

SPECIFICATIONS  
SFA Project No. 21080

# **Donlon Fire Alarm Donlon Elementary School**

Pleasanton

Unified School District



2155 S. Bascom Ave. Suite 200  
Campbell, California 95008  
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DSA File No. 1-32  
DSA Application No. 01-119913

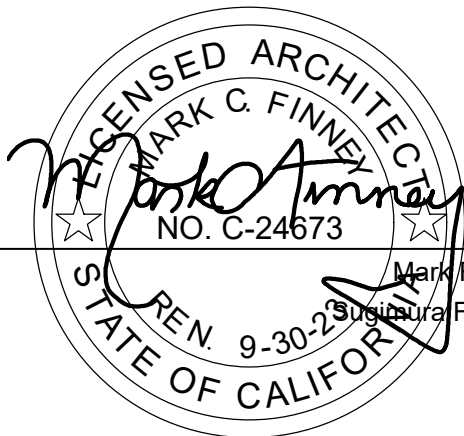
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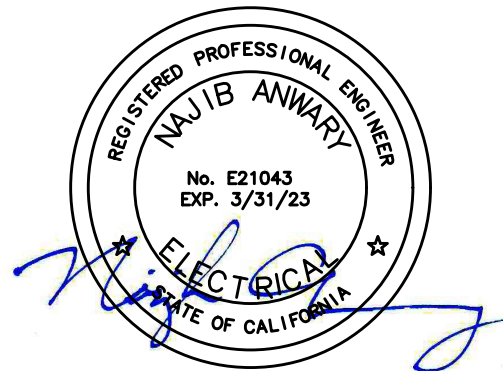
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Division of the State Architect  
California Department of General Services



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Mark Finney, Architect  
Sugimura Finney Architects



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Najib Anwary, Electrical Engineer and Fire Alarm Designer  
Aurum Consulting Engineer



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Donlon Fire Alarm  
Donlon Elementary School  
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## **SECTION 26 05 00**

### **GENERAL ELECTRICAL REQUIREMENTS**

#### **PART 1 – GENERAL**

##### **1.01 Description of Work:**

- A. The work of this Section consists of providing all required labor, supervision, materials and equipment to satisfactorily complete all electrical installations that are shown on the Drawings, included in these specifications, or otherwise needed for a complete and fully operating facility.
- B. Furnish and install all required in-place equipment, conduits, conductors, cables and any miscellaneous materials for the satisfactory interconnection and operation of all associated electrical systems.

##### **1.02 Related Work:**

- A. This Section provides the basic Electrical Requirements which supplement the General Requirements of Division 01 and apply to all Sections of Division 26.

##### **1.03 Submittals:**

- A. As specified in Division 01. Submit to the Architect shop drawings, manufacturer's data and certificates for equipment, materials and finish, and pertinent details for each system specified. Information to be submitted includes manufacturer's descriptive literature of cataloged products, equipment, drawings, diagrams, performance and characteristic curves as applicable, test data and catalog cuts. Obtain written approval before procurement, fabrication, or delivery of the items to the job site. Partial submittals are not acceptable and will be returned without review. Furnish manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable Federal, Industry and Technical Society Publication References, and years of satisfactory service of each item required to establish contract compliance. Photographs of existing installations and data submitted in lieu of catalog data are not acceptable and will be returned without approval.
- B. Organize submittals for equipment and items related to each specification section together as a package.
- C. Proposed substitutions of products will not be reviewed or approved prior to awarding of the Contract.
- D. Substitutions shall be proven to the Architect or Engineer to be equal or superior to the specified product. Architect's decision is final. The Contractor shall pay all costs incurred by the Architect and Engineer in reviewing and processing any proposed substitutions whether or not a proposed substitution is accepted.
- E. If a proposed substitution is rejected, the contractor shall furnish the specified product at no increase in contract price.
- F. If a proposed substitution is accepted, the contractor shall be completely responsible for all dimensional changes, electrical changes, or changes to other work which are a result of the substitution. The accepted substitution shall be made at no additional cost to the owner or design consultants.

1.04 Quality Assurance:

- A. Codes: All electrical equipment and materials, including installation and testing, shall conform to the latest editions following applicable codes:
  - 1. California Electrical Code (CEC).
  - 2. Occupational Safety and Health Act (OSHA) standards.
  - 3. All applicable local codes, rules and regulations.
  - 4. Electrical Contractor shall possess a C-10 license and all other licenses as may be required. Licenses shall be in effect at start of this contract and be maintained throughout the duration of this contract.
- B. Variances: In instances where two or more codes are at variance, the most restrictive requirement shall apply.
- C. Standards: Equipment shall conform to applicable standards of American National Standards Institute (ANSI), Electronics Industries Association (EIA), Institute of Electrical and Electronics Engineers (IEEE), and National Electrical Manufacturers Association (NEMA).
- D. Underwriter Laboratories (UL) listing is required for all equipment and materials where such listing is offered by the Underwriters Laboratories. Provide service entrance labels for all equipment required by the NEC to have such labels.
- E. The electrical contractor shall guarantee all work and materials installed under this contract for a period of one (1) year from date of acceptance by owner.
- F. All work and materials covered by this specification shall be subject to inspection at any and all times by representatives of the owner. Work shall not be closed in or covered before inspection and approval by the owner or his representative. Any material found not conforming with these specifications shall, within 3 days after being notified by the owner, be removed from premises; if said material has been installed, entire expense of removing and replacing same, including any cutting and patching that may be necessary, shall be borne by the contractor.

1.05 Contract Documents:

- A. Drawings and Specifications:
  - 1. In the case of conflict between the drawings and specifications, the specifications shall take precedence.
  - 2. Drawings and specifications are intended to comply with all law, ordinances, rules and regulations of constituted authorities having jurisdiction, and where referred to in the Contract Documents, said laws, ordinance, rules and regulations shall be considered as a part of said Contract Documents within the limits specified. The Contractor shall bear all expenses of correcting work done contrary to said laws, ordinance, rules and regulations if the Contractor knew or should have known that the work as performed is contrary to said laws, ordinances, rules and regulations and if the Contractor performed same (1) without first consulting the Architect for further instructions regarding said work and/or (2) disregarded the Architect's instructions regarding said work.

- B. Drawings: The Electrical Drawings shall govern the general layout of the completed construction.
1. Locations of equipment, panels, pullboxes, conduits, stub-ups, ground connections are approximate unless dimensioned; verify locations with the Architect prior to installation.
  2. Review the Drawings and Specification Divisions of other trades and perform the electrical work that will be required for those installations.
  3. Should there be a need to deviate from the Electrical Drawings and Specifications, submit written details and reasons for all changes to the Architect for approval.
  4. The general arrangement and location of existing conduits, piping, apparatus, etc., is approximate. The drawings and specifications are for the assistance and guidance of the contractor, exact locations, distances and elevations are governed by actual field conditions. Accuracy of data given herein and on the drawings is not guaranteed. Minor changes may be necessary to accommodate work. The contractor is responsible for verifying existing conditions. Should it be necessary to deviate from the design due to interference with existing conditions or work in progress, claims for additional compensation shall be limited to those for work required by unforeseen conditions as determined by the Architect.
  5. All drawings and divisions of these specifications shall be considered as whole. The contractor shall report any apparent discrepancies to the Architect prior to submitting bids.
  6. The contractor shall be held responsible to have examined the site and compared it with the specifications and plans and to have satisfied himself as to the conditions under which the work is to be performed. He shall be held responsible for knowledge of all existing conditions whether or not accurately described. No subsequent allowance shall be made for any extra expense due to failure to make such examination.

1.06 Closeout Submittals:

- A. Manuals: Furnish manuals for equipment where manuals are specified in the equipment specifications or are specified in Division 01.

1.07 Coordination:

- A. Coordinate the electrical work with the other trades, code authorities, utilities and the Architect.
- B. Provide and install all trenching, backfilling, conduit, pull boxes, splice boxes, etc. for all Utility Company services to the locations indicated on the Drawings. All materials and construction shall be in accordance with the requirements for all the Utility Companies. Prior to performing any work, the Electrical Contractor shall coordinate with the various Utility Companies and obtain utility company engineering drawings. Verify that all such work and materials shown on the Drawings are of sufficient sizes and correctly located to provide services on the site. The Electrical Contractor shall verify with all the Utility Companies that additional contractor furnished and installed work is not required. If additional work, materials, or changes are required by any of the Utility Companies, the Electrical Contractor shall advise the Architect of such changes and no further work shall then be performed until instructed to do so by the Architect. The Electrical Contractor shall coordinate with the various Utility Companies to schedule inspections and to obtain service connections.

- C. The Electrical Contractor shall schedule all utility work necessary for utility inspections, connections, cable installation, etc. for the new electrical service to meet the construction schedule.
- D. Utility Company charges shall be paid by the Owner.
- E. Contractor shall pay all inspection and other applicable fees and procure all permits necessary for the completion of this work.
- F. Where connections must be made to existing installations, properly schedule all the required work, including the power shutdown periods.
- G. When two trades join together in an area, make certain that no electrical work is omitted.

1.08 Job Conditions:

- A. Operations: Perform all work in compliance with Division 01.
  - 1. Keep the number and duration of power shutdown periods to a minimum.
  - 2. Show all proposed shutdowns and their expected duration on the construction schedule. Schedule and carry out shutdowns so as to cause the least disruption to operation of the Owner's facilities.
  - 3. Carry out shutdown only after the schedule has been approved, in writing, by the owner. Submit power interruption schedule 15 days prior to date of interruption.
- B. Construction Power: Unless otherwise noted in Division 01 of these specifications, contractor shall make all arrangements and provide all necessary facilities for temporary construction power [from the owner's on site source. Energy costs shall be paid for by the Owner.] [to the site. Energy costs shall be paid by the General Contractor.]
- C. Storage: Provide adequate storage for all equipment and materials which will become part of the completed facility so that it is protected from weather, dust, water, or construction operations.

1.09 Damaged Products:

- A. Notify the Architect in writing in the event that any equipment or material is damaged. Obtain approval from the Architect before making repairs to damaged products.

1.10 Locations:

- A. General: Use equipment, materials and wiring methods suitable for the types of locations in which they are located.
- B. Dry Locations: All those indoor areas which do not fall within the definition below for Wet Locations and which are not otherwise designated on the Drawings.
- C. Wet Locations: All locations exposed to the weather, whether under a roof or not, unless otherwise designated on the Drawings.

1.11 Safety and Indemnity:

- A. The Contractor is solely and completely responsible for conditions of the job site including safety of all persons and property during performance of the work. This requirement will apply continually and not be limited to normal working hours. The contractor shall provide and maintain throughout the work site proper safeguards including, but not limited to, enclosures, barriers, warning signs, lights, etc. to prevent accidental injury to people or damage to property.
- B. No act, service, drawing review or construction review by the Owner, the Engineer or their Consultants is intended to include reviews of the adequacy of the Contractors safety measures in or near the construction site.
- C. The Contractor performing work under this Division of the Specifications shall hold harmless, indemnify, and defend the Owner, the Engineer, their consultants, and each of their officers, agents and employees from any and all liability claims, losses, or damage arising out of or alleged to arise from bodily injury, sickness, or death of a person or persons and for all damages arising out of injury to or destruction of property arising directly or indirectly out of or in connection with the performance of the work under this Division of the Specifications, and from the Contractor's negligence in the performance of the work described in the construction contract documents, but not including liability that may be due to the sole negligence of the Owner, the Engineer, their Consultants or their officers, agents and employees.
- D. If a work area is encountered that contains hazardous materials, the contractor is advised to coordinate with the owner and it's abatement consultant for abatement of hazardous material by the Owner's Representative. "Hazardous materials" means any toxic substance regulated or controlled by OSHA, EPA, State of California or local rules, regulations and laws. Nothing herein shall be construed to create a liability for Aurum Consulting Engineers regarding hazardous materials abatement measures, or discovery of hazardous materials.

1.12 Access Doors:

- A. The contractor shall install access panels as required where floors, walls or ceilings must be penetrated for access to electrical, control, fire alarm or other specified electrical devices. The minimum size panel shall be 14" x 14" in usable opening. Where access by a service person is required, minimum usable opening shall be 18" x 24".
- B. All access doors installed lower than 7'-0" above finished floor and exposed to public access shall have keyed locks.
- C. Where specific information or details relating to access panels differ from Division 26 paragraph 1.12 of these specifications, or shown on the electrical drawings and details or under other Divisions of work, those requirements shall supersede these specifications.

1.13 Arc Flash:

- A. The contractor shall install a clearly visible arc flash warning to the inside door of all panelboards and industrial control panels, as well as to the front of all switchboards and motor control centers that are a part of this project.
- B. The warning shall have the following wording: line 1 "WARNING" (in large letters), line 2 "Potential Arc Flash Hazard" (in medium letters), line 3 & 4 "Appropriate Personal Protective Equipment and Tools required when working on this equipment".

1.14 Emergency Boxes:

- A. All boxes and enclosures for emergency circuits shall be permanently marked with a readily visible red spray painted mark.

PART 2 - PRODUCTS

2.01 Standard of Quality:

- A. Products that are specified by manufacturer, trade name or catalog number establish a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are established to be equal to the specified product and approved by the Architect prior to installation.
- B. Material and Equipment: Provide materials and equipment that are new and are current products of manufacturers regularly engaged in the production of such products. The standard products shall have been in satisfactory commercial or industrial use for two years prior to bid opening. The two-year period includes use of equipment and materials of similar size under similar circumstances. For uniformity, only one manufacturer will be accepted for each type of product.
- C. Service Support: Submit a certified list of qualified permanent service organizations including their addresses and qualification for support of the equipment. These service organizations shall be convenient to the equipment installation and able to render service to the equipment on a regular and emergency basis during the warranty period of the contract.
- D. Manufacturer's Recommendations: Where installation procedures are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendation shall be cause for rejection of the equipment or material.

2.02 Nameplates:

- A. For each piece of electrical equipment, provide a manufacturer's nameplate showing his name, location, the pertinent ratings, the model designation, and shop order number.
- B. Identify each piece of equipment and related controls with a rigid laminated engraved plastic nameplate. Unless otherwise noted, nameplates shall be melamine plastic 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be 0.5 by 2.5 inches unless otherwise noted. Where not otherwise specified, lettering shall be a minimum of 0.25 inch high normal block style. Engrave nameplates with the inscriptions indicated on the Drawings and, if not so indicated, with the equipment name. Securely fasten nameplates in place using two stainless steel or brass screws.

2.03 Fasteners:

- A. Fasteners for securing equipment to walls, floors and the like shall be either hot-dip galvanized after fabrication or stainless steel.

2.04 Finish requirements:

- A. Equipment: Refer to each electrical equipment section of these Specifications for painting requirements of equipment enclosures. Repair any final paint finish which has been damaged or is otherwise unsatisfactory, to the satisfaction of the Architect.
- B. Wiring System: In finished areas, paint all exposed conduits, boxes and fittings to match the color of the surface to which they are affixed.

### PART 3 - EXECUTION

#### 3.01 Workmanship:

- A. Ensure that all equipment and materials fit properly in their installation.
- B. Perform any required work to correct improperly fit installation at no additional expense to the owner.
- C. All electrical equipment and materials shall be installed in a neat and workmanship manner in accordance with the "NECA-1 Standard Practices for Good Workmanship in Electrical Contracting". Workmanship of the entire job shall be first class in every respect.

#### 3.02 Equipment Installations:

- A. Provide the required inserts, bolts and anchors, and securely attach all equipment and materials to their supports.
- B. Do all the cutting and patching necessary for the proper installation of work and repair any damage done.
- C. Earthquake restraints: all electrical equipment, including conduits over 2 inches in diameter, shall be braced or anchored to resist a horizontal force acting in any direction as per CBC Section 1616A Title 24, part 2 and ASCE7-10, Sections 13.3 and 13.6 and Table 13.6-1.
- D. Structural work: All core drilling, bolt anchor insertion, or cutting of existing structural concrete shall be approved by a California registered structural consulting engineer prior to the execution of any construction. At all floor slabs and structural concrete walls to be drilled, cut or bolt anchors inserted, the contractor shall find and mark all reinforcing in both faces located by means of x-ray, pach-ometer, or prof-ometer. Submit sketch showing location of rebar and proposed cuts, cores, or bolt anchor locations for approval.

#### 3.03 Field Test:

- A. Test shall be in accordance with Acceptance testing specifications issued by the National Electrical Testing Association (NETA).
- B. Perform equipment field tests and adjustments. Properly calibrate, adjust and operationally check all circuits and components, and demonstrate as ready for service. Make additional calibration and adjustments if it is determined later that the initial adjustments are not satisfactory for proper performance. Perform equipment field test for equipment where equipment field tests are specified in the equipment Specifications. Give sufficient notice to the Architect prior to any test so that the tests may be witnessed.

- C. Provide instruments, other equipment and material required for the tests. These shall be of the type designed for the type of tests to be performed. Test instrument shall be calibrated by a recognized testing laboratory within three months prior to performing tests.
- D. Operational Tests: Operationally test all circuits to demonstrate that the circuits and equipment have been properly installed and adjusted and are ready for full-time service. Demonstrate the proper functioning of circuits in all modes of operation, including alarm conditions.
- E. Re-testing will be required for all unsatisfactory tests after the equipment or system has been repaired. Re-test all related equipment and systems if required by the Architect. Repair and re-test equipment and systems which have been satisfactorily tested but later fail, until satisfactory performance is obtained.
- F. Maintain records of each test and submit five copies to the Architect when testing is complete. All tests shall be witnessed by the Architect. These records shall include:
  - 1. Name of equipment tested.
  - 2. Date of report.
  - 3. Date of test.
  - 4. Description of test setup.
  - 5. Identification and rating of test equipment.
  - 6. Test results and data.
  - 7. Name of person performing test.
  - 8. Owner or Architect's initials.
- G. Items requiring testing shall be as noted in the additional electrical sections of these specifications.

#### 3.04 Cleaning Equipment:

- A. Thoroughly clean all soiled surfaces of installed equipment and materials.

#### 3.05 Painting of Equipment:

- A. Factory Applied: Electrical equipment shall have factory applied painting system which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test and the additional requirements specified in the technical section.
- B. Field Applied: Paint electrical equipment as required to match finish of adjacent surfaces.

#### 3.06 Records:

- A. Maintain one copy of the contract Drawing Sheets on the site of the work for recording the "as built" condition. After completion of the work, the Contractor shall carefully mark the work as

actually constructed, revising, deleting and adding to the Drawing Sheets as required. The following requirements shall be complied with:

1. Cable Size and Type: Provide the size and type of each cable installed on project.
2. Substructure: Where the location of all underground conduits, pull boxes, stub ups and etc. where are found to be different than shown, carefully mark the correct location on the Drawings. Work shall be dimensioned from existing improvements.
3. Size of all conduit runs.
4. Routes of concealed conduit runs and conduit runs below grade.
5. Homerun points of all branch circuit.
6. Location of all switchgear, panels, MCC, lighting control panels, pullcans, etc.
7. Changes made as a result of all approved change orders, addendums, or field authorized revisions.
8. As Builds: At the completion of the Work the Contractor shall review, certify, correct and turn over the marked up Drawings to the Architect for his use in preparing "as built" plans.
9. As built Drawings shall be delivered to the Architect within ten (10) days of completion of construction.

3.07 Clean Up:

- A. Upon completion of electrical work, remove all surplus materials, rubbish, and debris that accumulated during the construction work. Leave the entire area neat, clean, and acceptable to the Architect.

3.08 Mechanical and Plumbing Electrical Work:

- A. The requirements for electrical power and/or devices for all mechanical and plumbing equipment supplied and/or installed under this Contract shall be coordinated and verified with the following:
  1. Mechanical and Plumbing Drawings.
  2. Mechanical and Plumbing sections of these Specifications.
  3. Manufacturers of the Mechanical and Plumbing equipment supplied.
- B. The coordination and verification shall include the voltage, ampacity, phase, location and type of disconnect, control, and connection required. Any changes that are required as a result of this coordination and verification shall be a part of this Contract.
- C. The Electrical Contractor shall furnish and install the following for all mechanical and plumbing equipment:
  1. Line voltage conduit and wiring.
  2. Disconnect switches.
  3. Manual line motor starters.

- D. Automatic line voltage controls and magnetic starters shall be furnished by the Mechanical and/or Plumbing Contractor and installed and connected by the Electrical Contractor. When subcontracted for by the Mechanical and/or Plumbing Contractor, all line voltage control wiring installed by the Electrical Contractor shall be done per directions from the Mechanical and/or Plumbing Contractor.
- E. All low voltage control wiring for Mechanical and Plumbing equipment shall be installed in conduit. Furnishing, installation and connection of all low voltage conduit, boxes, wiring and controls shall be by the Mechanical and/or Plumbing Contractor.
- F. Disconnects (Motor And Circuit)
  - 1. Disconnect switches shall be as manufactured by ITE- Siemens, General Electric or Square D.
- G. Disconnects (Motor: Fused):
  - 1. Disconnect switches shall be provided and located at all motors.
  - 2. Switches for three-phase motors shall be heavy-duty, horsepower rated three-pole, and surface mounted except as noted on drawings.
  - 3. Switches containing more than three poles shall be as specified on the drawings.
  - 4. Switches for single-phase, fractional horsepower motors shall be heavy-duty, horsepower rated.
  - 5. Switches shall be horsepower rated.
- G. Manual motor starters, where required, shall have toggle type operators with pilot light and melting alloy type overload relays, SQUARE D COMPANY, Class 2510, Type FG-1P (surface) or Type FS-1P (flush) or ITE, WESTINGHOUSE or GENERAL ELECTRIC equal.

END OF SECTION

## **SECTION 26 05 19**

### **LINE VOLTAGE WIRE AND CABLE**

#### **PART 1 - GENERAL**

##### **1.01 Description of Work:**

- A. The work of this Section consists of providing all wire and cable rated 600 volts or less, including splices and terminations, as shown on the Drawings and as described herein.

##### **1.02 Related Work:**

- A. See the following Specification Section for work related to the work in this Section:
  - 1. 26 05 42 Conduits, Raceways and Fittings.
  - 2. 26 05 33 Junction and Pull Boxes.

##### **1.03 Quality Assurance**

- A. Field tests shall be performed as specified in paragraph 3.04 of this Section.

#### **PART 2 - PRODUCTS**

##### **2.01 Conductors:**

- A. Conductors shall be copper, type THHN/THWN/MTW oil and gasoline resistant, 600 volt rated insulation.
- B. Conductors shall be stranded copper.
- C. Minimum power and control wire size shall be No. 12 AWG unless otherwise noted.
- D. All conductors used on this Project shall be of the same type and conductor material.

