Jefferson County School District, R-1
Support Services

TECHNICAL GUIDELINES

DIVISION 28 –ELECTRONIC SAFETY AND SECURITY

AUGUST 2022

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DIVISION 28 –ELECTRONIC SAFETY AND SECURITY

28 05 00 COMMON WORK RESULTS FOR ELECTRONIC LIFE SAFETY AND SECURITY – AUGUST 2021

Note: This section is presented in its entirety. It is suggested that the engineer cut and paste from this section to create a project specific specification section edited for each project.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Cable Material Requirements.

B. Cable Installation Requirements.

1.2 GENERAL REQUIREMENTS

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

B. At the time of bid, all exceptions taken to these Specifications, any variances to the contract drawing design, and any non-conformance to the operating capabilities called for in this specification, shall be listed in writing and forwarded with the submission of the bid. Any such exception, variance, or non-conformance, which was not listed at the time of bid, and is identified in the submittal, shall be grounds for immediate disapproval without comment.

C. Consultant shall reference District Archives' Composite Floor Plans to verify accuracy of room usage and placarding. The contractor is responsible for providing door placards.

1.3 RELATED SECTIONS

A. Section 07 80 00: Fire and Smoke Protection
B. .
C. Division 08 71 00: Door Hardware

D. Division 26: Common Work Results for Electrical Systems.

E. Division 26: Low Voltage Electrical Power Conductors and Cables.

F. Division 26: Grounding and Bonding for Electrical Systems.

G. Division 26: Hangers and Supports for Electrical Systems.

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I. Division 26: Identification for Electrical Systems.

J. Division 27: Communications.

K. Division 28: Access Control Security System.

L. Division 28: Video Surveillance Security Systems.

M. Division 28: Fire Alarm and Detection System (New and Existing)

N. Division 28: Security Detection and Alarm Systems (New and Existing)

O. District's Technical Details Drawings – Volume II

1.4 SUBMITTALS

A. Reference Division 01 – Submittal Procedures

1. Product Data: Provide manufacturer's data sheets showing product appearance, electrical characteristics, and connection requirements.
2. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use, as stipulated by the product-testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and start-up or products.
3. Exceptions: Provide a details listing of any and all exceptions, variances, and non-conformances to the specifications and contract design drawings. Failure to disclose any such items shall be grounds for immediate disapproval of submittals without comment.
4. Samples: Provide samples of the following items.
    a. Provide a minimum of two (2) samples of all cable to be installed on the projects. Cable samples shall be of sufficient length to identify cable marking (striping) and cable listing identification.
    b. Provide a minimum of two (2) samples of all cable supporting devices, metal bridle rings, metal mounting brackets, plastic plenum rated wire bushings, and other applicable cable installation equipment to be utilized on the project.
5. Card Access\Security Systems Installer: Documented experience and certifications of

Installation Supervisor.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with a minimum three (3) years' experience, and with service facilities within fifty (50) miles of the project.

B. Fire Alarm Installer: Installing Company shall use only District Approved Premier level Notifier dealer or JCI dealer for programming and final testing. The Bidding Company must specialize in installing the products specified in this section with a minimum three (3) years documented experience. The installer shall employ NICET Level 2 trained technicians to install the products specified in this Section.

C. Card Access\Security Systems Installer: The Installing Company and personnel assigned to the project must specialize in installing the products specified in this section and shall meet, at a minimum, the following:
   1. Installer shall be licensed by "City and County of Denver" as Access Control System Supervisor. Minimum experience required as follows:
      a. Three (3) years' experience working in the access control trade with similar type projects..
      b. Experience must be displayed in each of the following disciplines:
         i. Electrical Design and Installation
         ii. Hardware Application and Installation (e.g., maglocks, card readers, electric locks and strikes)
   2. Final programming of Card Access/Security System shall be performed by the Owner.

PART 2 - PRODUCTS

2.1 ACCESS CONTROL/SECURITY AND SAFETY ALARM SYSTEM WIRE AND CABLE

A. Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600 volts insulation rated 75 degrees C, individual conductors twisted together, shielded, and covered with a non-metallic jacket, UL listed for use in air handling ducts, hollow spaces used as ducts, and plenums.

B. Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volts insulation rated 75 degrees C, individual conductors twisted together, shielded, and covered with a non-metallic jacket, UL listed for use in air handling ducts, hollow spaces used as ducts, and plenums.

C. Miscellaneous Access Control/System Circuits: Power limited fire protective signaling cable for fire and smoke characteristics, copper conductor, 300 volts insulation rated 105 degrees C, UL listed for use in air handling ducts, hollow spaces used as ducts, and

plenums.

D. Use #18/4 AWG minimum size stranded conductors for security device initiating loop circuits.

E. Provide wet environment exterior rated cable for underground raceway or exterior cable applications.

F. Install all remote control and signal cables in raceways, or supported every 4 to 6 feet on metal bridal rings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Plenum rated cable.

1. Cable routing shall be perpendicular to or parallel to structural building members, and shall utilize a metal bridal ring type support system attached to structural building members only.
2. Mounting cable to other building systems (fire protection, electrical conduit, mechanical ductwork, etc.), or running cable in any fashion other than described, is strictly forbidden.

C. Do not exceed 40% fill rate in raceways and back boxes.

1. For retrofit applications, conduit and box fill shall be assessed and approved by the Engineer and District.

D. Minimum size for back boxes shall be 4" x 4" x 2-1/8" with 512 HD mounting bracket or approved equivalent.

E. Combination speaker/strobe back boxes shall be ORBIT Fire alarm 4S (FA-UMAB) 4" x 4" x 3-1/2" with associated SSB-TBAR or approved equivalent.

F. Adjustable Caddys are not permitted.

G. The use of extension rings on new or retrofit construction shall be approved on a "case-by-case basis" by the Engineer and District.

H. Junction boxes for any new or retrofit construction, that have more than four (4) wire splice connections, shall utilize WAGO connectors (http://www.wago.us/products/2631.htm) , or equivalent as approved by District project

manager.

I. Wire runs shall be continuous and shall not contain splices or t-taps unless otherwise approved by Engineer and District.

J. Provide Wiremold© or Plastic surface raceway in all areas that are exposed to the Public. Paint to match existing wall or ceiling finish, unless approved by the Engineer and District. Paint to match existing wall or ceiling finish, unless approved by the Engineer or District. Knockouts are not permitted in exposed back boxes installed in public areas.

K. Electrical junction boxes shall be covered with a red cover plate.

L. Electrical back boxes shall utilize knockouts only as necessary. Unused knockout holes are not permitted.

M. All box knock outs and exposed conduit edges shall have plastic edge protection.

1. Conduit shall be provided in exposed joist construction and concealed spaces. Contractor shall utilize Wiremold© where permitted in writing by Jefferson County for surface mount in locations accessible to the public. Contractor shall obtain approval from Jefferson County or engineer representative for Wiremold© and conduit locations.

2. Conduit shall be provided for all inaccessible spaces and above hard lid ceilings.

3. Conduit shall be provided for all areas where wire would be exposed or unprotected.

4. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.

5. Conduit is not permitted to be secured to the roof deck. All existing conduit utilized for fire alarm shall be removed if improperly secured to the roof deck and new conduit shall be installed. Conduit shall be installed in accordance with NEC spacing requirements from the roof deck.

6. All conduit shall be installed by a licensed electrician.

7. All conduit shall be red, hot-galvanized, fire alarm EMT. Conduit shall be painted to match existing surface if requested by owner.

8. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC.

9. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or back boxes, except where conduit entry is specified by the FACP manufacturer.

10. Conduit shall be trade size 3/4-inch (19.1 mm) minimum. ½-inch conduit may be allowed if the contractor submits a specific request in writing.

11. Conduit edge protection shall be provided for all transitions from conduit to bridle rings. Reference Open (Plenum) Cable Installation Requirements.

12. Conduit sleeves shall be used for all penetrations through fire rated or non-fire rated walls and partitions. Sleeves through fire rated walls shall be fire caulked on both sides of the wall and filled after cable installation.

13. Knockouts are not permitted in exposed back boxes installed in public areas. Provide and install surface skirts for all surface mounted devices.

N. Support all boxes by All-thread or other approved box support device; or bolt directly to building structural members. Do not support boxes to ceiling tie-wires.

O. Provide marking paint on support hardware. Red for Fire Alarm, Green for Security and card Access systems. Do not allow paint to contaminate any wire.

P. Fire alarm wire contaminated with paint shall be removed and re-pulled. Fire alarm support hardware contaminated with paint [does not apply to approved marking paint (red)] shall be removed and replaced.

Q. Mount end-of-line device in box with last device.

R. Mount outlet box for electric door holder to withstand 80 pounds pulling force. Where wall construction is wood or steel frame, utilize Caddy telescopic bracket TSGB16/TSGB24 or approved equivalent.

S. Division 28 contractor shall make conduit and wiring connections to door release devices, sprinkler flow switches, sprinkler valve tamper switches, duct smoke detectors, smoke/fire dampers, HVAC units, and other applicable devices, furnished under other Sections.

T. Automatic Detector Installation: Conform to NFPA 72.

U. Automatic Duct Detector Installation: Conform to NFPA 90A. When patching ducts, utilize steel plates secured by #8 x ½" indented slotted hex washer head type A sheet metal screws and apply mastic which is listed and labeled "181A-M" in accordance with UL 181A. Do not use tape.

3.2 OPEN (Plenum) CABLE INSTALLATION REQUIREMENTS

A. Wire shall be new, twisted, unshielded FPLP.

B. Each wire shall be labeled with shrink wrap at each junction box and termination. The wire label shall be securely fastened to the circuit and shall indicate in minimum 12 point font typed lettering the circuit type (SLC, IDC, NAC, Power, etc.) in addition to the circuit number matching the as-built documentation. (For example: SLC Loop 1, IDC kitchen hood, IDC waterflow, NAC 1-4 or Power 3.)

C. Open cabling shall be installed in a neat and workmanlike manner, and shall be run perpendicular or parallel to building structural members. Diagonal routing of cable shall not be considered acceptable and shall cause to be removed and reinstalled.

D. Open cabling shall be routed away from other building cabling and equipment, and shall be routed to and from the device in a vertical or horizontal manner. Maintain cabling at the same level where possible, Cabling that is not dropped vertically to the device or routed horizontally straight to the device shall not be considered acceptable. Cabling that is routed through, over, under or around other equipment, when a straight horizontal or vertical path is available shall not be considered acceptable and shall cause the cable to be removed and be reinstalled.

E. Open cabling shall be supported at a minimum of every 4 to 6 feet to building structural members utilizing metal bridle rings. Cabling that is secured to, or contacting, sprinkler piping, HVAC ductwork, electrical conduit or other non-structural building member shall not be acceptable and shall cause the cable to be re-installed and re-supported in a proper manner.

F. Conduits and device back boxes shall have appropriate plastic plenum rated strain relief wire bushings where open cable routing occurs. Do not use Romex type connectors.

G. Conduits shall be utilized for all separation (wall, ceiling, fire separation barrier, etc.) penetrations.

H. EMT conduit shall be utilized in all wall cavities. Provide appropriate plastic plenum rated wire bushing where open cable routing occurs. Do not use Romex connectors.

I. Surface mount and lighting level devices shall incorporate a wiremold backbox or a device specific backbox skirt.

J. STI backplate shall be utilized for joist mounted devices requiring a wire guard.

K. Appropriate fire caulking or sealant shall be utilized where open cabling penetrations through fire separation barriers or building separation walls occur. Fire caulk all conduit ends where conduit sleeves penetrate fire barrier separations, after cable has been

installed. Reference 07 80 00 – Fire and Smoke Protection.

L. Provide wet environment exterior rated cable for underground raceway or exterior cable applications. THHN cable is not acceptable for fire alarm wet locations.

3.3 LABELING

A. All fire alarm devices shall have the room number\location description provided in the software programming. Example [(Device Address) AHU-1 Return Classroom 201]. RPS monitor modules shall have the room number included in the software description. When necessary to distinguish the locations of two or more detectors, compass directions shall be incorporated in the device location description in programming.

B. Label each initiating device with device ID address (Manufacturer's format), and control module or monitor module with device ID address and circuit function [(Device Address), Strobes format]. Use Kroy lettering machine with ¼-inch minimum black lettering on clear background, unless alternate labeling approved by the District. Place label on initiating device base. DO NOT PLACE ON SENSOR.

C. Label each notification appliance with notification appliance circuit number and device number in circuit (Ex: RPS or AMP 1:1-1, RPS or AMP 1:1-2, etc.). Label notification appliance circuit end of line (EOL) device location on the notification appliance where the EOL is located (Ex: RPS or AMP 1:1 EOL). Provide separate label for strobe and speaker circuits. Use power supply and amplifier designations for notification labels. Use Kroy lettering machine with ¼-inch minimum black lettering on clear background, unless alternate labeling approved by the District.

D. Open cabling shall be installed in a neat and workmanship-like manner. Contractor shall utilize plenum rated, red Velcro. Velcro shall be utilized only to avoid obstructions and to secure the service loop in the bridal ring (utilize electrical tape to manage service loop). Zip ties are NOT acceptable.

E. Label each remote duct detector or beam detector test station with device ID address and associated HVAC unit or beam detector designated [(Device Address) RTU-1 format]. Label location of the device associated with the test station, if the test station is not in the direct vicinity of the associated device [(Device Address) RTU-1 Classroom 201 format]. Use Kroy lettering machine with ¼-inch minimum black lettering on white background, unless alternate labeling approved by the District.

F. Label each concealed device location with device ID address and HVAC unit or module function [(Device Address) AHU-2 Duct Detector or (Device Address) Door Holder Class Rm 201 format] at the adjacent ceiling tile grid T-bar. Use plastic laminate with engraved ¼-inch lettering. Laminate shall be of red on white core construction (white lettering on red background), unless alternate labeling approved by the District.

