

SECTION 16721

FIRE ALARM DETECTION SYSTEM

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NOTE TO SPECIFIER: Edit for addressable systems. Use non-addressable systems at existing facilities only when an addressable system will not be feasible or compatible with the existing system.

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PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Complete, operable, tested and certified, addressable or non-addressable (zoned), non-coded, electrically supervised fire alarm detection system including necessary controls and accessories.

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NOTE TO SPECIFIER: The following paragraph applies to existing additions, remodeling, or renovations.

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- B. Upgrade the entire existing fire alarm detection system to meet applicable current code requirements.

C. Related Sections:

- 1. 08710 - Finish Hardware.
2. 13745 - Sound Intercom and Clock System.
3. 13845 - Intrusion Detection System.
4. 13851 - Card Access Control System.
5. 15300 - Fire Protection.
6. 15371 - Kitchen Hood and Duct Fire Protection.
7. 15515 - Valves and Specialties.
8. 16112 - Raceways and Conduits.
9. 16120 - Wire and Cable.
10. 16131 - Outlet, Pull, and Junction Boxes.

1.02 REFERENCES

- A. Florida Department of Education, Office of Educational Facilities - State Requirements for Educational Facilities (SREF)- 1999.
B. The American with Disabilities Act (ADA), as referenced in SREF.
C. Florida Accessibility Code for Building Construction, October 1997 edition.

- D. American National Standards Institute, Inc. (ANSI) A117.1, Building and Facilities - Providing Accessibility and Usability for Physically Handicapped People, as referenced in SREF.
- E. Department of Insurance, Division of State Fire Marshall (SFM), Uniform Fire Safety Rules and Standards, Chapter 4A-48, Fire Alarm Systems, latest edition.
- F. National Fire Protection Association, Inc. (NFPA):
  - 1. NFPA 70 National Electrical Code - 1996 (NEC).
  - 2. NFPA 72 National Fire Alarm Code, 1993 edition.
  - 3. NFPA 90A Installation of Air-conditioning and Ventilating Systems, 1993 edition.
  - 4. NFPA 92A Smoke Control Systems, 1993 edition.
- G. Underwriters Laboratories (UL), latest edition.
  - 1. UL 38 Manually Activated Signaling boxes for Use with Fire Protective Signaling Systems.
  - 2. UL 228 Door Closers-Holders, With or Without, Interior Smoke Detectors.
  - 3. UL 268 Smoke Detectors for Fire Protective Signaling Systems.
  - 4. UL 268A Smoke detectors for Duct Application.
  - 5. UL 346 Water Flow Indicators for Fire Protective Signaling Systems.
  - 6. UL 464 Audible Signal Appliances.
  - 7. UL 497B Protectors for Data Communication and Fire Alarm Circuits.
  - 8. UL 521 Heat Detectors for Fire Protective Signaling Systems.
  - 9. UL 864 Control Units for Fire Protective Signaling Systems.
  - 10. UL 1424 Cables for Power Limited Fire Protective Signaling Circuits.
  - 11. UL 1481 Power Supplies for Fire Protective Signaling Systems.
  - 12. UL 1635 Digital Alarm Communication Systems Units.
  - 13. UL 1971 Signaling Devices for the Hearing Impaired.

1.03 SYSTEM DESCRIPTION

- A. Design addressable and non-addressable systems to meet the requirements of NFPA 70 (NEC), NFPA 72, accessibility codes, SREF, and UL.

1.04 SUBMITTALS

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- A. Before starting the work, the manufacturer's authorized representative shall submit one of the following:
1. A signed document committing the manufacturer to provide the Board or its authorized maintenance contractor with all the special tools, hardware, software, any proprietary items or products, and instruction or training programs necessary to service and maintain the system installed under this contract, as well as any other system of the same manufacturer and model containing similar features, currently installed in any M-DCPS facility.
  2. A signed document stipulating that service and maintenance of the system installed under this contract does not require special tools, hardware, software, any proprietary items or products, or instruction or training programs.
  3. Pass codes for maintenance and programming of the installed fire alarm system shall be forwarded to M-DCPS District Alarms upon system acceptance.
- B. Before starting the work, submit shop drawings and product data on all equipment including the following:
1. Dimensioned outline drawings and technical data sheets for all equipment.
  2. Riser diagrams indicating wiring and conduits.
  3. Indicate cabinet elevations with each item on the face of the cabinet identified.
  4. Functional description of the complete fire alarm system and subsystem.
  5. Fuel shut-off system.
  6. Operation and maintenance manuals.
  7. Parts list.
  8. Name, address, and telephone numbers of local supplier and local factory trained Technical Representative (TR). Provide 3 copies of TR's certificate verifying factory training on the submitted system.
  9. Delineate the fire zones and the device identifications for the entire project.
- C. Operating Instructions: Furnish 3 sets of detailed written operating instructions to the Board.
- D. Quality Control Submittals:
1. Submit a signed NFPA 72-1993 CERTIFICATE OF COMPLETION form with Parts 1 and 3 through 9 completed at least 5 working days before the Board first formal inspection

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- of the installed fire alarm detection system.
2. Part 2 shall be completed, notarized, and 5 original copies submitted after the Board's acceptance.

E. Substantial Completion Submittal Requirements:

1. Provide 3 complete sets of operating and maintenance instructions, literature, and information concerning equipment, indexed and bound in accepted loose leaf binders.
2. Furnish 3 sets of Record Drawings to the A/E indicating accurate plan layout, conduit runs, and wiring diagrams as actually installed. One of the 3 sets shall be in reproducible sepia.
3. Provide and maintain 3 sets of record drawings for the complete system. Show connections, numbering system of every device including wiring and cabling identification, raceways, and junction and terminal cabinets. Update the record drawings daily and make available at all times for review by the Board. Typical wiring diagrams are not allowed.
4. According to SFM Chapter 4A-48 provide fire alarm system required decal at the panel and system log book with certificate of completion at the facility.