##### **2.02 Cables:**

- A. All individual conductors shall be copper with type THHN/THWN, 600 volt rated insulation.
- D. Insulation Marking - All insulated conductors shall be identified with printing colored to contrast with the insulation color.
- E. Color Coding - As specified in paragraph 3.03.
- F. Special Wiring - Where special wiring is proposed by an equipment manufacturer, submit the special wiring requirements to the Owner's Representative and, if approved, provide same. Special wire shall be the type required by the equipment manufacturer.
- G. Other Wiring - Wire or cable not specifically shown on the Drawings or specified, but required, shall be of the type and size required for the application and as approved by the Owner's Representative.
- H. Manufacturer - Acceptable manufacturers including Cablec, Southwire, or equal.

### 2.03 Terminations:

- A. Manufacturer - Terminals as manufactured by T&B, Burndy or equal.
- B. Wire Terminations – Stranded conductors shall be terminated in clamping type terminations which serve to contain all the strands of the conductor. Curling of a stranded conductor around a screw type terminal is not allowed. For screw type terminations, use a fork type stake-on termination on the stranded conductor. Use only a stake-on tool approved for the fork terminals selected.
- C. End Seals - Heat shrink plastic caps of proper size for the wire on which used.

### 2.04 Tape:

- A. Tape used for terminations and cable marking shall be compatible with the insulation and jacket of the cable and shall be of plastic material.

## PART 3 - EXECUTION

### 3.01 Cable Installation:

- A. Clean Raceways - Clean all raceways prior to installation of cables as specified in Section 260542 - Conduits Raceway and Fittings.
- B. All line voltage wiring shall be installed in conduit.
- C. All feeder conductors shall be continuous from equipment to equipment. Splices in feeders are not permitted unless specifically noted or approved by the Electrical Engineer.
- D. All branch circuit wiring shall be run concealed in ceiling spaces, walls, below floors or in crawl spaces unless noted otherwise.
- E. Cable Pulling - Exercise care in pulling wires and cables into conduit or wireways so as to avoid kinking, putting undue stress on the cables or otherwise abrading them. No grease will be permitted in pulling cables. Only soapstone, talc, or UL listed pulling compound will be permitted. The raceway construction shall be complete and protected from the weather before cable is pulled into it. Swab conduits before installing cables and exercise care in pulling, to avoid damage to conductors.
- F. Bending Radius - Cable bending radius shall be per applicable code. Install feeder cables in one continuous length.
- G. Equipment Grounding Conductors - Provide an equipment grounding conductor, whether or not it is shown on the Drawings, in all conduits or all raceways.
- H. Panelboard Wiring - In panels, bundle incoming wire and cables which are No. 6 AWG and smaller, lace at intervals not greater than 6 inches, neatly spread into trees and connect to their respective terminals. Allow sufficient slack in cables for alterations in terminal connections. Perform lacing with plastic cable ties or linen lacing twine. Where plastic panel wiring duct is provided for cable runs, lacing is not necessary when the cable is properly installed in the duct.

3.02 Cable Terminations and Splices:

- A. Splices - UL Listed wirenuts.
- B. Terminations - Shall comply with the following:
  - 1. Make up and form cable and orient terminals to minimize cable strain and stress on device being terminated on.
  - 2. Burnish oxide from conductor prior to inserting in oxide breaking compound filled terminal.

3.03 Circuit and Conductor Identification:

- A. Color Coding - Provide color coding for all circuit conductors. Insulation color shall be white for neutrals and green for grounding conductors. Conductor colors shall be as follows:

<u>VOLTAGE</u>	<u>208/120V</u>
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Ground	Green

- B. Color coding shall be in the conductor insulation for all conductors #10 AWG and smaller; for larger conductors, color shall be either in the insulation or in colored plastic tape applied at every location where the conductor is readily accessible.
- C. Circuit Identification - All underground distribution and service circuits shall be provided with plastic identification tags in each secondary box and at each termination. Tags shall identify the source transformer of the circuit and the building number(s) serviced by the circuit.

3.04 Field Tests:

- A. All systems shall test free from short circuits and grounds, shall be free from mechanical and electrical defects, and shall show an insulation resistance between phase conductors and ground of not less than the requirements of the CEC. All circuits shall be tested for proper neutral connections.
- B. Insulation Resistance Tests: Perform insulation resistance tests on circuits with #2 AWG and larger conductors to be energized with a line-to-neutral voltage of 120 volts or more. Make these tests before all equipment has been connected. Test the insulation with a 500Vdc insulation resistance tester with a scale reading 100 megohms. The insulation resistance shall be 2 megohms or more. Submit results for review.

END OF SECTION

**SECTION 26 05 42**

**CONDUITS, RACEWAYS AND FITTINGS**

**PART 1 - GENERAL**

**1.01 Description of Work:**

- A. The work of this section consists of furnishing and installing conduits, raceways and fittings as shown on the Drawings and as described herein.

**1.02 Related Work:**

- A. See the following specification sections for work related to the work in this section:
  - 1. 26 05 43 Underground Ducts
  - 2. 26 05 44 In Grade Pull Boxes
  - 3. 26 05 19 Line Voltage Wire and Cable
  - 4. 26 05 33 Junction and Pull Boxes

**PART 2 - PRODUCTS**

**2.01 Conduits, Raceways:**

- A. Electrical Metallic Tubing (EMT) shall be hot-dip galvanized after fabrication. Couplings shall be compression or set-screw type.
- B. Flexible Conduit: Flexible metal conduit shall be galvanized steel.
- C. Galvanized Rigid Steel Conduit (GRS) shall be hot-dip galvanized after fabrication. Couplings shall be threaded type.
- D. Rigid Non-metallic Conduit: Rigid non-metallic conduit shall be PVC Schedule 40 (PVC-40 or NEMA Type EPC-40) conduit approved for underground use and for use with 90° C wires.

**2.02 Conduit Supports:**

- A. Supports for individual conduits shall be galvanized malleable iron one-hole type with conduit back spacer.
- B. Supports for multiple conduits shall be hot-dipped galvanized Unistrut or Superstrut channels, or approved equal. All associated hardware shall be hot-dip galvanized.
- C. Supports for EMT conduits shall be galvanized pressed steel single hole straps.
- D. Clamp fasteners shall be by wedge anchors. Shot in anchors shall not be allowed.

**2.03 Fittings:**

- A. Provide threaded-type couplings and connectors for rigid steel conduits; provide steel compression (watertight), or steel set-screw type for EMT, (die-cast zinc or malleable iron type fittings are not allowed). Provide threaded couplings and Meyers hubs for rigid steel conduit exposed to weather.
- B. Fittings for flexible conduit shall be Appleton, Chicago, IL, Type ST, O-Z Gedney Series 4Q by General Signal Corp., Terryville, CT, T & B 5300 series, or approved equal.
- C. Fittings for use with rigid steel shall be galvanized steel or galvanized cast ferrous metal; access fittings shall have gasketed cast covers and be Crouse Hinds Condulets, Syracuse, NY, Appleton Unilets, Chicago, IL, or approved equal. Provide threaded-type couplings and connectors; set-screw type and compression-type are not acceptable.
- D. Fittings for use with rigid non-metallic conduit shall be PVC and have solvent-weld-type conduit connections.
- E. Union couplings for conduits shall be the Erickson type and shall be Appleton, Chicago, IL, Type EC, O-Z Gedney 3-piece Series 4 by General Signal Corp., Terryville, CT, or approved equal. Threadless coupling shall not be used.
- F. Bushings:
  - 1. Bushings shall be the insulated type.
  - 2. Bushings for rigid steel shall be insulated grounding type, O-Z Gedney Type HBLG, Appleton Type GIB, or approved equal.
- G. Conduit Sealants:
  - 1. Fire Retardant Types: Fire stop material shall be reusable, non-toxic, asbestos-free, expanding, putty type material with a 3-hour rating in accordance with UL Classification 35L4 or as specified on the Drawings.

## PART 3 - EXECUTION

### 3.01 Conduit, Raceway and Fitting Installation:

- A. For conduit runs exposed to weather provide rigid metal (GRS).
- B. For conduit run underground, in concrete or masonry block wall and under concrete slabs, install minimum 3/4" size nonmetallic (PVC) with PVC elbows. Where conduits transition from underground or under slab to above grade install wrapped rigid metal (GRS) elbows and risers.
- C. For conduit runs concealed in steel or wood framed walls or in ceiling spaces or exposed in interior spaces above six feet over the finished floor, install EMT.
- D. Flexible metal conduit shall be used only for the connection of recessed lighting fixtures and motor connections unless otherwise noted on the Drawings. Liquid-tight steel flexible conduit shall be used for motor connections.
- E. The minimum size raceway shall be 1/2-inch unless indicated otherwise on the Drawings.
- F. Installation shall comply with the CEC.

- G. From pull point to pull point, the sum of the angles of all of the bends and offset shall not exceed 360 degrees.
- H. Conduit Supports: Properly support all conduits as required by the NEC. Run all conduits concealed except where otherwise shown on the drawings.
  - 1. Exposed Conduits: Support exposed conduits within three feet of any equipment or device and at intervals not exceeding NEC requirements; wherever possible, group conduits together and support on common supports. Support exposed conduits fastened to the surface of the concrete structure by one-hole clamps, or with channels. Use conduit spacers with one-hole clamps.
    - a. Conduits attached to walls or columns shall be as unobtrusive as possible and shall avoid windows. Run all exposed conduits parallel or at right angles to building lines.
    - b. Group exposed conduits together. Arrange such conduits uniformly and neatly.
  - 2. Support all conduits within three feet of any junction box, coupling, bend or fixture.
  - 3. Support conduit risers in shafts with Unistrut Superstrut, or approved equal, channels and straps.
- I. Moisture Seals: Provide in accordance with NEC paragraphs 230-8 and 300-5(g).
- J. Where PVC conduit transitions from underground to above grade, provide rigid steel 90's with risers. Rigid steel shall be half-lap wrapped with 20 mil tape and extend minimum 12" above grade.
- K. Provide a nylon pull cord in each empty raceway.
- L. Provide galvanized rigid steel factory fittings for galvanized rigid steel conduit.
- M. Slope all underground raceways to provide drainage; for example, slope conduit from equipment located inside a building to the pull box or manhole located outside the building.
- N. Conduits shall be blown out and swabbed prior to pulling wires, or installation of pull cord in empty conduits.

END OF SECTION

**SECTION 26 05 43**

**UNDERGROUND DUCTS**

**PART 1 - GENERAL**

**1.01 Description of Work:**

- A. The work of this section consists of furnishing and installing raceways, and raceway spacers with necessary excavation.

**1.02 Related Work:**

- A. See the following specification sections for work related to the work of this section.

- 1. 02200 Excavation and Backfill
- 2. 26 05 42 Conduit Raceway and Fittings

**1.03 Standards and Codes:**

- A. Work and material shall be in compliance with and according to the requirements of the latest revision of the following standards and codes.
  - 1. National Electrical Code (NEC) (Latest Revision)
  - 2. California Electrical Code (CEC).
  - 3. Underground Installations CEC - Article 300.5
  - 4. Rigid NonMetallic Conduit CEC - Article 347

**PART 2 - PRODUCTS**

**2.01 Raceways:**

- A. As specified in Section 26 05 42 Conduits, Raceways and Fittings.

**PART 3 - EXECUTION**

**3.01 Excavation:**

- A. As specified in Section 02200, Excavation and Backfill and as required for the work shown on the Drawings.

**3.02 Install raceways as indicated on drawings.**

**3.03 Sand Encasement:**

- A. As specified in Section 02200 - Excavation and Backfill.

**3.04 Backfill:**

- A. As specified in Section 02200 - Excavation and Backfill.

**END OF SECTION**

**SECTION 26 05 44**

**IN GRADE PULL BOXES**

**PART 1 - GENERAL**

**1.01 Description of Work:**

- A. The work of this section consists of providing all labor, supervision, tools, materials, and performing all work necessary to furnish and install pre-cast concrete vaults, and pull boxes with necessary excavation.

**1.02 Related Work:**

- A. See the following specification sections for work related to the work of this section.

- 1. 02200 Excavation and Backfill.
- 2. 26 05 43 Underground Ducts.

**1.03 Submittals:**

- A. As specified in Section 26 05 00 and Division 01.

- 1. Catalog Data: Provide manufacturer's descriptive literature - Pre-cast Vaults, Pull Boxes and Accessories.

**PART 2 - PRODUCTS**

**2.01 Materials and Equipment:**

**A. General Requirements:**

- 1. Pull boxes for electrical power, controls and other communication circuits shall consist of pre-cast reinforced concrete boxes, extensions' bases, and covers as specified herein and as indicated on the Drawings. Pre-cast units shall be the product of a manufacturer regularly engaged in the manufacture of pre-cast vaults and pull boxes. Acceptable manufacturers are Christy, Utility Vault, Brooks, Associated Concrete or equal.

**B. Construction:**

- 1. Pre-cast concrete vaults and pull boxes for electrical power distribution and communication circuits with associated risers and tops shall conform to ASTM C478 and ACI 318. Pull boxes shall be the type noted on the Drawings and shall be constructed in accordance with the applicable details as shown. Tops and walls shall consist of reinforced concrete. Walls and bottom shall be of monolithic concrete construction. Duct entrances and windows shall be located near the corners of structures to facilitate cable racking.

**C. Covers:**

- 1. The word "ELECTRICAL" shall be cast in the top face of all electrical cable boxes. The word "Signal" or "Fire Alarm" shall be cast in the top of the boxes utilized for these systems.

### PART 3 - EXECUTION

#### 3.01 Installation:

- A. Install pull boxes where required to limit bends in conduit runs to not more than 360 degrees or where pulling tension achieved would exceed the maximum allowable for the cable to be installed. Note that these boxes are not shown on the Drawings.
- B. Pre-cast pull boxes shall be installed approximately where indicated on the Drawings. The exact location of each pull box shall be determined after careful consideration has been given to the location of other utilities, grading, and paving. All cable boxes and secondary pull boxes shall be installed with a minimum of 6-inch thick crushed rock or sand bedding.
- C. Paved areas - Vaults and pull boxes located in areas to be paved shall be installed such that the top of the cover shall be flush with the finished surface of the paving.
- D. Unpaved Areas - In unpaved areas, the top of vaults and pull box covers shall be approximately 2 inches above finished grade.
- E. Joint Seals - Section joints of pre-cast vaults and pull boxes shall be sealed with compound as recommended by the manufacturer.
- F. Trenching, Backfilling, and Compaction - Trenching, backfilling and compaction shall be as specified in Section 02200 - Excavation and Backfill.

END OF SECTION

**SECTION 28 31 00**

**FIRE ALARM/VOICE EVACUATION SYSTEM**

**PART 1 - GENERAL**

**1.01 Description of Work:**

- A. Furnish and install all materials and equipment including all required equipment, panels, raceways, conductors and connections, and provide all labor required and necessary to complete the work shown on the drawings and/or specified in all Sections of Division 26 and all other work and miscellaneous items, not specifically mentioned, but reasonably inferred for a complete addressable fire alarm installation including all accessories and appurtenances required for testing the systems. It is in the intent of the drawings and specifications that all systems will be complete, and ready for operation. No extra charge will be paid for furnishing items required by regulations, but not specified herein, or on drawings.
- B. Fire Alarm system shall include a main fire alarm control panel, digital communicator for backup phone communication, a remote annunciator[s] and all devices, wiring, etc as indicated on the plans.
- C. The contractor shall include all costs to de-commission the existing system before any new construction can start. The District School District shall be advised in writing the date as to when the existing system will be de-commissioned. The contractor scope of work shall not degrade any function or operation of the remaining site fire alarm system.

**1.02 Related Work:**

- A. Division 26 General Requirements.
- B. See the following specification sections for work related to the work in this section.
  - 1. All other sections of Division 26.

**1.03 Codes and Standards:**

- A. Devices and equipment for fire alarm systems shall be U.L. listed.
- B. UL 864 Control Units, Fire Protective Signaling Systems.
- C. Devices and equipment for fire alarm system shall be listed by the California State Fire Marshal for the specific purpose the device or equipment is used.
- D. Work and material shall be in compliance with and according to the requirements of the latest version of the following standards and codes:
  - 1. California Fire Code (CFC) based on the International Fire Code (IFC) with California Amendments.

2. California Building Code (CBC) based on the International Building Code (IBC) with California Amendments.
3. California Electric Code (CEC) based on the National Electric Code (NEC) and California Amendments.
4. California Mechanical Code (CMC) based on the Uniform Mechanical Code (UMC) and California Amendments.
5. California Plumbing Code (CPC) based on the Uniform Plumbing Code (UPC) and California Amendments.
6. Title 19 C.C.R., Public Safety, State Fire Marshals Regulations.
7. NFPA 72, National Fire Alarm and Signaling Code.

1.04 Submittals:

- A. In accordance with Division 26.
- B. Submit the following items:
  1. Manufacturer's Catalog Data: Manufacturer's original catalog cuts and original description of data of all material and equipment with sufficient information provided so that the exact function of each device is known. Each item supplied shall be clearly identified including both U.L. number and a copy of the State Fire Marshal's listing.
- C. Description of conductors to be used with a statement that all wire shall be in conduit. Where accessible ceiling occurs, plenum rated wire on J-hooks is acceptable.

1.05 Quality Assurance:

- A. Installer: The installation firm shall be an established communications and electronics contractor with at least 10 years successful installation experience of products utilizing integrated communications systems and equipment specific to that required for this project. Only California Certified fire alarm technicians or California Certified electrician shall be used to install the fire alarm system. Provide proof to District that all employees are California Certified to install the fire alarm system.
- B. All materials, unless otherwise specified, shall be new, and free from any defects. All items of equipment including wire and cable shall be designed by the manufacturer unless otherwise specified, shall function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.
- C. The Contractor shall show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The contractor shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

- D. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

1.06 Warranties:

- A. The contractor shall warrant all equipment and wiring free from inherent mechanical and electrical defect for one year (365 days) from the date of final acceptance. The contractor shall without additional expense to the School District, replace any defective materials or equipment provided by him under this contract within the warranty period.

PART 2 - PRODUCTS

2.01 System Description

- A. The contractor shall furnish and install a complete 24 VDC, electrically supervised, addressable analog, microprocessor-based fire alarm control panel as specified herein. The fire alarm system shall include but not be limited to all control equipment, power supply, initiating devices, audible and visual indicating appliances as appropriate, conduit, wiring, fittings, and all other accessories necessary to provide a complete and operable system.

B. General System Operation:

1. When an alarm occurs on a zone the control panel indicates the alarm condition until manually reset.
2. An alarm may be acknowledged by actuating the "ACKNOWLEDGE" switch. This shall silence the control panel buzzer, and change the "SYSTEM ALARM" LED and the individual zone LED from flashing to steadily lit.
3. All alarm signals may be silenced by actuating the "SILENCE" switch. This shall steadily illuminate the "SIGNAL SILENCE" LED. If a subsequent alarm is activated, the alarm signal shall "resound" until again silenced. Once silenced, all alarm signals may be restored again by activating the "SILENCE" switch. Waterflow zones shall be non-silenceable.
4. If the microprocessor fails, the system shall execute a default signaling program. This program will enable the panel to sound the audible signals and summon the Fire Department. In addition, a yellow "DEGRADE" LED shall light to indicate the programming failure. Inability of the system to sound signals or summon the fire department during microprocessor failure shall not be acceptable.

C. Alarm Operation:

1. Operation of a manual pull station or automatic activation of any smoke detector, heat detector, or water flow switch zone shall cause the FACP to:
2. Sound all indicating appliances in a temporal pattern.
3. Flash all strobes.

4. Shut down all air handling units as specified herein.
5. Flash the panel "System Alarm" LED and pulse a panel audible signal.
6. Display a description of the specific analog/addressable device in alarm via an 80-character alpha-numeric display.
7. Display a description of the specific analog/Addressable device in alarm on the administrations Remote 80-character Annunciators.
8. Notify the Fire Department via the UDACT [and AES-Intellinet Radio].

D. Electrical Supervision:

1. Each initiating and signal circuit shall be electronically supervised for opens, shorts, and ground faults in the wiring. The occurrence of any fault shall activate the system trouble circuitry but shall not interfere with the proper operation of any circuit that does not have a fault connection.
2. Each initiating circuit shall be capable of being wired using Class "B" (Style B) supervised circuits (a break or ground fault in any conductor shall be reported as a trouble condition) at no extra cost.

E. Normal Power Supply:

1. Connections to the normal electrical service shall be on a dedicated branch circuit in accordance with the California Electrical Code (CEC) the circuit and connections shall be mechanically protected. The circuit disconnecting means shall be accessible only to authorized personnel and shall be clearly marked "FIRE ALARM CIRCUIT CONTROL."

2.02 Fire Alarm Control Panel:

A. The FACP is a new Notifier NFS2-3030 with Emergency Voice Evacuation Digital Voice Command:

1. Auxiliary SPDT alarm and trouble dry contacts.
2. Auxiliary circuitry in the control panel to operate remote relays for control of air handling equipment.
3. A solid-state power transfer circuit that shall switch to standby power automatically and instantaneously if normal power fails or falls below 15% of normal ("brown out" conditions).
4. This electronic circuit shall allow the batteries to be effectively "floated" on the operating system to avoid upsetting normal microprocessor operation and minimize resultant nuisance troubles and /or alarms. This circuit shall be physically isolated from the power supply to facilitate service.

5. A ground fault detector to detect positive or negative grounds on the initiating circuits, signal circuits, power circuits, and telephone line circuit. A ground fault LED shall be illuminates and shall operate the general trouble devices as specified herein but shall not cause an alarm to be sounded.
6. Short circuit LED's for all notification appliance circuits shall be a standard feature of the fire alarm control panel. Each circuit shall be monitors for short circuits and shall have a distinct LED for visual indication of the circuit.
7. Operating trouble devices as specified herein but shall not cause an alarm to be sounded.
8. Individual circuit fuses shall be provided from the following: smoke detector (resettable) power, main power supply, battery standby power, and auxiliary (non-resettable) output.
9. A common reset and lamp test switch, labeled "RESET/LAMP TEST" shall be provided to reset the system.
10. Circuitry shall be provided in the control panel to permit transmission of trouble alarm signals over leased or privately owned telephone cables to a remote receiving panel. There shall be a remote disconnect switch to allow testing of the fire alarm signal without transmitting an alarm signal to the central station.