G. Label each power supply with power supply designation and function. Use plastic laminate with engraved ¼-inch lettering. Laminate shall be of red on white core construction (white lettering on red background), unless alternate labeling approved by the District.

H. Label circuit terminations in panels and junction boxes with shrink wrap type written labels.

I. Label each security device with device ID address (ID # format), and motion detector, keypad, card reader, etc. with device ID address and circuit function with ¼-inch minimum black lettering on white background, unless alternate labeling approved by the District. All motion detectors shall also have the Contact ID Zone number on the label.

J. Contractor shall provide and install door frame placards to match facility assessment. The door frame placards shall reflect the MAPPS room designation and shall be engraved phenolic labels with white text on a black or dark brown background, 1.5” tall by 3” wide and attached to the latching corner of the door frame (sticky back and screwed). Rooms with multiple entries shall have a placard for each entry. Remove outdated or incorrect signage on door frames.

1. Reference Division 10 Signage for additional information.

3.4 ACCESS CONTROL/SECURITY WIRE AND CABLE COLOR CODE

A. Provide access control system conductors with insulation color coded as

1. Power Branch Circuit Conductors
    a. Black, red, blue, white, green
2. Card Reader (In/Out) Circuit
    a. 6/ C #22 minimum with overall shield, stranded (Wire size will change depending on intended wire run length)
    b. White jacket with green striping
3. Motion Detector Circuit
    a. 4/C #, stranded
        i. Run wires to each device on the polling loop. No individual wire run may exceed the lengths given in the table to follow. In addition, no more than 64mA may be drawn on any individual wire run. When a star configuration is used, the total length of all wire runs combined cannot exceed 4000 ft (2000 ft. if using unshielded wire in conduit or shielded wire). Twisted-pair is recommended for all normal wire runs.
    b. Maximum Polling Loop Wire Runs
        i. Wire Gauge Max. Length
        ii. #22 gauge 650 feet
        iii. #18 gauge 1500 feet
        iv. #16 gauge 2400 feet
    c. When running polling loop wires, they must not be run within 6" of AC

power, telephone, or intercom wiring. Since the polling loop is carrying data between the control panel and the devices, interference on this loop can cause an interruption of this communication. The polling loop can also cause outgoing interference on the intercom or phone lines. If this spacing cannot be achieved, shielded wire must be used. (Note that the maximum total wire length supported is cut in half when shielded wire is used.)

   d. White jacket with green striping

4. RS-485 Data Circuit
   a. 2-Pair #18 with overall shield, stranded
   b. White jacket with green striping
5. Ethernet TCP/IP network cable
   a. Shall be CAT-6, maximum distance based on industry standards
   b. White jacket with green striping
6. Door Strike Circuit
   a. 4/C #18 stranded
   b. White jacket with green striping
7. Request-to-Exit (RX) Motion Detector Circuit
   a. 6/C #20 twisted pair with overall shield, stranded
   b. White jacket with green striping
8. Door Position Switch Circuit
   a. 4/C #22 with overall shield, stranded
   b. White jacket with green striping
9. Security Keypad Circuit
   a. Wiring to the Keypads
      i. Determine wire gauge by referring to the wiring length/gauge chart below.
      ii. Wire keypads to a single wire run or connect individual keypads to separate wire runs. The maximum wire run length from the control to a keypad, which is homerun back to the control must not exceed the lengths listed in the table.
         a) Wire Run Length Table
         b) Wire Gauge Length
         c) #22 gauge 450 feet
         d) #18 gauge 1100 feet
         e) #16 gauge 1750 feet
      iii. The length of all wire runs combined must not exceed 2000 feet when unshielded quad conductor cable is used (1000 feet if unshielded cable is run in conduit or if shielded cable issued).
      iv. If more than one keypad is wired to a run, then the above maximum lengths must be divided by the number of keypads on the run (e.g., the maximum length is 225 feet if two keypads are wired on a #22 gauge

run).
v. White jacket with green striping

10. Future Data Circuit Spare to each Card Access Door (CAD)
    a. CAT-6 cable
    b. White jacket with green striping
    c. Leave cable coiled in the accessible ceiling space above the RX motion detector.

3.5 VIDEO SURVEILLANCE WIRE AND CABLE COLOR CODE (specific conductor and shielding requirements will be per system manufacturer)

A. Video cameras will use CAT-6 (UTP) Circuit:

1. 1 CAT6 to each camera. All cameras and cabling shall be installed by PRE-APPROVED Data and Security Vendors. Contact District Project Manager for current approved vendor list.
2. Refer to Division 27 for cable requirements. (Recommended manufacturers current UTP distances shall prevail)
3. All cameras shall be IP Cameras wired with network drops to the closest MDF\IDF patch panel per Division 27.

B. Camera Power Circuit:

1. All cameras shall be powered via POE.
2. Exterior cameras shall be equipped with Lightning Suppression

C. Ethernet TCPIP network cable

1. CAT-6, maximum distance based on industry standards.

3.6 FIRE ALARM WIRE AND CABLE COLOR CODE

A. Provide Fire alarm system conductors with insulation color codes as:

1. SLC Circuit: 16AWG, Red Jacket with preprinted SLC (every foot)
2. IDC Circuit: 16 AWG, Red Jacket with Brown Stripe
3. 24 VDC Power Circuit: 14AWG, Red Jacket with Purple Stripe
4. Notification Appliance Circuit (NAC):
    a. NAC Strobe only Circuit: 14AWG, Red Jacket with Green Stripe
    b. NAC Speaker only Circuit: 16 AWG, Red Jacket with Blue Stripe
5. Network Circuit: 16AWG, Red with Yellow Stripe
6. Relay Circuit: 16AWG, Red with Yellow Stripe
7. Remote Test Station Circuit: 16AWG, Red with Yellow Stripe
8. Miscellaneous Fire Circuit: 16AWG, Red with Yellow Stripe

9. Fire alarm wire shall be one pair [Red (+)/Black (-)].
10. Remote test station wire can be two pair [Red (+)/Black (-) and Yellow (+)/Green (-)]
11. Left hand lay shall be a minimum of 4.
12. Conductor sizing and numbers subject to equipment manufacturer recommendations.
13. Fire alarm wire shall be unshielded unless required by manufacture.
14. All 120VAC shall meet NEC standards.

3.7 DEDICATED CIRCUIT

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

B. Provide dedicated circuits for amplifiers and power supplies.

3.8 FIELD QUALITY CONTROL

A. Access Control/Security System

1. Test in accordance with District requirements
2. Provide forty-eight (48) hours prior notice to the Engineer and District personnel for rough inspection, prior to installing ceiling tiles or drywall.
3. Provide seven (7) day prior notice to the Engineer and District personnel for scheduled contractor pre-testing of the Security and Safety alarm system.
4. Provide two (2) detailed record of the pre-testing of the system; one for the District and one for the facility's Security System logbook. Pre-testing record must contain a minimum of the device ID, proper device description, proper functionality of the device (panel notification, door unlock, etc.), and date of the testing. Utilize the standard District form available on the District website, or provide Contractor equivalent form approved by the District in advance of the system pre-test.
5. Access Control/Security System Contractor shall sub-contract the Services of a current PRE-APPROVED IDenticard Authorized Factory Partner Level Dealer to provide the access control/security system equipment, panels, enclosures, device terminations, and system programming.

B. Fire Alarm System

1. Test in accordance with NFPA 72, District, State, and Authority Having Jurisdiction (AHJ) fire department requirements. Use District Record of Completion and Pretesting forms included in section 28 46 00.
2. Provide forty-eight (48) hours prior notice to the Engineer and District personnel for rough inspection, prior to installing ceiling tiles, devices or drywall.
3. Provide seven (7) day prior notice to the Engineer and District personnel for

scheduled contractor pre-testing of the system.

4. Provide three (3) day prior notice to the Engineer and District personnel for the scheduled Authority Having Jurisdiction (AHJ) testing of the system.
5. Provide three (3) original copies of the NFPA 72 - Certificate of Completion Form.
    a. One for the District, one for the Authority Having Jurisdiction (AHJ), and one for the facility's Fire Alarm System Logbook.
    b. Voltage and current values must be true measured values not estimates.
    c. Provide a table list of each Horn/Speaker location with actual measured dB per NFPA
6. Provide two (2) detailed records of the pre-testing of the system.
    a. One for the District and one for the facility's Fire Alarm System logbook.
    b. Pre-testing record must contain a minimum of the device ID, proper annunciator description, proper functionality of the device (audible/visual signaling, shutdown, etc.), and date of the testing.
    c. Utilize the standard District form available on the District website, or provide Contractor equivalent form approved by the District in advance of the system pre-test.
7. Fire and Security Alarm Contractor shall be responsible for coordination and employing the Controls Contractor to accomplish programming required between Fire and Security Alarm system and Building Automation system as well as connection of all interface circuits.

3.9 MANUFACTURER'S FIELD SERVICES

A. Prepare and start systems.

B. Include services of certified technician to supervise installation, adjustments, final connections, and system testing.

C. Provide two (2) hard copies and two (2) electronic copies in flash drive format of the final system programming. One set to be delivered to the District Project Manager for the District Central Reporting System programming, and one set to be left at the facility.

3.10 DEMONSTRATION

A. Demonstrate normal and abnormal modes of operation, and required responses to each.

3.11 TRAINING

A. Provide the services of a factory-certified service representative to demonstrate the system and train Owner's maintenance personnel as specified below.

1. On-Site Training: Provide a minimum of two (2) hours of on-site training of the facility's school staffing in the basic operations and functionality of the access control / security system panel, and field devices. Review field panel locations, typically device locations, and 120vAC power locations (panels, breakers, and circuits).

Demonstrate the various system responses to the field off-normal conditions. Simulate card access conditions, supervisory conditions, security conditions, trouble conditions, and ground fault conditions of the various field devices. Demonstrate how to reset various building systems (HVAC units, fire doors, security gates, etc.). Provide written instructions of basic system operating instructions in Fire Alarm Log Book, located adjacent to the fire alarm control panel.

a. On-Site System Training shall be completed within six (6) days of completion of the system and Owner Acceptance of the system.
b. Schedule on-site training with the District at least three (3) days in advance.

2. Off-Site Training: Provide a minimum of eight (8) hours of off-site training of the District's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, programming, and preventative maintenance of a system. The off-site training shall be conducted in a classroom type setting, with the content approved by the District in advance. Provide maintenance, service, and programming manuals of the various components of the system. Provide a working (panel and field devices) system demonstration unit; whereby the various system troubleshooting and servicing procedures can be adequately performed in a "hands-on" scenario.
    a. Off-Site System Training shall be completed within thirty (30) days of completion of the system and Authority Having Jurisdiction (AHJ) test and/or final Owner Acceptance of the System, unless the District specifically directs and alternate training schedule.
    b. Schedule Off-Site Training with the District at least fourteen (14) days in advance.

END OF SECTION 28 05 00

28 13 00 ACCESS CONTROL SECURITY SYSTEM – AUGUST 2021

This Technical Guidelines Section is not open to the public. Contact the District Project Manager for access to this information.

END OF SECTION 28 13 00

28 16 00 SECURITY DETECTION AND ALARM SYSTEMS – AUGUST 2021

This Technical Guidelines Section is not open to the public. Contact the District Project Manager for access to this information.

END OF SECTION 28 16 00

28 23 00 VIDEO SURVEILLANCE – AUGUST 2016

This Technical Guidelines Section is not open to the public. Contact the District Project Manager for access to this information.

END OF SECTION 28 23 00

28 46 00 FIRE ALARM & DETECTION SYSTEM – AUGUST 2021

GENERAL

1.1 GENERAL REQUIREMENTS

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

B. At the time of bid, all exceptions taken to these Specifications, any variances to the contract drawing design, and any nonconformance to the operating capabilities called for in this specification, shall be listed in writing and forwarded with the submission of the bid. Any such exception, variance, or nonconformance, which was not listed at the time of bid, and is identified in the submittal, shall be grounds for immediate disapproval without comment.

C. Fire Alarm manufacturer shall be required to provide Jefferson County Public Schools a licensed copy of any software required to download, modify and maintain the system. Programming access codes shall not be given to the District until after the warranty period.

1.2 SCOPE

A. The work covered by this Section of the Specification shall include all labor, equipment, materials, and services to furnish and install a complete fire alarm security and detection system of the zoned, non-coded general alarm type. It shall be complete with all necessary hardware, software, and memory specifically tailored for this installation. The system shall consist of, but not be limited to, the following:

1. Fire Alarm control panels.
2. Annunciator panels.
3. Addressable manual fire alarm stations.
4. Analog/Addressable automatic initiating devices.
5. Fire alarm signaling devices.
6. Auxiliary fire alarm equipment and connections.