1.05 QUALITY ASSURANCE

- A. The equipment manufacturer shall have a local branch office or authorized distributor staffed with factory trained, full-time employees capable of performing installation, testing, inspection, repair, and maintenance services for the life of the fire alarm detection system.
- B. Any equipment, device, system component, or part provided or installed by contractor containing or using date processing shall be Year 2000 (Y2K) compliant. Before substantial completion, contractor shall provide a manufacturer's statement of Year 2000 compliance and manufacturer's and contractor's warranty against date-related failures.
- C. Fire alarm system, devices, and wiring installation shall be by the certifying company, either the original equipment manufacturer or the factory distributor for the brand of equipment used. Furnish wiring diagrams and wire runs for the raceway system installed by the licensed electrical contractor, under Division 16.
- D. Installer Qualifications:

1. The installing contractor for the Fire Alarm Detection System shall be properly licensed by the State of Florida Department of Business and Professional Regulation under Section 489, Part II of the Florida Statute as an EC-Unlimited electrical contractor or an EF-Alarm contractor I. The installing contractor shall possess a valid occupational license, and a current certificate of insurance.
2. The installing contractor shall ensure that a qualified representative of the fire alarm detection system manufacturer monitors and coordinates the installation and is present at the Acceptance Inspection to test and instruct the Board as to the use of the system.
3. Employees installing the fire alarm detection system shall possess, or be directly supervised by a person with a Certificate of Competency as an Electrical Master, Electrical Journeyman, Master Speciality or Journeyman Speciality in the fire alarm trade as issued by the Miami-Dade County Construction Trades Qualifying Board, Division B or the equivalent construction trades qualifying licensing boards of Broward, Collier, Monroe, or Palm Beach counties.
  - a. Provide a minimum of 1 Electrical Master, Electrical Journeyman, Master Speciality or Journeyman Speciality in the fire alarm trade for every 3 apprentices performing the installation of the fire alarm detection system.

E. Fire Alarm Detection System:

1. Listed and labeled by Underwriters Laboratories.
2. Listed and labeled for commercial use. Residential devices are not allowed.

F. Components, Parts, and Assemblies: Furnished by the same manufacturer and compatible throughout the system, one-to-the-other, without exception.

1.06 WARRANTY

A. Components, parts, raceways, wiring, and assemblies furnished and installed by the manufacturer's representative or distributor shall be warranted for 1 year after substantial completion, in writing, against defects in labor and materials.

1. Written Warranty:

- a. Extend the requirements of General Conditions, to

include a signed manufacturer's 1 year written warranty against defects in materials and labor quality.

- b. Provide 5 notarized copies signed by authorized manufacturer's representative, giving details of warranty being provided, listing components included and not included in the warranty, number of hours per days for warranted service, and billable rates for services not covered by warranty.
- c. Provide 5 original copies of:
  - 1) A notarized and properly completed NFPA 72-1993 CERTIFICATE OF COMPLETION form signed by the EF or EC license holder. License holder shall be employed by the manufacturer and/or Contractor.
  - 2) Valid electrical license of the installing contractor.

B. Warranty service shall be performed by a certified factory trained and approved fire alarm technician of the equipment manufacturer's representative or distributor.

1. The Contractor shall respond to routine warranty service requests by completing repairs within 24 hours of service request by the Board.
2. The Contractor shall respond to emergency warranty service requests with the arrival of service technician at affected site within 4 hours of notification of emergency. Repairs shall be expedited to bring system online as soon as possible. Emergencies include, but are not limited to, the following:
  - a. Total system failure.
  - b. Inability to acknowledge, silence, or reset audibles or panel troubles.
  - c. Failure of air-conditioning to reset after an alarm.
  - d. Failure of any gas system to reset after an alarm.
  - e. Failure of alarm system to communicate with the M-DCPS monitoring center.
  - f. Loss of battery power.
  - g. Damage caused to system due to transients and power surges.
  - h. Complete zone or loop failure.
  - i. Fire at a facility.
3. If problem is not correctable within specified time frames, the Contractor shall provide in writing an expected completion date to the Board.

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C. Inspections at End of Warranty:

1. At the end of the 1 year general warranty period, the Board will decide if the warranty items cited during the course of the warranty period have been completed to the satisfaction of the Board.
2. Meet on-site with M-DCPS Warranty Section to establish the end of the 1 year warranty period and address unresolved warranty items to the satisfaction of the Board.

D. Equipment and systems shall be warranted by the Contractor for 1 year following acceptance. The warranty shall include parts, labor, prompt field service, pickup, and delivery.

E. Required inspections according to State Fire Marshal Rule 4A-48 and NFPA 72 will be performed by M-DCPS Maintenance. Deficiencies will be forwarded to M-DCPS Project Manager for corrections by the warranty provider.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Alarm Detection System:

1. Edwards Systems Technology.
2. Faraday.
3. Fire Control Instruments.
4. Notifier.
5. Cerberus Pyrotronics.
6. Simplex.

B. Lightning Protection and Transient Voltage and Surge Suppression:

1. Atlantic Scientific.
2. Diversified Technology Group (DITEK).
3. EDCO.
4. Transtector, Hayden Lake, ID.

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*NOTE TO SPECIFIER: A control panel with manual reset and battery backup for fuel shut-off shall be used at science labs for safety and battery backup and not at food service areas.*

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C. Fuel Shut-Off System: Greitzer Model GGD or accepted equivalent by A/E and the Board.