#### 2.03 System Cabinet:

- A. The system cabinet shall be surface mounted with a texture finish and shall be made of these three parts: backbox, backplate, and door.
- B. The cabinet shall be of dead-front construction and 16-gauge cold rolled steel. The door lock system shall consist of two locks which will accept two different keys. One "OPER" key shall allow dead front access to the module display for all operator functions while one "TECH" key shall allow access to all pane electronics without further dismantling of the cabinet, control unit, or wiring.

#### 2.04 Power Supply:

- A. All AC line connections shall be isolated from the power supply unit and transformer by means of a cable-connected AC Unit per U.L. 864.
- B. The 120 VAC main power shall be transformer converted to low voltage, rectified and filters 24 VDC nominal for system operation and to eliminate the possibility of line voltage being present on any internal panel components. The power supply shall be integral, filtered, nominal 24 VDC at 5 Amps, and comply with U.L. 864.
- C. Primary Power outputs shall be as follows:
  1. A green LED on the power supply card shall indicate the presence of primary power.
- D. Power Supply outputs shall be as follows:

1. 24 VDC Non-Resettable, 3.2 Amps max., Power Limited.
2. 24 VDC Resettable, 3.2 Amps max., Power Limited.

E. NOTE: maximum combined output for both is 8.0 Amp.

#### 2.05 Battery Charger:

- A. The power supply shall contain a supervised and fused battery charger with a maximum average charging current of 1.5 Amp (this current shall be sufficient to maintain the system batteries at full charge).
- B. If the system loses AC power, a System Trouble shall occur.
- C. The battery charger shall be capable of charging up to 34 ampere/hour capacity, lead-acid batteries. If batteries are mounted within the control panel enclosure provide a battery shelf.

#### 2.06 Detection Circuits:

- A. Each Analog Detection Loop Unit shall provide communication with all analog/addressable devices (initiating/control) connected to the system through two (2) analog/addressable communications loops. Each loop shall communicate with a maximum of ninety-nine analog detectors and ninety-eight addressable monitor/control devices.
- B. The first nine-nine addressed (1-99) on each loop shall be dedicated to analog detectors, while addresses 101-198 shall be reserved for addressable monitor/control devices.

#### 2.07 Analog/Addressable Communications Loops:

- A. All initiating devices shall be connected to their addressable loop via a two wire style 4 (class B) circuit.

#### 2.08 Notification Appliance circuits:

- A. Four (4) independent (class B) notification appliance circuits shall be provided on the SCU, each polarized and rated at 1.75 Amps DC, individually fused and supervised for opens, grounds, and short circuits. They shall be capable of being wired Class "A" (style Z) or class "B" (style Y) supervised and fused @ 2 Amps. Specifications are as follows:

Voltage	Current
24VDC Non-Regulated	3.2 Amps: Maximum Alarm
	.001 Amps: Normal Standby

#### 2.09 Trouble Input:

- A. Trouble input shall be provided rated at 5-24 Volts input and, if used, shall accept a trouble from an external source.

2.10 Trouble Dry Contacts:

- A. Trouble dry contacts (form A or Form B; jumper selectable) shall be provided rated at 2 Amps at 24 VDC (resistive) and shall transfer whenever a system trouble occurs.

2.11 Alarm Dry Contacts:

- A. Alarm dry contacts (form C) shall be provided rated at 2 Amps at 24 VDC (resistive) and shall transfer whenever a system alarm occurs.

2.12 Central Station Monitoring:

- A. The entire fire alarm system shall be connected via leased telephone lines and radio communications to a central station and in accordance with the requirements of the fire department.

2.13 Alarm Signals:

- A. All alarm signals shall be automatically "locked in" at the control panel until the operated device is returned to its normal condition and the control panel is manually reset. When used for Water flow, the silence switch shall be bypassed.
- B. Alarm or Trouble Activation of Initiating Zones.
- C. Alarm or Trouble activation of initiating zones shall be indicated by zone alarm and trouble LED's.

2.14 Detection Devices:

A. Manual Pull Stations:

- 1. Provide non coded, addressable, semi-recessed, double-action type manual pull station with mechanical reset features. Where installed in existing buildings, boxes may be surface-mounted. Surface mounted boxes shall be the same color as the pull stations.
- 2. Provide separate screw terminal for each conductor connected to the manual alarm pull station. Break-glass-front pull stations will not be permitted. Provide red aluminum, housing labeled "fire". The pull stations shall not be resettable without the use of a key.

B. Detectors:

- 1. Each photoelectric smoke detector and heat detector shall be interchangeable via twist-lock mounting base, to ensure matching the proper sensor to the potential hazards of the areas being protected. The system shall recognize when an improper sensor type has been installed in a previously programmed sensor type location.

C. Photoelectric Smoke Detector:

1. Provide white flame retardant plastic, addressable, analog, photoelectric type, smoke detectors. Detectors shall operate using an optical sensing chamber principal which complies with UL 268.
2. Each detector shall be capable of being set at two sensitivity settings.
3. Each detector shall have two LED visual indicators providing local 360 degree visibility of operating status and alarm indication.
4. Each detector shall be supported independently of wiring connections, and connected by separate screw terminals of each conductor.
5. The detector screen and cover assembly must be easily removable for field cleaning.

D. Combination Fixed Temperature, rate of Rise Heat Detectors:

1. Provide off-white flame retardant plastic, addressable, combination 140 degree F fixed temperature, rate of rise heat dual thermistor detectors. Detector shall initiate an alarm when temperature rises at a rate of over 15 degrees F per minute or above 140 degrees F.
2. Each detector shall have two LED visual indicators providing local 360 degree visibility of operating status and alarm indication.
3. Contacts shall be self-resetting after response to rate or rise principal. Locate detectors in accordance with UL FPD or FM P7825 listing and the requirements of NFPA 72. Temperature rating of detectors shall be in accordance with NFPA 72.

E. Addressable Monitor Module: provide addressable monitor module wired as style B (class "B") to provide an address for normally open contact devices.

1. Provide Addressable Monitor Module to monitor status of all Water flow Switches, Valve tamper Switches and Post Indicator Valves.

2.15 Alarm Notification Devices:

- A. Color of notification appliances shall be red, unless otherwise noted by District.
- B. All alarm notification devices shall be synchronized throughout the school campus building.
- C. Strobe Lights: Provide recessed mounted strobe light assembly suitable for use in electrically supervised circuit. Lamps shall be xenon flashtube type, powered from the fire alarm control panel alarm signaling circuit. Strobes shall provide candela ratings as indicated on the drawings candelas and flash 60 times per minute unless otherwise noted. Strobes in toilets shall provide a minimum of 15 candelas. Lamps shall be protected be a clear polycarbonate lens. Housing shall be labeled "FIRE" in red vertical lettering.

- D. Speaker/Strobes: Provide recessed mounted, grille face, vibrating diaphragm type, audio alarm devices consisting of an electro-mechanical horn suitable for use in an electrically supervised circuit. Speaker/Strobes shall be provided with a red, tamper resistant grill. Speaker shall have a minimum sound rating of 90 DBA at 10 feet and have field selectable sound levels. Speakers shall be capable of providing a synchronized, field selectable, temporal code 3 tone. Strobes shall have a separate minimum candela as shown on the drawings and flash 60 times per minute unless otherwise noted. Lamps shall be protected by a clear polycarbonate lens. Housing shall be labeled "FIRE" in red vertical lettering.
- E. Speakers: Provide recessed mounted, grille face, vibrating diaphragm type, audio alarm devices consisting of an electro-mechanical horn suitable for use in an electrically supervised circuit. Horns shall be provided with a red, tamper resistant grill. Horn shall have a minimum sound rating of 90 DBA at 10 feet and have field selectable sound levels. Horns shall be capable of providing a synchronized, field selectable, temporal code 3 tone. Horns shall have a separate screw terminal for each conductor connection.
- F. Exterior Speakers: Provide recessed mounted, grille face, vibrating diaphragm type, audio alarm devices consisting of an electro-mechanical horn suitable for use in an electrically supervised circuit. Horns shall be provided with a red, tamper resistant grill, and a weatherproof backbox. Horn shall have a minimum sound rating of 90 DBA at 10 feet and have field selectable sound levels. Horns shall be capable of providing a synchronized, field selectable, temporal code 3 tone. Horns shall have a separate screw terminal for each conductor connection. Horns located in areas subject to moisture or exterior atmospheric conditions, shall be approved for such locations.
- G. Field Charging Power Supply (FCPS):
  - 1. The FCPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.
  - 2. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 60 hour standby.
  - 3. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.
  - 4. The FCPS shall include an attractive surface mount backbox.
  - 5. The Field Charging Power Supply shall include the ability to delay the AC fail delay per NFPA requirements.
  - 6. The FCPS include power limited circuitry, per 1995 UL standards.

## 2.16 Wiring and Conduit:

- A. Provide wiring in accordance with NFPA 72.
- B. Conductors shall be solid copper. Conductors for 120 volt circuits shall be No. 12 AWG minimum; conductors for low-voltage DC circuits shall be No. 14 AWG minimum for annunciation circuits and No. 14 AWG minimum for initiation circuits. All cables shall be rated and code compliant for their use.
  - 1. All low voltage wiring not installed in conduits shall be plenum rated.
  - 2. Provide color-coded conductors. Identify conductors by plastic-coated, self-sticking, printed markers or by heat-shrink type sleeves. Each conductor used for the same specific function shall be distinctly color coded. Use different color codes for each interior circuit. Each circuit color code wire shall remain uniform throughout the circuit.
  - 3. Pigtail or "T" tap connections to the evacuation alarm horns, horn/strobes and strobes are not acceptable.
  - 4. Underground circuit or circuits in wet areas shall be gel filled cables in scheduled 40 PVC conduit. There shall be no splicing of any underground cables.
- C. Conduits:
  - 1. Identification of Conduit: New conduits containing fire alarm system conductors shall be red,  $\frac{3}{4}$ " minimum. Junction-boxes, covers, gutters, and terminal cabinets, containing fire alarm system conductors, shall be painted red or provided red in color with engraved plastic identification signs permanently attached to the equipment.
  - 2. Do not run fire alarm circuits in the same conduit with the non-fire alarm circuits.
  - 3. Do not run AC circuits in the same conduit with the fire alarm circuits.
  - 4. Provide wiring in rigid metal conduit for exterior installations or where exposed to damage.
  - 5. Conceal conduit in finished areas of new construction and wherever practical in existing construction. Conduit runs shall be straight, neatly arranged properly supported and parallel or perpendicular to walls and partitions. Identify conductors within each enclosure where a tap, splice, or termination is made.

### PART 3 - EXECUTION

#### 3.01 Installation:

- A. Equipment, materials, installation, workmanship, inspection, and testing shall be in accordance with the NFPA publications and as modified herein.
- B. Follow manufacturer's directions in all cases for installation, testing and energizing.
- C. Accurately set, level, support, and fasten all equipment.

D. Smoke and heat detectors:

1. No detector shall be located closer than 12 inches to any part of any lighting fixture. Detectors, located in areas subject to moisture or exterior atmospheric conditions, or hazardous locations as defined by NFPA 70, shall be approved for such locations.
  2. Provide guards for all detectors mounted in any high athletic activity areas such as gym's, wrestling rooms, shower rooms.
- E. Conduit where exposed shall be installed parallel with the walls or structural elements; vertical runs to be plumb; horizontal runs to be level or parallel with structure; conduit grouped neatly together with straight runs, all bends parallel and uniformly spaced.
- F. Earthquake Resistant installation/fastening of all electrical equipment shall conform to the general requirements of section 1614A of the California Building Code.

3.02 Preliminary Tests:

- A. Conduct the following tests during installation of wiring and system components. Correct deficiency pertaining to these requirements prior to formal functional and operational tests of the system, preliminary tests shall be performed in the presence of the Local Fire Authority and Project inspector of Record to determine the conformance with the specified requirements.
- B. Ground Resistance: Measure the resistance of each connection to ground. Ground resistance shall not exceed 10 ohms.
- C. Dielectric Strength insulation Resistance: Test the dielectric strength and the Insulating resistance of the system interconnecting wiring by means of an instrument capable of generating 500 volts of DC and equipped to indicate leakage current 1000 megohms. For the purpose of this test, connect the instrument between each conductor on the line and between each conductor and ground at the control panel end of the line, with the other extremity open circuited and all series-connected devices in place. The system shall withstand the test without breakdown and shall indicate a resistance of not less than 1.0 minute with a DC potential of not less than 100 volts and not more than 500 volts.
- D. Standby Battery Test: prior to formal inspection and tests, place the fire alarm system on standby battery power for 24 hours; immediately thereafter, sound the building evacuation alarm signaling devices for 5 minutes. When the test is complete, the fire alarm system battery charger shall be fully recharged within 24 hours.
- E. Field Inspection and Test:
1. Before final acceptance of the work, pre-test system to demonstrate compliance with the contract requirements. System shall be subjected to complete functional and operational tests, including tests in place of each detector. When tests have been completed and corrections made, submit a signed and dated NFPA Certificate of Completion along with a completed testing matrix with the request for formal inspection and tests.

2. Where application of heat would destroy a heat detector, it may be manually activated.
3. Verify the proper receipt of the alarm signals at the central station for the UDACT provide printout of test reports. It shall be the sole obligation of the contractor to coordinate and to provide all testing documentation from the central station.
4. The communication loops and the indicating appliance circuits shall be opened in at least two locations per zone to check for the presence of correct supervisory circuitry.
5. Perform the field inspection and test in the presence of the manufacturer's representative, the School District's representative, local Fire Authority and Project Inspector of Record (IOR).
6. Test equipment: It shall be the responsibility of the installing Contractor to furnish tools, instruments, and materials required for a thorough test of the system. This includes, but is not limited to, the following:
  - a. VOM meter
  - b. Manufacturer's recommended smoke detector testing device and sensitivity test equipment.
  - c. Heat source for testing heat detectors.
  - d. Keys to all control panels.
  - e. Ladders

### 3.03 Project Closeout:

#### A. As Built Drawings:

1. Provide a complete set (full size scalable) of reproducible "as-built" and AutoCAD format drawings showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment, and internal wiring of the equipment upon completion of system.

#### B. Operating and Instruction Manuals:

1. Operating and Instruction manuals shall be submitted prior to testing of the system. Four complete sets of operation and instructions manuals shall be delivered to the School District upon request.
2. Complete, accurate, step-by-step testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, and troubleshooting manual explaining how to test the preliminary internal parts or each piece of equipment shall be delivered upon completion of the system.

- C. Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:
1. Instructions on replacing any components of the system, including internal parts.
  2. Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions.
  3. A complete list of all equipment and components with information as to the address and telephone number of both the manufacturer and local supplier of each item.
  4. User operating instructions shall be provided prominently displayed on a separate sheet located next to the control unit in accordance with U.L. Standard 864.

## **EMERGENCY VOICE EVACUATION SYSTEM**

### **PART 1.0 - GENERAL**

#### **1.1. DESCRIPTION:**

A. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled Voice Evacuation/Mass Notification control panel.

B. The Voice Evacuation/Mass Notification panel shall comply with NFPA 72 requirements.

1. The Secondary Power Source of the Voice Evacuation/Mass Notification panel will be capable of providing at least 24 hours of backup power with the ability to sustain 15 minutes in alarm at the end of the backup period.

C. The Voice Evacuation/Mass Notification panel shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC, Q9001-1994.

D. The Voice Evacuation/Mass Notification panel and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).

Donlon School Fire Alarm  
Donlon Elementary School  
Pleasanton School District  
SFA Project No. 21080

Underwriters Laboratories Inc. (UL) - USA:

UL 864 Standard for Control Units for Fire Protective Signaling Systems

UL 1711 Amplifiers for Fire Protective Signaling Systems

UL 2572 Communication and Control Units for Mass Notification Systems

Other:

NEC Article 250 Grounding

NEC Article 300 Wiring Methods

NEC Article 760 Fire Protective Signaling Systems

Compliant with Unified Facilities Criteria UFC 4-021-01

1. The Voice Evacuation/Mass Notification panel shall be ANSI 864, 9th Edition Listed. Systems listed to ANSI 864, 8th edition (or previous revisions) shall not be accepted.

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

#### 1.2. SCOPE:

A. A microprocessor-controlled Voice Evacuation/Mass Notification control panel shall be installed in accordance with the project specifications and drawings.

#### 1.3. SUBMITTALS

##### A. General:

1. Two copies of all submittals shall be submitted to the Architect/Engineer for review.
2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

##### B. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

3. Show system layout, configurations, and terminations.

C. Manuals:

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

D. Software Modifications

1. Provide the services of a qualified technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
2. Provide all hardware, software, programming tools and documentation necessary to modify the Voice Evacuation/Mass Notification Control Panel on site. Modification includes addition and deletion of messages, circuits, zones and changes to system operation. The system structure and software shall place no limit on the type or extent of software modifications on-site.

1.4. GUARANTY:

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

1.5. MAINTENANCE:

- A. Maintenance and testing shall be on a semi-annual schedule or as required by the local AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance. The Voice Evacuation/Mass Notification Control Panel shall be tested in accordance with the requirements of NFPA 72.
- B. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

1.6. POST CONTRACT EXPANSIONS:

- A. The contractor shall have the ability to provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.
- B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of speakers zones or wattage by ten percent (10%).

- C. The quotation shall include installation, test labor, and labor to reprogram the system for this 10% expansion. If additional Voice Evacuation/Mass Notification Control Panel hardware is required, include the material and labor necessary to install this hardware.
- D. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the Voice Evacuation/Mass Notification Control Panel.
- E. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

#### 1.7. APPLICABLE STANDARDS AND SPECIFICATIONS:

The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

##### A. National Fire Protection Association (NFPA) - USA:

No. 70 National Electric Code (NEC)

No. 72 National Fire Alarm Code

No. 101 Life Safety Code

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

C. Local and State Building Codes.

D. All requirements of the Authority Having Jurisdiction (AHJ).

#### 1.8. APPROVALS:

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

UL Underwriters Laboratories Inc (Ninth Edition)

CSFM California State Fire Marshal

MEA Material Equipment Acceptance (NYFD COA)

### PART 2.0 PRODUCTS

#### 2.1. EQUIPMENT AND MATERIAL, GENERAL:

A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a fire protective signaling system, meeting the National Fire Alarm Code.

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

C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place

(e.g., speakers shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

D. All equipment must be available "over the counter" through the Security Equipment Distributor (SED) market and can be installed by dealerships independent of the manufacturer.

## 2.2. CONDUIT AND WIRE:

### A. Conduit:

1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
2. Where required, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760.
4. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
5. Conduit shall not enter the Voice Evacuation/Mass Notification Control Panel, or any other remotely mounted panel equipment or backboxes, except where conduit entry is specified by the Voice Evacuation/Mass Notification Control Panel manufacturer.
6. Conduit shall be 3/4 inch (19.1 mm) minimum.

### B. Wire:

1. All Voice Evacuation/Mass Notification Control Panel wiring shall be new.
2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the Voice Evacuation/Mass Notification Control Panel. Number and size of conductors shall be as recommended by the Voice Evacuation/Mass Notification Control Panel, but not less 14 AWG (1.63 mm) for Notification Appliance Circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NEC 760 (e.g., FPLR).
5. All field wiring shall be electrically supervised for open circuit and ground fault.

### C. Terminal Boxes, Junction Boxes and Cabinets:

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

D. The Voice Evacuation/Mass Notification Control Panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as Voice Evacuation/Mass Notification Control Panel. Voice Evacuation/Mass Notification Control Panel

primary power wiring shall be 12 AWG. The panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.

1. The Voice Evacuation/Mass Notification Control Panel notification circuit (NACs 1) shall also automatically synchronize any of the following manufacturer's notification appliances connected to them: System Sensor, Wheelock, or Gentex with no need for additional synchronization modules.

### 2.3. Voice Evacuation/Mass Notification Control Panel:

A. The Voice Evacuation/Mass Notification Control Panel is a new Silent Knight 6820EVS (with Digital Voice Command Center) and contains a microprocessor-based Central Processing Unit (CPU). The CPU shall distribute and control emergency voice messages over the speaker circuits.

B. The system shall provide the capability to interface to **LOC (Local Operator Console)**, Distributed Audio Amplifiers, Remote Page Unit, Remote Microphone, Fire Fighter Telephone Unit and Remote Telephone Zone Module from the same manufacturer.

C. Shall have as minimum requirements:

1. Integral 50 Watt, 25 Vrms audio amplifier with optional converter for 70.7 volt systems. The system shall be capable of expansion to 100 watts total via the insertion of an additional 50-watt audio amplifier module (can be used as a backup amplifier) into the same cabinet and expandable over 1100 watts.
2. Speaker circuit that can be wired both Class A and B.
3. Integral Digital Message Generator with a memory capacity for up to 60 seconds per messaging. The Digital Message Generator shall be capable of producing fourteen distinct messages (60 seconds each). Field-selectable message and custom message recording capability using the local microphone, a USB port, or an external audio input.
4. Built in alert tone patterns with ANSI, March Code, California,

Steady, Alert Tone, Hi-Lo, ANSI Whoop, Continuous Whoop, or No Tone is field programmable. Tone Prior to transmitting a message, the Voice Evacuation/Mass Notification Control Panel can be programmed to produce a pre-announce and post-announce tone.

- a. Leading Tone Duration If a pre-announce tone is desired, select the length of time it will play before a message is broadcasted. Select 4, 8, 12, 16, 20, 24, or 28 seconds. In a pre-announce tone is not desired, select 0 seconds.
  - b. Trailing Tone Duration Select the length of time for the post-message announcement tone. Select 4, 8, 12, 16, 20, 24, 28, or 32 seconds from the drop-down menu.
  - c. Repeat Cycle Select the number of times the message will be repeated during an alarm. A message can be repeated 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or an *Infinite* amount of times.
5. The Voice Evacuation/Mass Notification Control Panel will be capable of detecting and annunciating the following conditions: Loss of Power (AC and DC), System Trouble, Ground Fault, Alarm, Microphone Trouble, Message Generator Trouble, Tone Generator Trouble, and Amplifier Fault.
6. The Voice Evacuation/Mass Notification Control Panel shall be fully supervised including microphone, amplifier output, message generator, speaker wiring, and tone generation.