1.3 RELATED SECTIONS

A. Section 07 80 00: Fire and Smoke Protection

B. Section 08 71 00: Door Hardware

C. Section 21 10 00: Water Based Fire Suppression Systems

D. Section 23 33 00: Air Duct Accessories

E. Section 26 05 00: Common Work Results For Electrical Systems

F. Section 26 05 19: Low Voltage Electrical Power Conductors and Cables

G. Section 26 05 26: Grounding and Bonding for Electrical Systems

H. Section 26 05 29: Hangers and Supports for Electrical Systems

I. Section 26 05 33: Raceways and Boxes for Electrical Systems

J. Section 26 05 53: Identification for Electrical Systems

K. Division 27: Communications

L. Jefferson County School District Technical Details Drawings, Volume II

M. Section 28 05 00: Common Work Results For Electronic Life Safety and Security

1.4 APPLICABLE CODES AND STANDARDS

A. Materials and workmanship shall conform to the latest issue of all industry standards, publications, or Regulations referenced in this Section, and with the following Codes and Standards, as applicable:

1. All equipment shall be listed and classified by Underwriters Laboratories, under the following standards:
    a. Signaling Systems
    b. UL 228 – Door Closers-Holders, With or Without Integral Smoke Detectors
    c. UL 639 – Intrusion – Detection units
    d. UL 268 – Smoke Detectors of Fire Protective Signaling Systems
    e. UL 268A – Smoke Detectors for Duct Applications
    f. UL 464 – Audible Signal Devices for Fire Alarm and Signaling Systems, Including Accessories
    g. UL1638 – Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories.
    h. UL 1480 – Speakers for Fire Alarm and Signaling Systems, Including

Accessories.

i. UL 38 – Standard for Manual Signaling Boxes for Fire Alarm Systems.
j. UL 346 – Standard for Waterflow Indicators for Fire Protective Signaling Systems.
k. UL 521 – Standard for Heat Detectors for Fire Protective Signaling Systems.
l. UL 1481 – Standard for Power Supplies for Fire-Protective Signaling Systems.
m. UL 1711 – Standard for Amplifiers for Fire Protective Signaling Systems.
n. UL 521 – Heat Detectors for Fire Protective Signaling Systems.
o. UL 864 – Control Units for Fire Protective Signaling Systems.
p. UL 1076 – Proprietary Burglar Alarm Units and Systems.
q. UL 1971 – Signaling Devices for the Hearing Impaired.
r. FM P7825a – Approval Guide Fire Protection
s. NFPA 70 - National Electrical Code Current Version adopted By the AHJ.
t. NFPA 72 - National Fire Alarm Code Current Version adopted By the AHJ.
u. IFC - International Fire Code. Current Version adopted By the AHJ.
v. IBC International Building Code. Current Version adopted By the AHJ.
w. IMC – International Mechanical Code. Current Version adopted By the AHJ.
x. ANSI S3.41 – Audible Emergency Evacuation Signals.
y. EIA ANSI/EIA/TIA2323 – Interface between Data Terminal Equipment and Data Circuit Terminating Equipment employing Serial Binary Data Interchange.
z. IEEE C6.41 – Surge Voltages in Low Voltage AC Power Circuits.
aa. Division 1 – Jefferson County Public Schools Technical Guidelines.
bb. Local AHJ Amendments.
cc. Americans with Disabilities Act (ADA)

1.5 SPECIAL REQUIREMENTS

A. Definitions: “Furnish” shall mean “provide and install”. “Provide” means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories and all other items customarily required for the proper and complete application. “Install” means to join, unit, fasten, link, attach, set up or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation. The words “accept” or “acceptable” denote only that the equipment items are in general conformance with the design concept of the project

1.6 SUBMITTALS

A. Reference 01 33 00 – Submittal Procedures.

1. Shop Drawings: Provide shop drawings in compliance with NFPA 72 Chapter 7 including:
    a. Wiring diagrams showing all equipment, device placement, and wiring connection required.
    b. One-line riser diagrams.

c. Device ID numbers (manufacturer's format), room numbers, room descriptors, and compass direction (if applicable).
d. Zone schedules, operational matrix, and location of all end-of-line (EOL) devices.
e. Each initiating device and notification appliance device shall include signaling loop circuit or notification appliance circuit number and device ID numbers (manufacturer's format).
f. All system wiring shown on the floor plans.
g. Include fire alarm control panel elevation view.

2. Product Data: Provide manufacturer's data sheets showing product appearance, electrical characteristics, and connection requirements.
3. Load Calculations: Provide load calculations for all visual appliance circuits, audible notification appliance circuits, audible/visual notification appliance circuits, system power supplies, and battery standby systems.
4. Control Panels and Power Supply: Show fire alarm control panel layout, configurations, and terminations.
5. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use, as stipulated by the product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and start-up of products.
6. Submittals shall be reviewed and approved by architect, engineer and owner prior to submittal to AHJ.
7. Exceptions: Provide a detailed listing of any and all exceptions, variances, and non-conformances to the specifications and contract design drawings. Failure to disclose any such items shall be grounds for immediate disapproval of submittals without comment.
8. Samples: Provide samples of various items, when requested.
    a. Provide a minimum of two (2) samples of all fire alarm cable to be installed on the projects. Cable samples shall be of sufficient length to identify cable marking (striping) and cable listing identification.
    b. Provide a minimum of two (2) samples of all cable supporting devices, metal bridle rings, metal mounting brackets, plastic plenum rated wire bushings, and other applicable cable installation equipment to be utilized on the project.

1.7 CLOSEOUT SUBMITTALS

A. Reference 01 77 00 Closeout Procedures

B. Record Drawings

1. Record "as-built" locations of all system components, initiating devices, signaling appliances, and end-of-line devices. Include "as-built" conduit routing and wire counts. The design engineer and Jefferson County representative shall walk through the building and spot check 5-10% of device locations against the as-builts. If devices are not as shown, drawings will be rejected for a redraw. Upon resubmittal, another spot check will be performed. If deficiencies are found on the second check, an

independent audit to the system by the system manufacturer shall be required. The contractor shall bear the cost of any such audit.

2. As-Built drawings shall consist of two hard copy bond sets and one electronic AutoCAD file copy on CD or flash drive format.
3. As-Built system load and battery calculations shall consist of two full size hard copy bond sets and one electronic copy on CD or flash drive format. Load calculations shall include all audible, visual, and audible/visual notification appliance circuits with calculated voltage drop levels, calculated maximum circuit distance measurements, actual recorded circuit length distance measurements, and actual measured voltage drop levels.
4. Provide electronic copy of all excel files (i.e. calculations, sequencing matrix, legend, etc.).
5. Provide two (2) hard copies of all system programming (software).
6. Provide two (2) electronic copies of all system programming (software); on CD ROM or flash drive format.
7. Provide Contractor redline construction drawing set, with mark-ups.
8. Provide two (2) full size hard copy bond sets of As-Built record drawing set.
9. Provide one (1) 11x17 hard copy bond sets of As-Built record drawing set.
10. Provide one (1) electronic copy of As-Built record drawing sets; on CD or flash drive format.
11. Provide all special test equipment, filters, test leads, cords, etc. required to test the system.
12. Record document box shall be located adjacent to FACP and shall contain contractor working set (actual field set – not cleaned up version) along with electronic copies as indicated above.

C. Operation and Maintenance (O&M) Manuals

1. Operational Data: Provide operating instructions, detailed for the specific project.
2. Maintenance Data: Provide maintenance and repair procedures for each type of equipment provided, as applicable. Include any specific requirements particular to the project.
3. Equipment Data: Provide manufacturer data sheets or catalog sheets for each type of equipment provided.
4. Spare Parts Data: Provide manufacturer’s recommended spare parts list, including quantity, and any equipment replaced schedules, as applicable.
5. Supplier Data: Provide system manufacturer and local service organization information. Include contact, phone numbers, and addresses, as applicable.
6. Warranty Data: Provide system warranty information, including all material and/or labor terms.

D. Warranty

1. The manufacturer shall guarantee the system equipment for a minimum period of one (1) year from the date of final acceptance of the system. Any additional warranty periods shall be listed in the Operation and Maintenance Data manuals. Any defective

equipment, material, or software shall be replaced at no cost to the Owner during this warranty period.

2. The installing contractor shall guarantee all wiring and raceways to be free from inherent mechanical or electrical defects for a minimum period of one (1) year from the date of final acceptance of the system. Any defective material and/or labor shall be replaced at no cost to the Owner.

E. Maintenance Service

1. Furnish warranty service and maintenance of the fire alarm system for one (1) year from the date of final acceptance of the system, as follows:
    a. Basic Services: Systematic, routine maintenance visits, as required; at times coordinated with the Owner. In addition, respond to service calls within 24 hours of notification of system trouble. Adjust and replace defective parts, components, and supplies.
    b. Additional Services: Perform services within the above two (2) year period, not classified as routine maintenance or as warranty work, when authorized on writing by the Owner. Compensation for additional services shall be agreed upon in writing, prior to performing and additional services.

F. Field Modifications

1. Include pricing for field changes in bid, as follows:
    a. Provide 5% analog/addressable manual stations minimum 1.
    b. Provide 5% of each type of automatic smoke or heat detector minimum 1.
    c. Provide 5% of each type of smoke or heat detector base minimum 1.
    d. Provide 5% of each type of audible, audible/visual, or visual notification appliance minimum 1 of each.
    e. Provide 5% of each type of addressable monitor module minimum 1.
    f. Provide 5% of each type of addressable control module minimum 1.

G. Spare Parts

1. Provide extra materials, as follows:
    a. Provide 5% analog/addressable manual stations minimum 1.
    b. Provide 5% of each type of automatic smoke or heat detector minimum 1.
    c. Provide 5% of each type of smoke or heat detector base minimum 1.
    d. Provide 5% of each type of audible, audible/visual, or visual notification appliance minimum 1 of each.
    e. Provide 5% of each type of addressable monitor module minimum 1.
    f. Provide 5% of each type of addressable control module minimum 1.
    g. Provide six (6) of each type of key.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with a minimum three (3) years' experience, and with service facilities within

fifty (50) miles of the project.

B. Shop Drawing Preparer: Company shall employ a NICET level 3 or 4 shop drawing preparer. Preparer shall sign shop drawing submittal.

C. Project Supervisor: The installing company shall provide a full time project supervisor dedicated to the supervision of the fire alarm installation. The project supervisor shall have at least 5 years of experience installing addressable fire alarm systems. The project supervisor shall be on site at all times that the fire alarm system installation is in progress, including system testing.

D. Project Engineer: Company shall employ an engineer of record with a registered P.E. in fire protection engineering, or a registered P.E. in a related engineering discipline, with a minimum of four (4) years' experience in fire protection and alarm engineering, or a minimum NICET Level 3 Project engineer.

E. Installer: Installing Company shall use only District Approved Premier level Notifier dealer or JCI dealer for programming and final testing. The Bidding Company must specialize in installing the products specified in this section with a minimum three (3) years documented experience. The installer shall employ NICET Level 2 trained technicians to install the products specified in this Section.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with specified requirements, products of the following manufacturers shall be acceptable:
   1. Base Bid: Shall be based upon Simplex 4100ES.
   2. Substitutions: No substitutions allowed.

2.2 MATERIALS

A. FIRE ALARM CONTROL PANEL

   1. The fire alarm control panel shall incorporate all control electronics, relays, necessary modules, and components in a semi-flush mounted cabinet. The operating controls and zone/supervisory indicators shall be located for the Fire Department and other authorized operating personnel. The fire alarm control panel shall consist of a base panel, system power supply, and battery charger, with optional modules suitable to meet the requirements of these specifications.
   2. The fire alarm control panel shall be supervised, site programmable, and of modular design with expansion modules to provide analog addressable loop modules as required. Allow for 20% spare on both detector and modules. The expansion modules be configurable to either Class A or Class B wiring.
   3. The fire alarm control panel shall store all basic system functionality and job specific data in nonvolatile memory, and shall survive a complete power failure intact. The

fire alarm control panel shall be capable of automatic system operation with support of alarm silence, trouble silence, drill, lamp test and reset common controls. The fire alarm control panel shall allow downloading of job specific custom programming, and shall support programming of any input point to any output point, or using initiating events to start actions and sequences.

4. The fire alarm control panel shall utilize full digital communications to supervise all addressable loop detectors and modules for proper operation. The fire alarm control panel shall have a UL Listed Detector Sensitivity test feature, and shall support 100% of all remote detectors, remote alarm indicators and modules in alarm at any time.
5. The fire alarm control panel shall supervise all system modules for placement, and shall have a digital display for reporting system status and abnormal conditions. The fire alarm control panel shall provide common control indicators (normal, alarm, monitor, ground fault, supervisory, trouble), common control switches (reset, alarm silence, trouble silence, and drill), and zone alarm and trouble LEDs, as required for the system zoning requirements. The fire alarm control panel shall provide system function keys for status, reports, enable, disable, activate, restore, program and test.
6. Provide a District approved Fire Alarm Document Enclosure adjacent to the FACP.
7. Provide a wall mounted 3 ring binder holder for District provided Fire Alarm Log Book adjacent to the FACP.

B. Power Supplies:

1. The fire alarm power supply shall be switch mode type with line monitoring to automatically switch to batteries upon power failure or brown out conditions, and shall be adequate to service all control panel modules, all fire alarm system powered smoke sensors and modules, remote annunciators, control relays, and all fire alarm signaling appliances. The fire alarm power supply shall contain an integral battery charger capable of recharging the standby batteries per NFPA 72 requirements, and shall provide battery supervision for placement and low voltage.
2. Provide booster power supply panels as required, to meet project requirements. The booster power supply shall activate via dry contact from the fire alarm control panel. The booster power supply shall generate a fault condition at the main fire alarm control panel, when any fault condition occurs on circuits connected to the booster power supply, or a trouble condition occurs at the booster power supply panel. The booster power supply shall contain an integral battery charger capable of recharging the standby batteries per NFPA 72 requirements, and shall provide battery supervision for placement and low voltage.
3. Multiple power supplies may share monitor and control modules ONLY if they are mounted in the same room, not to exceed 3 power supplies per monitor point. Activation of a power supply from another power supply is not permitted.
4. Provide a dedicated booster power supply for 24VDC magnetic door holders. Configure power supply for control only. Do not monitor this power supply and do not provide batteries as magnetic door holders are fail safe.
5. Provide a dedicated booster power supply for NAC modular classroom NAC circuits.

C. Standby Batteries: The secondary power source shall be standby batteries. Batteries shall

be sealed lead acid type, with a minimum life expectancy of five years, and shall provide twenty four (24) hours of normal standby operation and five (5) minutes of normal alarm condition at the end of the standby period. System can use four (4) hour battery system if the site has an Automatic-starting, engine-driven generator serving the dedicated branch circuit of the fire alarm system arranged in accordance with NFPA 72 10.5.10.3.1

1. Batteries shall be dated with month and year of installation in the system as well as manufacture date.
2. Dedicated battery cabinets (when required) shall be located below the fire alarm control panel. Do not locate these panels above finished ceilings.