- D. Fire Alarm Cables for Wet Locations: Aquaseal by West Penn or accepted equivalent.
- E. UL Protective Covers: Safety Technology International (STI), Waterford, MI as follows or accepted equivalent.

2.02 COMPONENTS

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*NOTE TO SPECIFIER: Edit the following subparagraph A to suit project conditions.*

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A. System Types:

1. New Facilities:

- a. Provide a single standalone or a multiple panel network type system for the entire facility. The system shall be a 24-Volts Direct Current (VDC), fully analog addressable using multiple Signaling Line Circuits (SLC) Style 4 (Class B) and multiple Style Y (Class B) Notification Appliance Circuits (NAC), wired in exclusive conduits, electrically supervised and power limited.

2. Existing Facilities:

- a. Provide a single stand alone or a multiple panel network type system for the entire facility. The system shall be 1 of the following:
  - 1) A 24VDC, fully analog addressable, using multiple SLC Style 4 (Class B) and multiple Style Y(Class B) NAC zones.
  - 2) A 24VDC, non-addressable using multiple Style B (Class B) Initiating Device Circuit (IDC) and multiple Style Y(Class B) NAC zones.
- b. Either system type shall be wired in exclusive conduits, electrically supervised and power limited. System type shall be determined as follows:
  - 1) Select an addressable system for the project, if the entire fire alarm detection system, inclusive of any existing panels or sub-panels, is to be replaced.
  - 2) Select a non-addressable system for the project, if the facility is to remain



conventionally wired or the cost becomes a determining factor for the project.

- c. Interfacing between fire alarm detection systems shall be accomplished with the UL listed equipment for that purpose. Systems shall function in unison and be controllable from the master panel location.

3. Relocatables:

- a. In Type VI construction (combustible), each unit shall have at least one (1) smoke or heat detector. The detector may be installed in the classroom, storage space, or custodial closet, and shall activate the fire alarm.
- b. In Type IV construction (non-combustible), smoke or heat detectors shall be installed in unsupervised spaces, such as storage and custodial closets, and shall activate the fire alarm.

B. Addressable Systems:

1. The fire alarm detection system shall consist of a UL 864 listed intelligent microprocessor based main control panel, printer, automatic detection devices, manual stations, and notification appliance devices wired according to the schedule on the Drawings and function as specified.
  - a. Equipment shall allow a one-person walk-through test of either the complete system or each individual SLC while maintaining full functionality of SCL not being tested. If no test activity occurs for a specified period, as determined by the manufacturer, the system shall automatically return to the normal operating mode.
  - b. System shall be capable of being programmed in the field, by a laptop computer. Store programmed information in non-volatile memory. System programming shall be password protected by fire alarm detection manufacturer and include full upload and download capability.
  - c. System shall be capable of monitoring intelligent/analog and non-addressable ionization, manual stations, thermal and photoelectric detection devices, and interface modules for water flow and tamper switches.
  - d. As a minimum, the panel shall have behind a locked door the following switches:

- 1) Audible silence.
  - 2) Trouble silence.
  - 3) Supervisory silence.
  - 4) Panel reset.
  - 5) Occupancy recall.
- e. System shall have a real time history log, stored in non-volatile memory, capable of containing a minimum of 400 events.
- f. The input AC power to the fire alarm detection system shall be from a dedicated branch circuit of the facility emergency backup system. AC breaker shall be marked "WARNING - AC POWER TO FIRE ALARM DETECTION SYSTEM - DO NOT TURN OFF OR DISCONNECT".
- g. Provide 1 dry form C relay contacts for central monitoring for each of the following:
- 1) System alarm.
  - 2) System trouble.
  - 3) Sprinkler supervisory.
- h. Provide battery backup capable of operating the fire alarm system under maximum normal load for 24 hours and then operating in the alarm mode for 5 minutes after loss of input power. Include remote power supplies.

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*NOTE TO SPECIFIER: The following subparagraph is to alleviate the compatibility problems created when portables are moved to other sites.*

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- i. Initiating devices for portables (relocatables) shall be conventional type wired to conventional zone interface modules. Mount modules where the portable conductors leave the main building or at the portable electrical distribution area outside the portable in an appropriate electrical enclosure.
- 1) The wiring shall match the existing conditions to avoid conflict with products of different manufacturers.
2. Intelligent/analog and non addressable ionization, photoelectric and thermal detectors shall be capable of being intermixed on the same control panel. Detection devices shall contain an integral alarm LED. Intelligent/analog detectors shall be individually identifiable from the control panel.

- a. The intelligent/analog type smoke detector shall be UL 268 listed.
  - b. The intelligent/analog detector type thermal detector shall be UL 521 listed.
  - c. The intelligent/analog detector sensitivity shall be individually adjustable from the control panel. It shall also be possible to accurately measure the intelligent/analog detector's sensitivity from the control panel.
3. The intelligent monitoring module shall incorporate a custom microprocessor based integrated circuit, supervised and uniquely identifiable by the control panel. The intelligent interface module shall be used to uniquely identify water flow switches, tamper switches, OS & Y valves, kitchen alarm panels, and power to the building sound system.
  4. The intelligent manual fire station shall be non-coded, single action, and operate on any SLC. The intelligent manual fire station shall be individually annunciated on the control panel.
    - a. Intelligent Manual Fire Station: UL 38 listed.
    - b. Manual Stations: Mount semi-flush where possible.
    - c. If it is not possible to mount a semi-flush station, the supplier shall provide the proper manufacturer's surface mounted box.
    - d. Protect each manual pull station with a UL listed transparent protective cover.
    - e. Provide 10 keys or wrenches to the Board.
  5. The air duct detector shall operate on a cross-sectional air sampling principal to overcome stratification and the skin effect. The air duct detector shall consist of a standard intelligent/analog ionization detector mounted in an air duct sampling assembly and sampling tube that protrudes across the duct of the ventilating system. The air duct detector shall retain the features of the (intelligent/analog or non-addressable) ionization detector, and be installed in the ventilating duct as indicated in the devices if both are required.
    - a. Intelligent/analog air duct detector shall be UL 268A listed.
    - b. When used for air handling control, the relay within the base of the duct detector shall be capable of operating from general alarm.

