentation shall include:

1. A complete printout of the system prior to the change.
2. A complete printout of the system program subsequent to the change, with all modifications highlighted.
3. A letter prepared and signed by the individual who made the changes, describing each change made and the reason for the change. This letter shall certify that the programmer has personally reviewed and compared the before and after program printout and verified the correctness of the modification(s).
4. An equivalent means performed automatically in computer software, which verified the results of changes made is acceptable.

C. Once the fire detection and alert notification system is put into service, in whole or in part, and the associated building(s) are partially or wholly occupied, no software changes shall be performed without prior written permission of the Owner, or Owner's Representative.

D. Only a certified manufacturer's representative trained in the specific programming software shall make changes to the fire detection and alert notification system software once the system is in service.

E. Each revision to the software shall be identified by a unique version number and date.

F. Prior to final payment for the fire detection and alert notification system and the beginning of the warranty period, submit the following completed project record documents to the Owner's Representative:

1. Copies of all test and inspection reports as required by the AHJ and NFPA 72:

   a. The Record of Completion form shall be in the format as outlined in NFPA 72.
   b. The Inspection and Testing form shall be in the format as outlined in NFPA 72.

2. DFW Airport Fire Marshall shall accept the system and is provided with all permits, licenses, acceptance tests and final acceptance requirements as per NFPA applicable codes and standards. All permits and licenses required to be in the possession of the Owner by the AHJ.
3. Accurate record (as-built) drawings of the complete installation to include, but not be limited to, the information required for the shop drawings. Record drawings of the floor plans shall be AutoCAD generated.
4. Original warranty documents including, but not limited to, those of the EM. Warranty

documents shall reference and be binding to the warranty provisions specified in the warranty portion of this specification.

5. Submit to the Engineer a copy of the transmittal to the Owner's Representative for all final complete project record documents.

G. Upon completion of construction, submit the following:

1. Provide ~~one (1) sepia bond reproducible print,~~ two (2) prints, and a set of disks in Electronic Format of the drawings, floor plans with device locations, device addresses, wire routing and wiring diagrams reflecting "as-built" conditions to the Owner.
2. Provide two (2) complete sets of "as-built" data sheets for all system-connected equipment to the Owner.
3. Provide two (2) sets of complete "as-built" software listing of all data files, even programs, print statements, points' lists, etc. to the Owner.
4. Provide one (1) copy of all data files on diskette to the Owner.
5. Provide two (2) sets of customized "as-built" operating manuals to the Owner.
6. Provide one (1) complete set of electronic files of "as-built" drawings and wiring diagrams to the Engineer. Electronic files shall be in AutoCAD.
7. Provide a completed test form which complies with NFPA 72, signed and dated by the fire detection and alert notification system manufacturer or his agent.
8. Provide NFPA 72 completion certificate, signed by the Fire Department.
9. All items of this section shall be provided prior to final payment request.

H. A copy of all software documentation required by this section shall be maintained on-site by the Contractor, in a binder, arranged in chronological order. This binder shall be provided to the Owner's Representative at the completion of the project.

I. Submit to the owner in electronic format, all fire detection and alert notification as-builds.

1.9 RELATED REQUIREMENTS:

A. Materials and methods specified in other sections:

1. Electrical – Division 26

a. Section 260526 – Grounding For Electrical Systems
b. Section 260529 – Hangers and Supports for Electrical Systems
c. Section 260533 – Raceways, Conduits and Boxes
d. Section 260534 – Wireways
e. Section 260549 – Through-Penetration Firestoping for Electrical

1.10 WARRANTY

A. Repair all defective workmanship or replace all defective materials for a period of one (1) year from the date of acceptance by the Owner's Representative. Workmanship or equipment found to be defective during that period shall be replaced at no additional cost to the Owner.