D. System Design Parameters:

1. Design the fire alarm system such that each power supply, initiating device (IDC) circuit, device initiating signaling loop (SLC) circuit, audible/visual notification appliance (NAC) circuit, power supply, and standby battery system shall have a minimum 20% spare capacity included.
2. Design the fire alarm system such that each analog/addressable device initiating loop (SLC) circuit shall have a minimum 20% spare capacity included.
3. Fire Alarm Loop Fault Isolation: Design the fire alarm system such that each analog/addressable device initiating loop (SLC) circuit shall incorporate isolation detector bases and/or loop fault isolation modules, placed at any location where the SLC leaves the building or enters a wet location.
4. Fire Alarm Class B Device Initiating Loop (SLC) Circuits: The analog/addressable device loop (SLC) circuit shall be power limited, electronically supervised and shall be monitored for active (short), trouble (open), and ground fault conditions. The analog/ addressable loop (SLC) circuit shall provide all power, signaling and polling communications to the analog detectors and addressable modules connected to it, and shall monitor all sensors for their analog values, environmental compensation levels, and maintenance conditions. The analog/ addressable device loop (SLC) circuit shall monitor all devices for trouble and alarm conditions and shall place the circuit in trouble mode; but shall not disable any device from initiating an alarm of trouble signal to the fire alarm control panel. The analog/ addressable device loop circuit shall be Class B (Style 4) type.
5. Class B Notification Appliance (NAC) Circuits: The notification appliance (NAC) circuits shall be power limited, electronically supervised, and shall be monitored for trouble (open and/or short) and ground fault conditions. Occurrence of a single ground condition shall place the circuit in trouble mode but shall not disable that circuit from signaling the alarm condition (audible or visual) to the field notification appliances. The alarm notification appliance circuits shall provide all power for the audible, visual, and audible/visual notification appliances, and shall by Style Y (Class B).
6. Audible and Visual (NAC) Appliance Circuits: Provide audible and visual notification appliance (NAC) circuits, such that the visual and audible notification appliances deactivate upon system silence. Strobes shall synchronize where two or

more visual notification appliances or groups of synchronized appliances in the same room or adjacent space are within the field of view.

7. Design the fire alarm system such that the Beam and Duct smoke detectors are intelligent/analog devices. Conventional devices shall not be used without written permission from the engineer and District Project Manager. If conventional devices are approved, a separate 24vDC power source that is resettable from the fire alarm control panel must be installed, as applicable.
8. Jeffco Fire Alarm System Design Criteria shall be used to provide supplemental coverage. This section shall be printed on the front page of all Fire Alarm Plans submitted to Local AHJ's. It is intended to help local AHJ's understand how the District applies additional selective coverage.

Jefferson County Public Schools
FIRE ALARM SYSTEM DESIGN CRITERIA

The fire alarm system design is based upon the following codes:

Latest versions as adopted by the State of Colorado, Division of Fire Prevention and Control.

1. International Building Code (IBC)
2. International Fire Code (IFC)
3. International Mechanical Code (IMC)
4. National Electrical Code (NEC)
5. National Fire Alarm Code (NFPA 72)
6. Elevator Safety Code (ANSI A17.1)
7. Americans with Disabilities Accessibility Guidelines (ADAAG)
8. State of Colorado Requirements
9. Jefferson County Public Schools Division 28 Technical Guidelines

In addition to the state and code requirements, the fire alarm system design incorporates the following additional design criteria:

<u>Smoke Detection:</u>

1. Smoke detectors shall be located in all electrical rooms, air handling equipment rooms, and other similar code required areas.
2. Smoke detectors shall be located throughout all common corridors, gyms, cafeterias, and libraries.
3. Smoke detectors shall be located in all MDF, IDF and other communication type rooms.
4. Smoke detectors shall be located at the fire alarm control panel.
5. Smoke detectors shall be located at all fire alarm remote power supply panels.
6. Smoke detectors shall be located at all distributed amplifier panels.
7. Smoke detectors shall be located in all kindergarten classrooms.
8. Smoke detectors shall be located in all special education classrooms, and other areas where special needs students would normally be located.

9. Smoke detectors shall be located in all computer classrooms.
10. Smoke detectors shall be located in all auditoriums.
11. Smoke detectors shall be located in elevator lobbies, elevator machine room, and the top of shaft for elevator control purposes as allowed by code.
12. Only a single smoke detector is required in each modular classroom except where full detection is required for special needs classrooms or kindergarten classrooms.
13. Smoke detectors for fire/smoke damper and firefly release shall be located in accordance with IBC latest edition. Contractor shall pretest fire/smoke damper and firefly function prior to start of construction and report deficiencies to JCSD.

Heat Detection:

1. Heat detectors shall be located in all code required areas not suitable for smoke detection, and shall be intelligent, analog heat detectors.
2. 135°F rate of rise heat detectors shall be located in all chemical storage areas, science prep rooms, and science classrooms.
3. 135°F rate of rise heat detectors shall be located in all student use restrooms. Heat detectors shall be located outside of the airflow path of HVAC registers. Heat detectors that are required in small restrooms in which the detector must be located in the airflow path shall be programmed for fixed temperature. Heat detectors are not required for single toilet rooms with no sink.
4. 135°F fixed temperature heat detectors shall be located in modular classroom restrooms and mechanical closets.
5. 135°F fixed temperature heat detectors shall be located in kitchen areas.
6. Heat detectors set at the highest programmable fixed temperature possible shall be located in yard equipment storage rooms unless storage is detached from the main school building.
7. Heat detectors set at the highest programmable fixed temperature possible shall be located in all boiler rooms, chiller rooms, and other similar rooms unless sprinkled.
8. Heat detectors set at the highest programmable fixed temperature possible shall be located in the kiln room.
9. Heat detectors shall be located in the elevator machine room and top of shaft for elevator shunt trip purposes as required by state code.
10. 135°F rate of rise heat detectors shall be located in all teacher/staff lounges.
11. 135°F rate of rise heat detectors shall be located on all middle school and high school stages.
12. 135°F fixed temperature heat detectors shall be located in all home economics classrooms.

Duct Smoke Detection:

1. Duct smoke detectors shall be intelligent analog/addressable type, which shall report to the fire alarm system as a “supervisory” type device.
2. Duct smoke detectors shall be located in the return air ductwork of all HVAC units greater than 2,000 cfm. Duct smoke detectors shall be located in the return air ductwork of all HVAC systems with a combined capacity greater than 2,000 cfm.

3. Duct smoke detectors shall be located in the return ductwork of all HVAC units greater than 15,000 cfm where return air risers serve two or more stories such smoke detectors shall be installed at each story per the IMC.
4. Duct smoke detectors shall be located within five feet of each smoke damper or fire/smoke damper used for control purposes unless an alternate method from IMC 607.3.3.2 can be applied.

Manual Pull Stations:

1. Manual pull stations shall be dual action type.
2. Manual pull stations shall be located in the Main Office of the school and in a normally attended non-public location near areas for the school used after hours.
3. Manual pull stations shall be located at the exit doors in the kitchen, mechanical rooms and electrical rooms with direct exterior access.
4. Manual stations shall be mounted with the operating mechanism at 48" above finished floor.

Magnetic Door Holders:

1. New door holders shall be 24VDC and located as shown on Fire Alarm drawings and as directed by the Architect.
2. Existing magnetic door holders shall remain in place. If door holders are 120VAC, a separate heavy duty relay shall be provided outside of enclosure.
3. Magnetic door hardware shall be powered by new, dedicated remote power supplies.
4. Contractor shall remove door stops at locations of new and existing magnetic door holders.

Carbon Monoxide (CO) Sensors:

1. Carbon monoxide (CO) sensors shall be intelligent and shall report to the fire alarm system as a "GAS" Contact ID type device.
2. Carbon monoxide (CO) sensors shall have three CO exposure level settings for short, medium, and long duration periods of exposure to CO gas.
3. Carbon monoxide (CO) sensors shall have a sounder base, which shall provide a local alarm signal upon activation of any of the three CO exposure level settings.
4. Carbon monoxide detectors shall be located in kitchen, boiler room, rooms with gas fired equipment including science rooms, laboratories, gas water heaters, gas furnaces, and gas fired AHUs **or** first room served by a gas fired AHU.

Audible, Visual, and Audible/Visual Notification Appliances:

1. Speakers and speaker/strobes shall be generally located to provide a minimum of 15dB above ambient sound levels throughout all building areas.
2. Speaker/strobes shall be located in all mechanical rooms, and other high-noise areas.
3. Speaker/strobes shall be located in all classroom areas.

4. Loudspeakers and strobes shall be located in gymnasiums.
5. All speakers shall be set to the volume setting recommended by manufacturer to meet intelligibility and dB level requirements.
6. Speaker/strobes shall be located in all common "public area" spaces, including corridors, classrooms, multi-person restrooms, open office areas, and other areas where more than one-person occupancy would be expected.
7. Strobes shall be located in all single-person restrooms except single water closets (toilet only) without a sink specifically in kindergarten and pre-school classrooms.
8. Strobes shall be located in copy rooms, work rooms, storage rooms greater than 400 square feet, and storage rooms where high occupant usage levels are anticipated under normal conditions.
9. Strobes shall be located in clinics and conference rooms.
10. Strobes shall not be installed in single occupant offices.
11. Ceiling mounted speaker/strobes are preferred over wall mounted in classrooms, restrooms, and offices. Ceiling mounted speakers, strobes, and speaker/strobes shall be centered in the space as much as possible but shall not exceed 5 feet in any direction from the center, unless approved by the engineer or AHJ.
12. When ceiling mounting is not practical, speakers, strobes, and speaker/strobes shall be wall mounted with the bottom of the visual signal (strobe) lens at 80" above finished floor, or with the top of the visual signal (strobe) lens at 6" below the ceiling (for low ceiling areas), whichever is lower.
13. For specific limited applications, the speakers, strobes, and speaker/strobes may be installed with the top of the visual signal (strobe) lens at up to 96" above finished floor. Each location must be approved in writing by the engineer or AHJ.
14. Exterior weatherproof horn/strobes shall be provided at the fire department response point. The horn shall be silenceable and the notification appliance shall be mounted 10 feet above grade.
15. Exterior weatherproof loudspeakers shall be provided at main entry and any playground areas. The speakers shall be silenceable and the notification appliance shall be mounted 10 feet above grade.
16. Exterior weatherproof strobes with amber lenses shall be provided at entrances with in-bound card readers.

Speakers and speaker/strobes shall be installed in dedicated zones as required by Division 28 46 50.

END FIRE ALARM SYSTEM DESIGN CRITERIA

E. OFFSITE SIGNALING

1. Dialer: Provide digital alarm communicator transmitter (DACT) that shall transmit all control panel off normal condition, including Alarm, Water flow, Supervisory, or Trouble. The DACT shall utilize two (1) Cat6 voice line to comply with NFPA 72 requirements, shall utilize Contact ID type point-by-point communication format. The DACT shall be the latest Notifier Model UDACT, Simplex Model SDACT, or District approved equivalent transmitter (DACT). The Contractor shall provide all

point-by-point programming to support transmission of all control panel off normal conditions, including Alarm, Supervisory, Water flow and Trouble.

2. Building Automation Relay Contacts: Provide separate supervisory Form "C" relay contacts rated at 120vAC at 1 Amps inductive load, for interconnection to Building Automation system for each AHU shut down function. These may be stand-alone relays or auxiliary contacts at the duct detectors.
3. Ethernet Communications: Provide Ethernet topology data communications module (LAN) that shall transmit all control panel off normal condition, including Alarm, Water flow, Supervisory, or Trouble via Email. The LAN module shall utilize a Category 6 RJ45 data Ethernet connection port for interconnection to the District LAN/WAN network. The LAN module shall support remote web browsing and email alert functions.
4. Bosch Dialer Capture Ethernet module:
    a. Extend DACT phone line from MDF 66 block to Bosch module. Phone line shall return to 66 block for connection to a leased voice line.
    b. The Bosch shall utilize a Category 6 RJ45 data Ethernet connection port for interconnection to the District LAN/WAN network.
    c. Provide B10R-1640-120WI medium control panel enclosure which includes:
        i. B46 external annunciator
        ii. A keyed lock that matches the FACP
        iii. 1640-120WI Transformer
    d. Provide three (3) fire alarm monitor modules to supervise: B465 Loss of 120VAC Power
        i. B465 Loss of 120VAC Power
        ii. B465 Battery Fail
        iii. B465 System Trouble
    e. Mount top of cabinet no higher than 6 feet above finish floor.
5. Access Control Interface:
    a. Provide the ability to monitor card access for lockdown condition. When the lockdown is active, fire alarm notification devices shall silence.
    b. Provide the ability to track the status of lockdown.

F. SUPPORT FOR INSTALLER AND OWNER PROVISIONS:

1. The fire alarm control panel shall provide a coded "self-test" test feature, capable of audible or silent testing. The "self-test" test feature shall signal alarms and troubles during test and shall allow receipt of alarms and programmed operations for alarms from other areas not under "self-test".
2. The fire alarm control panel shall provide internal system diagnostics and maintenance user interface controls to display and/or report the power, communications, and general status of specific panel components, detectors, and modules. The fire alarm control panel shall provide device loop controller diagnostics to identify common alarm, trouble, ground fault, and Class A fault conditions.
3. The fire alarm control panel shall allow the user to display/report the condition of the analog/addressable detectors, with analog sensitivity reading, and shall allow the user to report history for alarm, supervisory, monitor, trouble ad restore activity on the

system, with time date stamp.