7. Speaker outputs shall be fully power-limited.
8. Amplifiers will be supplied power independently to eliminate a short on one circuit from affecting other circuits.
9. The Voice Evacuation/Mass Notification Control Panel will provide full supervision on both active (alarm or music) and standby conditions.
10. An optional zone splitter version shall be available that permits splitting speaker circuits into 8 specific zones.
11. An optional distributed amplifiers unit shall be available that permits splitting speaker circuits up to a total of 24 speaker zones.
12. Wiring terminals shall be removable terminal blocks (Wire Gauge 12 – 18 AWG) for ease of servicing.
13. Voice Evacuation/Mass Notification Control Panel will provide 2 amp Notification Appliance Circuit (NAC) output with sync generator or follower for System Sensor, Wheelock or Gentex protocols. The NAC shall be capable of One (1) Style Y (Class B) or Style Z (Class A) circuit.
14. Shall have eight Command Input Circuits to activate messages via reverse polarity or contact closures.
15. Built in External Audio Input can be used for background music.
16. On-board battery charger which supports charging up to 26 AH batteries (cabinet holds up to 18AH batteries).
17. Programmable delay of immediate, 2 hours or 6 hours reporting of AC Loss.
18. Built in Piezo sounder for local trouble.
19. Stores the events in the 100 Event History log
20. Shall have Console Lamp Test switch and shall activate all system LEDs including Remote Consoles.
21. Shall have three Form-C relays:
  - AC Power Loss Relay
  - System Trouble Relay
  - MNS Active (For Mass Notification signage)
22. Shall have a Special Application (auxiliary power) output for addressable modules when interfaced with compatible addressable FACPs and End-of-Line power supervision relays.
23. Shall be capable of Speaker Volume Control. The Supervised

Volume Control will allow manual volume setting for telephone paging and background music for a specific speaker or speaker zone.

24. Shall have a Night Ring input allows a building's Private Branch Exchange (PBX) to activate the Voice Evacuation/Mass Notification panel.
25. The Voice Evacuation/Mass Notification panel can communicate in any combination up to eight (8) external remote consoles:

Optional Remote Microphone

Optional Remote Page Unit

Optional Local Operator Console

26. The Voice Evacuation/Mass Notification panel can communicate in any combination up to eight (8) external distributed audio amplifiers:

Optional Distributed Amplifier, 50 watts.

Optional Distributed Amplifier, 125 watts.

27. Shall be capable of integrating with firefighter telephone system that provides secure and reliable communications. The firefighter telephone system will allow for up to ten users to plug in to a remote telephone jack and communicate simultaneously within a building.
28. Shall be capable of secure access to the Voice Evacuation/Mass Notification panel via cell phone or other remote telephone.
29. The Voice Evacuation/Mass Notification panel can be integrated by an FACP via the ANN/ACS (EIA-485) link. Compatible FACP's include the MS-9200UDLS and MS-9600(UD)LS.
30. The Voice Evacuation/Mass Notification shall report Mass Notification events to the Central Station.
31. The Voice Evacuation/Mass Notification panel can be interface with other UL Listed Fire Alarm Control Panels via activation of reverse polarity or by contact closure.

#### D. Speakers:

1. All speakers shall operate on 25 or 70 VRMS with field selectable output taps from 0.25 to 2.0 Watts.
2. Speakers in corridors and public spaces shall produce a minimum sound levels of 75 dBA output at 10 feet (3m).
3. The plug-in speaker allows the installer to pre-wire mounting plates and dress the wires before plugging in the speakers.
4. Flush mount applications are achievable without the need for an extension ring.
5. Frequency response shall be a minimum of 400 HZ to 4000 HZ.
6. Rotary switch simplifies field selection of speaker voltage and power settings.

#### E. Enclosures:

1. The Voice Evacuation/Mass Notification panel shall be housed in a UL-listed cabinet suitable for

surface mounting. The cabinet and front shall be corrosion protected and painted red via the powder coat method with manufacturer's standard finish.

2. The back box and door shall be constructed of steel with provisions for electrical conduit connections into the sides and top.

The door shall provide a key lock and shall provide for the viewing of all indicators.

#### F. Power Supply:

1. The main power supply for the Voice Evacuation/Mass Notification panel shall provide up to 7.5 amps of available power for the panel and peripheral devices.
2. Provisions will be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies.
3. The power supply shall provide an integral battery charger or may be used with an external battery and charger systems. Battery arrangement may be configured in the field.
4. The main power supply shall continuously monitor all field wires for earth ground conditions.
5. The main power supply shall operate on 120 VAC, 60 Hz or 240 VAC, 50 Hz, and shall provide all necessary power for the Voice Evacuation/Mass Notification panel.

#### G. BATTERIES:

1. Upon loss of Primary (AC) power to the Voice Evacuation/Mass Notification panel, the batteries shall have sufficient capacity to power the Voice Evacuation/Mass Notification panel for required standby time (24 or 60 hours) followed by 15 minutes of alarm.
2. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.

### PART 3.0 - EXECUTION

#### 3.1. INSTALLATION:

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

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect speakers from contamination and physical damage.

#### 3.2. TEST:

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

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

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

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

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

E. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying voice messages.

### 3.3. FINAL INSPECTION:

A. At the final inspection a minimum NICET Level II technician shall demonstrate that the system functions properly in every respect.

### 3.4. INSTRUCTION:

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

B. The contractor or installing dealer shall provide a user manual indicating "Sequence of Operation."

END OF SECTION

## **SECTION 31 23 00**

### **TRENCHING, BACKFILLING, AND COMPACTING**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Trench, backfill, and compact as specified herein and as needed for installation of underground utilities associated with the Work.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division I of these Specifications.

##### **1.2 QUALITY ASSURANCE**

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.
- C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the construction soil engineer.

#### **PART 2 - PRODUCTS**

##### **2.1 SOIL MATERIALS**

- A. Fill and backfill materials:
  - 1. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps over 2" in greatest dimension, and with not more than 10% of the rocks or lumps larger than 1" in their greatest dimension.
  - 2. Fill material is subject to the approval of the construction soil engineer, and is that material removed from excavations or imported from off-site borrow areas, predominantly granular, non- expansive soil free from roots and other deleterious matter.
  - 3. Imported fill material shall, in addition, have 10 to 40% by weight passing the #200 sieve, a plasticity index of less than 12, and a liquid limit of less than 30%.

##### **2.2 OTHER MATERIALS**

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

#### **PART 3 - EXECUTION**

### 3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

### 3.2 FINISH ELEVATIONS AND LINES

- A. Comply with documents.

### 3.3 PROCEDURES

- A. Utilities:
  - 1. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the School District.
  - 2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.
  - 3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the School District.
  - 4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Architect and secure his instructions.
  - 5. Do not proceed with permanent relocation of utilities until written instructions are received from the Architect.
- B. Protection of persons and property:
  - 1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.
  - 2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
  - 3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.
- C. De-watering:
  - 1. Remove all water, including rain water, encountered during trench and sub-structure work to an approved location by pumps, drains, and other approved methods.
  - 2. Keep trenches and site construction area free from water.
- D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- E. Maintain access to adjacent areas at all times.

### 3.4 TRENCHING

- A. Provide sheeting and shoring necessary for protection of the Work and for the safety of personnel.
  - 1. Prior to backfilling, remove all sheeting.
  - 2. Do not permit sheeting to remain in the trenches except when, in the opinion of the Architect, field conditions or the type of sheeting or methods of construction such as use of concrete bedding are such as to make removal of sheeting impracticable. In

such cases, the Architect may permit portions of sheeting to be cut off and remain in the trench.

- B. Open cut:
  - 1. Excavate for utilities by open cut.
  - 2. If conditions at the site prevent such open cut, and if approved by the Architect, trenching may be used.
  - 3. Short sections of a trench may be tunneled if, in the opinion of the Architect, the conductor can be installed safely and backfill can be compacted properly into such tunnel.
  - 4. Where it becomes necessary to excavate beyond the limits of normal excavation lines in order to remove boulders or other interfering objects, backfill the voids remaining after removal of the objects as directed by the construction soil engineer.
  - 5. When the void is below the subgrade for the utility bedding, use approved earth materials and compact to the relative density directed by the construction soil engineer, but in no case to a relative density less than 90%.
  - 6. When the void is in the side of the utility trench or open cut, use approved earth or sand compacted as approved by the construction soil engineer, but in no case to a relative density less than 85%.
  - 7. Remove boulders and other interfering objects, and backfill voids left by such removals, at no additional cost to the School District.
  - 8. Excavating for appurtenances:
    - a. Excavate for manholes and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.
    - b. Overdepth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel, or lean concrete as directed by the construction soil engineer, and at no additional cost to the School District.
- C. Trench to the minimum width necessary for proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing for the utility.
- D. Depressions:
  - 1. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.
  - 2. Except where rock is encountered, do not excavate below the depth indicated or specified.
  - 3. Where rock is encountered, excavate rock to a minimum overdepth of 4" below the trench depth indicated or specified.
- E. Where utility runs traverse public property or are subject to governmental or utility company jurisdiction, provide depth, bedding, over, and other requirements as set forth by legally constituted authority having jurisdiction, but in no case less than the depth shown in the Contract Documents.
- F. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace turf upon completion of the backfilling.
- G. Cover:
  - 1. Provide minimum trench depth indicated below to maintain a minimum cover over the top of the installed item below the finish grade or subgrade, unless specifically designed and shown otherwise on the drawings:

- a. Areas subject to vehicular traffic:
  - 1) Sanitary sewers: 24";
  - 2) Storm drains: 24".
- b. Areas not subject to vehicular traffic:
  - 1) Sanitary sewers: 18";
  - 2) Storm drains: 18".
- c. All areas:
  - 1) Water lines: 18";
  - 2) Natural gas lines: 18";
  - 3) Electrical cables: 24";
  - 4) Electrical ducts: 18".
- d. Concrete encased:
  - 1) Pipe sleeves for water and gas lines: 18";
  - 2) Sanitary sewers and storm drains: 12";
  - 3) Electrical ducts: 18".
- e. Where utilities are under a concrete structure slab or pavement, the minimum depth need only be sufficient to completely encase the conduit or pipe sleeve, and electrical long-radius rigid metal conduit riser, provided it will not interfere with the structural integrity of the slab or pavement.
- f. Where the minimum cover is not provided, encase the pipes in concrete as indicated. Provide concrete with a minimum 28 day compressive strength of 3000 psi.

### 3.5 BEDDING

- A. Provide bedding as indicated on the Drawings.

### 3.6 BACKFILLING

- A. General:
  - 1. Do not completely backfill trenches until required pressure and leakage tests have been performed, and until the utilities systems as installed conform to the requirements specified in the pertinent Sections of these Specifications.
  - 2. Except as otherwise specified or directed for special conditions, backfill trenches to the ground surface with selected material approved by the construction soil engineer.
  - 3. Reopen trenches which have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified, or otherwise correct to the approval of the construction soil engineer.
  - 4. Do not allow or cause any of the Work performed or installed to be covered up or enclosed by work of this Section prior to required inspections, tests, and approvals.
  - 5. Should any of the Work be so enclosed or covered up before it has been approved, uncover all such Work and, after approvals have been made, refill and compact as specified, all at no additional cost to the School District.
- B. Lower portion of trench:
  - 1. Deposit approved backfill and bedding material in layers of 3" minimum thickness, and compact with suitable tampers to 90% relative density (85% in landscape areas), until there is a cover of not less than 24" over sewers and 12" over other utility lines.
  - 2. Take special care in backfilling and bedding operations to not damage pipe and pipe coatings.
- C. Remainder of trench:
  - 1. Except for special materials for pavements, backfill the remainder of the trench with approved backfill.

2. Deposit backfill material in layers not exceeding the thickness specified, and compact each layer to the minimum density indicated by the construction soil engineer.
  - D. Adjacent to buildings: Mechanically compact backfill within ten feet of buildings.
  - E. Consolidation of backfill by jetting with water may be permitted, when specifically approved by the construction soil engineer, in areas other than building and pavement areas.
- 3.7 TEST FOR DISPLACEMENT OF SEWERS AND STORM DRAINS
- A. Check sewers and storm drains to determine whether displacement has occurred after the trench has been backfilled to above the pipe and has been compacted as specified.
  - B. Flash a light between manholes or, if the manholes have not yet been constructed, between the locations of the manholes, by means of a flashlight or by reflecting sunlight with a mirror.
  - C. If the illuminated interior of the pipe line shows poor alignment, displaced pipes, or any other defects, correct the defects to the specified conditions and at no additional cost to the School District.
- 3.8 PIPE JACKING
- A. The Contractor may, at his option, install steel pipe casings, tongue-and-groove reinforced concrete pipes, and steel pipes under existing roads or pavements by jacking into place using procedures approved by the governmental agencies having jurisdiction and approved by the construction soil engineer.
- 3.9 TUNNELING OPERATIONS
- A. The Contractor may, at his option, tunnel pipes into position using procedures approved by the construction soil engineer and the governmental agencies having jurisdiction.
- 3.10 FIELD QUALITY CONTROL
- A. The construction soil engineer will inspect open cuts and trenches before installation of utilities, and will make the following tests:
  - B. Assure that trenches are not backfilled until all tests have been completed;
  - C. Check backfilling for proper layer thickness and compaction;
  - D. Verify that test results conform to the specified requirements, and that sufficient tests are performed;
  - E. Assure that defective work is removed and properly replaced.

**END OF SECTION 312300**



SPECIFICATIONS  
SFA Project No. 21083

# **Walnut Grove Fire Alarm Walnut Grove Elementary School**

Pleasanton

Unified School District



2155 S. Bascom Ave. Suite 200  
Campbell, California 95008  
(408) 879-0600



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SPECIFICATIONS  
SFA Project No. 21083

DSA File No. 1-32  
DSA Application No. 01-119914

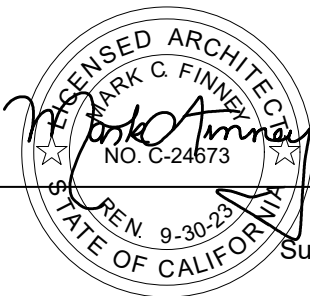
**Walnut Grove Fire Alarm  
Walnut Grove Elementary School**

Pleasanton

Unified School District

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Division of the State Architect  
California Department of General Services



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Mark Finney, Architect  
Sugimura Finney Architects



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Najib Anwar, Electrical Engineer and Fire Alarm Designer  
Aurum Consulting Engineer



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Walnut Grove Fire Alarm  
Walnut Grove Elementary School  
Pleasanton Unified School District  
SFA Project No. 21083

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END OF SECTION

## **SECTION 26 05 00**

### **GENERAL ELECTRICAL REQUIREMENTS**

#### **PART 1 – GENERAL**

##### **1.01 Description of Work:**

- A. The work of this Section consists of providing all required labor, supervision, materials and equipment to satisfactorily complete all electrical installations that are shown on the Drawings, included in these specifications, or otherwise needed for a complete and fully operating facility.
- B. Furnish and install all required in-place equipment, conduits, conductors, cables and any miscellaneous materials for the satisfactory interconnection and operation of all associated electrical systems.

##### **1.02 Related Work:**

- A. This Section provides the basic Electrical Requirements which supplement the General Requirements of Division 01 and apply to all Sections of Division 26.

##### **1.03 Submittals:**

- A. As specified in Division 01. Submit to the Architect shop drawings, manufacturer's data and certificates for equipment, materials and finish, and pertinent details for each system specified. Information to be submitted includes manufacturer's descriptive literature of cataloged products, equipment, drawings, diagrams, performance and characteristic curves as applicable, test data and catalog cuts. Obtain written approval before procurement, fabrication, or delivery of the items to the job site. Partial submittals are not acceptable and will be returned without review. Furnish manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable Federal, Industry and Technical Society Publication References, and years of satisfactory service of each item required to establish contract compliance. Photographs of existing installations and data submitted in lieu of catalog data are not acceptable and will be returned without approval.
- B. Organize submittals for equipment and items related to each specification section together as a package.
- C. Proposed substitutions of products will not be reviewed or approved prior to awarding of the Contract.
- D. Substitutions shall be proven to the Architect or Engineer to be equal or superior to the specified product. Architect's decision is final. The Contractor shall pay all costs incurred by the Architect and Engineer in reviewing and processing any proposed substitutions whether or not a proposed substitution is accepted.
- E. If a proposed substitution is rejected, the contractor shall furnish the specified product at no increase in contract price.
- F. If a proposed substitution is accepted, the contractor shall be completely responsible for all dimensional changes, electrical changes, or changes to other work which are a result of the substitution. The accepted substitution shall be made at no additional cost to the owner or design consultants.

1.04 Quality Assurance:

- A. Codes: All electrical equipment and materials, including installation and testing, shall conform to the latest editions following applicable codes:
  - 1. California Electrical Code (CEC).
  - 2. Occupational Safety and Health Act (OSHA) standards.
  - 3. All applicable local codes, rules and regulations.
  - 4. Electrical Contractor shall possess a C-10 license and all other licenses as may be required. Licenses shall be in effect at start of this contract and be maintained throughout the duration of this contract.
- B. Variances: In instances where two or more codes are at variance, the most restrictive requirement shall apply.
- C. Standards: Equipment shall conform to applicable standards of American National Standards Institute (ANSI), Electronics Industries Association (EIA), Institute of Electrical and Electronics Engineers (IEEE), and National Electrical Manufacturers Association (NEMA).
- D. Underwriter Laboratories (UL) listing is required for all equipment and materials where such listing is offered by the Underwriters Laboratories. Provide service entrance labels for all equipment required by the NEC to have such labels.
- E. The electrical contractor shall guarantee all work and materials installed under this contract for a period of one (1) year from date of acceptance by owner.
- F. All work and materials covered by this specification shall be subject to inspection at any and all times by representatives of the owner. Work shall not be closed in or covered before inspection and approval by the owner or his representative. Any material found not conforming with these specifications shall, within 3 days after being notified by the owner, be removed from premises; if said material has been installed, entire expense of removing and replacing same, including any cutting and patching that may be necessary, shall be borne by the contractor.

1.05 Contract Documents:

- A. Drawings and Specifications:
  - 1. In the case of conflict between the drawings and specifications, the specifications shall take precedence.
  - 2. Drawings and specifications are intended to comply with all law, ordinances, rules and regulations of constituted authorities having jurisdiction, and where referred to in the Contract Documents, said laws, ordinance, rules and regulations shall be considered as a part of said Contract Documents within the limits specified. The Contractor shall bear all expenses of correcting work done contrary to said laws, ordinance, rules and regulations if the Contractor knew or should have known that the work as performed is contrary to said laws, ordinances, rules and regulations and if the Contractor performed same (1) without first consulting the Architect for further instructions regarding said work and/or (2) disregarded the Architect's instructions regarding said work.

- B. Drawings: The Electrical Drawings shall govern the general layout of the completed construction.
1. Locations of equipment, panels, pullboxes, conduits, stub-ups, ground connections are approximate unless dimensioned; verify locations with the Architect prior to installation.
  2. Review the Drawings and Specification Divisions of other trades and perform the electrical work that will be required for those installations.
  3. Should there be a need to deviate from the Electrical Drawings and Specifications, submit written details and reasons for all changes to the Architect for approval.
  4. The general arrangement and location of existing conduits, piping, apparatus, etc., is approximate. The drawings and specifications are for the assistance and guidance of the contractor, exact locations, distances and elevations are governed by actual field conditions. Accuracy of data given herein and on the drawings is not guaranteed. Minor changes may be necessary to accommodate work. The contractor is responsible for verifying existing conditions. Should it be necessary to deviate from the design due to interference with existing conditions or work in progress, claims for additional compensation shall be limited to those for work required by unforeseen conditions as determined by the Architect.
  5. All drawings and divisions of these specifications shall be considered as whole. The contractor shall report any apparent discrepancies to the Architect prior to submitting bids.
  6. The contractor shall be held responsible to have examined the site and compared it with the specifications and plans and to have satisfied himself as to the conditions under which the work is to be performed. He shall be held responsible for knowledge of all existing conditions whether or not accurately described. No subsequent allowance shall be made for any extra expense due to failure to make such examination.

1.06 Closeout Submittals:

- A. Manuals: Furnish manuals for equipment where manuals are specified in the equipment specifications or are specified in Division 01.

1.07 Coordination:

- A. Coordinate the electrical work with the other trades, code authorities, utilities and the Architect.
- B. Provide and install all trenching, backfilling, conduit, pull boxes, splice boxes, etc. for all Utility Company services to the locations indicated on the Drawings. All materials and construction shall be in accordance with the requirements for all the Utility Companies. Prior to performing any work, the Electrical Contractor shall coordinate with the various Utility Companies and obtain utility company engineering drawings. Verify that all such work and materials shown on the Drawings are of sufficient sizes and correctly located to provide services on the site. The Electrical Contractor shall verify with all the Utility Companies that additional contractor furnished and installed work is not required. If additional work, materials, or changes are required by any of the Utility Companies, the Electrical Contractor shall advise the Architect of such changes and no further work shall then be performed until instructed to do so by the Architect. The Electrical Contractor shall coordinate with the various Utility Companies to schedule inspections and to obtain service connections.

- C. The Electrical Contractor shall schedule all utility work necessary for utility inspections, connections, cable installation, etc. for the new electrical service to meet the construction schedule.
- D. Utility Company charges shall be paid by the Owner.
- E. Contractor shall pay all inspection and other applicable fees and procure all permits necessary for the completion of this work.
- F. Where connections must be made to existing installations, properly schedule all the required work, including the power shutdown periods.
- G. When two trades join together in an area, make certain that no electrical work is omitted.

1.08 Job Conditions:

- A. Operations: Perform all work in compliance with Division 01.
  - 1. Keep the number and duration of power shutdown periods to a minimum.
  - 2. Show all proposed shutdowns and their expected duration on the construction schedule. Schedule and carry out shutdowns so as to cause the least disruption to operation of the Owner's facilities.
  - 3. Carry out shutdown only after the schedule has been approved, in writing, by the owner. Submit power interruption schedule 15 days prior to date of interruption.
- B. Construction Power: Unless otherwise noted in Division 01 of these specifications, contractor shall make all arrangements and provide all necessary facilities for temporary construction power [from the owner's on site source. Energy costs shall be paid for by the Owner.] [to the site. Energy costs shall be paid by the General Contractor.]
- C. Storage: Provide adequate storage for all equipment and materials which will become part of the completed facility so that it is protected from weather, dust, water, or construction operations.

1.09 Damaged Products:

- A. Notify the Architect in writing in the event that any equipment or material is damaged. Obtain approval from the Architect before making repairs to damaged products.