B. The warranty or any part of the warranty shall not be made void by any required operation or inspection of the system after final completion during the warranty period. The Owner may select qualified firms other than Warrantor to provide required tests and inspections. System testing and inspections will be conducted only by a duly licensed company under contract with the Owner to perform scheduled testing and inspections as required by the AHJ. The Owner may elect to have a representative present at the scheduled testing during the warranty period.

C. As an option alternate bid, the Contractor shall supply pricing for extended Warranty of the

system. This option shall be renewable on a yearly basis and pricing shall be supplied for a minimum of five (5) years from the expiration of the initial Warranty.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Products for this project shall be of the latest design. Obsolete or discontinued models are not acceptable.

B. All equipment supplied shall be UL listed for the required function and shall be compatable with the existing fire alarm and alert notification control system.

2.2 CONTROL PANELS

A. The existing Honeywell XLS control panel will remain. Provide the additional modular components as necessary to satisfy system capacity requirements and to accomplish all system functions.

B. Auxiliary Power Supplies

1. Provide each auxiliary power supply (APS) unit in an individual, single, self-contained, lockable cabinet. Input shall be 120 volt AC nominal with an output of regulated 24 volt DC. Each APS shall be capable of actuation from either a host panel notification circuit, or programmed dry contacts. Each APS shall provide a trouble indication to host panel upon loss of AC power or abnormal conditions on individual output circuits. Each APS shall have a minimum of four (4) supervised output notification circuits rated individually at a minimum of 2.5 amperes available per circuit, with a total output of 10 amperes. The Contractor shall be responsible for all redesign, circuiting, and additional equipment costs to provide the necessary output amperage. Each APS shall have a minimum of twenty (20) percent spare capacity on each circuit.
2. The APS shall operate from a dedicated 120 volt AC or 24 volt DC source with a listed secondary power source conforming to the same alarm and standby time requirements as the FACP.

a. Acceptable Equipment Suppliers (provided compatibility requirements are met, i.e. synchronization): Honeywell HPFF8 or Notifier FCPS-24S8 only.

~~3. synchronization): Honeywell, Inc. (XLS-BPS10 series)~~

~~4.~~3. Provide a smoke detector above remote power supplies where required.

2.3 FIELD DEVICES

A. Monitor Modules

1. Provide addressable monitor modules where required to interface with contact alarm devices, or to connect a supervised zone of conventional initiating devices (any normally open dry contact device) to an intelligent SLC loop.
2. The module shall include a unique internal identification code that is factory installed and programmed into the control panel through a mapping process which the control panel shall use to identify the type of device. Flash status/power LED under normal conditions, indicating that the monitor module is operational and in regular communication with the

control panel. The LED may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected.

3. Provide an automatic test feature to permit functional testing of the device from the main control panel. Indicate results of the test on the LCD display at the control panel.
4. Monitor modules with multiple input contact connections are acceptable if each input is capable of independent programming and functional operation.

C. Control/Relay Modules

1. Provide addressable control/relay modules where required to interface with a dry contact (Form C) relay. Provide power for the relay actuation from the intelligent SLC loop.
2. Minimum rating of Form C contacts shall be 2 amperes at 24 volts and 0.5 amperes at 120 volts AC.
3. The module shall include a unique internal identification code that is factory installed and programmed into the control panel through a mapping process which the control panel shall use to identify the type of device. Flash status LED under normal conditions, indicating that the control module is operational and in regular communication with the control panel. The LED may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected.
4. Control/relay modules with multiple output contact connections are acceptable if each output is capable of independent programming and functional operation.

C. Signal Modules

1. Provide addressable signal modules where required to interface with audible or visual notification appliances, or to connect a supervised zone of conventional indicating appliances (any 24 volt DC polarized notification appliance) to an intelligent SLC loop. Provide notification appliance power through a separate loop from the main control panel or from supervised remote power supplies.
2. The Minimum rating of the output current shall be 1.5 amperes at 24 volts and 0.5 amperes at 120 volts AC.
3. The module shall include a unique internal identification code that is factory installed and programmed into the control panel through a mapping process LED under normal conditions, indicating that the control module is operational and in regular communication with the control panel. The LED may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected.