4. The fire alarm control panel shall allow the user to disable/enable devices, zones, actions, and sequences. The fire alarm control panel shall allow the user to activate/restore outputs, actions, and sequences. The fire alarm control panel shall allow the user to service the time and date of the system, and to change passwords for users. All these features shall be password protected.
5. The fire alarm system shall be programmed to District standards for specific general alarm functions, and other common operating functions, as defined by the District's Fire Alarm Maintenance Group. Failure to follow District standards shall be considered cause to reprogram the system to District standards, at contractor's expense. All panels will include a separate general alarm, NAC, HVAC\damper, Door Holder, Sprinkler and Elevator disable function. Fire Drill\Dialer disable function shall not be allowed.

2.3 FIRE ALARM SYSTEM SEQUENCE OF OPERATION

A. Alarm Sequence of Operation: Operation of any alarm initiating devices shall automatically:

1. Sound local audible signal and display red common alarm LED.
2. Sound audible notification appliances throughout the building.
3. Flash visual notification appliances throughout the building.
4. Sound/flash the exterior Fire Dept. Response Point horn/strobes.
5. Indicate the device in alarm on the fire alarm control panel and remote annunciator.
6. Indicate the location of alarm zone (floor and area) on fire alarm control panel and remote annunciator.
7. Alarm signal transmitted to District central stating receiver.
8. Alarm signal transmitted to e-mail list
9. Manual acknowledgement function at the fire alarm control panel silences local audible alarm. Visual alarm condition is displayed until alarm condition is restored and panel is reset.

B. Duct Smoke Detector Sequence of Operation: Operation of any duct smoke detector shall automatically:

1. Sound local audible signal and display yellow common supervisory LED.
2. Indicate the device in supervisory on the fire alarm control panel and remote annunciator.
3. Indicate the location of supervisory zone (floor and area) on the fire alarm control panel and remote annunciator.
4. Supervisory signal transmitted to District central station receiver.
5. Shutdown all HVAC unit(s) associated with the duct smoke detector zone, as required by the AHJ.
6. Delay for 60 seconds then close smoke/fire damper(s) associated with the specific HVAC system ductwork, as required by the AHJ. On reset allow 60 second delay of HVAC unit for dampers to open first.

7. A manual acknowledge function at the fire alarm control panel silences local audible alarm. Visual supervisory condition is displayed until supervisory condition is restored.

C. Trouble Sequence of Operation: The entire fire alarm system wiring shall be electrically supervised to automatically detect and report trouble conditions to the fire alarm panel. Any opens, grounds, disarrangement of system wiring on alarm initiating circuits, opens, shorts, grounds, or disarrangement of system wiring on alarm notification appliance circuits, or device trouble or maintenance conditions, shall automatically:

1. Sound local audible signal and display yellow common trouble LED.
2. Indicate the device in trouble on the fire alarm control panel and remote annunciator.
3. Indicate the location of trouble condition, as applicable, on the fire alarm annunciator.
4. Trouble signal transmitted to District central station receiver.
5. Manual acknowledgement function at the fire alarm control panel silences local audible signal. Visual trouble condition is displayed until the trouble condition is restored.

D. Alarm Reset: System remains in alarm mode until alarm condition is restored and fire alarm system is manually reset with key-accessible reset function. System resets only if initiating circuits are out of alarm. On reset allow 60 second delayed startup of HVAC unit for dampers to open first.

E. Alarm Silence: System audible and visual notification appliances remain sounding/flashing until the fire alarm system is manually silenced with a key-accessible alarm silence function. Visual notification appliances remain flashing until the fire alarm system is manually reset as described above. System audible and visual notification appliances shall resound/flash upon reactivation of alarm silence function.

F. Drill Switch: Shall not be allowed.

G. Lamp Test: A manual lamp test function causes alarm indication of each alarm, trouble and/or system LED at the fire alarm control panel and remote annunciators upon activation of key-accessible lamp test function. Alarm indication of LEDs shall turn off upon reactivation of lamp test function, or upon automatic timeout.

2.4 ANNUNCIATORS

A. Remote Annunciators

1. Alpha Numeric Annunciators: Remote alpha numeric Annunciators shall be located throughout the facility, as indicated on the plans. The annunciator shall operate from system 24vDC, be battery backed up, and shall contain a supervised, backlit, liquid crystal display (LCD) with a minimum of 4 lines with 20 characters per line. Each annunciator shall be capable of supporting custom messages similar to the main fire

alarm control panel display. Provide key-accessible Lexan cover for Main Entry Annunciator location only.

2.5 GRAPHIC DISPLAY MAPS

A. Graphic display maps of the system shall be located at the fire alarm control panel and at all fire alarm annunciator panels, as shown on the plans. The graphic maps shall provide a graphical representation of the building layout with the fire alarm devices and system ID numbering indicated. The maps shall be framed behind clear Lexan glass, and shall be readily modifiable to incorporate future changes in the buildings function.

B. Graphic Maps shall be orientated for user reference based on the location in the building and have a "You Are Here" flag for each location.

C. Graphic maps shall include:

1. Building name and address including zip code (Black, Bold, ½" text)
2. Accurate north arrow based on orientation of each map.
3. Symbol legend identifying each device as shown on graphic map.
4. "You Are Here" arrow indicator (Red, Bold, ¼" text)
5. Room Designations (Black, 1/8" text)
6. Device addresses with preceding zeros, i.e. L01D001 (Blue, 1/8" text)
7. Initiating Devices (Red)
8. Supervisory Devices (Orange)
9. Controlled HVAC units (Black, 1/8" text in hexagon include AHU, RTU or other)
10. Water Shutoff Location (Blue)
11. Gas Shutoff Location (Green)
12. Electrical Shutoff Location (Red)
13. Fire Hydrant Locations (Red)
14. Sprinkler zone map key plan
15. Roof Access Locations

D. For buildings protected by automatic sprinklers, graphic maps shall include a sprinkler zone map indicating areas of the building protected by automatic sprinklers with associated sprinkler zone labels.

2.6 INTELLIGENT ANALOG/ADDRESSABLE INITIATING DEVICES

A. All initiating devices shall be UL Listed for Fire Protective Use.

B. INTELLIGENT DETECTORS GENERAL:

1. The system detectors shall be capable of full digital communications using polling protocol and shall be individually addressable. The detectors shall have a separate means of displaying communication and alarm status. As a minimum, each detector shall have a flashing LED to indicate communications status, and a red LED to

indicate alarm status of the detector,

2. Each detector shall be capable of providing pre-alarm and alarm signals in addition to normal, trouble and need for cleaning information. Each detector shall be individually programmed to operate at any one (1) of five (5) sensitivity levels. And shall be capable of being programmed for different sensitivities during day/night periods: which allows the detector to be more sensitive during unoccupied periods, when lower ambient background conditions are expected. Each detector shall be provided with an environmental compensation feature, which will adjust the detector's compensation value to counteract the impacts of temperature, humidity, other contaminates, as well as detector aging. The individual detector's environmental compensation feature shall update itself, as a minimum, once every twenty-four (24) period. The detector shall monitor the environmental compensation value and alert the system operator when the detector approaches 80% and 100% of the allowable environmental compensation value.
3. Ionization smoke detectors shall not be used in District facilities.
4. Where necessary to distinguish the locations of two or more detectors, compass directions shall be incorporated in the device location description in programming.

C. FIRE DETECTION SENSORS

1. Heat Detector, Fixed Temperature/Rate-of-Rise: provide intelligent analog/addressable combination fixed temperature/rate of rise heat detector with a nominal alarm point rating of 135 degrees F, and a rate of raise alarm point of 15 degrees F. The heat detector shall incorporate a low mass thermistor heat sensor and shall operate at a fixed temperature and at a temperature of the air in its surroundings to minimize thermal lag or wall mount installation. The device location description in programing shall include "R135" for this type of heat detector. The heat detector shall mount to any of the mounting bases as specified below, and shall be suitable for operation in the following environment:
    a. Temperature: 32 degrees F to 100 degrees F
    b. Humidity: 93% RH, non-condensing
    c. Elevation: No limit
2. Heat Detector, Fixed Temperature: Provide intelligent analog/addressable fixed temperature heat detector with a nominal alarm point rating 135 degrees F and 200 degrees F. The heat detector shall incorporate a low mass thermistor heat sensor and operate at a fixed temperature. The heat detector shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to report an alarm condition and shall be rated for ceiling or wall mount installation. The device location description in programing shall include "F" followed by the nominal alarm point rating for each heat detector of this type (F135, F200, etc.) The heat detector shall mount to any of the mounting bases as specified below, and shall be suitable for operating in the following environment:
    a. Temperature: 32 degrees F to 100 degrees F
    b. Humidity 93% RH, non-condensing
    c. Elevation: No limit

D. SMOKE DETECTOR SENSORS

1. Photoelectric Smoke Detector: Provide intelligent analog-addressable photoelectric smoke detector. The photoelectric smoke detector shall utilize a light scattering type photoelectric smoke sensor to sense changes in air samples from its surroundings and shall continually monitor any changes in sensitivity due to the environmental effects of dirt, smoke, temperature, aging and humidity. The photoelectric smoke detector shall be rated for ceiling or wall mount installation, and shall be rated for operation in constant air velocities from 4,000 ft/min. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five (5) sensitivity settings, ranging from 1.0% to 3.5% and shall be suitable for operation in the following environment:
    a. Temperature: 32 degrees F to 100 degrees F
    b. Humidity 93% RH, non-condensing
    c. Elevation: No limit
2. Projected Beam Smoke Detectors: Provide OSID (by Xtralis) type beam detectors, as indicated on the plans. The unit shall be capable of covering distances up to 300 feet, and shall feature automatic gain control, which shall compensate for gradual deterioration from dirt accumulation on lenses. The beam detectors shall be either ceiling mount or wall mount. Provide a key activated remote test switch/annunciator station (if compatible) mounted on ceiling (preferred) or a minimum of 8ft above the finished floor (accessible from a 6' ladder). Identify the remote test station with the associated device ID number it controls, and the associated beam detector unit identification. Provide a keyed override switch or override selectable button on the FACP to bypass the beam detectors for 4 hours. An active bypass shall annunciate a supervisory condition on the FACP and annunciator panels.
3. Standard Detector Mounting Base with Trim Ring: Provide standard detector mounting base with trim ring suitable for mounting to a standard electrical box or trim ring. The standard detector base shall have the following minimum requirements:
    a. Removal of the respective smoke detector shall not affect communications with the remaining other detectors.
    b. Terminal connections shall be made on the room side of the base.
    c. The base shall be capable of supporting one (1) remote alarm LED indicator, where shown on the drawings.
4. Relay Detector Mounting Base with Trim Ring: Provide relay detector mounting base with trim ring suitable for mounting to a standard electrical box or trim ring. The relay detector base shall have the following minimum requirements:
    a. Removal of the respective smoke detector shall not affect communications with the remaining other detectors.
    b. Terminal connections shall be made on the room side of the base.
    c. The form "C" dry relay contacts shall have a minimum contact rating of 1 Amp at 30vDC and be listed for "pilot duty."
    d. The operation of the relay shall be controlled from its respective detector and shall automatically de-energize when the detector is removed.
5. Isolator Detector Mounting Base with Trim Ring: Provide isolator detector mounting base with trim ring suitable for mounting to a standard electrical box or trim ring. Isolator devices shall only be used when the SLC leaves the building or enters a wet

area. The isolator detector base shall have the following minimum requirements:
   a. Terminal connections shall be made on the room side of the base.
   b. The isolator base shall operate upon a short circuit condition on the device initiating loop circuit.
   c. Following a short circuit condition, each isolator/detector shall be capable of performing an internal self-test procedure to reestablish normal operations.
   d. Isolator device locations shall be shown on the graphic maps.

6. Duct Detector Housing: Provide smoke detector duct housing assemblies to facilitate mounting an intelligent analog/addressable photoelectric smoke detector, with a standard, relay, or isolator mounting base. Protect the measuring chamber from damage and insects and provide an air exhaust tube and an air sampling inlet tube, which extends into the duct air stream, a minimum length of 75% of the duct width being covered. Provide air sampling inlet tube to cover duct widths up to ten (10) feet. The duct detector shall be suitable for use on ductwork with airflow velocities of 300ft^3/min to 4,000 ft^3/min.
   a. Provide key activated remote test station, as shown on the drawings.
   b. Provide duct detector housing with auxiliary relay for all HVAC unit locations, for transmission of the alarm signal to the HVAC unit DDC control panel.
   c. Provide duct detector housing with auxiliary relay for all smoke/fire damper locations and Building Automation interface.
   d. Provide MAGNEHELIC DIFFERENTIAL PRESSURE delta and date of install written on the duct above the detector housing with a BLACK SHARPIE PEN. Also document this value on the permanent Record of Completion.
7. Remote Duct\Beam Detector Test Station: Provide a remote duct detector test station to facilitate testing of intelligent duct smoke detectors programmed actions and sequences. The test station shall be key-operated, shall feature a red alarm LED, and shall mount to a standard electrical box or trim ring. When the key is in the "TEST" position, it shall not be possible to remove the key; the alarm LED shall light to indicate that the duct detector is in alarm, and all programmed functions shall occur. Upon system reset, the "TEST" condition shall clear and the system returns to normal. Mount remote test station in the nearest corridor location in the ceiling tile (preferred), or wall mounted at a minimum height of 8 ft from the finished floor (accessible from 6' ladder). Identify the remote test station with the associated device ID number it controls and the associated HVAC until identification.
8. Provide keyed override switch with four (4) hour timer for gym and auditorium beam detectors. Location to be approved by JCSD and Engineer prior to installation.