1.10 Locations:

- A. General: Use equipment, materials and wiring methods suitable for the types of locations in which they are located.
- B. Dry Locations: All those indoor areas which do not fall within the definition below for Wet Locations and which are not otherwise designated on the Drawings.
- C. Wet Locations: All locations exposed to the weather, whether under a roof or not, unless otherwise designated on the Drawings.

1.11 Safety and Indemnity:

- A. The Contractor is solely and completely responsible for conditions of the job site including safety of all persons and property during performance of the work. This requirement will apply continually and not be limited to normal working hours. The contractor shall provide and maintain throughout the work site proper safeguards including, but not limited to, enclosures, barriers, warning signs, lights, etc. to prevent accidental injury to people or damage to property.
- B. No act, service, drawing review or construction review by the Owner, the Engineer or their Consultants is intended to include reviews of the adequacy of the Contractors safety measures in or near the construction site.
- C. The Contractor performing work under this Division of the Specifications shall hold harmless, indemnify, and defend the Owner, the Engineer, their consultants, and each of their officers, agents and employees from any and all liability claims, losses, or damage arising out of or alleged to arise from bodily injury, sickness, or death of a person or persons and for all damages arising out of injury to or destruction of property arising directly or indirectly out of or in connection with the performance of the work under this Division of the Specifications, and from the Contractor's negligence in the performance of the work described in the construction contract documents, but not including liability that may be due to the sole negligence of the Owner, the Engineer, their Consultants or their officers, agents and employees.
- D. If a work area is encountered that contains hazardous materials, the contractor is advised to coordinate with the owner and it's abatement consultant for abatement of hazardous material by the Owner's Representative. "Hazardous materials" means any toxic substance regulated or controlled by OSHA, EPA, State of California or local rules, regulations and laws. Nothing herein shall be construed to create a liability for Aurum Consulting Engineers regarding hazardous materials abatement measures, or discovery of hazardous materials.

1.12 Access Doors:

- A. The contractor shall install access panels as required where floors, walls or ceilings must be penetrated for access to electrical, control, fire alarm or other specified electrical devices. The minimum size panel shall be 14" x 14" in usable opening. Where access by a service person is required, minimum usable opening shall be 18" x 24".
- B. All access doors installed lower than 7'-0" above finished floor and exposed to public access shall have keyed locks.
- C. Where specific information or details relating to access panels differ from Division 26 paragraph 1.12 of these specifications, or shown on the electrical drawings and details or under other Divisions of work, those requirements shall supersede these specifications.

1.13 Arc Flash:

- A. The contractor shall install a clearly visible arc flash warning to the inside door of all panelboards and industrial control panels, as well as to the front of all switchboards and motor control centers that are a part of this project.
- B. The warning shall have the following wording: line 1 "WARNING" (in large letters), line 2 "Potential Arc Flash Hazard" (in medium letters), line 3 & 4 "Appropriate Personal Protective Equipment and Tools required when working on this equipment".

1.14 Emergency Boxes:

- A. All boxes and enclosures for emergency circuits shall be permanently marked with a readily visible red spray painted mark.

PART 2 - PRODUCTS

2.01 Standard of Quality:

- A. Products that are specified by manufacturer, trade name or catalog number establish a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are established to be equal to the specified product and approved by the Architect prior to installation.
- B. Material and Equipment: Provide materials and equipment that are new and are current products of manufacturers regularly engaged in the production of such products. The standard products shall have been in satisfactory commercial or industrial use for two years prior to bid opening. The two-year period includes use of equipment and materials of similar size under similar circumstances. For uniformity, only one manufacturer will be accepted for each type of product.
- C. Service Support: Submit a certified list of qualified permanent service organizations including their addresses and qualification for support of the equipment. These service organizations shall be convenient to the equipment installation and able to render service to the equipment on a regular and emergency basis during the warranty period of the contract.
- D. Manufacturer's Recommendations: Where installation procedures are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendation shall be cause for rejection of the equipment or material.

2.02 Nameplates:

- A. For each piece of electrical equipment, provide a manufacturer's nameplate showing his name, location, the pertinent ratings, the model designation, and shop order number.
- B. Identify each piece of equipment and related controls with a rigid laminated engraved plastic nameplate. Unless otherwise noted, nameplates shall be melamine plastic 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be 0.5 by 2.5 inches unless otherwise noted. Where not otherwise specified, lettering shall be a minimum of 0.25 inch high normal block style. Engrave nameplates with the inscriptions indicated on the Drawings and, if not so indicated, with the equipment name. Securely fasten nameplates in place using two stainless steel or brass screws.

2.03 Fasteners:

- A. Fasteners for securing equipment to walls, floors and the like shall be either hot-dip galvanized after fabrication or stainless steel.

2.04 Finish requirements:

- A. Equipment: Refer to each electrical equipment section of these Specifications for painting requirements of equipment enclosures. Repair any final paint finish which has been damaged or is otherwise unsatisfactory, to the satisfaction of the Architect.
- B. Wiring System: In finished areas, paint all exposed conduits, boxes and fittings to match the color of the surface to which they are affixed.

### PART 3 - EXECUTION

#### 3.01 Workmanship:

- A. Ensure that all equipment and materials fit properly in their installation.
- B. Perform any required work to correct improperly fit installation at no additional expense to the owner.
- C. All electrical equipment and materials shall be installed in a neat and workmanship manner in accordance with the "NECA-1 Standard Practices for Good Workmanship in Electrical Contracting". Workmanship of the entire job shall be first class in every respect.

#### 3.02 Equipment Installations:

- A. Provide the required inserts, bolts and anchors, and securely attach all equipment and materials to their supports.
- B. Do all the cutting and patching necessary for the proper installation of work and repair any damage done.
- C. Earthquake restraints: all electrical equipment, including conduits over 2 inches in diameter, shall be braced or anchored to resist a horizontal force acting in any direction as per CBC Section 1616A Title 24, part 2 and ASCE7-10, Sections 13.3 and 13.6 and Table 13.6-1.
- D. Structural work: All core drilling, bolt anchor insertion, or cutting of existing structural concrete shall be approved by a California registered structural consulting engineer prior to the execution of any construction. At all floor slabs and structural concrete walls to be drilled, cut or bolt anchors inserted, the contractor shall find and mark all reinforcing in both faces located by means of x-ray, pach-ometer, or prof-ometer. Submit sketch showing location of rebar and proposed cuts, cores, or bolt anchor locations for approval.

#### 3.03 Field Test:

- A. Test shall be in accordance with Acceptance testing specifications issued by the National Electrical Testing Association (NETA).
- B. Perform equipment field tests and adjustments. Properly calibrate, adjust and operationally check all circuits and components, and demonstrate as ready for service. Make additional calibration and adjustments if it is determined later that the initial adjustments are not satisfactory for proper performance. Perform equipment field test for equipment where equipment field tests are specified in the equipment Specifications. Give sufficient notice to the Architect prior to any test so that the tests may be witnessed.

- C. Provide instruments, other equipment and material required for the tests. These shall be of the type designed for the type of tests to be performed. Test instrument shall be calibrated by a recognized testing laboratory within three months prior to performing tests.
- D. Operational Tests: Operationally test all circuits to demonstrate that the circuits and equipment have been properly installed and adjusted and are ready for full-time service. Demonstrate the proper functioning of circuits in all modes of operation, including alarm conditions.
- E. Re-testing will be required for all unsatisfactory tests after the equipment or system has been repaired. Re-test all related equipment and systems if required by the Architect. Repair and re-test equipment and systems which have been satisfactorily tested but later fail, until satisfactory performance is obtained.
- F. Maintain records of each test and submit five copies to the Architect when testing is complete. All tests shall be witnessed by the Architect. These records shall include:
  - 1. Name of equipment tested.
  - 2. Date of report.
  - 3. Date of test.
  - 4. Description of test setup.
  - 5. Identification and rating of test equipment.
  - 6. Test results and data.
  - 7. Name of person performing test.
  - 8. Owner or Architect's initials.
- G. Items requiring testing shall be as noted in the additional electrical sections of these specifications.

#### 3.04 Cleaning Equipment:

- A. Thoroughly clean all soiled surfaces of installed equipment and materials.

#### 3.05 Painting of Equipment:

- A. Factory Applied: Electrical equipment shall have factory applied painting system which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test and the additional requirements specified in the technical section.
- B. Field Applied: Paint electrical equipment as required to match finish of adjacent surfaces.

#### 3.06 Records:

- A. Maintain one copy of the contract Drawing Sheets on the site of the work for recording the "as built" condition. After completion of the work, the Contractor shall carefully mark the work as

actually constructed, revising, deleting and adding to the Drawing Sheets as required. The following requirements shall be complied with:

1. Cable Size and Type: Provide the size and type of each cable installed on project.
2. Substructure: Where the location of all underground conduits, pull boxes, stub ups and etc. where are found to be different than shown, carefully mark the correct location on the Drawings. Work shall be dimensioned from existing improvements.
3. Size of all conduit runs.
4. Routes of concealed conduit runs and conduit runs below grade.
5. Homerun points of all branch circuit.
6. Location of all switchgear, panels, MCC, lighting control panels, pullcans, etc.
7. Changes made as a result of all approved change orders, addendums, or field authorized revisions.
8. As Builds: At the completion of the Work the Contractor shall review, certify, correct and turn over the marked up Drawings to the Architect for his use in preparing "as built" plans.
9. As built Drawings shall be delivered to the Architect within ten (10) days of completion of construction.

3.07 Clean Up:

- A. Upon completion of electrical work, remove all surplus materials, rubbish, and debris that accumulated during the construction work. Leave the entire area neat, clean, and acceptable to the Architect.

3.08 Mechanical and Plumbing Electrical Work:

- A. The requirements for electrical power and/or devices for all mechanical and plumbing equipment supplied and/or installed under this Contract shall be coordinated and verified with the following:
  1. Mechanical and Plumbing Drawings.
  2. Mechanical and Plumbing sections of these Specifications.
  3. Manufacturers of the Mechanical and Plumbing equipment supplied.
- B. The coordination and verification shall include the voltage, ampacity, phase, location and type of disconnect, control, and connection required. Any changes that are required as a result of this coordination and verification shall be a part of this Contract.
- C. The Electrical Contractor shall furnish and install the following for all mechanical and plumbing equipment:
  1. Line voltage conduit and wiring.
  2. Disconnect switches.
  3. Manual line motor starters.

- D. Automatic line voltage controls and magnetic starters shall be furnished by the Mechanical and/or Plumbing Contractor and installed and connected by the Electrical Contractor. When subcontracted for by the Mechanical and/or Plumbing Contractor, all line voltage control wiring installed by the Electrical Contractor shall be done per directions from the Mechanical and/or Plumbing Contractor.
- E. All low voltage control wiring for Mechanical and Plumbing equipment shall be installed in conduit. Furnishing, installation and connection of all low voltage conduit, boxes, wiring and controls shall be by the Mechanical and/or Plumbing Contractor.
- F. Disconnects (Motor And Circuit)
  - 1. Disconnect switches shall be as manufactured by ITE- Siemens, General Electric or Square D.
- G. Disconnects (Motor: Fused):
  - 1. Disconnect switches shall be provided and located at all motors.
  - 2. Switches for three-phase motors shall be heavy-duty, horsepower rated three-pole, and surface mounted except as noted on drawings.
  - 3. Switches containing more than three poles shall be as specified on the drawings.
  - 4. Switches for single-phase, fractional horsepower motors shall be heavy-duty, horsepower rated.
  - 5. Switches shall be horsepower rated.
- G. Manual motor starters, where required, shall have toggle type operators with pilot light and melting alloy type overload relays, SQUARE D COMPANY, Class 2510, Type FG-1P (surface) or Type FS-1P (flush) or ITE, WESTINGHOUSE or GENERAL ELECTRIC equal.

END OF SECTION

**SECTION 26 05 19**

**LINE VOLTAGE WIRE AND CABLE**

**PART 1 - GENERAL**

**1.01 Description of Work:**

- A. The work of this Section consists of providing all wire and cable rated 600 volts or less, including splices and terminations, as shown on the Drawings and as described herein.

**1.02 Related Work:**

- A. See the following Specification Section for work related to the work in this Section:
  - 1. 26 05 42 Conduits, Raceways and Fittings.
  - 2. 26 05 33 Junction and Pull Boxes.

**1.03 Quality Assurance**

- A. Field tests shall be performed as specified in paragraph 3.04 of this Section.

**PART 2 - PRODUCTS**

**2.01 Conductors:**

- A. Conductors shall be copper, type THHN/THWN/MTW oil and gasoline resistant, 600 volt rated insulation.
- B. Conductors shall be stranded copper.
- C. Minimum power and control wire size shall be No. 12 AWG unless otherwise noted.
- D. All conductors used on this Project shall be of the same type and conductor material.

**2.02 Cables:**

- A. All individual conductors shall be copper with type THHN/THWN, 600 volt rated insulation.
- D. Insulation Marking - All insulated conductors shall be identified with printing colored to contrast with the insulation color.
- E. Color Coding - As specified in paragraph 3.03.
- F. Special Wiring - Where special wiring is proposed by an equipment manufacturer, submit the special wiring requirements to the Owner's Representative and, if approved, provide same. Special wire shall be the type required by the equipment manufacturer.
- G. Other Wiring - Wire or cable not specifically shown on the Drawings or specified, but required, shall be of the type and size required for the application and as approved by the Owner's Representative.
- H. Manufacturer - Acceptable manufacturers including Cablec, Southwire, or equal.

## 2.03 Terminations:

- A. Manufacturer - Terminals as manufactured by T&B, Burndy or equal.
- B. Wire Terminations – Stranded conductors shall be terminated in clamping type terminations which serve to contain all the strands of the conductor. Curling of a stranded conductor around a screw type terminal is not allowed. For screw type terminations, use a fork type stake-on termination on the stranded conductor. Use only a stake-on tool approved for the fork terminals selected.
- C. End Seals - Heat shrink plastic caps of proper size for the wire on which used.

## 2.04 Tape:

- A. Tape used for terminations and cable marking shall be compatible with the insulation and jacket of the cable and shall be of plastic material.

## PART 3 - EXECUTION

### 3.01 Cable Installation:

- A. Clean Raceways - Clean all raceways prior to installation of cables as specified in Section 260542 - Conduits Raceway and Fittings.
- B. All line voltage wiring shall be installed in conduit.
- C. All feeder conductors shall be continuous from equipment to equipment. Splices in feeders are not permitted unless specifically noted or approved by the Electrical Engineer.
- D. All branch circuit wiring shall be run concealed in ceiling spaces, walls, below floors or in crawl spaces unless noted otherwise.
- E. Cable Pulling - Exercise care in pulling wires and cables into conduit or wireways so as to avoid kinking, putting undue stress on the cables or otherwise abrading them. No grease will be permitted in pulling cables. Only soapstone, talc, or UL listed pulling compound will be permitted. The raceway construction shall be complete and protected from the weather before cable is pulled into it. Swab conduits before installing cables and exercise care in pulling, to avoid damage to conductors.
- F. Bending Radius - Cable bending radius shall be per applicable code. Install feeder cables in one continuous length.
- G. Equipment Grounding Conductors - Provide an equipment grounding conductor, whether or not it is shown on the Drawings, in all conduits or all raceways.
- H. Panelboard Wiring - In panels, bundle incoming wire and cables which are No. 6 AWG and smaller, lace at intervals not greater than 6 inches, neatly spread into trees and connect to their respective terminals. Allow sufficient slack in cables for alterations in terminal connections. Perform lacing with plastic cable ties or linen lacing twine. Where plastic panel wiring duct is provided for cable runs, lacing is not necessary when the cable is properly installed in the duct.

3.02 Cable Terminations and Splices:

- A. Splices - UL Listed wirenuts.
- B. Terminations - Shall comply with the following:
  - 1. Make up and form cable and orient terminals to minimize cable strain and stress on device being terminated on.
  - 2. Burnish oxide from conductor prior to inserting in oxide breaking compound filled terminal.

3.03 Circuit and Conductor Identification:

- A. Color Coding - Provide color coding for all circuit conductors. Insulation color shall be white for neutrals and green for grounding conductors. Conductor colors shall be as follows:

<u>VOLTAGE</u>	<u>208/120V</u>
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Ground	Green

- B. Color coding shall be in the conductor insulation for all conductors #10 AWG and smaller; for larger conductors, color shall be either in the insulation or in colored plastic tape applied at every location where the conductor is readily accessible.
- C. Circuit Identification - All underground distribution and service circuits shall be provided with plastic identification tags in each secondary box and at each termination. Tags shall identify the source transformer of the circuit and the building number(s) serviced by the circuit.

3.04 Field Tests:

- A. All systems shall test free from short circuits and grounds, shall be free from mechanical and electrical defects, and shall show an insulation resistance between phase conductors and ground of not less than the requirements of the CEC. All circuits shall be tested for proper neutral connections.
- B. Insulation Resistance Tests: Perform insulation resistance tests on circuits with #2 AWG and larger conductors to be energized with a line-to-neutral voltage of 120 volts or more. Make these tests before all equipment has been connected. Test the insulation with a 500Vdc insulation resistance tester with a scale reading 100 megohms. The insulation resistance shall be 2 megohms or more. Submit results for review.

END OF SECTION

**SECTION 26 05 42**

**CONDUITS, RACEWAYS AND FITTINGS**

**PART 1 - GENERAL**

**1.01 Description of Work:**

- A. The work of this section consists of furnishing and installing conduits, raceways and fittings as shown on the Drawings and as described herein.

**1.02 Related Work:**

- A. See the following specification sections for work related to the work in this section:
  - 1. 26 05 43 Underground Ducts
  - 2. 26 05 44 In Grade Pull Boxes
  - 3. 26 05 19 Line Voltage Wire and Cable
  - 4. 26 05 33 Junction and Pull Boxes

**PART 2 - PRODUCTS**

**2.01 Conduits, Raceways:**

- A. Electrical Metallic Tubing (EMT) shall be hot-dip galvanized after fabrication. Couplings shall be compression or set-screw type.
- B. Flexible Conduit: Flexible metal conduit shall be galvanized steel.
- C. Galvanized Rigid Steel Conduit (GRS) shall be hot-dip galvanized after fabrication. Couplings shall be threaded type.
- D. Rigid Non-metallic Conduit: Rigid non-metallic conduit shall be PVC Schedule 40 (PVC-40 or NEMA Type EPC-40) conduit approved for underground use and for use with 90° C wires.

**2.02 Conduit Supports:**

- A. Supports for individual conduits shall be galvanized malleable iron one-hole type with conduit back spacer.
- B. Supports for multiple conduits shall be hot-dipped galvanized Unistrut or Superstrut channels, or approved equal. All associated hardware shall be hot-dip galvanized.
- C. Supports for EMT conduits shall be galvanized pressed steel single hole straps.
- D. Clamp fasteners shall be by wedge anchors. Shot in anchors shall not be allowed.

**2.03 Fittings:**

- A. Provide threaded-type couplings and connectors for rigid steel conduits; provide steel compression (watertight), or steel set-screw type for EMT, (die-cast zinc or malleable iron type fittings are not allowed). Provide threaded couplings and Meyers hubs for rigid steel conduit exposed to weather.
- B. Fittings for flexible conduit shall be Appleton, Chicago, IL, Type ST, O-Z Gedney Series 4Q by General Signal Corp., Terryville, CT, T & B 5300 series, or approved equal.
- C. Fittings for use with rigid steel shall be galvanized steel or galvanized cast ferrous metal; access fittings shall have gasketed cast covers and be Crouse Hinds Condulets, Syracuse, NY, Appleton Unilets, Chicago, IL, or approved equal. Provide threaded-type couplings and connectors; set-screw type and compression-type are not acceptable.
- D. Fittings for use with rigid non-metallic conduit shall be PVC and have solvent-weld-type conduit connections.
- E. Union couplings for conduits shall be the Erickson type and shall be Appleton, Chicago, IL, Type EC, O-Z Gedney 3-piece Series 4 by General Signal Corp., Terryville, CT, or approved equal. Threadless coupling shall not be used.
- F. Bushings:
  - 1. Bushings shall be the insulated type.
  - 2. Bushings for rigid steel shall be insulated grounding type, O-Z Gedney Type HBLG, Appleton Type GIB, or approved equal.
- G. Conduit Sealants:
  - 1. Fire Retardant Types: Fire stop material shall be reusable, non-toxic, asbestos-free, expanding, putty type material with a 3-hour rating in accordance with UL Classification 35L4 or as specified on the Drawings.

## PART 3 - EXECUTION

### 3.01 Conduit, Raceway and Fitting Installation:

- A. For conduit runs exposed to weather provide rigid metal (GRS).
- B. For conduit run underground, in concrete or masonry block wall and under concrete slabs, install minimum 3/4" size nonmetallic (PVC) with PVC elbows. Where conduits transition from underground or under slab to above grade install wrapped rigid metal (GRS) elbows and risers.
- C. For conduit runs concealed in steel or wood framed walls or in ceiling spaces or exposed in interior spaces above six feet over the finished floor, install EMT.
- D. Flexible metal conduit shall be used only for the connection of recessed lighting fixtures and motor connections unless otherwise noted on the Drawings. Liquid-tight steel flexible conduit shall be used for motor connections.
- E. The minimum size raceway shall be 1/2-inch unless indicated otherwise on the Drawings.
- F. Installation shall comply with the CEC.

- G. From pull point to pull point, the sum of the angles of all of the bends and offset shall not exceed 360 degrees.
- H. Conduit Supports: Properly support all conduits as required by the NEC. Run all conduits concealed except where otherwise shown on the drawings.
  - 1. Exposed Conduits: Support exposed conduits within three feet of any equipment or device and at intervals not exceeding NEC requirements; wherever possible, group conduits together and support on common supports. Support exposed conduits fastened to the surface of the concrete structure by one-hole clamps, or with channels. Use conduit spacers with one-hole clamps.
    - a. Conduits attached to walls or columns shall be as unobtrusive as possible and shall avoid windows. Run all exposed conduits parallel or at right angles to building lines.
    - b. Group exposed conduits together. Arrange such conduits uniformly and neatly.
  - 2. Support all conduits within three feet of any junction box, coupling, bend or fixture.
  - 3. Support conduit risers in shafts with Unistrut Superstrut, or approved equal, channels and straps.
- I. Moisture Seals: Provide in accordance with NEC paragraphs 230-8 and 300-5(g).
- J. Where PVC conduit transitions from underground to above grade, provide rigid steel 90's with risers. Rigid steel shall be half-lap wrapped with 20 mil tape and extend minimum 12" above grade.
- K. Provide a nylon pull cord in each empty raceway.
- L. Provide galvanized rigid steel factory fittings for galvanized rigid steel conduit.
- M. Slope all underground raceways to provide drainage; for example, slope conduit from equipment located inside a building to the pull box or manhole located outside the building.
- N. Conduits shall be blown out and swabbed prior to pulling wires, or installation of pull cord in empty conduits.