~~D. Intelligent Photoelectric Smoke Detectors~~

~~1. Provide analog photoelectric type smoke detectors with the capability to send data, on command, to the control panel representing the analog level of smoke density.~~
~~2. Provide a "maintenance alert" feature whereby the detector initiates a trouble condition should the units' sensitivity approach the outside limits of the normal sensitivity window.~~
~~3. The detector shall include a unique internal identification code for each detector that is factory installed and programmed into the control panel through a mapping process which the control panel can use to identify the type and precise location of the detector.~~
~~4. Provide dual alarm and power/status LED's. Flash status LED's under normal conditions, indicating that the detector is operational and in regular communication with the control panel. Both LED's may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected and verified.~~
~~5. Provide a low profile design modular detector head with twist-lock base.~~

~~E.~~D. Intelligent Detector Base

1. Provide a UL listed low profile twist-lock detector base with screw terminals. Provide an

output connection in the base to connect an external remote alarm LED.
2. Detector base shall be capable of connecting to the control panel.
3. Provide supervision as required by NFPA 72 and the manufacturer's equipment literature.

~~F. Intelligent Photoelectric Smoke Detectors for Duct Applications~~

~~1. Provide duct mounted analog photoelectric type smoke detectors with the capability to send data, on command, to the control panel representing the analog level of smoke density.~~
~~2. Provide detectors operating in air velocities of 0 fpm to 4000 fpm without adverse effects on detector sensitivity.~~
~~3. Provide a "maintenance alert" feature whereby the detector initiates a trouble condition should the unit's sensitivity approach the outside limits of the normal sensitivity window.~~
~~4. Provide a molded plastic enclosure with integral conduit knockouts. Provide housing with gasket seals to insure proper seating of the housing to the associated ductwork. Provide sampling tubes that extend across the width of the duct and in compliance with the manufacturer's installation recommendations.~~
~~5. The detector shall include a unique internal identification code for each detector that is factory installed and programmed into the control panel through a mapping process which the control panel can use to identify the type and precise location of the detector.~~
~~6. Provide dual alarm and power/status LED's. Flash status LED's under normal conditions, indicating that the detector is operational and in regular communication with the control panel. Both LED's may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected and verified.~~
~~7. Provide a low profile design modular detector head with twist-lock base.~~
~~8. Remote test stations, where required, shall consist of a key operated switch and indicating LED. The remote test station shall be listed for use with the duct smoke detector.~~
~~9. Provide a separate addressable control/relay module for any associated control functions.~~

~~G.~~E. Addressable Manual Pull Stations

1. Provide dual action type manual pull stations. Manual pull stations shall be designed that upon activation, shall initiate a change of status at the control panel. The manual pull stations shall not be automatically resettable and shall include a visible indication of the manual pull station being activated.
2. The unit shall include a unique internal identification code that is factory installed and programmed into the control panel through a mapping process which the control panel can use to identify the type of device. Monitoring devices when used shall be located in the manual station's back box.
3. Construct of hi-impact red molded Lexan or die-cast metal with instructions for station operation in raised white letters.
4. Where possible, provide flush mounting of pull stations. Surface mounting of pull stations will be allowed if flush mounting is not possible. Semi-flush mounted stations shall mount on a standard electrical box.

~~H.~~F. Visual Notification Appliances - Wall Mounted

1. Provide visual notification appliances operable at 24 volt DC and polarized supervision. The appliances shall utilize a high intensity solid state xenon strobe tube with associated lens/reflector system. The appliances shall be constructed of high-impact white thermoplastic, shall indicate "ALERT", shall not include the "Running Man" symbol, and shall be UL listed for wall mounted applications.
2. Where possible, provide flush mounting of appliances. Where surface mounting is necessary, provide a decorative backbox skirt covering the appliance backbox.
3. Provide synchronization of all visual notification appliances. The synchronization modules

shall be capable of synchronizing appliances with candela ratings ranging from 15 cd to 185 cd.