E. CARBON MONOXIDE DETECTORS
1. Carbon monoxide (CO) detector shall be an intelligent detector listed to Underwriters Laboratories UL 2075 for Gas and Vapor Detectors and Sensors. The detector shall be equipped with a trouble relay. The detector's base shall be able to mount to an approved electrical box or direct (surface) mount to the wall or ceiling. The detector shall provide dual-color LED indication that blinks to indicate normal standby, alarm, or end-of-life. The detector shall provide this with a test mode that accepts CO gas from a test agent and alarms immediately upon sensing CO entry.

2.7 INTELLIGENT MODULES – GENERAL

A. The system modules shall be capable of full digital communications using polling protocol and shall be individually addressable. The modules shall have a separate means of displaying communication and alarm status. As a minimum, each module shall have a flashing LED to indicate communications status, and a red LED to indicate alarm or active control status of the module. The modules input and output circuit wiring shall be supervised for opens and grounds faults, and shall be suitable for operation in the following environment:

1. Temperature: 32 degrees F to 100 degrees F
2. Humidity 93% RH, non-condensing
3. Elevation: No limit
4. Do not mount intelligent modules above finished ceilings. The intelligent monitor and control modules shall be mounted so that the LED is visible.
    a. Simplex modules must have Simplex listed cover plate to allow view of LED.
    b. Notifier Mini-modules are not allowed
    c. Dual modules are not allowed.
5. Multi-input modules shall not be acceptable unless each input has a distinguishable color or pulse.
6. Bi-directional amplification (if provided) shall be monitored for loss of power, antenna failure, loss of radio signal, battery charger fail, and low battery.

B. FIRE ALARM INITIATING DEVICES

1. Intelligent modules must be mounted at a height accessible from a 6’ ladder from a finished floor.
2. Single Input Module:
    a. Provide intelligent addressable single input module, as applicable. The input module shall mount to a standard electrical box or trim ring, and shall provide one (1) supervised Class B circuit, capable of supporting the following circuit types:
        i. Normally Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
        ii. Normally Open Active Non-Latching (Monitors, Fans, Dampers, Doors, Tamper Switches, etc.)
        iii. Normally Open Active Latching (Supervisory, Duct Detectors, etc.)
3. Single Input Signal Module: Provide intelligent addressable single input signal module. The signal module shall mount to a standard electrical box or trim ring, and shall provide one (1) supervised Class B output circuit, capable of supporting the following circuit types:
    a. Audible Indicating Appliance Circuit, polarized, rated at 24vDC at 2 Amps.
    b. Visual Indicating Appliance Circuit, polarized, rated at 24vDC at 2 Amps.
    c. Supervised Control Circuit, polarized, rated at 24vDC at 2 Amps.
4. Control Relay Module: Provide intelligent addressable control relay module. The

control module shall mount to a standard electrical box or trim ring and shall provide one (1) Form "C" dry relay contact, rated at 2 Amps at 24vDC or 0.5 Amps at 120vDC; to control external appliances or equipment shutdown. The control relay module shall be rated for "pilot duty" and releasing systems.

5. Fault Isolation Module: Provide intelligent fault isolation module whenever the SLC leaves the building or enters a wet area. The fault isolation module shall mount to a standard electrical box or trim ring and shall be capable of isolating and removing a fault. Isolation devices shall not be installed above ceilings. Device locations shall be documented on the fire alarms graphic maps.

2.8 FIRE ALARM INTEGRATED AUDIO/VISUAL EVACUATION SYSTEMS

A. All notification appliances shall be UL Listed for Fire Protective Service.

B. All visual notification appliances (strobes) or combination appliances with strobes shall be capable of providing the "Equivalent Facilitation" allowed under the Americans with Disabilities Act Accessibilities Guidelines (ADAAG), and shall be UL 1971 listed.

C. Strobes: Provide standard synchronized UL 1971, 24vDC white strobe unit with 15cd, 30cd, 60cd, 75cd, 95cd, or 115cd flash outputs, as shown on the contract documents. The strobes shall have their lens markings oriented for wall mounting or ceiling mounting, shall be provided with screw terminals for wiring interconnect, and shall mount to a standard electrical box or trim ring. Strobes shall bear "ALERT" demarcation on the cover of the unit. Provide weatherproof wall box for outdoor mounting. Locate strobes per NFPA 72 and ADA guidelines.

D. HORNS & COMBINATION HORN/STROBES

1. Horns/Horn Strobes: Provide 24vDC, red electronic horn, with a selectable low or high dBA output, capable of producing a sound rating of 97dBA, and shall have a selectable steady or temporal output. Both selectable features shall be capable of being reversed. Horns that cannot reverse these selectable settings shall not be acceptable. The horn and horn/strobes shall be provided with screw terminals for wiring interconnect and shall mount to a standard electrical box or trim ring. Provide integral, 24vDC.
2. Synchronized UL 1971 strobe unit with 15cd, 30cd, 60cd, 75cd, 95cd, 110cd, or 115cd flash outputs, as shown on the contract documents. The horn/strobes shall have their lens markings oriented for wall mounting or ceiling mounting. Provide weatherproof device and back box, where required. Locate horns and horn/strobes per NFPA 72 and ADA guidelines.

E. FIRE ALARM PULL STATIONS

1. Intelligent Manual Station: Provide intelligent addressable manual station. The manual station shall be semi-flush mounted, non-coded, dual action type, shall be red in color, and shall be individually addressable. The manual station shall require a key

to reset the station and shall mount a standard electrical box or trim ring.

2.9 ANCILLARY DEVICES

A. Remote Relays: provide remote control relays connected to supervised ancillary circuits for control of HVAC units, smoke/fire dampers, door releases, elevator controls, and other uses. Relay coils shall have a diode across its coil for polarity reversal purposes and SPDT contacts rated at 10 Amps at 120vAC. Provide load suppression devices, as required. Provide metal enclosure, as required.

B. Heavy Duty Remote Relays: Provide remote control relays connected to supervised ancillary circuits for control of HVAC units, smoke/fire dampers, door releases, elevator controls, and other uses. Relay coils shall have a diode across its coil for polarity reversal purposes and SPDT contacts rated for its interconnected load. Provide load suppression devices, as required. Provide metal enclosure, as required.

C. Magnetic Door Holders: Provide 24VDC magnetic door hardware as shown on the floor plans. Connect all existing magnetic door hardware to a new, dedicated remote power supply. Magnetic door hardware shall be capable of 120VAC or 24VDC power and shall have at least 40 pounds of holding power. Magnet shall be protected against transient surges up to 600 volts. Floor and wall mount models shall be available as well as surface and flush mounting options. Refer to Part 3.1 K for outlet box mounting.

D. Protective Device Wire Guards: Device wire guards shall be UL Listed with specific fire alarm device type and installation application.

1. Wire guards shall be installed on all gym, locker room and cafeteria initiating devices and notification appliances.
2. Contractor shall reuse/reinstall existing UL listed pull station covers.
3. Protective pull station covers equipped with alarms shall be installed without batteries unless otherwise noted on plans or in writing by the engineer or District Project Manager.

2.10 FIRE ALARM WIRE AND CABLE

A. Fire Alarm Power Branch Circuits: Building wire as specified in Section 26 05 19.

B. Fire Alarm Initiating Device Loop (SLC) Circuits and Notification Appliance (NAC) Circuits: as specified in Section 28 05 00.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer’s instructions.

B. Install manual station with operating handle at 48 inches above finished floor.

C. Install audible and audible/visual notification devices to achieve Code required sound levels as defined in NFPA and ADA Guidelines.

D. Install ceiling mounted visual and audible/visual notification appliances in the center of the space as much as possible, but do not exceed 5 feet in any direction from the center, unless approved by the Engineer, District, or AHJ, prior to rough or installation.

E. Audible/visual notification appliances shall be wall mounted in all common corridors and other areas where ceiling mounted devices are not practical.

F. Ceiling mount visual notification appliances (in rooms/areas open to structure) shall be located at or below lighting level.

G. Install wall mounted visual and audible/visual notification appliances with the bottom of the visual (strobe) lens at 80" above finished floor, or with the top of the visual signal (strobe) lens at 6" below the ceiling (for low ceiling areas), whichever is lower.

H. Install ceiling mounted devices located on structural beams and joists with STI-8170 back plate or approved equivalent. Protect accessible back boxes with bell box or back box skirt or approved equivalent.

I. Install wiring with plenum rated cable. Cable routing shall be perpendicular to or parallel to structural building members and shall utilize a metal bridle ring type support system attached to structural building members only. Mounting cable to other building systems (fire protection, electrical conduit, mechanical ductwork, etc.) or running cable in any fashion other than described, is strictly forbidden. For each device, neatly loop four feet of cable and support inside the nearest bridle ring. Route cables such that a minimum separation of ½" is maintained between Class 1 wire and power-limited fire alarm circuits. Provide separate relay (MR101C or approved equivalent) where 120VAC is required to release fire/smoke dampers, magnetic door holders, or similar. For Notifier devices, barrier CB500 may be installed in place of an additional relay. See paragraph 3.2 below.

    1. For specific limited applications, the visual and audible/visual notification appliances may be installed with the top of the visual signal (strobe) lens at up to 96" above finished floor. Each location must be approved in writing by the Engineer, District, or AHJ, prior to rough-in or installation.
    2. For specific limited applications, the visual and audible/visual notification appliances may be wall mounted, when no suitable ceiling mount location is available. Each location must be approved in writing by the Engineer, District, or AHJ, prior to rough-in or installation.

J. Provide panel breaker locks for all electrical circuits for fire alarm and detection control equipment panels. Fire alarm and detection circuit breaker locks shall be color coded red.

Breaker Locks shall be Garvin Item # UBL1-RED.

K. Provide and install UL listed surge suppressor on 120VAC at the source for fire alarm control units, remote power supplies, amplifiers, and communicators.

L. Mount end-of-line device in box with last device.

M. Mount outlet box for electric door holder to withstand 80 pounds pulling force. Where wall construction is wood or steel frame, utilize Caddy telescopic bracket TSGB16/TSGB24 or approved equivalent.

N. Make conduit and wiring connections to door release devices, duct smoke detectors, smoke/fire dampers, HVAC units, and other applicable devices, furnished under other Sections.

O. Automatic Detector Installation: Conform to NFPA 72.

P. Automatic Duct Detector Installation: Conform to IMC. When patching ducts, utilize steel plates secured by #8 x ½" indented slotted hex washer head type A sheet metal screws and apply mastic which is listed and labeled "181A-M" in accordance with UL 181A. Do not use tape.

Q. Label each device as specified in Section 28 05 00.

R. Fire alarm contractor shall provide up to five (5) fire alarm system programming downloads in his base bid price, to accommodate the required phasing for the project. Fire alarm contractor shall furnish a unit price for one (1) lot of system programming and download for additional system downloads as part of his bid.

S. Maintain supervision of existing sprinkler system at all times. Coordinate transfer with JCSD and engineer of record in writing.

3.2 FIRE ALARM WIRE AND CABLE COLOR CODE

A. Provide fire alarm circuit conductors with insulation color coded as specified in Section 28 05 00.

3.3 FIELD QUALITY CONTROL

A. Test in accordance with NFPA 72, District, State, and Authority Having Jurisdiction (AHJ) fire department requirements. Use District forms for record of completion.

B. Provide forty-eight (48) hours prior notice to the Engineer and District personnel for rough Inspection, prior to installing ceiling tiles or drywall.

C. Provide seven (7) day prior notice to the Engineer and District personnel for scheduled contractor pre-testing of the system.

D. Provide three (3) day prior notice to the Engineer and District personnel for the scheduled Authority Having Jurisdiction (AHJ) testing of the system.

E. Provide three (3) original copies of the District Certificate of Completion Form. One for the District, one for the Authority Having Jurisdiction (AHJ), and one for the facility's Fire Alarm System Logbook. Utilize the standard District form available on the District website

F. Provide two (2) detailed records of the pre-testing of the system: One for the District and one for the facility's Fire Alarm System logbook. Pre-testing record must contain a minimum of the device ID, proper annunciator description, proper functionality of the device (audible/visual notification, HVAC shutdown, etc.), and date of the testing. Records must be typed in numerical order by device address and include a report generated by the fire alarm control panel. Utilize the standard District form available on the District website. Pre-testing records shall be included as part of the Record of Completion.

G. Decibel levels in every room shall be documented on the record drawings. Any rooms exceeding 95dB as measured per NFPA 72 shall be adjusted by the contractor.

H. Provide voltage drop readings for all notification circuits on battery backup.

I. Contractor to provide ear protection for occupants during fire alarm testing.

3.4 MANUFACTURER'S FIELD SERVICES

A. Prepare and start systems.

B. Include services of factory trained and certified technician to supervise installation adjustments, final connections, and system testing.

C. Provide two (2) hard copies and two (2) electronic copies in CD or flash drive format of the final system programming. One set to be delivered to the District Project Manager for the District Central Reporting System (Building Automation) programming, and one set to be left inside the facility's Fire Alarm System logbook.

3.5 DEMONSTRATION

A. Demonstrate normal and abnormal modes of operation and required responses to each.

3.6 TRAINING

A. Provide the services of a factory certified service representative to demonstrate the

system and train Owner's maintenance personnel as specified below.

1. On-Site Training: Provide a minimum of two (2) hours of onsite training of the facility's school staff and Maintenance personal in the basic operations and functionality of the fire alarm system panel, annunciator, and field devices. Review field panel locations, typical device locations, and 120vAC power locations (panels, breakers, and circuits). Demonstrate the various system responses to the field off-normal conditions. Simulate alarm conditions, supervisory conditions, security conditions, trouble conditions, and ground fault conditions of the various field devices. Demonstrate how to reset various building systems (HVAC units, fire doors, security gates, etc.). Provide written instructions of basic system operating instructions behind clear Lexan framed glass, located adjacent to the fire alarm control panel. DO NOT EVER TRAIN SCHOOL STAFF ON HOW TO DISABLE ANY POINTS.
2. Offsite Training: Provide a minimum of eight (8) hours of offsite training of the District's maintenance personnel in the procedures involved in operating, trouble shooting, servicing, programming, and preventive maintenance of the system. The offsite training shall be conducted in a classroom type setting, and programming manuals of the various components of the system. Provide a working (panel and field devices) system demonstration unit; whereby the various system troubleshooting and servicing procedures can be adequately performed in a "hands-on" scenario. This is per project and can acuminate training time from several projects to allow more detailed instruction.