6. Horns: Polarized 24VDC type with capability of alarm audibility and occupancy recall.
  - a. UL 464 listed.
  - b. Operate march time beat during alarm condition.
  - c. Locate horns at heights according to NFPA 72 6-3.7. and ADA.
  - d. Protect each horn less than 7'-6" above finished floor (AFF) or at unsecured or unsupervised student occupied locations with a UL listed transparent protective cover.
  - e. Audio shall be used for alarm audibility and occupancy recall. The recall signal shall be separate and distinct from any other signal.
  - f. Provide horns of the same type and sound throughout the facility.
  
7. Horn/Strobes: Polarized 24VDC type and meeting ADA requirements. The audio portion shall be used for alarm audibility and occupancy recall. The recall signal shall be separate and distinct from any other signal. Each unit shall have separate terminals associated with the horns and the strobes so the strobes may remain on during the alarm condition.
  - a. Horn/Strobes: UL 464 and UL 1971 listed respectively.
  - b. Horns: Operate march time beat during alarm condition.
  - c. Provide horns of the same type and sound throughout the facility.
  - d. Locate horns/strobes at heights according to NFPA 72 6-4.4 and ADA.
  
8. Strobes: Polarized 24VDC type meeting ADA requirements. The strobes shall remain on during any alarm condition and until the system is reset.
  - a. Strobes: UL 1971 listed.
  - b. Install at heights according to NFPA 72 6-4.4.
  - c. Protect each strobe with a UL listed transparent protective cover.
  
9. Protective Covers: Provide and install clear polycarbonate covers for initiating or annunciating devices at less than 7'-6" AFF or at unsecured or unsupervised student occupied locations. Provide spacers as required for surface mounted units. By Safety Technology International, Waterford, MI or

accepted equivalent.

a. For flush mounted pull stations:

- 1) STI 1200 for indoor locations.
- 2) STI 1250 for outdoor locations (weather resistant).

b. For surface mounted pull stations:

- 1) STI 1230 for indoor locations.
- 2) STI 3150 for outdoor locations (weather resistant).

c. For flush mounted horns and horn/strobe combinations less than 7'-6" AFF or at unsecured or unsupervised student occupied locations:

- 1) STI 1210 for indoor locations.
- 2) STI 1210 with STI 3002 weather resistant gaskets for outdoor locations (weather resistant).

d. For surface mounted horns and horn/strobe combinations less than 7'-6" AFF or at unsecured or unsupervised student occupied locations:

- 1) STI 1223 for indoor locations.
- 2) STI 1223 with STI 3002 weather resistant gaskets for outdoor locations (weather resistant).

e. For flush mounted strobes:

- 1) STI 1221 for indoor locations.
- 2) STI 1221 with STI 3002 weather resistant gaskets for outdoor locations (weather resistant).

f. For surface mounted strobes:

- 1) STI 1221 with STI 3100 conduit spacer for indoor locations.
- 2) STI 1221 with STI 3100 conduit spacer and STI 3002 weather resistant gaskets for outdoor locations (weather resistant).

g. For flush mounted smoke detectors less than 8'-6" AFF:

- 1) STI 9601.
  - 2) STI 9604.
  - 3) STI 9609.
- h. For surface mounted smoke detectors less than 8'-6" AFF:
- 1) STI 9602.
  - 2) STI 9605.
  - 3) STI 9610.
- i. Fasteners for covers shall be tamperproof.
10. Door Holders: 24VDC powered. Door holders types are specified in Section 08710 - Finish Hardware.
- a. Door holders shall be UL 228 listed.
11. The Fire Alarm Detection System Annunciator shall be of an LCD or graphic LED type and display the exact origin of the alarmed device with a custom user defined message. Locate as shown on the Drawings. The annunciator shall duplicate the information available at the main panel.
- a. Locate a floor plan with legible device addresses and room numbers within each room or an area zone map with device types and locations next to the fire alarm system annunciator panel by the designated intercom station receiving incoming calls.
- b. Orient the map so when facing the mounting wall, the "YOU ARE HERE" arrow will point up.
12. Wiring shall be power limited and meet the intent of NFPA 70, article 760. The systems shall be wired Style 4(Class B) and Style Y (Class B).
- a. Wiring shall be UL 1424 listed for indoor installations.
13. Fire Alarm Cables for Wet Locations: Cables shall be suitable for use in raceways and in wet locations, comply with NEC 70, articles 725 and 760.
- a. Audible/Strobes:
- 1) Cable Description: 4 conductor non-shielded cable manufactured according to UL 1424 and NEC 70, articles 725 and 760 type Fire Power

- Limited (FPL).
- 2) AWG of Conductors: 14 solid bare copper.
  - 3) Number of Conductors: Four.
  - 4) Conductor Insulation: 0.010 tri-rated semi-rigid PVC rated for 105C.
  - 5) Cable Jacket: 0.015 Red PVC.
  - 6) Nominal Cable Diameter: 0.225 inches.
  - 7) Applicable UL Designation: Type FPL, 75C.
  - 8) Meet the low capacitance requirements for the manufacture of the fire alarm system being installed.