END OF SECTION

**SECTION 26 05 43**

**UNDERGROUND DUCTS**

**PART 1 - GENERAL**

**1.01 Description of Work:**

- A. The work of this section consists of furnishing and installing raceways, and raceway spacers with necessary excavation.

**1.02 Related Work:**

- A. See the following specification sections for work related to the work of this section.

1. 02200 Excavation and Backfill
2. 26 05 42 Conduit Raceway and Fittings

**1.03 Standards and Codes:**

- A. Work and material shall be in compliance with and according to the requirements of the latest revision of the following standards and codes.
  1. National Electrical Code (NEC) (Latest Revision)
  2. California Electrical Code (CEC).
  3. Underground Installations CEC - Article 300.5
  4. Rigid NonMetallic Conduit CEC - Article 347

**PART 2 - PRODUCTS**

**2.01 Raceways:**

- A. As specified in Section 26 05 42 Conduits, Raceways and Fittings.

**PART 3 - EXECUTION**

**3.01 Excavation:**

- A. As specified in Section 02200, Excavation and Backfill and as required for the work shown on the Drawings.

**3.02 Install raceways as indicated on drawings.**

**3.03 Sand Encasement:**

- A. As specified in Section 02200 - Excavation and Backfill.

**3.04 Backfill:**

- A. As specified in Section 02200 - Excavation and Backfill.

**END OF SECTION**

**SECTION 26 05 44**

**IN GRADE PULL BOXES**

**PART 1 - GENERAL**

**1.01 Description of Work:**

- A. The work of this section consists of providing all labor, supervision, tools, materials, and performing all work necessary to furnish and install pre-cast concrete vaults, and pull boxes with necessary excavation.

**1.02 Related Work:**

- A. See the following specification sections for work related to the work of this section.
  - 1. 02200 Excavation and Backfill.
  - 2. 26 05 43 Underground Ducts.

**1.03 Submittals:**

- A. As specified in Section 26 05 00 and Division 01.
  - 1. Catalog Data: Provide manufacturer's descriptive literature - Pre-cast Vaults, Pull Boxes and Accessories.

**PART 2 - PRODUCTS**

**2.01 Materials and Equipment:**

**A. General Requirements:**

- 1. Pull boxes for electrical power, controls and other communication circuits shall consist of pre-cast reinforced concrete boxes, extensions' bases, and covers as specified herein and as indicated on the Drawings. Pre-cast units shall be the product of a manufacturer regularly engaged in the manufacture of pre-cast vaults and pull boxes. Acceptable manufacturers are Christy, Utility Vault, Brooks, Associated Concrete or equal.

**B. Construction:**

- 1. Pre-cast concrete vaults and pull boxes for electrical power distribution and communication circuits with associated risers and tops shall conform to ASTM C478 and ACI 318. Pull boxes shall be the type noted on the Drawings and shall be constructed in accordance with the applicable details as shown. Tops and walls shall consist of reinforced concrete. Walls and bottom shall be of monolithic concrete construction. Duct entrances and windows shall be located near the corners of structures to facilitate cable racking.

**C. Covers:**

- 1. The word "ELECTRICAL" shall be cast in the top face of all electrical cable boxes. The word "Signal" or "Fire Alarm" shall be cast in the top of the boxes utilized for these systems.

### PART 3 - EXECUTION

#### 3.01 Installation:

- A. Install pull boxes where required to limit bends in conduit runs to not more than 360 degrees or where pulling tension achieved would exceed the maximum allowable for the cable to be installed. Note that these boxes are not shown on the Drawings.
- B. Pre-cast pull boxes shall be installed approximately where indicated on the Drawings. The exact location of each pull box shall be determined after careful consideration has been given to the location of other utilities, grading, and paving. All cable boxes and secondary pull boxes shall be installed with a minimum of 6-inch thick crushed rock or sand bedding.
- C. Paved areas - Vaults and pull boxes located in areas to be paved shall be installed such that the top of the cover shall be flush with the finished surface of the paving.
- D. Unpaved Areas - In unpaved areas, the top of vaults and pull box covers shall be approximately 2 inches above finished grade.
- E. Joint Seals - Section joints of pre-cast vaults and pull boxes shall be sealed with compound as recommended by the manufacturer.
- F. Trenching, Backfilling, and Compaction - Trenching, backfilling and compaction shall be as specified in Section 02200 - Excavation and Backfill.

END OF SECTION

**SECTION 28 31 00**

**FIRE ALARM/VOICE EVACUATION SYSTEM**

**PART 1 - GENERAL**

**1.01 Description of Work:**

- A. Furnish and install all materials and equipment including all required equipment, panels, raceways, conductors and connections, and provide all labor required and necessary to complete the work shown on the drawings and/or specified in all Sections of Division 26 and all other work and miscellaneous items, not specifically mentioned, but reasonably inferred for a complete addressable fire alarm installation including all accessories and appurtenances required for testing the systems. It is in the intent of the drawings and specifications that all systems will be complete, and ready for operation. No extra charge will be paid for furnishing items required by regulations, but not specified herein, or on drawings.
- B. Fire Alarm system shall include a main fire alarm control panel, digital communicator for backup phone communication, a remote annunciator[s] and all devices, wiring, etc as indicated on the plans.
- C. The contractor shall include all costs to de-commission the existing system before any new construction can start. The District School District shall be advised in writing the date as to when the existing system will be de-commissioned. The contractor scope of work shall not degrade any function or operation of the remaining site fire alarm system.

**1.02 Related Work:**

- A. Division 26 General Requirements.
- B. See the following specification sections for work related to the work in this section.
  - 1. All other sections of Division 26.

**1.03 Codes and Standards:**

- A. Devices and equipment for fire alarm systems shall be U.L. listed.
- B. UL 864 Control Units, Fire Protective Signaling Systems.
- C. Devices and equipment for fire alarm system shall be listed by the California State Fire Marshal for the specific purpose the device or equipment is used.
- D. Work and material shall be in compliance with and according to the requirements of the latest version of the following standards and codes:
  - 1. California Fire Code (CFC) based on the International Fire Code (IFC) with California Amendments.

2. California Building Code (CBC) based on the International Building Code (IBC) with California Amendments.
3. California Electric Code (CEC) based on the National Electric Code (NEC) and California Amendments.
4. California Mechanical Code (CMC) based on the Uniform Mechanical Code (UMC) and California Amendments.
5. California Plumbing Code (CPC) based on the Uniform Plumbing Code (UPC) and California Amendments.
6. Title 19 C.C.R., Public Safety, State Fire Marshals Regulations.
7. NFPA 72, National Fire Alarm and Signaling Code.

1.04 Submittals:

- A. In accordance with Division 26.
- B. Submit the following items:
  1. Manufacturer's Catalog Data: Manufacturer's original catalog cuts and original description of data of all material and equipment with sufficient information provided so that the exact function of each device is known. Each item supplied shall be clearly identified including both U.L. number and a copy of the State Fire Marshal's listing.
- C. Description of conductors to be used with a statement that all wire shall be in conduit. Where accessible ceiling occurs, plenum rated wire on J-hooks is acceptable.

1.05 Quality Assurance:

- A. Installer: The installation firm shall be an established communications and electronics contractor with at least 10 years successful installation experience of products utilizing integrated communications systems and equipment specific to that required for this project. Only California Certified fire alarm technicians or California Certified electrician shall be used to install the fire alarm system. Provide proof to District that all employees are California Certified to install the fire alarm system.
- B. All materials, unless otherwise specified, shall be new, and free from any defects. All items of equipment including wire and cable shall be designed by the manufacturer unless otherwise specified, shall function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.
- C. The Contractor shall show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The contractor shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

- D. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

#### 1.06 Warranties:

- A. The contractor shall warrant all equipment and wiring free from inherent mechanical and electrical defect for one year (365 days) from the date of final acceptance. The contractor shall without additional expense to the School District, replace any defective materials or equipment provided by him under this contract within the warranty period.

## PART 2 - PRODUCTS

### 2.01 System Description

- A. The contractor shall furnish and install a complete 24 VDC, electrically supervised, addressable analog, microprocessor-based fire alarm control panel as specified herein. The fire alarm system shall include but not be limited to all control equipment, power supply, initiating devices, audible and visual indicating appliances as appropriate, conduit, wiring, fittings, and all other accessories necessary to provide a complete and operable system.

- B. General System Operation:

1. When an alarm occurs on a zone the control panel indicates the alarm condition until manually reset.
2. An alarm may be acknowledged by actuating the "ACKNOWLEDGE" switch. This shall silence the control panel buzzer, and change the "SYSTEM ALARM" LED and the individual zone LED from flashing to steadily lit.
3. All alarm signals may be silenced by actuating the "SILENCE" switch. This shall steadily illuminate the "SIGNAL SILENCE" LED. If a subsequent alarm is activated, the alarm signal shall "resound" until again silenced. Once silenced, all alarm signals may be restored again by activating the "SILENCE" switch. Waterflow zones shall be non-silenceable.
4. If the microprocessor fails, the system shall execute a default signaling program. This program will enable the panel to sound the audible signals and summon the Fire Department. In addition, a yellow "DEGRADE" LED shall light to indicate the programming failure. Inability of the system to sound signals or summon the fire department during microprocessor failure shall not be acceptable.

- C. Alarm Operation:

1. Operation of a manual pull station or automatic activation of any smoke detector, heat detector, or water flow switch zone shall cause the FACP to:
2. Sound all indicating appliances in a temporal pattern.
3. Flash all strobes.

4. Shut down all air handling units as specified herein.
5. Flash the panel "System Alarm" LED and pulse a panel audible signal.
6. Display a description of the specific analog/addressable device in alarm via an 80-character alpha-numeric display.
7. Display a description of the specific analog/Addressable device in alarm on the administrations Remote 80-character Annunciators.
8. Notify the Fire Department via the UDACT [and AES-Intellinet Radio].

D. Electrical Supervision:

1. Each initiating and signal circuit shall be electronically supervised for opens, shorts, and ground faults in the wiring. The occurrence of any fault shall activate the system trouble circuitry but shall not interfere with the proper operation of any circuit that does not have a fault connection.
2. Each initiating circuit shall be capable of being wired using Class "B" (Style B) supervised circuits (a break or ground fault in any conductor shall be reported as a trouble condition) at no extra cost.

E. Normal Power Supply:

1. Connections to the normal electrical service shall be on a dedicated branch circuit in accordance with the California Electrical Code (CEC) the circuit and connections shall be mechanically protected. The circuit disconnecting means shall be accessible only to authorized personnel and shall be clearly marked "FIRE ALARM CIRCUIT CONTROL."

2.02 Fire Alarm Control Panel:

A. The FACP is a new Notifier NFS2-3030 with Emergency Voice Evacuation Digital Voice Command:

1. Auxiliary SPDT alarm and trouble dry contacts.
2. Auxiliary circuitry in the control panel to operate remote relays for control of air handling equipment.
3. A solid-state power transfer circuit that shall switch to standby power automatically and instantaneously if normal power fails or falls below 15% of normal ("brown out" conditions).
4. This electronic circuit shall allow the batteries to be effectively "floated" on the operating system to avoid upsetting normal microprocessor operation and minimize resultant nuisance troubles and /or alarms. This circuit shall be physically isolated from the power supply to facilitate service.

5. A ground fault detector to detect positive or negative grounds on the initiating circuits, signal circuits, power circuits, and telephone line circuit. A ground fault LED shall be illuminates and shall operate the general trouble devices as specified herein but shall not cause an alarm to be sounded.
6. Short circuit LED's for all notification appliance circuits shall be a standard feature of the fire alarm control panel. Each circuit shall be monitors for short circuits and shall have a distinct LED for visual indication of the circuit.
7. Operating trouble devices as specified herein but shall not cause an alarm to be sounded.
8. Individual circuit fuses shall be provided from the following: smoke detector (resettable) power, main power supply, battery standby power, and auxiliary (non-resettable) output.
9. A common reset and lamp test switch, labeled "RESET/LAMP TEST" shall be provided to reset the system.
10. Circuitry shall be provided in the control panel to permit transmission of trouble alarm signals over leased or privately owned telephone cables to a remote receiving panel. There shall be a remote disconnect switch to allow testing of the fire alarm signal without transmitting an alarm signal to the central station.

#### 2.03 System Cabinet:

- A. The system cabinet shall be surface mounted with a texture finish and shall be made of these three parts: backbox, backplate, and door.
- B. The cabinet shall be of dead-front construction and 16-gauge cold rolled steel. The door lock system shall consist of two locks which will accept two different keys. One "OPER" key shall allow dead front access to the module display for all operator functions while one "TECH" key shall allow access to all pane electronics without further dismantling of the cabinet, control unit, or wiring.

#### 2.04 Power Supply:

- A. All AC line connections shall be isolated from the power supply unit and transformer by means of a cable-connected AC Unit per U.L. 864.
- B. The 120 VAC main power shall be transformer converted to low voltage, rectified and filters 24 VDC nominal for system operation and to eliminate the possibility of line voltage being present on any internal panel components. The power supply shall be integral, filtered, nominal 24 VDC at 5 Amps, and comply with U.L. 864.
- C. Primary Power outputs shall be as follows:
  1. A green LED on the power supply card shall indicate the presence of primary power.
- D. Power Supply outputs shall be as follows:

1. 24 VDC Non-Resettable, 3.2 Amps max., Power Limited.

2. 24 VDC Resettable, 3.2 Amps max., Power Limited.

E. NOTE: maximum combined output for both is 8.0 Amp.

#### 2.05 Battery Charger:

A. The power supply shall contain a supervised and fused battery charger with a maximum average charging current of 1.5 Amp (this current shall be sufficient to maintain the system batteries at full charge).

B. If the system loses AC power, a System Trouble shall occur.

C. The battery charger shall be capable of charging up to 34 ampere/hour capacity, lead-acid batteries. If batteries are mounted within the control panel enclosure provide a battery shelf.

#### 2.06 Detection Circuits:

A. Each Analog Detection Loop Unit shall provide communication with all analog/addressable devices (initiating/control) connected to the system through two (2) analog/addressable communications loops. Each loop shall communicate with a maximum of ninety-nine analog detectors and ninety-eight addressable monitor/control devices.

B. The first nine-nine addressed (1-99) on each loop shall be dedicated to analog detectors, while addresses 101-198 shall be reserved for addressable monitor/control devices.

#### 2.07 Analog/Addressable Communications Loops:

A. All initiating devices shall be connected to their addressable loop via a two wire style 4 (class B) circuit.

#### 2.08 Notification Appliance circuits:

A. Four (4) independent (class B) notification appliance circuits shall be provided on the SCU, each polarized and rated at 1.75 Amps DC, individually fused and supervised for opens, grounds, and short circuits. They shall be capable of being wired Class "A" (style Z) or class "B" (style Y) supervised and fused @ 2 Amps. Specifications are as follows:

Voltage	Current
24VDC Non-Regulated	3.2 Amps: Maximum Alarm
	.001 Amps: Normal Standby

#### 2.09 Trouble Input:

A. Trouble input shall be provided rated at 5-24 Volts input and, if used, shall accept a trouble from an external source.

2.10 Trouble Dry Contacts:

- A. Trouble dry contacts (form A or Form B; jumper selectable) shall be provided rated at 2 Amps at 24 VDC (resistive) and shall transfer whenever a system trouble occurs.

2.11 Alarm Dry Contacts:

- A. Alarm dry contacts (form C) shall be provided rated at 2 Amps at 24 VDC (resistive) and shall transfer whenever a system alarm occurs.

2.12 Central Station Monitoring:

- A. The entire fire alarm system shall be connected via leased telephone lines and radio communications to a central station and in accordance with the requirements of the fire department.

2.13 Alarm Signals:

- A. All alarm signals shall be automatically "locked in" at the control panel until the operated device is returned to its normal condition and the control panel is manually reset. When used for Water flow, the silence switch shall be bypassed.
- B. Alarm or Trouble Activation of Initiating Zones.
- C. Alarm or Trouble activation of initiating zones shall be indicated by zone alarm and trouble LED's.

2.14 Detection Devices:

A. Manual Pull Stations:

- 1. Provide non coded, addressable, semi-recessed, double-action type manual pull station with mechanical reset features. Where installed in existing buildings, boxes may be surface-mounted. Surface mounted boxes shall be the same color as the pull stations.
- 2. Provide separate screw terminal for each conductor connected to the manual alarm pull station. Break-glass-front pull stations will not be permitted. Provide red aluminum, housing labeled "fire". The pull stations shall not be resettable without the use of a key.

B. Detectors:

- 1. Each photoelectric smoke detector and heat detector shall be interchangeable via twist-lock mounting base, to ensure matching the proper sensor to the potential hazards of the areas being protected. The system shall recognize when an improper sensor type has been installed in a previously programmed sensor type location.

C. Photoelectric Smoke Detector:

1. Provide white flame retardant plastic, addressable, analog, photoelectric type, smoke detectors. Detectors shall operate using an optical sensing chamber principal which complies with UL 268.
2. Each detector shall be capable of being set at two sensitivity settings.
3. Each detector shall have two LED visual indicators providing local 360 degree visibility of operating status and alarm indication.
4. Each detector shall be supported independently of wiring connections, and connected by separate screw terminals of each conductor.
5. The detector screen and cover assembly must be easily removable for field cleaning.

D. Combination Fixed Temperature, rate of Rise Heat Detectors:

1. Provide off-white flame retardant plastic, addressable, combination 140 degree F fixed temperature, rate of rise heat dual thermistor detectors. Detector shall initiate an alarm when temperature rises at a rate of over 15 degrees F per minute or above 140 degrees F.
2. Each detector shall have two LED visual indicators providing local 360 degree visibility of operating status and alarm indication.
3. Contacts shall be self-resetting after response to rate or rise principal. Locate detectors in accordance with UL FPD or FM P7825 listing and the requirements of NFPA 72. Temperature rating of detectors shall be in accordance with NFPA 72.

E. Addressable Monitor Module: provide addressable monitor module wired as style B (class "B") to provide an address for normally open contact devices.

1. Provide Addressable Monitor Module to monitor status of all Water flow Switches, Valve tamper Switches and Post Indicator Valves.

2.15 Alarm Notification Devices:

- A. Color of notification appliances shall be red, unless otherwise noted by District.
- B. All alarm notification devices shall be synchronized throughout the school campus building.
- C. Strobe Lights: Provide recessed mounted strobe light assembly suitable for use in electrically supervised circuit. Lamps shall be xenon flashtube type, powered from the fire alarm control panel alarm signaling circuit. Strobes shall provide candela ratings as indicated on the drawings candelas and flash 60 times per minute unless otherwise noted. Strobes in toilets shall provide a minimum of 15 candelas. Lamps shall be protected be a clear polycarbonate lens. Housing shall be labeled "FIRE" in red vertical lettering.

- D. Speaker/Strobes: Provide recessed mounted, grille face, vibrating diaphragm type, audio alarm devices consisting of an electro-mechanical horn suitable for use in an electrically supervised circuit. Speaker/Strobes shall be provided with a red, tamper resistant grill. Speaker shall have a minimum sound rating of 90 DBA at 10 feet and have field selectable sound levels. Speakers shall be capable of providing a synchronized, field selectable, temporal code 3 tone. Strobes shall have a separate minimum candela as shown on the drawings and flash 60 times per minute unless otherwise noted. Lamps shall be protected by a clear polycarbonate lens. Housing shall be labeled "FIRE" in red vertical lettering.
- E. Speakers: Provide recessed mounted, grille face, vibrating diaphragm type, audio alarm devices consisting of an electro-mechanical horn suitable for use in an electrically supervised circuit. Horns shall be provided with a red, tamper resistant grill. Horn shall have a minimum sound rating of 90 DBA at 10 feet and have field selectable sound levels. Horns shall be capable of providing a synchronized, field selectable, temporal code 3 tone. Horns shall have a separate screw terminal for each conductor connection.
- F. Exterior Speakers: Provide recessed mounted, grille face, vibrating diaphragm type, audio alarm devices consisting of an electro-mechanical horn suitable for use in an electrically supervised circuit. Horns shall be provided with a red, tamper resistant grill, and a weatherproof backbox. Horn shall have a minimum sound rating of 90 DBA at 10 feet and have field selectable sound levels. Horns shall be capable of providing a synchronized, field selectable, temporal code 3 tone. Horns shall have a separate screw terminal for each conductor connection. Horns located in areas subject to moisture or exterior atmospheric conditions, shall be approved for such locations.
- G. Field Charging Power Supply (FCPS):
  - 1. The FCPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.
  - 2. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 60 hour standby.
  - 3. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.
  - 4. The FCPS shall include an attractive surface mount backbox.
  - 5. The Field Charging Power Supply shall include the ability to delay the AC fail delay per NFPA requirements.
  - 6. The FCPS include power limited circuitry, per 1995 UL standards.

## 2.16 Wiring and Conduit:

- A. Provide wiring in accordance with NFPA 72.
- B. Conductors shall be solid copper. Conductors for 120 volt circuits shall be No. 12 AWG minimum; conductors for low-voltage DC circuits shall be No. 14 AWG minimum for annunciation circuits and No. 14 AWG minimum for initiation circuits. All cables shall be rated and code compliant for their use.
  - 1. All low voltage wiring not installed in conduits shall be plenum rated.
  - 2. Provide color-coded conductors. Identify conductors by plastic-coated, self-sticking, printed markers or by heat-shrink type sleeves. Each conductor used for the same specific function shall be distinctly color coded. Use different color codes for each interior circuit. Each circuit color code wire shall remain uniform throughout the circuit.
  - 3. Pigtail or "T" tap connections to the evacuation alarm horns, horn/strobes and strobes are not acceptable.
  - 4. Underground circuit or circuits in wet areas shall be gel filled cables in scheduled 40 PVC conduit. There shall be no splicing of any underground cables.
- C. Conduits:
  - 1. Identification of Conduit: New conduits containing fire alarm system conductors shall be red,  $\frac{3}{4}$ " minimum. Junction-boxes, covers, gutters, and terminal cabinets, containing fire alarm system conductors, shall be painted red or provided red in color with engraved plastic identification signs permanently attached to the equipment.
  - 2. Do not run fire alarm circuits in the same conduit with the non-fire alarm circuits.
  - 3. Do not run AC circuits in the same conduit with the fire alarm circuits.
  - 4. Provide wiring in rigid metal conduit for exterior installations or where exposed to damage.
  - 5. Conceal conduit in finished areas of new construction and wherever practical in existing construction. Conduit runs shall be straight, neatly arranged properly supported and parallel or perpendicular to walls and partitions. Identify conductors within each enclosure where a tap, splice, or termination is made.