B. Onsite System training shall be completed within six (6) days of completion of the system and Authority Having Jurisdiction (AHJ) test. Offsite System training shall be completed within thirty (30) days of completion of the system and Authority Having Jurisdiction (AHJ) test, unless the District specifically directs an alternate training schedule.

C. Schedule the onsite training with the District at least three (3) days in advance. Schedule the offsite training with the District at least fourteen (14) days in advance.

3.7 FILE FORMATTING

A. Format the UDACT points list as requested by owner.

B. Example Formatting:

Zone	Description		Item	Address	Type
Zone	Served Area/Physical Location	Physical Location (Blank if physical location is in previous column	Smoke/ Heat/ Flow/ Tamper/ CO/ etc.	Address	Supervisory/ Fire Alarm
1	Vestibule 104		Smoke (Photo)	N1L1D2	Fire Alarm
2	Elevator Lobby 105	North	Smoke (Photo)	N1L1D3	Fire Alarm
3	Clinic 103H		Smoke (Photo)	N1L1D4	Fire Alarm
4	ACU-7 Supply	Corr. 103	Sup L (Duct P)	N1L1D5	Supervisory
5	Elevator Mach. Rm. 105A		Heat	N1L1D6	Fire Alarm

Number	Description	Code	Phone llst
1	Power Supply in MDF (N0L1M1)	FRB	Trouble
2	STOR 116 - Smoke (N0L1D2)	FIR	Alarm
4	GYM 120 N.E. - Smoke (N0L1D4)	FIR	Alarm
5	GYM 120 S.E. - Smoke (N0L1D5)	FIR	Alarm
60	GYM SUPPLY - Supervisory (N0L1D62)	SUP	Supervisory
65	BOILER 120 - CO (N0L1D78)	SUP	GAS

Fire Alarm Inspection Report
Record of Completion

District Monitoring Center
303-232-8688

Contact: _____ Date: _____
Report To: _____ Business: _____
Address: _____ Location Inspected: _____
Jurisdiction: _____ Inspector: _____
_____ Phone: _____

INSPECTION TYPE

[ ] Record of Completion [ ] 22 Month Inspection [ ] 11 Month Inspection
[ ] [ ] [ ] Other (Specify):

DACT Type SYSTEM INFORMATION FACP Type

[ ] Stand Alone Dialer (verify all signal types at Dispatch Center)
[ ] Contact ID (verify all signal types at Dispatch Center)
[ ] LAN Card Installed and tested IP Address
[ ] Other (Specify)
DACT Account Number:
DACT Test Time:
DACT Primary Phone #

Manufacturer:
Model #:
Circuit Styles:
Number of Circuits:
Software Rev:
Recovery Flash Drive in Panel [ ] YES [ ] NO
Device List in Panel [ ] YES [ ] NO

ALARM INITIATING DEVICES AND CIRCUIT INFORMATION

# of	Circuit style	Description
		Manual Stations
		Ion Detectors
		Photo Detectors
		Duct Detectors
		Heat Detectors
		Water Flow
		Supervisory Tamper
		Supervisory DACT

SUPERVISORY SIGNAL-INITIATING DEVICES AND CIRCUIT

# of	Circuit	Description
		Fire Pump Power
		Fire Pump Running
		Fire Pump Auto
		Fire Pump\Controller Trouble
		Generator in Auto Position
		Generator or Controller Trouble
		Switch Transfer
		Generator Engine Running

ALARM NOTIFICATION APPLIANCES CIRCUITS

# of	Circuit Style	Description
		Horns
		Strobes
		Horns/Strobes
		Other: (Specify):
# of Alarm Indicating Circuits		
Are Circuits Supervised		[ ] YES [ ] NO
All Circuits tested for silence Function		[ ] YES [ ] NO
Water Flow Horn/Strobe Slaved to flow		[ ] YES [ ] NO

ANNUNCIATOR FUNCTIONAL TEST

Quantity and style (See NFPA 72, Table 3-6) of signaling line circuits connected to system	
Function Buttons disabled	[ ] YES [ ] NO
Power is non-resettable	[ ] YES [ ] NO
Data is Class A labeled Yellow	[ ] YES [ ] NO
All Lights function	[ ] YES [ ] NO
Back Lights function	[ ] YES [ ] NO
Graphic map is in place	[ ] YES [ ] NO
Verify Alarm and Trouble functions	[ ] YES [ ] NO
Knox box installed (6' 5" AFF)	[ ] YES [ ] NO
Knox Box keys and 3 badges update	[ ] YES [ ] NO
Response Point Horn/Strobe function	[ ] YES [ ] NO

PRIOR TO ANY TESTING

Notifications are made:	Yes	No	Who	Time
District Monitoring Center	[ ]	[ ]		
Building Occupants	[ ]	[ ]		
Building Management	[ ]	[ ]		
Other (Specify)	[ ]	[ ]		
AHJ (Notified of any impairments)	[ ]	[ ]		

FIRE ALARM CONTROL PANEL

FACP Location: _____

	Visual Pass / Fail		Functiona l Pass/ Fail		Comments
Control Panel					
Primary Power Supply					
Trouble Signals					
Lamps/LEDs					
Fuses					
Secondary Power Supply					

PRIMARY (Main): Nominal voltage

Over current Protection: Type _____ Amps _____

Location: _____

Panel Number & Breaker: _____

Dedicated Circuit Y ☐ N ☐ Secured Breaker Y ☐ N ☐

Web Interface Card IP Address: Comments

Bosch IP Address:

TROUBLE SIGNALS

Ring Back Feature Pass ☐ Fail ☐ N/A ☐ _____

Disconnect Switches Pass ☐ Fail ☐ N/A ☐ _____

Other Switches Pass ☐ Fail ☐ N/A ☐ _____

Ground-fault Each Conductor Pass ☐ Fail ☐ N/A ☐ _____

SECONDARY (Standby):

Type of Battery _____

Visual Inspection Battery #1 _____ Battery # 2 _____

Installation Date Battery #1 _____ Battery # 2 _____

Volts/Amp-Hr. Rating Battery #1 _____ V _____ AHr Battery #2 _____ V _____ AHr

Metered ***Standby*** Current: _____ Amps

Metered ***Alarm*** Current: _____ Amps

Charger Voltage _____ Volts

Comments

24 Hour Load Test Voltage _____ VDC Pass ☐ Fail ☐ _____

LAMPS/LEDs Comments

Check all LEDs for Illumination Pass ☐ Fail ☐ N/A ☐ _____

FUSES Comments

Remove all fuses check rating Pass ☐ Fail ☐ N/A ☐ _____

Check all fuses for supervisory Pass ☐ Fail ☐ N/A ☐ _____

Emergency or standby systems used as a backup to primary power supply instead of using a secondary power supply:

[ ] Emergency system described in NFPA 70, Article 700

[ ] Legally required standby described in NFPA 70, Article 701

[ ] Optional standby system described in NFPA 70, Article 702, which also meets performance requirements of Article 700/701

INITIATION & NOTIFICATION DEVICES TOTALS (MAIN FACP)

	DEVICE TYPE	Total # of Devices	Total # Tested	Visual Pass / Fail		Functional Pass / Fail				Comments
	Photo									
	Ion									
	Heat									
	Duct									
	Pull Stations									
	Horn Strobe									
	Horn									
	Strobe									
	Outside H/S									

NOTIFICATION DEVICES (MAIN FACP)

CIRCUIT	STYLE	Total # of Devices	Total # Tested	Visual Pass / Fail		Functional Pass / Fail		Circuit Rating Amps	Circuit Amps.	EOL True measured Voltage

COMMUNICATOR CONTROL PANEL

Manufacturer: _____

Model: _____

	Visual Pass / Fail		Functional Pass/ Fail		Comments
Control Panel					
Primary Power Supply					
Trouble Signals					
Lamps/LEDs					
Fuses					
Secondary Power Supply					

PRIMARY (Main): Nominal voltage _____

Overcurrent Protection: Type _____ Amps _____

Location: _____

Panel Number & Breaker: _____

Dedicated Circuit Y ☐ N ☐ Secured Breaker Y ☐ N ☐

TROUBLE SIGNALS				Comments
Power Disconnect Switches	Pass ☐	Fail ☐	N/A ☐	
Other Switches	Pass ☐	Fail ☐	N/A ☐	
Ground-fault Each Conductor	Pass ☐	Fail ☐	N/A ☐	

LAMPS/LEDs				Comments
Check all LEDs for Illumination	Pass ☐	Fail ☐	N/A ☐	

FUSES				Comments
Remove all fuses check rating	Pass ☐	Fail ☐	N/A ☐	
Check all fuses for supervisory	Pass ☐	Fail ☐	N/A ☐	

SECONDARY (Standby):
Type of Battery _____

Visual Inspection Battery #1 _____ Battery # 2 _____
Installation Date Battery #2 _____ Battery # 2 _____
Volts/Amp-Hr. Rating Battery #1 _____ V _____ Ahr Battery # 2 _____ V _____ Amps
Metered ***Standby*** Current: _____ Amps
Metered ***Alarm*** Current: _____ Amps
Charger Voltage _____ Volts

24 Hour Load Test Voltage _____ VDC Pass ☐ Fail ☐ Comments _____

Two Different Digital Alarm Communicator Receiver Telephone Numbers Programmed Into the Digital Alarm Communicator Transmitter. (DACT) Yes ☐ No ☐

Signal	**Yes**	***No***	***N/A***	***Comments***
Alarm Received in 90 Sec.	☐	☐	☐	
Alarm Restore	☐	☐	☐	
Trouble Received in 90 Sec.	☐	☐	☐	
Trouble Restore	☐	☐	☐	
Supervisory	☐	☐	☐	
AC Loss	☐	☐	☐	
AC Restore	☐	☐	☐	
Low Battery	☐	☐	☐	
Low Battery Restore	☐	☐	☐	
Primary Phone Line Loss	☐	☐	☐	
Primary Phone Line Loss Restore	☐	☐	☐	
Secondary Phone Line Loss	☐	☐	☐	

Secondary Phone Line Loss Restore	☐	☐	☐	
Building Automation Response To Alarm	☐	☐	☐	
Building Automation Response To Trouble	☐	☐	☐	

VERIFY DACT PHONE NUMBERS	# 1
	# 2

AUXILIARY POWER SUPPLY

(Use one form for each panel)

Power Supply Name _____

Power Supply Location _____

Power Supply Control _____

	Visual Pass / Fail		Functional Pass/ Fail		Comments
Control Panel					
Primary Power Supply					
Trouble Signals					
Lamps/LEDs					
Fuses					
Secondary Power Supply					

PRIMARY (Main): Nominal voltage _____

Over current Protection: Type _____ Amps _____

Location: _____

Panel Number & Breaker: _____

Dedicated Circuit Y [ ] N [ ] Secured Breaker Y [ ] N [ ]

TROUBLE SIGNALS				Comments
Ring Back Feature	Pass [ ]	Fail [ ]	N/A [ ]	
Disconnect Switches	Pass [ ]	Fail [ ]	N/A [ ]	
Other Switches	Pass [ ]	Fail [ ]	N/A [ ]	
Ground-fault Each Conductor	Pass [ ]	Fail [ ]	N/A [ ]	

LAMPS/LEDs				Comments
Check all LEDs for Illumination	Pass [ ]	Fail [ ]	N/A [ ]	

FUSES				Comments
Remove all fuses check rating	Pass [ ]	Fail [ ]	N/A [ ]	
Check all fuses for supervisory	Pass [ ]	Fail [ ]	N/A [ ]	

SECONDARY (Standby):

Type of Battery _____

Visual Inspection Battery #1 _____ Battery # 2 _____

Installation Date Battery #2 _____ Battery # 2 _____

Volts/Amp-Hr. Rating Battery #1 ____ V ____ AHr Battery # 2 ____ V ____ AHr

Metered ***Standby*** Current: _____ Amps

Metered ***Alarm*** Current: _____ Amps

Charger Voltage _____ Volts Comments

24 Hour Load Test Voltage _____ Volts Pass [ ] Fail [ ] _____

NOTIFICATION DEVICES

CIRCUIT	STYLE	Total # of Devices	Total # Tested	Visual Pass / Fail		Functional Pass / Fail		Circuit Rating Amps	Circuit Amps.	EOL True measured Voltage

COMMENTS:

Recommendations:

Items in need of Immediate Action:

Testing team must use ***Jeffco Schools Alarm Pre-testing and Device Report.XLS*** for inspection and testing of each device.

Notification That Testing is Complete	Yes	No	Who	Time
District Dispatch Center (303-232-8688)	[ ]	[ ]		
Building Occupants	[ ]	[ ]		
Building Management	[ ]	[ ]		
Other (Specify)	[ ]	[ ]		
AHJ (Notified of any impairments Cleared)	[ ]	[ ]		

The Following Did Not Operate Correctly:

System Restored to Normal Operation: **Date:** **Time:**

Recommendations:

Items in need of Immediate Action:

Inspector certifies that this system test and inspection has been performed in accordance with all NFPA standards

Name of Inspector: **Date:** **Time:**

Signature:

Name of Owner or Representative:

Date: **Time:**

Signature:

PRINT THIS SECTION FOR PRE-TESTING REPORT										
			Visual Inspection							
Address	Description	%	Location	Label	Ring	Dirty	Other	Functional	Pass	Fail
			OK	OK	OK			OK	X	

END OF SECTION 28 46 00

28 46 50 - Fire Alarm Voice Evacuation System – August 2021

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

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

B. Fire Alarm manufacturer shall be required to provide Jefferson County Public Schools a licensed copy of any software required to download, modify and maintain the system. Programming access codes shall not be given to the District until after the warranty period.