~~I.~~G. Audible/Visual Notification Appliances - Wall Mounted

1. Provide solid state electronic audible notification appliances with integral visual notification appliance operable at 24 volt DC and polarized supervision. The appliances shall utilize a high intensity solid state xenon strobe tube with associated lens/reflector system. The appliances shall be constructed of high-impact white thermoplastic, shall be labeled "ALERT", shall not include the "Running Man" symbol, and shall be UL listed for wall mounted applications.
2. Where possible, provide flush mounting of appliances. Where surface mounting is necessary, provide a decorative backbox skirt covering the appliance backbox.
3. Provide synchronization of all audible and visual notification appliances. Provide a synchronized temporal pattern audible tone producing a minimum sound pressure level of 75 dB reverberant per UL 464 using the A-weighted scale (dBA). The synchronization modules shall be capable of synchronizing appliances with candela ratings ranging from 15 cd to 185 cd.

~~J.~~H. Visual Notification Appliances - Ceiling Mounted

1. Provide visual notification appliances operable at 24 volt DC and polarized supervision. The appliances shall utilize a high intensity solid state xenon strobe tube with associated lens/reflector system. The appliances shall be constructed of high-impact white thermoplastic, shall indicate "ALERT", shall not include the "Running Man" symbol, and shall be UL listed for ceiling mounted applications.
2. Where possible, provide flush mounting of appliances. Where surface mounting is necessary, provide a decorative backbox skirt covering the appliance backbox.
3. Provide synchronization of all visual notification appliances. The synchronization modules shall be capable of synchronizing appliances with candela ratings ranging from 15 cd to 185 cd.

~~K.~~I. Audible/Visual Notification Appliances - Ceiling Mounted

1. Provide solid state electronic audible notification appliances with integral visual notification appliance operable at 24 volt DC and polarized supervision. The appliances shall utilize a high intensity solid state xenon strobe tube with associated lens/reflector system. The appliances shall be constructed of high-impact white thermoplastic, shall indicate "ALERT," shall not include the "Running Man" symbol, and shall be UL listed for ceiling mounted applications.
2. Where possible, provide flush mounting of appliances. Where surface mounting is necessary, provide a decorative backbox skirt covering the appliance backbox.
3. Provide synchronization of all audible and visual notification appliances. Provide a synchronized temporal pattern audible tone producing a minimum sound pressure level of 75 dB reverberant per UL 464 using the A-weighted scale (dBA). The synchronization modules shall be capable of synchronizing appliances with candela ratings ranging from 15 cd to 185 cd.

~~L.~~J. Auxiliary Relays

1. Provide relays for all auxiliary control interface. Provide heavy duty type rated up to 10 amperes at 24 volt DC. Provide with NEMA I dust cover assembly and DPDT contacts.
2. Relays shall be mounted within 3 feet of the controlled circuit or device.

2.4 CONDUCTORS

A. Wiring will be in accordance with local, state, National Electrical Code and the ICC Electrical Code.

B. SLC conductor(s) shall be Honeywell AK-3747.

C. Notification Alarm Circuit conductor(s) shall be #12 AWG, THHN stranded.

D. All electrical characteristics (conductor-to-conductor capacitance, DC resistance, etc.) of the fire detection and alert notification conductors shall meet the requirements of the selected EM for the intended application.

E. Wire used for 120 VAC power circuits shall be minimum size of 12 AWG stranded copper conductors with THHN insulation.

F. Wire used for point addressable, signaling line circuits, shall be a minimum size of 14 AWG solid copper conductor, UL listed for fire alarm system use and labeled FPL.