b. Initiating Circuits:

- 1) Cable description: 2 conductor shielded or non-shielded cable according to manufacturer's requirements and UL 1424 and NEC, articles 725 and 760 - type fire power limited.
- 2) AWG of Conductors: 16 or 18 solid bare copper.
- 3) Number of Conductors: Two.
- 4) Conductor Insulation: 0.020 PVC rated for 105C.
- 5) Cable Shield: Overall aluminum backed polyester tape shield, aluminum facing outward, and 100 percent shield coverage.
- 6) Cable Drain: 20 AWG stranded tinned copper.
- 7) Cable Jacket: 0.015 Red PVC.
- 8) Nominal Cable Diameter: 0.225 inches.
- 9) Applicable UL Designation: Type FPL, 75C.
- 10) Meet the manufacturer's low capacitance requirements for the fire alarm system being installed.

14. Provide lightning protection and transient voltage and surge suppression for the input AC power and all load side circuits.

- a. Lightning protection and transient voltage and surge suppression for load side circuits shall be UL 497B listed.
- b. Furnish lightning/surge protection integral with panel. Provide additional surge protection at 120 VAC disconnect breaker.
- c. Furnish and install additional transient suppression Isolated Loop Circuit Protector devices (ILCP) on fire alarm wiring, (including shield), extending beyond the main building by either aerial, underground, or other methods (walkways, bridges, or other aboveground connectors). The ILCP shall be located as close as practicable to the point the circuits leave or enter the building

containing the fire alarm control panel.

- 1) The ILCP grounding conductor shall be a No.12 AWG minimum wire having a maximum length of 28 feet to be run in as straight a line as practicable and connected to the building grounding electrode system (unified ground) according to Article 800-31 of the National Electrical Code - 1996. The ILCP shall have a line to line response time of less than one nano second capable of accepting 2,000 amps (10 x 50uS pulse). Line to earth response time shall be less than 25 nano seconds with maximum current of 2,000 amps (8 x 20uS pulse) to earth. Shield to earth current shall be 5,000 amps maximum.
- 2) The ILCP shall be protected by a high dielectric insulating material and be of small enough size to mount in a standard 4-11/16" square by 2-1/8" deep electrical box. Spark gap devices or devices incorporated in or installed within the fire alarm control panel in lieu of the specified ILCP are not acceptable.

C. Non-Addressable Systems:

1. The fire alarm detection system shall consist of a UL 864 listed microprocessor based main control panel, detection devices, manual stations, and alarm indicating devices wired according to the schedule on the Drawings and shall function as specified.
  - a. Equipment shall allow a one-person walk-through test of either the complete system or each individual zone while maintaining full functionality of zones not being tested. If no test activity occurs for a specified period, as determined by the manufacturer, the system shall automatically return to the normal operating mode.
  - b. System shall be capable of being field programmable. Programmed information shall be stored in non-volatile memory. System programming shall be password protected by the fire alarm detection system manufacturer.
  - c. As a minimum, the panel shall have behind a locked door the following switches:
    - 1) Audible silence.
    - 2) Trouble silence.
    - 3) Supervisory silence.



- 4) Panel reset.
  - 5) Occupancy recall.
- d. The input AC power to the fire alarm panel shall be from a dedicated branch circuit of the facility emergency backup system. AC breaker shall be marked "WARNING - AC POWER TO FIRE ALARM DETECTION SYSTEM - DO NOT TURN OFF OR DISCONNECT".
  - e. Provide 1 dry form C relay contacts for central monitoring for each of the following:
    - 1) System alarm.
    - 2) System trouble.
    - 3) Sprinkler supervisory.
  - f. Provide battery backup capable of operating the fire alarm system under maximum normal load for 24 hours and then operating in the alarm mode for 5 minutes after loss of input power. Include remote power supplies.
  - g. Standard zone designations for non-addressable systems shall be the following:
    - Zone 1: Main Administration area or according to program requirements.
    - Zone 2: Cafeteria.
    - Zone 3: Library/media center.
    - Zone 4: Auditorium.
    - Zone 5: Gymnasium.
    - One zone for each multiple of 2 relocatables.
    - All other zones including instructional spaces and any other spaces determined by A/E.
- 2. Ionization, photoelectric, and thermal detectors shall contain an integral alarm LED.
    - a. Smoke detectors shall be UL 268 listed.
    - b. Thermal detectors shall be UL 521 listed.
  - 3. Manual Fire Alarm Pull Station: Non-code, single action, pull down type with operating instructions provided on the front, in clearly visible raised contrast colored letters. The station shall be of a non-corrosive all metal sturdy construction or plastic, finished in fire alarm red and capable of proper operation with or without a breakglass rod. Stations requiring the use of a glass rod to maintain a standby condition are not acceptable.
    - a. Upon operation, the actuating lever shall lock into