### PART 3 - EXECUTION

#### 3.01 Installation:

- A. Equipment, materials, installation, workmanship, inspection, and testing shall be in accordance with the NFPA publications and as modified herein.
- B. Follow manufacturer's directions in all cases for installation, testing and energizing.
- C. Accurately set, level, support, and fasten all equipment.

D. Smoke and heat detectors:

1. No detector shall be located closer than 12 inches to any part of any lighting fixture. Detectors, located in areas subject to moisture or exterior atmospheric conditions, or hazardous locations as defined by NFPA 70, shall be approved for such locations.
  2. Provide guards for all detectors mounted in any high athletic activity areas such as gym's, wrestling rooms, shower rooms.
- E. Conduit where exposed shall be installed parallel with the walls or structural elements; vertical runs to be plumb; horizontal runs to be level or parallel with structure; conduit grouped neatly together with straight runs, all bends parallel and uniformly spaced.
- F. Earthquake Resistant installation/fastening of all electrical equipment shall conform to the general requirements of section 1614A of the California Building Code.

3.02 Preliminary Tests:

- A. Conduct the following tests during installation of wiring and system components. Correct deficiency pertaining to these requirements prior to formal functional and operational tests of the system, preliminary tests shall be performed in the presence of the Local Fire Authority and Project inspector of Record to determine the conformance with the specified requirements.
- B. Ground Resistance: Measure the resistance of each connection to ground. Ground resistance shall not exceed 10 ohms.
- C. Dielectric Strength insulation Resistance: Test the dielectric strength and the Insulating resistance of the system interconnecting wiring by means of an instrument capable of generating 500 volts of DC and equipped to indicate leakage current 1000 megohms. For the purpose of this test, connect the instrument between each conductor on the line and between each conductor and ground at the control panel end of the line, with the other extremity open circuited and all series-connected devices in place. The system shall withstand the test without breakdown and shall indicate a resistance of not less than 1.0 minute with a DC potential of not less than 100 volts and not more than 500 volts.
- D. Standby Battery Test: prior to formal inspection and tests, place the fire alarm system on standby battery power for 24 hours; immediately thereafter, sound the building evacuation alarm signaling devices for 5 minutes. When the test is complete, the fire alarm system battery charger shall be fully recharged within 24 hours.
- E. Field Inspection and Test:
1. Before final acceptance of the work, pre-test system to demonstrate compliance with the contract requirements. System shall be subjected to complete functional and operational tests, including tests in place of each detector. When tests have been completed and corrections made, submit a signed and dated NFPA Certificate of Completion along with a completed testing matrix with the request for formal inspection and tests.

2. Where application of heat would destroy a heat detector, it may be manually activated.
3. Verify the proper receipt of the alarm signals at the central station for the UDACT provide printout of test reports. It shall be the sole obligation of the contractor to coordinate and to provide all testing documentation from the central station.
4. The communication loops and the indicating appliance circuits shall be opened in at least two locations per zone to check for the presence of correct supervisory circuitry.
5. Perform the field inspection and test in the presence of the manufacturer's representative, the School District's representative, local Fire Authority and Project Inspector of Record (IOR).
6. Test equipment: It shall be the responsibility of the installing Contractor to furnish tools, instruments, and materials required for a thorough test of the system. This includes, but is not limited to, the following:
  - a. VOM meter
  - b. Manufacturer's recommended smoke detector testing device and sensitivity test equipment.
  - c. Heat source for testing heat detectors.
  - d. Keys to all control panels.
  - e. Ladders

### 3.03 Project Closeout:

#### A. As Built Drawings:

1. Provide a complete set (full size scalable) of reproducible "as-built" and AutoCAD format drawings showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment, and internal wiring of the equipment upon completion of system.

#### B. Operating and Instruction Manuals:

1. Operating and Instruction manuals shall be submitted prior to testing of the system. Four complete sets of operation and instructions manuals shall be delivered to the School District upon request.
2. Complete, accurate, step-by-step testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, and troubleshooting manual explaining how to test the preliminary internal parts or each piece of equipment shall be delivered upon completion of the system.

- C. Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:
1. Instructions on replacing any components of the system, including internal parts.
  2. Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions.
  3. A complete list of all equipment and components with information as to the address and telephone number of both the manufacturer and local supplier of each item.
  4. User operating instructions shall be provided prominently displayed on a separate sheet located next to the control unit in accordance with U.L. Standard 864.

## **EMERGENCY VOICE EVACUATION SYSTEM**

### **PART 1.0 - GENERAL**

#### **1.1. DESCRIPTION:**

A. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled Voice Evacuation/Mass Notification control panel.

B. The Voice Evacuation/Mass Notification panel shall comply with NFPA 72 requirements.

1. The Secondary Power Source of the Voice Evacuation/Mass Notification panel will be capable of providing at least 24 hours of backup power with the ability to sustain 15 minutes in alarm at the end of the backup period.

C. The Voice Evacuation/Mass Notification panel shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC, Q9001-1994.

D. The Voice Evacuation/Mass Notification panel and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).

Walnut Grove School Fire Alarm  
Walnut Grove Elementary School  
Pleasanton School District  
SFA Project No. 21083

Underwriters Laboratories Inc. (UL) - USA:

UL 864 Standard for Control Units for Fire Protective Signaling Systems

UL 1711 Amplifiers for Fire Protective Signaling Systems

UL 2572 Communication and Control Units for Mass Notification Systems

Other:

NEC Article 250 Grounding

NEC Article 300 Wiring Methods

NEC Article 760 Fire Protective Signaling Systems

Compliant with Unified Facilities Criteria UFC 4-021-01

1. The Voice Evacuation/Mass Notification panel shall be ANSI 864, 9th Edition Listed. Systems listed to ANSI 864, 8th edition (or previous revisions) shall not be accepted.

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

#### 1.2. SCOPE:

A. A microprocessor-controlled Voice Evacuation/Mass Notification control panel shall be installed in accordance with the project specifications and drawings.

#### 1.3. SUBMITTALS

##### A. General:

1. Two copies of all submittals shall be submitted to the Architect/Engineer for review.
2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

##### B. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

3. Show system layout, configurations, and terminations.

C. Manuals:

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

D. Software Modifications

1. Provide the services of a qualified technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
2. Provide all hardware, software, programming tools and documentation necessary to modify the Voice Evacuation/Mass Notification Control Panel on site. Modification includes addition and deletion of messages, circuits, zones and changes to system operation. The system structure and software shall place no limit on the type or extent of software modifications on-site.

1.4. GUARANTY:

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

1.5. MAINTENANCE:

- A. Maintenance and testing shall be on a semi-annual schedule or as required by the local AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance. The Voice Evacuation/Mass Notification Control Panel shall be tested in accordance with the requirements of NFPA 72.
- B. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

1.6. POST CONTRACT EXPANSIONS:

- A. The contractor shall have the ability to provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.
- B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of speakers zones or wattage by ten percent (10%).

- C. The quotation shall include installation, test labor, and labor to reprogram the system for this 10% expansion. If additional Voice Evacuation/Mass Notification Control Panel hardware is required, include the material and labor necessary to install this hardware.
- D. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the Voice Evacuation/Mass Notification Control Panel.
- E. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

#### 1.7. APPLICABLE STANDARDS AND SPECIFICATIONS:

The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

##### A. National Fire Protection Association (NFPA) - USA:

No. 70 National Electric Code (NEC)

No. 72 National Fire Alarm Code

No. 101 Life Safety Code

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

C. Local and State Building Codes.

D. All requirements of the Authority Having Jurisdiction (AHJ).

#### 1.8. APPROVALS:

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

UL Underwriters Laboratories Inc (Ninth Edition)

CSFM California State Fire Marshal

MEA Material Equipment Acceptance (NYFD COA)

### PART 2.0 PRODUCTS

#### 2.1. EQUIPMENT AND MATERIAL, GENERAL:

A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a fire protective signaling system, meeting the National Fire Alarm Code.

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

C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place

(e.g., speakers shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

D. All equipment must be available "over the counter" through the Security Equipment Distributor (SED) market and can be installed by dealerships independent of the manufacturer.

## 2.2. CONDUIT AND WIRE:

### A. Conduit:

1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
2. Where required, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760.
4. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
5. Conduit shall not enter the Voice Evacuation/Mass Notification Control Panel, or any other remotely mounted panel equipment or backboxes, except where conduit entry is specified by the Voice Evacuation/Mass Notification Control Panel manufacturer.
6. Conduit shall be 3/4 inch (19.1 mm) minimum.

### B. Wire:

1. All Voice Evacuation/Mass Notification Control Panel wiring shall be new.
2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the Voice Evacuation/Mass Notification Control Panel. Number and size of conductors shall be as recommended by the Voice Evacuation/Mass Notification Control Panel, but not less 14 AWG (1.63 mm) for Notification Appliance Circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NEC 760 (e.g., FPLR).
5. All field wiring shall be electrically supervised for open circuit and ground fault.

### C. Terminal Boxes, Junction Boxes and Cabinets:

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

D. The Voice Evacuation/Mass Notification Control Panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as Voice Evacuation/Mass Notification Control Panel. Voice Evacuation/Mass Notification Control Panel

primary power wiring shall be 12 AWG. The panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.

1. The Voice Evacuation/Mass Notification Control Panel notification circuit (NACs 1) shall also automatically synchronize any of the following manufacturer's notification appliances connected to them: System Sensor, Wheelock, or Gentex with no need for additional synchronization modules.

### 2.3. Voice Evacuation/Mass Notification Control Panel:

A. The Voice Evacuation/Mass Notification Control Panel is a new Silent Knight 6820EVS (with Digital Voice Command Center) and contains a microprocessor-based Central Processing Unit (CPU). The CPU shall distribute and control emergency voice messages over the speaker circuits.

B. The system shall provide the capability to interface to **LOC (Local Operator Console)**, Distributed Audio Amplifiers, Remote Page Unit, Remote Microphone, Fire Fighter Telephone Unit and Remote Telephone Zone Module from the same manufacturer.

### C. Shall have as minimum requirements:

1. Integral 50 Watt, 25 Vrms audio amplifier with optional converter for 70.7 volt systems. The system shall be capable of expansion to 100 watts total via the insertion of an additional 50-watt audio amplifier module (can be used as a backup amplifier) into the same cabinet and expandable over 1100 watts.
2. Speaker circuit that can be wired both Class A and B.
3. Integral Digital Message Generator with a memory capacity for up to 60 seconds per messaging. The Digital Message Generator shall be capable of producing fourteen distinct messages (60 seconds each). Field-selectable message and custom message recording capability using the local microphone, a USB port, or an external audio input.
4. Built in alert tone patterns with ANSI, March Code, California,

Steady, Alert Tone, Hi-Lo, ANSI Whoop, Continuous Whoop, or No Tone is field programmable. Tone Prior to transmitting a message, the Voice Evacuation/Mass Notification Control Panel can be programmed to produce a pre-announce and post-announce tone.

- a. Leading Tone Duration If a pre-announce tone is desired, select the length of time it will play before a message is broadcasted. Select 4, 8, 12, 16, 20, 24, or 28 seconds. In a pre-announce tone is not desired, select 0 seconds.
  - b. Trailing Tone Duration Select the length of time for the post-message announcement tone. Select 4, 8, 12, 16, 20, 24, 28, or 32 seconds from the drop-down menu.
  - c. Repeat Cycle Select the number of times the message will be repeated during an alarm. A message can be repeated 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or an *Infinite* amount of times.
5. The Voice Evacuation/Mass Notification Control Panel will be capable of detecting and annunciating the following conditions: Loss of Power (AC and DC), System Trouble, Ground Fault, Alarm, Microphone Trouble, Message Generator Trouble, Tone Generator Trouble, and Amplifier Fault.
6. The Voice Evacuation/Mass Notification Control Panel shall be fully supervised including microphone, amplifier output, message generator, speaker wiring, and tone generation.

7. Speaker outputs shall be fully power-limited.
8. Amplifiers will be supplied power independently to eliminate a short on one circuit from affecting other circuits.
9. The Voice Evacuation/Mass Notification Control Panel will provide full supervision on both active (alarm or music) and standby conditions.
10. An optional zone splitter version shall be available that permits splitting speaker circuits into 8 specific zones.
11. An optional distributed amplifiers unit shall be available that permits splitting speaker circuits up to a total of 24 speaker zones.
12. Wiring terminals shall be removable terminal blocks (Wire Gauge 12 – 18 AWG) for ease of servicing.
13. Voice Evacuation/Mass Notification Control Panel will provide 2 amp Notification Appliance Circuit (NAC) output with sync generator or follower for System Sensor, Wheelock or Gentex protocols. The NAC shall be capable of One (1) Style Y (Class B) or Style Z (Class A) circuit.
14. Shall have eight Command Input Circuits to activate messages via reverse polarity or contact closures.
15. Built in External Audio Input can be used for background music.
16. On-board battery charger which supports charging up to 26 AH batteries (cabinet holds up to 18AH batteries).
17. Programmable delay of immediate, 2 hours or 6 hours reporting of AC Loss.
18. Built in Piezo sounder for local trouble.
19. Stores the events in the 100 Event History log
20. Shall have Console Lamp Test switch and shall activate all system LEDs including Remote Consoles.
21. Shall have three Form-C relays:
  - AC Power Loss Relay
  - System Trouble Relay
  - MNS Active (For Mass Notification signage)
22. Shall have a Special Application (auxiliary power) output for addressable modules when interfaced with compatible addressable FACPs and End-of-Line power supervision relays.
23. Shall be capable of Speaker Volume Control. The Supervised

Volume Control will allow manual volume setting for telephone paging and background music for a specific speaker or speaker zone.

24. Shall have a Night Ring input allows a building's Private Branch Exchange (PBX) to activate the Voice Evacuation/Mass Notification panel.
25. The Voice Evacuation/Mass Notification panel can communicate in any combination up to eight (8) external remote consoles:

Optional Remote Microphone

Optional Remote Page Unit

Optional Local Operator Console

26. The Voice Evacuation/Mass Notification panel can communicate in any combination up to eight (8) external distributed audio amplifiers:

Optional Distributed Amplifier, 50 watts.

Optional Distributed Amplifier, 125 watts.

27. Shall be capable of integrating with firefighter telephone system that provides secure and reliable communications. The firefighter telephone system will allow for up to ten users to plug in to a remote telephone jack and communicate simultaneously within a building.
28. Shall be capable of secure access to the Voice Evacuation/Mass Notification panel via cell phone or other remote telephone.
29. The Voice Evacuation/Mass Notification panel can be integrated by an FACP via the ANN/ACS (EIA-485) link. Compatible FACP's include the MS-9200UDLS and MS-9600(UD)LS.
30. The Voice Evacuation/Mass Notification shall report Mass Notification events to the Central Station.
31. The Voice Evacuation/Mass Notification panel can be interface with other UL Listed Fire Alarm Control Panels via activation of reverse polarity or by contact closure.

#### D. Speakers:

1. All speakers shall operate on 25 or 70 VRMS with field selectable output taps from 0.25 to 2.0 Watts.
2. Speakers in corridors and public spaces shall produce a minimum sound levels of 75 dBA output at 10 feet (3m).
3. The plug-in speaker allows the installer to pre-wire mounting plates and dress the wires before plugging in the speakers.
4. Flush mount applications are achievable without the need for an extension ring.
5. Frequency response shall be a minimum of 400 HZ to 4000 HZ.
6. Rotary switch simplifies field selection of speaker voltage and power settings.

#### E. Enclosures:

1. The Voice Evacuation/Mass Notification panel shall be housed in a UL-listed cabinet suitable for

surface mounting. The cabinet and front shall be corrosion protected and painted red via the powder coat method with manufacturer's standard finish.

2. The back box and door shall be constructed of steel with provisions for electrical conduit connections into the sides and top.

The door shall provide a key lock and shall provide for the viewing of all indicators.

#### F. Power Supply:

1. The main power supply for the Voice Evacuation/Mass Notification panel shall provide up to 7.5 amps of available power for the panel and peripheral devices.
2. Provisions will be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies.
3. The power supply shall provide an integral battery charger or may be used with an external battery and charger systems. Battery arrangement may be configured in the field.
4. The main power supply shall continuously monitor all field wires for earth ground conditions.
5. The main power supply shall operate on 120 VAC, 60 Hz or 240 VAC, 50 Hz, and shall provide all necessary power for the Voice Evacuation/Mass Notification panel.

#### G. BATTERIES:

1. Upon loss of Primary (AC) power to the Voice Evacuation/Mass Notification panel, the batteries shall have sufficient capacity to power the Voice Evacuation/Mass Notification panel for required standby time (24 or 60 hours) followed by 15 minutes of alarm.
2. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.

### PART 3.0 - EXECUTION

#### 3.1. INSTALLATION:

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

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect speakers from contamination and physical damage.

#### 3.2. TEST:

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

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

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

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

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

E. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying voice messages.

### 3.3. FINAL INSPECTION:

A. At the final inspection a minimum NICET Level II technician shall demonstrate that the system functions properly in every respect.

### 3.4. INSTRUCTION:

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

B. The contractor or installing dealer shall provide a user manual indicating "Sequence of Operation."

END OF SECTION

## **SECTION 31 23 00**

### **TRENCHING, BACKFILLING, AND COMPACTING**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Trench, backfill, and compact as specified herein and as needed for installation of underground utilities associated with the Work.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division I of these Specifications.

##### **1.2 QUALITY ASSURANCE**

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.
- C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the construction soil engineer.

#### **PART 2 - PRODUCTS**

##### **2.1 SOIL MATERIALS**

- A. Fill and backfill materials:
  - 1. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps over 2" in greatest dimension, and with not more than 10% of the rocks or lumps larger than 1" in their greatest dimension.
  - 2. Fill material is subject to the approval of the construction soil engineer, and is that material removed from excavations or imported from off-site borrow areas, predominantly granular, non- expansive soil free from roots and other deleterious matter.
  - 3. Imported fill material shall, in addition, have 10 to 40% by weight passing the #200 sieve, a plasticity index of less than 12, and a liquid limit of less than 30%.

##### **2.2 OTHER MATERIALS**

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

#### **PART 3 - EXECUTION**

### 3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

### 3.2 FINISH ELEVATIONS AND LINES

- A. Comply with documents.

### 3.3 PROCEDURES

- A. Utilities:
  - 1. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the School District.
  - 2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.
  - 3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the School District.
  - 4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Architect and secure his instructions.
  - 5. Do not proceed with permanent relocation of utilities until written instructions are received from the Architect.
- B. Protection of persons and property:
  - 1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.
  - 2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
  - 3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.
- C. De-watering:
  - 1. Remove all water, including rain water, encountered during trench and sub-structure work to an approved location by pumps, drains, and other approved methods.
  - 2. Keep trenches and site construction area free from water.
- D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- E. Maintain access to adjacent areas at all times.

### 3.4 TRENCHING

- A. Provide sheeting and shoring necessary for protection of the Work and for the safety of personnel.
  - 1. Prior to backfilling, remove all sheeting.
  - 2. Do not permit sheeting to remain in the trenches except when, in the opinion of the Architect, field conditions or the type of sheeting or methods of construction such as use of concrete bedding are such as to make removal of sheeting impracticable. In

such cases, the Architect may permit portions of sheeting to be cut off and remain in the trench.

- B. Open cut:
  - 1. Excavate for utilities by open cut.
  - 2. If conditions at the site prevent such open cut, and if approved by the Architect, trenching may be used.
  - 3. Short sections of a trench may be tunneled if, in the opinion of the Architect, the conductor can be installed safely and backfill can be compacted properly into such tunnel.
  - 4. Where it becomes necessary to excavate beyond the limits of normal excavation lines in order to remove boulders or other interfering objects, backfill the voids remaining after removal of the objects as directed by the construction soil engineer.
  - 5. When the void is below the subgrade for the utility bedding, use approved earth materials and compact to the relative density directed by the construction soil engineer, but in no case to a relative density less than 90%.
  - 6. When the void is in the side of the utility trench or open cut, use approved earth or sand compacted as approved by the construction soil engineer, but in no case to a relative density less than 85%.
  - 7. Remove boulders and other interfering objects, and backfill voids left by such removals, at no additional cost to the School District.
  - 8. Excavating for appurtenances:
    - a. Excavate for manholes and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.
    - b. Overdepth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel, or lean concrete as directed by the construction soil engineer, and at no additional cost to the School District.
- C. Trench to the minimum width necessary for proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing for the utility.
- D. Depressions:
  - 1. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.
  - 2. Except where rock is encountered, do not excavate below the depth indicated or specified.
  - 3. Where rock is encountered, excavate rock to a minimum overdepth of 4" below the trench depth indicated or specified.
- E. Where utility runs traverse public property or are subject to governmental or utility company jurisdiction, provide depth, bedding, over, and other requirements as set forth by legally constituted authority having jurisdiction, but in no case less than the depth shown in the Contract Documents.
- F. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace turf upon completion of the backfilling.
- G. Cover:
  - 1. Provide minimum trench depth indicated below to maintain a minimum cover over the top of the installed item below the finish grade or subgrade, unless specifically designed and shown otherwise on the drawings:

- a. Areas subject to vehicular traffic:
  - 1) Sanitary sewers: 24";
  - 2) Storm drains: 24".
- b. Areas not subject to vehicular traffic:
  - 1) Sanitary sewers: 18";
  - 2) Storm drains: 18".
- c. All areas:
  - 1) Water lines: 18";
  - 2) Natural gas lines: 18";
  - 3) Electrical cables: 24";
  - 4) Electrical ducts: 18".
- d. Concrete encased:
  - 1) Pipe sleeves for water and gas lines: 18";
  - 2) Sanitary sewers and storm drains: 12";
  - 3) Electrical ducts: 18".
- e. Where utilities are under a concrete structure slab or pavement, the minimum depth need only be sufficient to completely encase the conduit or pipe sleeve, and electrical long-radius rigid metal conduit riser, provided it will not interfere with the structural integrity of the slab or pavement.
- f. Where the minimum cover is not provided, encase the pipes in concrete as indicated. Provide concrete with a minimum 28 day compressive strength of 3000 psi.