2.5 AIR SAMPLING SMOKE DETECTION (ASSD) SYSTEM

A. System Description

1. Principle components of ASSD System indlude the detector housing, display, power supply and air-sampling pipe network.
2. The detector assembly housing shall contain the integral aspiration fan, filter, laser based detection chamber and control, output and supervision circuitry
3. System shall consist of a piping or tubing distribution network that runs from the detector assembly(s) to the protected area and is supported by calculations from a computer-based design modeling tool.
4. System shall include configurable alarm and trouble relay outputs for interface to the fire alarm system.
5. System shall be capable of communicating to the Honeywell XLS fire alarm control panel through a UL-listed High Level Interface or by relay connectivity.
6. Open area ceiling sampling points shall be oriented downward and shall be located horizontally and vertically in accordance with the applicable provisions of NFPA 72.
7. Sampling points shall be accessible for inspection and maintenance. Install sample points with a minimum of 18 inches from any obstructions below and on all sides.
8. Sampling points shall be a minimum of three feet away from air supply diffusers.
9. All sampling points shall be marked with the Manufacturer's standard identification labels.

B. Air Sampling Smoke detector

1. Detector shall be aspirated laser-based type.
2. Detector shall be self monitoring for filter contamination and provide indication through system fault when replacement is necessary.
3. Detector shall be equipped with integral control buttons for Reset and Isolate.
4. Detector shall be equipped with a general purpose input to allow either: Remote Reset, Isolate or Standby.
5. Detector shall allow programming of:
   a. Smoke threshold alarm levels.
   b. Time delays.
   c. Faults, including airflow, detector, power, filter and network as well as an indication of the urgency of the fault.
   d. Configuration of relay outputs for remote indication of alarm and fault conditions.

e. General purpose input functionality.

6. Detectors shall provide a minimum of three alarm output levels corresponding to Alert, Action or Prealarm and Fire 1.
7. Detector shall be self monitoring for filter contamination and provide indication through system fault when replacement is necessary.

C. Display Unit:

1. Display Unit shall have as a minimum the following features:
2. LED indicators corresponding to actual smoke growth.
3. Real-time smoke level in obsc/ft.
4. LED indicators corresponding to the alarm thresholds of the detector.
5. Minor and urgent fault LED indicators.
6. User interface buttons, supporting at a minimum, the following features:
   a. Reset
   b. Isolate

7. Display Unit shall be either integral to the detector or externally mounted next to its corresponding detector or were designated on Drawings.

D. Sampling Pipe, Fittings and Mounting Hardware:

1. Material for pipe and fittings shall be orange ¾" chlorinated polyvinyl chloride (CPVC) pipe. The pipe shall be UL listed as an accessory for plenum use as per UL1887 standard.
2. Pipe interior shall be smooth bore.
3. The pipe shall be marked with the UL Listing information and marking requirements as per NFPA 72.
4. All fittings shall be made with compatible ¾" CPVC pre-formed elbows, tees, couplings and unions.
5. All joints in the sampling pipe must be air tight and made by using solvent cement, except at entry to the detector.
6. Pipe shall be UL listed and FM approved for its intended use and with the system in which it is connected to.
7. Mechanical pipe fasteners and hangers shall be approved for use with the CPVC pipe material in which it is supporting. Fasteners and hangars shall allow pipe to freely slide in and out to facilitate expansion and contraction of the material.
8. It shall be the installing contractor's responsibility to confirm pipe material and mounting methods selected meets this Specification, requirements of the local Authority Having Jurisdiction, and Manufacturer's guidelines.

E. Power Supply and Batteries:

1. System shall be powered by from a UL1481 listed regulated supply of nominally 24Vdc.
2. Power supply shall be provided with appropriately sized/rated batteries to accommodate the system's power requirements in the event main AC power is interrupted.
3. Provide battery size based on the systems power requirements which will have 24-hour standby and 15-minutes in an alarm condition.