- the alarm position and remain locked until manually reset. A key or wrench shall be required to gain access for resetting the station, testing the station or replacing the glass rod.
- b. Stations with test features that do not test the actual station actuating switch are not acceptable.
  - c. Stations shall contain 1 normally open alarm contact. Wiring to the fire alarm system initiating circuit shall be by pressure type screw terminals. Provide separate terminals for in and out wiring.
  - d. Manual Stations: Semi-flush mounted when possible. Where not possible, provide the proper surface mounted box.
  - e. Protect each manual station with a UL listed transparent protective cover.
  - f. Manual Fire Alarm Pull Stations: UL 38 listed.
4. Design the air duct housing unit for detection of combustion products and smoke in air-conditioning and ventilation system ducts according to NFPA 90A.
- a. The air duct smoke detector shall operate on a cross-sectional air sampling principle to overcome stratification and the skin effect.
  - b. The detector unit shall be listed UL 268A specifically for use in air handling system and UL listed for compatibility with the fire alarm control panel and obtain its power from the alarm initiating circuit.
  - c. The unit shall operate at duct velocities from 300 to 4000 feet per minute.
  - d. The unit shall employ a separate head and base design to allow for retrofit of either ionization or photoelectric detection heads.
  - e. The unit shall be capable of local testing via magnetic switch or remote testing via an optional remote test station.
  - f. The duct unit shall incorporate an air tight smoke chamber and be capable of mounting to either rectangular or round ducts without additional brackets.
  - g. Include an integral filter system to reduce dust and residue effects on the unit.
  - h. Sampling tubes shall be capable of being installed after the housing is mounted.
  - i. Provide terminal connections for all wiring with clamp action type suitable for 14 - 18 AWG wiring.
  - j. Air duct detector shall be UL 268A listed.
  - k. When used for air handling control, the relay within the base of the duct detector must be

capable of operating from general alarm.

5. Horns: Polarized 24VDC type with capability of alarm audibility and occupancy recall.
  - a. UL 464 listed.
  - b. Operate march time beat during alarm condition.
  - c. Locate horns at heights according to NFPA 72 6-3.7.
  - d. Protect each horn less than 7'-6" AFF or at unsecured or unsupervised student occupied locations with a UL listed transparent protective cover.
  - e. Audio shall be used for alarm audibility and occupancy recall. The recall signal shall be separate and distinct from any other signal.
  - f. Provide horns of the same type and sound throughout the facility.
  
6. Horn/Strobes: Polarized 24VDC type and meeting ADA requirements. The audio portion shall be used for alarm audibility and occupancy recall. The recall signal shall be separate and distinct from any other signal. Each unit shall have separate terminals associated with the horns and the strobes so the strobes may remain on during the alarm condition.
  - a. Horn/Strobes: UL 464 and UL 1971 listed respectively.
  - b. Horns: Operate march time beat during alarm condition.
  - c. Provide horns of the same type and sound throughout the facility.
  - d. Locate horns/strobes at heights according to NFPA 72 6-4.4.
  
7. Strobes: Polarized 24VDC type meeting ADA requirements. The strobes shall remain on during any alarm condition and until the system is reset.
  - a. Strobes shall be UL 1971 listed.
  - b. Protect each strobe with a UL listed transparent protective cover.
  
8. Protective Covers: Provide and install clear polycarbonate slotted covers for initiating or annunciating devices at less than 7'-6" AFF or at unsecured or unsupervised student occupied locations. Provide spacers as required for surface mounted units. By Safety Technology International, Waterford, MI or accepted equivalent.

- a. For flush mounted pull stations:
  - 1) STI 1200 for indoor locations.
  - 2) STI 1250 for outdoor locations (weather resistant).
- b. For surface mounted pull stations:
  - 1) STI 1230 for indoor locations.
  - 2) STI 3150 for outdoor locations (weather resistant).
- c. For flush mounted horns and horn/strobe combinations less than 7'-6" AFF or at unsecured or unsupervised student occupied locations:
  - 1) STI 1210 for indoor locations.
  - 2) STI 1210 with STI 3002 weather resistant gaskets for outdoor locations (weather resistant).
- d. For surface mounted horns and horn/strobe combinations less than 7'-6" AFF or at unsecured or unsupervised student occupied locations:
  - 1) STI 1223 for indoor locations.
  - 2) STI 1223 with STI 3002 weather resistant gaskets for outdoor locations (weather resistant).
- e. For flush mounted strobes:
  - 1) STI 1221 for indoor locations.
  - 2) STI 1221 with STI 3002 weather resistant gaskets for outdoor locations (weather resistant).
- f. For surface mounted strobes:
  - 1) STI 1221 with STI 3100 conduit spacer for indoor locations.
  - 2) STI 1221 with STI 3100 conduit spacer and STI 3002 weather resistant gaskets for outdoor locations (weather resistant).
- g. For flush mounted smoke detectors less than 8'-6" AFF:
  - 1) STI 9601.

- 2) STI 9604.
  - 3) STI 9609.
- h. For surface mounted smoke detectors less than 8'-6" AFF:
- 1) STI 9602.
  - 2) STI 9605.
  - 3) STI 9610.
- i. Fasteners for covers shall be tamperproof.
9. Door Holders: 24VDC powered. Provide and install door holders types as specified in Section 08710 - Finish Hardware.
- a. Door holders shall be UL 228 listed.
10. The fire alarm system annunciator shall be of an LCD type and display the exact origin of the alarmed device with a custom user defined message. Locate as shown on the Drawings. The annunciator shall duplicate the information available at the main panel.
- a. Place a legible framed floor plan alongside the annunciator to show the individual initiating, type and zones.
  - b. Orient the map so when facing the mounting wall, the "YOU ARE HERE" arrow will point up.
11. Wiring shall be fire power limited and meet NFPA 70, article 760. The systems shall be wired Style 4 (Class B) and Style Y (Class B).
- a. Wiring shall be UL 1424 listed.
12. Provide lightning protection and transient voltage and surge suppression for the input AC power and load side circuits.
- a. Lightning protection and transient voltage and surge suppression for load side circuits shall be UL 497B listed.
  - b. Furnish lightning/surge protection integral with panel. Provide additional surge protection at 120 VAC disconnect breaker.
  - c. Furnish and install additional transient suppression Isolated Loop Circuit Protector devices (ILCP) on fire alarm wiring, (including shield), extending beyond the main building by either

aerial, underground, or other methods (walkways, bridges, or other aboveground connectors). The ILCP shall be located as close as practicable to the point the circuits leave or enter the building containing the fire alarm control panel.