1.2 SCOPE

A. The work covered by this Section of the Specification shall include all labor, equipment, materials, and services to furnish and install a complete emergency communication system of the zoned, non-coded general alarm type. It shall be complete with all necessary hardware, software, and memory specifically tailored for this installation. The system shall consist of, but not be limited to, the following:

1. Digital Voice Command
2. Digital amplifiers
3. Local paging microphone
4. Access control interface
5. Gymnasium sound system interface
6. Auditorium sound system and lighting interface
7. Indoor selectable output speaker strobes and dual voltage evacuation speakers
8. Outdoor Selectable output loudspeakers.

1.3 RELATED SECTIONS

A. Section 07 80 00: Fire and Smoke Protection

B. Section 08 71 00: Door Hardware

C. Section 21 13 13: Wet Pipe Sprinkler Systems

D. Section 23 33 00: Air Duct Accessories

E. Section 26 05 00: Common Work Results for Electrical Systems

F. Section 26 05 19: Low Voltage Electrical Power Conductors and Cables

G. Section 26 05 26: Grounding and Bonding for Electrical Systems

H. Section 26 05 29: Hangers and Supports for Electrical Systems

I. Section 26 05 33: Raceways and Boxes for Electrical Systems

J. Section 26 05 53: Identification for Electrical Systems

K. Division 27: Communications

L. Jefferson County School District Technical Details Drawings Volume II

M. Section 28 05 00: Common Work Results for Electronic Life Safety and Security

N. Section 28 46 00: Fire Alarm and Detection Systems

1.4 APPLICABLE CODES AND STANDARDS

A. Materials and workmanship shall conform to the latest issue of all industry standards, publications, or Regulations referenced in this Section, and with the following Codes and Standards, as applicable:

1. All equipment shall be listed and classified by Underwriters Laboratories, under the following standards:
   a. Signaling Systems
   b. UL 464 – Audible Signal Applications
   c. UL 864 – Control Units for Fire Protective Signaling Systems
   d. UL 1480 - Speakers for Fire Alarm and Signaling Systems, Including Accessories
   e. UL 1971 - Standard for Signaling Devices for the Hearing Impaired
   f. NFPA 72 - National Fire Alarm and Signaling Code

B. The vendor shop drawings shall comply with Jefferson County School District (JCSD) Technical Guidelines and Technical Details Drawings - Volume II.

C. The contractor installation shall comply with Jefferson County School District Technical Guidelines and Technical Details Drawings - Volume II.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. The JCSD Fire Alarm System Voice Evacuation Design Criteria shall be used to communicate compliance with NFPA and JCSD standards to the AHJ. Acoustically Distinguishable Spaces and Fire Alarm System Interfaces shall be incorporated into the Plans submitted to Local AHJ's.

B. The design criteria matrix indicating expected dBA levels and CIS scores shall be incorporated into the Plans submitted to Local AHJ's.

C. Speakers shall be set for 25volt operation and adjusted or tapped as follows unless otherwise recommended by the vendor to meet Acoustically Distinguishable Space requirements:

1. Hall speakers: 1 watt
2. Room speakers: 1 watt
3. Bathroom speakers: 0.25 watt
4. Gym speakers: 7 ½ / 2 watts
5. Cafeteria speakers: 2 watts
6. Outside speakers: 7 ½ / 1.8 watts

D. Size amplifiers to accommodate maximum speaker tap settings for each device.

E. Furnish exterior weatherproof strobes with amber lenses at card reader entrances.

1. Mount 10'AFF.
2. Provide permanent placard adjacent to strobe that reads "DO NOT ENTER WHEN FLASHING". Placard background shall match building color with contrasting 6 inch letters.

2.2 FIRE ALARM SYSTEM SEQUENCE OF OPERATION

A. Audible Alarm Notification: By voice evacuation and tone signals on loudspeakers in areas as indicated on drawings.

B. Automatic Voice Evacuation Sequence:

1. The audio alarm signal shall consist of two cycles of the temporal code alarm tone followed by an automatic digital voice message. At the end of the voice message, the alarm tone shall resume. This sequence shall sound continuously until the "Alarm Silence" switch is activated.
2. All audio operations shall be activated by the system software so that any required future changes can be facilitated by authorized personnel without any component rewiring or hardware additions.

C. The voice evacuation system shall a minimum of 16 pre-recorded messages and 8 custom recorded messages to be defined by Jefferson County Public Schools in a format similar to the following:

1. Fire Evacuation:
   Label Identification/Color – "FIRE"/Red

Alert Tone – Two cycles of the temporal code 3 pattern, then the evacuation message, then two more cycles of the temporal code 3 pattern.
Message [if available] [female voice] – "Attention, Attention. A fire emergency has been reported in the building. Please leave the building using the nearest exit, immediately."
NOTE: The temporal code 3 pattern shall only be used for fire evacuation messages.

2. Emergency Evacuation
   Label Identification/Color – "EMERGENCY"/Orange
   Alert Tone – Fast whoop sound is played for 5 seconds. Follow same pattern as above (Tone, tone, message, message, repeat).
   Message [if available] [female voice] – "Emergency Evacuation. An emergency has been reported in the building. Please leave the building using the nearest exit, immediately."
3. Shelter:
   Label Identification/Color – "SHELTER"/Purple
   Alert Tone – 100kHz steady tone is played for 5 seconds.
   Message – "Take shelter."
4. Label Identification/Color – "ALL CLEAR"/Green
   Alert Tone – 3 chimes.
   Message – "May I have your attention please. The emergency has now ended. An "All Clear" has been given. Please resume normal duties. Thank you for your cooperation."
5. Carbon Monoxide
   Label Identification/Color– "CARBON MONOXIDE"/Light Green
   Alert Tone – Two cycles of temporal 4 pattern
   Message [if available] [female voice] – "Carbon Monoxide detected, please evacuate the building, Carbon Monoxide detected, please evacuate the building." Repeat until Silence.
6. Temporal Code dBA test tone –
   Label Identification/Color – "TEST TONE"/Brown
   Alert Tone – Continuous Temporal Code

D. Paging Interface:

   1. Provide a relay to deactivate/shunt the Bogen paging system during an active fire alarm.

E. Gymnasium sound system interface:

   1. Provide low level audio interface with the gymnasium sound system during an active fire alarm.

F. Auditorium sound system and lighting interface

1. Provide a relay to activate the auditorium lights during an active fire alarm.
2. Provide low level audio interface with the auditorium sound system during an active fire alarm.

G. Voice Paging

1. The system shall be configured to allow voice paging. Upon activation of any speaker manual control switch, the alarm tone shall be sounded over all speakers in that group.
2. The control panel operator shall be able to make announcements via the push-to-talk paging microphone over the pre-selected speakers.
3. Facility for total building paging shall be accomplished by the means of an "All Call" switch.
4. Paging zones shall be categorized:
    a. By level
    b. Academic (classrooms, hallways, administration, restrooms)
    c. Commons (Gym, Cafeteria, Auditorium, stage)
    d. Exterior
    e. As directed on contract documents

2.3 FIRE ALARM INTEGRATED AUDIO/VISUAL EVACUATION SYSTEMS

A. All notification appliances shall be UL Listed for Fire Protective Service.

B. All visual notification appliances (strobes) or combination appliances with strobes shall be capable of providing the “Equivalent Facilitation” allowed under the Americans with Disabilities Act Accessibilities Guidelines (ADAAG), and shall be UL 1971 listed.

C. Strobes: Provide standard synchronized UL 1971, 24vDC white strobe unit with 15cd, 30cd, 60cd, 75cd, 95cd, 115cd, 135cd, 150, 177 or 185cd flash outputs, as shown on the contract documents. The strobes shall have their lens markings oriented for wall mounting or ceiling mounting, shall be labeled “ALERT”, shall be provided with screw terminals for wiring interconnect, and shall mount to a standard electrical box or trim ring. Provide weatherproof wall box for wet location mounting. Locate strobes per NFPA 72 and ADA guidelines.

D. SPEAKERS & COMBINATION SPEAKER/STROBES

3. Speaker/Speaker Strobes: Provide 25.0 or 70.7 Vrms white UL 1480 speaker approved for fire protective signaling systems., with a selectable low or high dBA output, capable of producing a sound rating of 97dBA, and shall have a selectable speaker taps for 1/4W, 1/2W, 1W and 2W. Both selectable features shall be capable of being changed. Speakers that cannot modify selectable settings shall not be acceptable. The speakers and speaker/strobes shall be provided with screw terminals for wiring interconnect, and shall mount to a deep electrical box or trim ring. Provide integral, 24vDC.Synchronized UL 1971 strobe unit with 15cd, 30cd,

60cd, 75cd, 95cd, 110cd, or 115cd flash outputs, as shown on the contract documents. Provide weatherproof device and back box, where required.

2. Synchronized UL 1971 strobe unit with 15cd, 30cd, 60cd, 75cd, 95cd, 110cd, or 115cd flash outputs, as shown on the contract documents. The horn/strobes shall have their lens markings oriented for wall mounting or ceiling mounting. Provide weatherproof device and back box, where required. Locate horns and horn/strobes per NFPA 72 and ADA guidelines.

3. The supervised horn loudspeaker shall be a STH-15S/STH-15SR or approved equal. The horn shall be weather resistant and constructed of heavy gauge, treated aluminum. The horn shall be able to operate within any ambient temperature environment ranging from 66 degrees C (150°F) to -35 degrees C (-30°F). The horn shall be a double reentrant type with a 15 watt RMS audio power rated compression driver producing a UL rated 102 dB measured at 15 watts at 10 feet. The horn shall have an impedance selection via a 7 position switch of 5000, 2500, 1300, 666, 333, 89 & 45. Power taps shall be available at 2.0, 4.0, 7.5 & 15 watts for the 100 volt line, .9, 1.8, 3.8, 7.5 & 15 watts for the 70 volt line and .48, .94, 1.8, 7.5 & 15 watts for the 25 volt line. Each power tap shall have a 3dB incremental rating. The frequency response range shall be 400 - 14000 Hz. The horn shall have a dispersion of 70 degrees. The horn assembly shall be furnished with a mounting bracket that allows adjustment on either a vertical or horizontal plane with a single locking pin and include provisions for mounting, banding or strapping. Wiring terminals shall be fully enclosed and a vandal-resistant adapter cover shall provide connection protection for cable or conduit. The horn shall be 7.875” W x 8.75” H x 9.313” D (200 x 222 x 237 mm). The horn shall be finished in gray (STH-15S) or red (STH-15SR) baked epoxy.

4. Speakers, Strobes and Speaker/strobes shall be white and labeled “ALERT”.

E. Voice Alarm: Provide an emergency communication system, integral with the FACP, including voice alarm system components, microphones, amplifiers, and tone generators. Features include:

1. Amplifiers comply with UL 1711, "Amplifiers for Fire Protective Signaling Systems." Amplifiers shall provide an onboard local mode temporal coded horn tone as a default backup tone. Test switches on the amplifier shall be provided to test and observe amplifier backup switchover. Each amplifier shall communicate to the host panel amplifier and NAC circuit voltage and current levels for display on the user interface.

2. Dual alarm channels permit simultaneous transmission of different announcements to different zones automatically or by use of the central control microphone. All announcements are made over dedicated, supervised communication lines. All risers shall support Class B wiring for each audio channel.

3. Emergency voice communication audio controller module shall provide up to 32 minutes of message memory for digitally stored messages. Provide supervised connections for master microphone and up to 5 remote microphones.

4. Status annunciator indicating the status of the various voice alarm speaker zones and the status of fire fighter telephone two-way communication zones.

F. Distributed Module Operation: FACP shall be capable of allowing remote location of the following modules; interface of such modules shall be through a Style 4 (Class B) supervised serial communications channel (SLC):

1. Amplifiers, voice and telephone control circuits
2. Addressable Signaling Line Circuits
3. Initiating Device Circuits
4. Notification Appliance Circuits
5. Auxiliary Control Circuits
6. Graphic Annunciator LED/Switch Control Modules

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install audible and audible/visual notification devices to achieve Code required sound levels as defined in NFPA and ADA Guidelines and Intelligibility levels of .8CIS.

C. Install ceiling mounted visual and audible/visual notification appliances in the center of the space as much as possible, but do not exceed 5 feet in any direction from the center, unless approved by the Engineer, District, or AHJ, prior to rough or installation.

D. Audible/visual notification appliances shall be wall mounted in all common corridors and other areas where ceiling mounted devices are not practical.

E. Install wall mounted visual and audible/visual notification appliances with the bottom of the visual (strobe) lens at 80' above finished floor, or with the top of the visual signal (strobe) lens at 6" below the ceiling (for low ceiling areas), whichever is lower.

F. Install ceiling mounted devices located on structural beams and joists with STI-8170 back plate or approved equivalent. Protect accessible back boxes with bell box or back box skirt or approved equivalent.

1. For specific limited applications, the visual and audible/visual notification appliances may be installed with the top of the visual signal (strobe) lens at up to 96"

above finished floor. Each location must be approved in writing by the Engineer, District, or AHJ, prior to rough-in or installation.

2. For specific limited applications, the visual and audible/visual notification appliances may be wall mounted, when no suitable ceiling mount location is available. Each location must be approved in writing by the Engineer, District, or AHJ, prior to rough-in or installation.

G. Mount end-of-line device in box with last device.

H. Speaker and strobe circuits shall be paired such that strobe circuit runs will have a respective speaker circuit.

END OF SECTION 28 46 50