F. Initial Commissioning Settings:

1. Alarm threshold sensitivity settings:
   a. Fire 1 – Divide target sampling point sensitivity of 1.5% obs/ft by number of holes in overall system pipe network to derive at the Fire 1 alarm threshold.
   b. Action or Prealarm – Program at 40% below Fire 1 threshold.

c. Alert – Program at 30% below Action threshold.

2. Both day and night alarm thresholds are to be programmed to the same settings.
3. Detector(s) alarm delays shall be as follows :
   a. Fire 1: 15 seconds.
   b. Action / Prealarm: 30 seconds.
   c. Alert: 30 seconds.

G. Signals:

1. Fire 1
   a. Discrete visual indicator at detector unit
   b. Fire alarm at Fire Alarm Control Panel
   c. Audible/visual alarm at Fire Alarm Control Panel
   d. Fire alarm signal to DFW AOC

2. Action / Prealarm
   a. Discrete visual indicator at detector unit
   b. Action/Prealarm at Fire Alarm Control Panel
   c. Audible/visual alarm at Fire Alarm Control Panel
   d. Fire alarm signal to DFW AOC

3. Alert
   a. Discrete visual indicator at detector unit
   b. Alert at Fire Alarm Control Panel
   c. Audible/visual alarm at Fire Alarm Control Panel
   d. Fire alarm signal to DFW AOC

4. Fault
   a. Discrete visual indicator at detector unit
   b. Trouble indication at Fire Alarm Control Panel
   c. Trouble signal to DFW AOC

~~2.5~~2.6 CONDUIT/RACEWAY

A. The following raceway types shall be permitted:

1. EMT conduit (3/4 inch minimum).
2. RIGID conduit (3/4 inch minimum).
3. Non-Metallic conduit for wet locations (3/4 inch minimum).
4. Metal clad cable is permitted in concealed spaces for horizontal fire detection and alert notification branch circuits and connections to devices and fixtures.

B. All raceway types shall be new. Installing used raceway is unacceptable.

C. Using existing raceway is unacceptable without prior written permission of the Engineer or Owner's Representative.

D. Boxes, supports, and other accessories for the raceway installation shall be listed for the intended application.

E. All wiring shall be installed in conduit.

F. Install fire detection and alert notification system wire in conduit or approved raceway, parallel to

existing building structure when possible.

G. All riser wiring and wiring between floors shall be installed in conduit.

H. Strap or bundle all cables and wires inside equipment enclosures and terminal cabinets, parallel to the enclosure sides.

I. All EMT conduit fittings shall be compression type. All rigid conduit fitting shall be threaded with plastic inserts.

J. Flexible conduit and associated junction boxes connecting sprinkler water flow and supervisory switches shall be water resistant.

K. All fire alarm conduit and junction boxes shall be RED in color. Flexible conduit between fire alarm junction boxes and device mounting boxes that are less than 6 feet in length are not required to be RED. Device mounting boxes are not required to be RED.

PART 3 – EXECUTION

3.1 COORDINATION WITH OTHER TRADES

A. Coordinate closely with all other trades to expedite construction, accurately interface with related systems and avoid interferences.

3.2 INSTALLATION / APPLICATION

A. Furnish and install all control wiring, raceway and outlet boxes for the fire detection and alert notification system.

B. Furnish and install all backboxes, equipment and devices for the fire detection and alert notification system.

1. Backboxes shall be of the exact type recommended by the EM as shown on the equipment and device submittals.
2. Backboxes shall be installed per the manufacturer's installation recommendations.
3. Devices and equipment must be installed by personnel legally permitted and currently licensed to install the devices and equipment. The cost of installation, warranty of installation and equipment, coordination of the installation, and supervision of the installation are responsibilities of the Contractor.