- 1) The ILCP grounding conductor shall be a No.12 AWG minimum wire having a maximum length of 28 feet to be run in as straight a line as practicable and connected to the building grounding electrode system (unified ground) according to Article 800-31 of the National Electrical Code - 1996. The ILCP shall have a line to line response time of less than one nano second capable of accepting 2,000 amps (10 x 50uS pulse). Line to earth response time shall be less than 25 nano seconds with maximum current of 2,000 amps (8 x 20uS pulse) to earth. Shield to earth current shall be 5,000 amps maximum.
- 2) The ILCP shall be protected by a high dielectric insulating material and be of small enough size to mount in a standard 4-11/16" square by 2-1/8" deep electrical box. Spark gap devices or devices incorporated in or installed within the fire alarm control panel in lieu of the specified ILCP are not acceptable.

D. Sequence of Operation/Alarm Activation:

1. The system shall function as follows when an area or duct detector, manual station, or water flow switch operates:
  - a. Sound required audible in a march time mode and activate devices and strobes throughout the school.
  - b. Automatically notify the Board's District Communication Management (DCOM) Center at Department of Energy and Recycling Programs located at 1450 N.E. 2nd Avenue, Miami, Florida via a digital alarm communicator transmitter (DACT).
  - c. Display individual detector or zone number on alphanumeric display with user defined message.
  - d. Light an indicating LED on the device initiating the alarm. Smoke detectors and monitor modules only.
  - e. Shut down the HVAC system and operate selected dampers.

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*NOTE TO SPECIFIER: Delete the following 2 subparagraphs if the project has no elevators or fire doors.*

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- f. Activate the elevator capture if an elevator related device is activated.
  - g. Close all magnetically held fire doors.
  - h. There shall be no limit, other than maximum system capacity, as to the number of intelligent/analog devices that may be in alarm simultaneously.
2. When an alarm has been acknowledged and silenced, the audible devices shall cease to operate but the strobes shall remain on.
- a. The block acknowledge feature of addressable system is not allowed and shall be disabled except for system start-up and maintenance.
3. After the alarm has been investigated, it shall be possible to press the recall button in the control panel to emit a steady sound throughout the facility as a recall signal.
- a. It shall not be possible to activate the recall before the alarm signal is silenced.
  - b. The recall button shall be used as a signal to reoccupy the building after a fire and not be for any other purpose.
4. Kitchen Hood Suppression System And Fuel Shut-off:
- a. Activation of kitchen hood suppression system shall cause a signal to be transmitted instantaneously to both the fire alarm system (control/annunciator panel) and fuel shut-off system to accomplish the following according to SREF:
    - 1) The kitchen hood exhaust fan shall continue to operate, unless required to be shut down by the pre-fab engineered hood system manufacturer. EXCEPTION: The fire suppression system for an NFPA 96 exhaust hood for commercial cooking appliances and fire rated gates and shutters in the kitchen are not required to be activated by the facilities fire alarm system; however, when the hood's automatic fire extinguishing systems are activated, kitchen ventilation and heating systems shall shut down, fuel valves shall close, electrical appliances shall de-energize,

- fire gates and shutters shall close, and the facility's fire alarm shall activate.
- 2) The fire alarm system shall shut off gas and fuel oil supplies which serve student-occupied spaces or pass through such spaces. The shut-off valve shall be located exterior to the building. The shut-off valve shall have a manual reset.
  - 3) EXCEPTION: The fire alarm system shall not shut off gas supplies which serve emergency power sources.
- b. Alarm Signal Originating from the Fire Alarm System.
- 1) Activate gas solenoid valves to close at boiler rooms, labs, and student occupied spaces, but not kitchen area.
5. Fuel Shut-off System for Multiple Lab Facilities:
- a. Gas solenoid fire fuel shut-off control with adjustable nuisance outage delay.
- 1) Battery back up.
  - 2) Constant battery charge.
  - 3) Adjustable delay to 1 minute and 42 seconds (available fixed).
  - 4) Status indicator lights.
  - 5) Emergency shut-off switch.
- b. Construction:
- 1) 16 gage Type 304 enclosure.
  - 2) NEMA 1.
  - 3) Surface mount or with semi-recess flange.
  - 4) Hinged door with cylinder lock.
- c. Electrical Requirement: 15A 24 hour 120/1 from micro switch in fire suppression cabinet.
- d. Operation:
- 1) Provides continuous electrical power to the supplied 12 volt gas solenoid valves when fire suppression system is armed and gas reset button is pushed. Valves shall be of brass construction.
  - 2) Immediately shut-off electrical power to gas solenoid valves upon activation of any fire alarm manual or automatic device in the kitchen



or upon discharge of fire suppression system. Fire suppression system must be rearmed, fire alarm shall be reset, and the fire reset button pushed to reopen the gas valve.

- 3) Provides electrical power to gas solenoid valve for up to 1 minute after loss of 120 volt electrical power to unit.
- 4) If the 120 volt electrical power is restored to unit within the time preset on timer, the gas solenoid valve remains open.
- 5) If the 120 volt electrical power is not restored to the unit within the time preset on the timer, the 12 volt electrical power to the gas solenoid valves is interrupted and the valve shall close. Upon power being restored, the reset button must be pushed to open the valve.
- 6) Pressing the red emergency shut-off switch immediately interrupts 12 volt power to the gas solenoid valves thus allowing closure. To open the gas valve the red shut-off switch must be pulled out and the reset button pushed.
- 7) A red indicator light illuminates to indicate when gas valve is closed.
- 8) A green indicator light is provided to show that power is on the system.

e. Special Requirements: Audible alarm to indicate gas solenoid valve is closed per valve.