C. All fire detection and alert notification junction boxes, pull boxes, cable splices and terminal cabinets shall be accessible, painted red and clearly marked "Fire Alarm." The Contractor shall comply with any local codes or AHJ requirements for circuit identification. Any access panels required for the accessibility to the junction boxes, pull boxes, cable splices and terminal cabinets shall be the responsibility of the Fire Detection and Alert Notification Contractor.

D. All wiring conductors and conduits shall be installed in a neat and workmanlike manner at right angles to the building walls, floors and ceilings, and supported from the building structure at intervals compliant with NEC requirements.

E. All wiring conductors for the fire detection and alert notification system shall be installed in conduit.

F. All wiring conductors shall be tagged at all junction points and shall test free from grounds or crosses between conductors.

G. Power-limited wiring conductors shall not be installed in conduits with electric light, power Class 1, non-power-limited fire alarm and medium power network-powered broadband communications circuits.

H. Fire detection and alert notification cabling shall not be painted.

I. Conduits shall enter the control panel enclosures only in the approved locations, as identified in the EM installation instructions.

J. Flexible Metal Conduit (FMC) is allowed to be installed between the junction boxes, conduit body, or other conduit termination and the device back box only in accessible ceilings. FMC shall not exceed 6 feet in length without prior approval from the Engineer of Record and DFW IT for the specific location. FMC shall be securely fastened in place and supported in one of the following methods:

1. By an approved means from building structure within 12 inches of each box, conduit body, or other conduit termination and shall be supported and secured at intervals not to exceed 4 1/2 feet. Hanger assemblies used to support the FMC shall be installed in accordance with the manufacturers published instructions.
2. By an approved means from building structure at the mid-point of the FMC at a minimum to ensure the FMC and connectors do not separate under normal operation of the building. Hanger assemblies used to support the FMC shall be installed in accordance with the manufacturers published instructions.

K. Existing fire alarm devices being replaced, or their operations abandoned shall be removed immediately after the new fire detection and alert notification system is accepted by the Owner. All fire detection and alert notification equipment, equipment backboxes, accessible conduit and wiring shall be removed. Conduit and wiring that cannot be removed shall be marked “Abandoned”. All fire detection and alert notification equipment (excluding backboxes, conduit, scrap wiring, and other equipment not strictly related to the demolished fire detection and alert notification system) shall be turned over to the Owner’s Representative.

L. Install all hangers, clamps, conduit, and backboxes for the fire detection and alert notification system prior to the application of fireproofing on structural members. The hangers, clamps, conduit, and backboxes for the fire detection and alert notification system shall be installed on the edge of any beam requiring fireproofing. Backboxes shall be fastened to the flange of the beam utilizing beam clamps, and shall not be attached directly to the beam. Verify the locations of all fireproofing, prior to the installation of any fire detection and alert notification conduit or backboxes.

M. Any damage to fireproofing on the building structure as a result of the fire detection and alert notification system installation shall be repaired by a qualified Fireproofing Contractor. All damage and repair of fireproofing shall be reported to and coordinated through the General Contractor. The Fire Detection and Alert Notification Contractor shall be responsible for all fireproofing repairs at no additional cost to the Owner.

N. Intelligent loop circuits shall be provided with adequate junction boxes, be expandable, and provide a means for connection to the loop in the junction box.

O. Conduits shall enter panels from the sides or bottom. Where flexible conduits are used to connect device loop wiring to alarm devices, the Contractor shall use a 1/2 inch flexible conduit.

3.3 EQUIPMENT MOUNTING

A. The control panels and auxiliary power supplies shall be surface mounted with no operational parts which may require maintenance mounted greater than 72 inches above the finished floor. The control panel annunciator shall be mounted so that no switch, manually operated device, display or LED is greater 60 inches above the finished floor.

B. Smoke detectors shall be mounted on the underside of the ceiling or deck, and shall be located more than 3 feet from air supply diffusers.

C. Smoke, heat, and duct detectors shall not be installed until after the construction clean-up of all trades is complete and final. Detectors that have been installed prior to final clean-up by all trades shall be cleaned or replaced in accordance with NFPA 72.

D. Manual pull stations shall be securely mounted with the operable part of the manual pull station no greater than 48 inches above the finished floor (AFF) for frontal wheelchair access and 54 inches AFF for side access as measured to the pull lever.

E. Wall mounted audible/visual, speaker/visual and visual appliances shall be flush mounted with their bottoms at 80 inches above the finished floor or 6 inches below the ceiling, whichever is lower. Wall mounted horns or speakers shall be mounted a minimum of 90 inches AFF.

F. Devices and appliances shall not be supported by ceiling tiles. Devices and appliances must be attached to backbox supported by the ceiling grid.

G. All initiating devices and addressable modules shall be mounted in a location accessible for testing and maintenance.

H. Provide a label for each initiating device indicating the specific address for that device. The label shall include the node number, loop number and device number where applicable. The label shall be located on the base of all detectors and the cover plates of addressable modules.

3.4 SAMPLE PIPE MOUNTING

A. The pipe network shall be mounted as per the design and ASPIRE2 specifications. The hardware used for mounting will depend upon the design and site requirements.

B. To minimize flexing the pipes shall be secured every 5 feet.

C. No bends are permitted within the first 18” from the detector inlet.

D. Piping shall be mounted as close to the ceiling as possible.

E. The routing of the piping network shall be coordinated with potential obstructions, including cable trays, grounding bars, and HVAC ductwork.

F. All changes in direction shall be made with standard elbows or tees.

G. All joints shall be air-tight and made by using solvent cement, except at the entry to the detector assembly. Refer to ASTM F402-88 standard practice for safe handling of solvent cements, primers and cleaners used for joining thermoplastic pipe and fittings.

H. Flexible tubing for termination of the sampling pipe network into detector inlet is not permitted.

I. All pipes shall be supported by mechanical hangers attached to the structure of the building. Not more than one foot of pipe shall extend beyond the last hanger of each sampling pipe. The final installation shall result in no noticeable deflection in the piping network.

~~3.4~~3.5 PAINTING AND PATCHING

A. All fire detection and alert notification junction boxes, pull boxes, conduit, cable splices and terminal cabinets shall be thoroughly cleaned, removing all dirt, oil, etc. and made ready to receive paint.

B. All penetrations of fire rated assemblies (wall or floor construction) shall be firestopped to preserve the original fire resistance and smoketight integrity of the assembly. All firestopping methods shall be UL listed Through Penetration Firestop Systems or otherwise approved by the Owner, Architect, Engineer, and AHJ. Specific firestop assembly shall be identified at the penetration location with a sticker or other approved identification means.

~~3.5~~3.6 SYSTEM TESTS

A. All test and inspections specified in this section shall be reported in writing and submitted in accordance with this specification section.

B. The system shall meet all the requirements of the listed applicable codes and the requirements of the AHJ. The system tests and test documents, including those required for and by the approved remote monitoring station, shall meet the requirements of the AHJ.

C. Provide one hundred (100) percent initial acceptance testing of the entire fire detection and alert notification system prior to the required AHJ acceptance testing. Before requesting the AHJ acceptance testing, furnish a written statement to the Owner's Representative indicating that the system has been installed in accordance with the approved documents and tested in accordance with the manufacturer's specifications and the applicable NFPA requirements. The Record of Completion shall be completed and submitted as part of the written statement.

D. All testing, inspection and retesting required for certification and required for all warranty work or replacements shall meet the requirements of the AHJ. This certification, inspection, or testing shall be completed at no additional cost to the Owner.

E. Provide the testing date in writing to the Owner a minimum of two (2) weeks before the date. The Owner may elect to have a representative present for testing.

F. The fire detection and alert notification system will not be acceptable until final testing and receipt of the testing certificates have been obtained.

- END OF SECTION –