6. Fire Alarm System Special Requirements:

a. To allow monitoring of signals through the telephone lines to DCOM, provide the fire alarm panel with 3 form C (open, common, close) auxiliary contacts to close/open on:

- 1) System alarm.
- 2) System trouble.
- 3) Sprinkler supervisory.

b. Provide a dual line Digital Alarm Communicator Transmitter (DACT) UL 1635 listed meeting NFPA 72 and power limited to monitor the signals described in this section.

c. Program the DACT to dial 350-3797 and transmit information to a FBI CP-220 receiver. For further information contact DCOM at 995-1550.

d. Connect fire alarm system to the 2 separate telephone outlets provided by M-DCPS in the fire

- alarm panel.
- e. Provide explosion-proof devices as required.
- f. Upon activation of its inputs, the DACT shall not sound an audible alert tone.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Mount control and other panels with sufficient clearance for observation and testing of the display and panel controls to comply with ADA and Florida Accessibility Code for Building Construction, Article 4.27 - Controls and Operating Mechanisms. Provide decal with telephone contact number for warranty work at the inside face of the panel door.
- B. Clearly mark fire alarm junction boxes for easy identification according to established color codes as outlined in Section 16112 - Raceway and Conduit. Wiring shall be in conduit, EMT thin-wall or other approved methods, refer to Section 16112 - Raceway and Conduit. Use flexible metal raceway for devices mounted in suspend ceiling panels. Conduit, mounting boxes, junction boxes, and panels shall be securely hung and fastened with appropriate fittings to insure positive grounding throughout the system.
- C. No wiring other than that directly associated with fire alarm detection, alarm, or auxiliary fire protection functions shall be allowed in fire alarm conduits.
  - 1. Avoid wiring splices to the extent possible and, if needed, splices shall be made only in junction boxes and be by NEC approved methods.
  - 2. Transposing or changing color coding of wires is not allowed.
  - 3. Conductors in conduit containing more than 1 wire shall be labeled on each end with "E-Z markers" or accepted equivalent.
  - 4. Conductors in cabinets shall be carefully formed and harnessed so that each drop off directly opposite to its terminal.
  - 5. Cabinet terminals shall be numbered and coded.
  - 6. Provide clearly labeled controls, function switches, etc., on equipment panels.
  - 7. In junction or pull boxes with splices, provide:
    - a. Minimum dimension of junction or pull boxes

according to NEC Articles 370-18a.1.a. and 370-18a.2, the conductor size notwithstanding.  
b. Terminal strips.

8. Color Codes:

- a. Signaling Line Circuits: Red jacket with red and black conductors.
- b. Initiating Device Circuits: Red and black.
- c. Notification Appliance Circuit Horns: Brown and orange.
- d. Notification Appliance Circuit Strobes: White and yellow.
- e. Control Circuits for Door Holders and Relays: White and orange.

D. Check and test wiring to insure grounds, opens, or shorts are not present.

E. Manual Pull Stations: Where manual pull stations are indicated on the Drawings, install 4'-0" AFF, with a minimum of 3 inches of clear, flat, wall space all around the devices from door or window trim, wall outlets, wall openings, thermostats, cabinets, shelving, or any other adjacent obstruction. Provide protective covers.

F. Audible Alarms: Mount on walls at least 6 inches below the adjacent surface or at 7'-6" AFF to top of unit, whichever is lower unless otherwise directed by the A/E. Use combination horn/strobe, with protective covers, if proposed location of audible unit is less than 7'-6" AFF or at unsecured or unsupervised student occupied locations.

G. Visual Alarms and Combination Horn/Strobes: Mount on walls 80 inches AFF or 6 inches below ceiling whichever is lower. Provide protective covers.

H. Conduit: Run concealed, unless written approval from the Board has been received to do otherwise. Refer to Section 16112 - Raceway and Conduit. Exceptions:

- 1. Electrical/mechanical rooms.
- 2. Kitchens.
- 3. Auto shops.
- 4. Wood shops.

3.02 FIELD QUALITY CONTROL

A. Tests and Reports: Perform electrical and mechanical tests required by NFPA 72 inspection and test form. Test and

report costs shall be in the contract price. Submit a check out report in triplicate, one copy of which will be registered with the equipment manufacturer. The report shall include, but not be limited to:

1. A complete list of equipment installed and wired.
2. Indication that equipment is properly installed and functions and conforms with these specifications.
3. Test of individual zones as applicable.
4. Test of all manual stations and detectors that can be reset.
5. Verification of line supervision of each initiating and indicating circuit.
6. Verification of the Class B operation of each initiating circuit as specified.
7. Verifying the operation of all alarm initiated functions, including, but not limited to, smoke control, and elevator capture features if used.
8. Written report indicating all area smoke detector sensitivity readings.
9. Written report indicating all AHU duct smoke detector air velocity and sensitivity readings.
10. Technician's name and date.

### 3.03 DEMONSTRATION

#### A. Manufacturer's Training:

1. Upon M-DCPS Request and at no cost to M-DCPS, provide factory level instructional training in the operation, maintenance and programming of the system for designated personnel from M-DCPS Facilities Operations and District Alarms.
2. At end of training provide:
  - a. Training certificates to each trainee.
  - b. Installation/user manual to each trainee.
3. System operation training for school staff, to include but not limited to the principal, assistant principals, office personnel, and zone mechanic. Training shall be a minimum of 2 classes, at 2 hours minimum for each class.
  - a. Provide to each trainee, an operators manual incorporating a quick reference operating instructions sheet.

END OF SECTION

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