### 3.5 BEDDING

- A. Provide bedding as indicated on the Drawings.

### 3.6 BACKFILLING

- A. General:
  - 1. Do not completely backfill trenches until required pressure and leakage tests have been performed, and until the utilities systems as installed conform to the requirements specified in the pertinent Sections of these Specifications.
  - 2. Except as otherwise specified or directed for special conditions, backfill trenches to the ground surface with selected material approved by the construction soil engineer.
  - 3. Reopen trenches which have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified, or otherwise correct to the approval of the construction soil engineer.
  - 4. Do not allow or cause any of the Work performed or installed to be covered up or enclosed by work of this Section prior to required inspections, tests, and approvals.
  - 5. Should any of the Work be so enclosed or covered up before it has been approved, uncover all such Work and, after approvals have been made, refill and compact as specified, all at no additional cost to the School District.
- B. Lower portion of trench:
  - 1. Deposit approved backfill and bedding material in layers of 3" minimum thickness, and compact with suitable tampers to 90% relative density (85% in landscape areas), until there is a cover of not less than 24" over sewers and 12" over other utility lines.
  - 2. Take special care in backfilling and bedding operations to not damage pipe and pipe coatings.
- C. Remainder of trench:
  - 1. Except for special materials for pavements, backfill the remainder of the trench with approved backfill.

2. Deposit backfill material in layers not exceeding the thickness specified, and compact each layer to the minimum density indicated by the construction soil engineer.
  - D. Adjacent to buildings: Mechanically compact backfill within ten feet of buildings.
  - E. Consolidation of backfill by jetting with water may be permitted, when specifically approved by the construction soil engineer, in areas other than building and pavement areas.
- 3.7 TEST FOR DISPLACEMENT OF SEWERS AND STORM DRAINS
- A. Check sewers and storm drains to determine whether displacement has occurred after the trench has been backfilled to above the pipe and has been compacted as specified.
  - B. Flash a light between manholes or, if the manholes have not yet been constructed, between the locations of the manholes, by means of a flashlight or by reflecting sunlight with a mirror.
  - C. If the illuminated interior of the pipe line shows poor alignment, displaced pipes, or any other defects, correct the defects to the specified conditions and at no additional cost to the School District.
- 3.8 PIPE JACKING
- A. The Contractor may, at his option, install steel pipe casings, tongue-and-groove reinforced concrete pipes, and steel pipes under existing roads or pavements by jacking into place using procedures approved by the governmental agencies having jurisdiction and approved by the construction soil engineer.
- 3.9 TUNNELING OPERATIONS
- A. The Contractor may, at his option, tunnel pipes into position using procedures approved by the construction soil engineer and the governmental agencies having jurisdiction.
- 3.10 FIELD QUALITY CONTROL
- A. The construction soil engineer will inspect open cuts and trenches before installation of utilities, and will make the following tests:
  - B. Assure that trenches are not backfilled until all tests have been completed;
  - C. Check backfilling for proper layer thickness and compaction;
  - D. Verify that test results conform to the specified requirements, and that sufficient tests are performed;
  - E. Assure that defective work is removed and properly replaced.

**END OF SECTION 312300**



SPECIFICATIONS  
SFA Project No. 21084

# **Harvest Park Fire Alarm Harvest Park Middle School**

Pleasanton

Unified School District



2155 S. Bascom Ave. Suite 200  
Campbell, California 95008  
(408) 879-0600



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Campbell, CA 95008  
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SPECIFICATIONS  
SFA Project No. 21080

DSA File No. 1-32  
DSA Application No. 01-119912

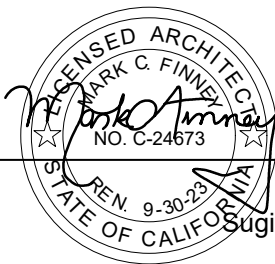
**Harvest Park Fire Alarm  
Harvest Park Middle School**

Pleasanton

Unified School District

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Division of the State Architect  
California Department of General Services



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Mark Finney, Architect  
Sugimura Finney Architects



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Najib Anwary, Electrical Engineer and Fire Alarm Designer  
Aurum Consulting Engineer



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Harvest Park Fire Alarm  
Harvest Park Middle School  
Pleasanton Unified School District  
SFA Project No. 21084

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END OF SECTION

## **SECTION 26 05 00**

### **GENERAL ELECTRICAL REQUIREMENTS**

#### **PART 1 – GENERAL**

##### **1.01 Description of Work:**

- A. The work of this Section consists of providing all required labor, supervision, materials and equipment to satisfactorily complete all electrical installations that are shown on the Drawings, included in these specifications, or otherwise needed for a complete and fully operating facility.
- B. Furnish and install all required in-place equipment, conduits, conductors, cables and any miscellaneous materials for the satisfactory interconnection and operation of all associated electrical systems.

##### **1.02 Related Work:**

- A. This Section provides the basic Electrical Requirements which supplement the General Requirements of Division 01 and apply to all Sections of Division 26.

##### **1.03 Submittals:**

- A. As specified in Division 01. Submit to the Architect shop drawings, manufacturer's data and certificates for equipment, materials and finish, and pertinent details for each system specified. Information to be submitted includes manufacturer's descriptive literature of cataloged products, equipment, drawings, diagrams, performance and characteristic curves as applicable, test data and catalog cuts. Obtain written approval before procurement, fabrication, or delivery of the items to the job site. Partial submittals are not acceptable and will be returned without review. Furnish manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable Federal, Industry and Technical Society Publication References, and years of satisfactory service of each item required to establish contract compliance. Photographs of existing installations and data submitted in lieu of catalog data are not acceptable and will be returned without approval.
- B. Organize submittals for equipment and items related to each specification section together as a package.
- C. Proposed substitutions of products will not be reviewed or approved prior to awarding of the Contract.
- D. Substitutions shall be proven to the Architect or Engineer to be equal or superior to the specified product. Architect's decision is final. The Contractor shall pay all costs incurred by the Architect and Engineer in reviewing and processing any proposed substitutions whether or not a proposed substitution is accepted.
- E. If a proposed substitution is rejected, the contractor shall furnish the specified product at no increase in contract price.
- F. If a proposed substitution is accepted, the contractor shall be completely responsible for all dimensional changes, electrical changes, or changes to other work which are a result of the substitution. The accepted substitution shall be made at no additional cost to the owner or design consultants.

1.04 Quality Assurance:

- A. Codes: All electrical equipment and materials, including installation and testing, shall conform to the latest editions following applicable codes:
  - 1. California Electrical Code (CEC).
  - 2. Occupational Safety and Health Act (OSHA) standards.
  - 3. All applicable local codes, rules and regulations.
  - 4. Electrical Contractor shall possess a C-10 license and all other licenses as may be required. Licenses shall be in effect at start of this contract and be maintained throughout the duration of this contract.
- B. Variances: In instances where two or more codes are at variance, the most restrictive requirement shall apply.
- C. Standards: Equipment shall conform to applicable standards of American National Standards Institute (ANSI), Electronics Industries Association (EIA), Institute of Electrical and Electronics Engineers (IEEE), and National Electrical Manufacturers Association (NEMA).
- D. Underwriter Laboratories (UL) listing is required for all equipment and materials where such listing is offered by the Underwriters Laboratories. Provide service entrance labels for all equipment required by the NEC to have such labels.
- E. The electrical contractor shall guarantee all work and materials installed under this contract for a period of one (1) year from date of acceptance by owner.
- F. All work and materials covered by this specification shall be subject to inspection at any and all times by representatives of the owner. Work shall not be closed in or covered before inspection and approval by the owner or his representative. Any material found not conforming with these specifications shall, within 3 days after being notified by the owner, be removed from premises; if said material has been installed, entire expense of removing and replacing same, including any cutting and patching that may be necessary, shall be borne by the contractor.

1.05 Contract Documents:

- A. Drawings and Specifications:
  - 1. In the case of conflict between the drawings and specifications, the specifications shall take precedence.
  - 2. Drawings and specifications are intended to comply with all law, ordinances, rules and regulations of constituted authorities having jurisdiction, and where referred to in the Contract Documents, said laws, ordinance, rules and regulations shall be considered as a part of said Contract Documents within the limits specified. The Contractor shall bear all expenses of correcting work done contrary to said laws, ordinance, rules and regulations if the Contractor knew or should have known that the work as performed is contrary to said laws, ordinances, rules and regulations and if the Contractor performed same (1) without first consulting the Architect for further instructions regarding said work and/or (2) disregarded the Architect's instructions regarding said work.

- B. Drawings: The Electrical Drawings shall govern the general layout of the completed construction.
1. Locations of equipment, panels, pullboxes, conduits, stub-ups, ground connections are approximate unless dimensioned; verify locations with the Architect prior to installation.
  2. Review the Drawings and Specification Divisions of other trades and perform the electrical work that will be required for those installations.
  3. Should there be a need to deviate from the Electrical Drawings and Specifications, submit written details and reasons for all changes to the Architect for approval.
  4. The general arrangement and location of existing conduits, piping, apparatus, etc., is approximate. The drawings and specifications are for the assistance and guidance of the contractor, exact locations, distances and elevations are governed by actual field conditions. Accuracy of data given herein and on the drawings is not guaranteed. Minor changes may be necessary to accommodate work. The contractor is responsible for verifying existing conditions. Should it be necessary to deviate from the design due to interference with existing conditions or work in progress, claims for additional compensation shall be limited to those for work required by unforeseen conditions as determined by the Architect.
  5. All drawings and divisions of these specifications shall be considered as whole. The contractor shall report any apparent discrepancies to the Architect prior to submitting bids.
  6. The contractor shall be held responsible to have examined the site and compared it with the specifications and plans and to have satisfied himself as to the conditions under which the work is to be performed. He shall be held responsible for knowledge of all existing conditions whether or not accurately described. No subsequent allowance shall be made for any extra expense due to failure to make such examination.

1.06 Closeout Submittals:

- A. Manuals: Furnish manuals for equipment where manuals are specified in the equipment specifications or are specified in Division 01.

1.07 Coordination:

- A. Coordinate the electrical work with the other trades, code authorities, utilities and the Architect.
- B. Provide and install all trenching, backfilling, conduit, pull boxes, splice boxes, etc. for all Utility Company services to the locations indicated on the Drawings. All materials and construction shall be in accordance with the requirements for all the Utility Companies. Prior to performing any work, the Electrical Contractor shall coordinate with the various Utility Companies and obtain utility company engineering drawings. Verify that all such work and materials shown on the Drawings are of sufficient sizes and correctly located to provide services on the site. The Electrical Contractor shall verify with all the Utility Companies that additional contractor furnished and installed work is not required. If additional work, materials, or changes are required by any of the Utility Companies, the Electrical Contractor shall advise the Architect of such changes and no further work shall then be performed until instructed to do so by the Architect. The Electrical Contractor shall coordinate with the various Utility Companies to schedule inspections and to obtain service connections.

- C. The Electrical Contractor shall schedule all utility work necessary for utility inspections, connections, cable installation, etc. for the new electrical service to meet the construction schedule.
- D. Utility Company charges shall be paid by the Owner.
- E. Contractor shall pay all inspection and other applicable fees and procure all permits necessary for the completion of this work.
- F. Where connections must be made to existing installations, properly schedule all the required work, including the power shutdown periods.
- G. When two trades join together in an area, make certain that no electrical work is omitted.

1.08 Job Conditions:

- A. Operations: Perform all work in compliance with Division 01.
  - 1. Keep the number and duration of power shutdown periods to a minimum.
  - 2. Show all proposed shutdowns and their expected duration on the construction schedule. Schedule and carry out shutdowns so as to cause the least disruption to operation of the Owner's facilities.
  - 3. Carry out shutdown only after the schedule has been approved, in writing, by the owner. Submit power interruption schedule 15 days prior to date of interruption.
- B. Construction Power: Unless otherwise noted in Division 01 of these specifications, contractor shall make all arrangements and provide all necessary facilities for temporary construction power [from the owner's on site source. Energy costs shall be paid for by the Owner.] [to the site. Energy costs shall be paid by the General Contractor.]
- C. Storage: Provide adequate storage for all equipment and materials which will become part of the completed facility so that it is protected from weather, dust, water, or construction operations.

1.09 Damaged Products:

- A. Notify the Architect in writing in the event that any equipment or material is damaged. Obtain approval from the Architect before making repairs to damaged products.

1.10 Locations:

- A. General: Use equipment, materials and wiring methods suitable for the types of locations in which they are located.
- B. Dry Locations: All those indoor areas which do not fall within the definition below for Wet Locations and which are not otherwise designated on the Drawings.
- C. Wet Locations: All locations exposed to the weather, whether under a roof or not, unless otherwise designated on the Drawings.

1.11 Safety and Indemnity:

- A. The Contractor is solely and completely responsible for conditions of the job site including safety of all persons and property during performance of the work. This requirement will apply continually and not be limited to normal working hours. The contractor shall provide and maintain throughout the work site proper safeguards including, but not limited to, enclosures, barriers, warning signs, lights, etc. to prevent accidental injury to people or damage to property.
- B. No act, service, drawing review or construction review by the Owner, the Engineer or their Consultants is intended to include reviews of the adequacy of the Contractors safety measures in or near the construction site.
- C. The Contractor performing work under this Division of the Specifications shall hold harmless, indemnify, and defend the Owner, the Engineer, their consultants, and each of their officers, agents and employees from any and all liability claims, losses, or damage arising out of or alleged to arise from bodily injury, sickness, or death of a person or persons and for all damages arising out of injury to or destruction of property arising directly or indirectly out of or in connection with the performance of the work under this Division of the Specifications, and from the Contractor's negligence in the performance of the work described in the construction contract documents, but not including liability that may be due to the sole negligence of the Owner, the Engineer, their Consultants or their officers, agents and employees.
- D. If a work area is encountered that contains hazardous materials, the contractor is advised to coordinate with the owner and it's abatement consultant for abatement of hazardous material by the Owner's Representative. "Hazardous materials" means any toxic substance regulated or controlled by OSHA, EPA, State of California or local rules, regulations and laws. Nothing herein shall be construed to create a liability for Aurum Consulting Engineers regarding hazardous materials abatement measures, or discovery of hazardous materials.

1.12 Access Doors:

- A. The contractor shall install access panels as required where floors, walls or ceilings must be penetrated for access to electrical, control, fire alarm or other specified electrical devices. The minimum size panel shall be 14" x 14" in usable opening. Where access by a service person is required, minimum usable opening shall be 18" x 24".
- B. All access doors installed lower than 7'-0" above finished floor and exposed to public access shall have keyed locks.
- C. Where specific information or details relating to access panels differ from Division 26 paragraph 1.12 of these specifications, or shown on the electrical drawings and details or under other Divisions of work, those requirements shall supersede these specifications.

1.13 Arc Flash:

- A. The contractor shall install a clearly visible arc flash warning to the inside door of all panelboards and industrial control panels, as well as to the front of all switchboards and motor control centers that are a part of this project.
- B. The warning shall have the following wording: line 1 "WARNING" (in large letters), line 2 "Potential Arc Flash Hazard" (in medium letters), line 3 & 4 "Appropriate Personal Protective Equipment and Tools required when working on this equipment".

1.14 Emergency Boxes:

- A. All boxes and enclosures for emergency circuits shall be permanently marked with a readily visible red spray painted mark.

PART 2 - PRODUCTS

2.01 Standard of Quality:

- A. Products that are specified by manufacturer, trade name or catalog number establish a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are established to be equal to the specified product and approved by the Architect prior to installation.
- B. Material and Equipment: Provide materials and equipment that are new and are current products of manufacturers regularly engaged in the production of such products. The standard products shall have been in satisfactory commercial or industrial use for two years prior to bid opening. The two-year period includes use of equipment and materials of similar size under similar circumstances. For uniformity, only one manufacturer will be accepted for each type of product.
- C. Service Support: Submit a certified list of qualified permanent service organizations including their addresses and qualification for support of the equipment. These service organizations shall be convenient to the equipment installation and able to render service to the equipment on a regular and emergency basis during the warranty period of the contract.
- D. Manufacturer's Recommendations: Where installation procedures are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendation shall be cause for rejection of the equipment or material.

2.02 Nameplates:

- A. For each piece of electrical equipment, provide a manufacturer's nameplate showing his name, location, the pertinent ratings, the model designation, and shop order number.
- B. Identify each piece of equipment and related controls with a rigid laminated engraved plastic nameplate. Unless otherwise noted, nameplates shall be melamine plastic 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be 0.5 by 2.5 inches unless otherwise noted. Where not otherwise specified, lettering shall be a minimum of 0.25 inch high normal block style. Engrave nameplates with the inscriptions indicated on the Drawings and, if not so indicated, with the equipment name. Securely fasten nameplates in place using two stainless steel or brass screws.

2.03 Fasteners:

- A. Fasteners for securing equipment to walls, floors and the like shall be either hot-dip galvanized after fabrication or stainless steel.

2.04 Finish requirements:

- A. Equipment: Refer to each electrical equipment section of these Specifications for painting requirements of equipment enclosures. Repair any final paint finish which has been damaged or is otherwise unsatisfactory, to the satisfaction of the Architect.
- B. Wiring System: In finished areas, paint all exposed conduits, boxes and fittings to match the color of the surface to which they are affixed.

### PART 3 - EXECUTION

#### 3.01 Workmanship:

- A. Ensure that all equipment and materials fit properly in their installation.
- B. Perform any required work to correct improperly fit installation at no additional expense to the owner.
- C. All electrical equipment and materials shall be installed in a neat and workmanship manner in accordance with the "NECA-1 Standard Practices for Good Workmanship in Electrical Contracting". Workmanship of the entire job shall be first class in every respect.

#### 3.02 Equipment Installations:

- A. Provide the required inserts, bolts and anchors, and securely attach all equipment and materials to their supports.
- B. Do all the cutting and patching necessary for the proper installation of work and repair any damage done.
- C. Earthquake restraints: all electrical equipment, including conduits over 2 inches in diameter, shall be braced or anchored to resist a horizontal force acting in any direction as per CBC Section 1616A Title 24, part 2 and ASCE7-10, Sections 13.3 and 13.6 and Table 13.6-1.
- D. Structural work: All core drilling, bolt anchor insertion, or cutting of existing structural concrete shall be approved by a California registered structural consulting engineer prior to the execution of any construction. At all floor slabs and structural concrete walls to be drilled, cut or bolt anchors inserted, the contractor shall find and mark all reinforcing in both faces located by means of x-ray, pach-ometer, or prof-ometer. Submit sketch showing location of rebar and proposed cuts, cores, or bolt anchor locations for approval.

#### 3.03 Field Test:

- A. Test shall be in accordance with Acceptance testing specifications issued by the National Electrical Testing Association (NETA).
- B. Perform equipment field tests and adjustments. Properly calibrate, adjust and operationally check all circuits and components, and demonstrate as ready for service. Make additional calibration and adjustments if it is determined later that the initial adjustments are not satisfactory for proper performance. Perform equipment field test for equipment where equipment field tests are specified in the equipment Specifications. Give sufficient notice to the Architect prior to any test so that the tests may be witnessed.

- C. Provide instruments, other equipment and material required for the tests. These shall be of the type designed for the type of tests to be performed. Test instrument shall be calibrated by a recognized testing laboratory within three months prior to performing tests.
- D. Operational Tests: Operationally test all circuits to demonstrate that the circuits and equipment have been properly installed and adjusted and are ready for full-time service. Demonstrate the proper functioning of circuits in all modes of operation, including alarm conditions.
- E. Re-testing will be required for all unsatisfactory tests after the equipment or system has been repaired. Re-test all related equipment and systems if required by the Architect. Repair and re-test equipment and systems which have been satisfactorily tested but later fail, until satisfactory performance is obtained.
- F. Maintain records of each test and submit five copies to the Architect when testing is complete. All tests shall be witnessed by the Architect. These records shall include:
  - 1. Name of equipment tested.
  - 2. Date of report.
  - 3. Date of test.
  - 4. Description of test setup.
  - 5. Identification and rating of test equipment.
  - 6. Test results and data.
  - 7. Name of person performing test.
  - 8. Owner or Architect's initials.
- G. Items requiring testing shall be as noted in the additional electrical sections of these specifications.

#### 3.04 Cleaning Equipment:

- A. Thoroughly clean all soiled surfaces of installed equipment and materials.

#### 3.05 Painting of Equipment:

- A. Factory Applied: Electrical equipment shall have factory applied painting system which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test and the additional requirements specified in the technical section.
- B. Field Applied: Paint electrical equipment as required to match finish of adjacent surfaces.

#### 3.06 Records:

- A. Maintain one copy of the contract Drawing Sheets on the site of the work for recording the "as built" condition. After completion of the work, the Contractor shall carefully mark the work as

actually constructed, revising, deleting and adding to the Drawing Sheets as required. The following requirements shall be complied with:

1. Cable Size and Type: Provide the size and type of each cable installed on project.
2. Substructure: Where the location of all underground conduits, pull boxes, stub ups and etc. where are found to be different than shown, carefully mark the correct location on the Drawings. Work shall be dimensioned from existing improvements.
3. Size of all conduit runs.
4. Routes of concealed conduit runs and conduit runs below grade.
5. Homerun points of all branch circuit.
6. Location of all switchgear, panels, MCC, lighting control panels, pullcans, etc.
7. Changes made as a result of all approved change orders, addendums, or field authorized revisions.
8. As Builds: At the completion of the Work the Contractor shall review, certify, correct and turn over the marked up Drawings to the Architect for his use in preparing "as built" plans.
9. As built Drawings shall be delivered to the Architect within ten (10) days of completion of construction.

3.07 Clean Up:

- A. Upon completion of electrical work, remove all surplus materials, rubbish, and debris that accumulated during the construction work. Leave the entire area neat, clean, and acceptable to the Architect.

3.08 Mechanical and Plumbing Electrical Work:

- A. The requirements for electrical power and/or devices for all mechanical and plumbing equipment supplied and/or installed under this Contract shall be coordinated and verified with the following:
  1. Mechanical and Plumbing Drawings.
  2. Mechanical and Plumbing sections of these Specifications.
  3. Manufacturers of the Mechanical and Plumbing equipment supplied.
- B. The coordination and verification shall include the voltage, ampacity, phase, location and type of disconnect, control, and connection required. Any changes that are required as a result of this coordination and verification shall be a part of this Contract.
- C. The Electrical Contractor shall furnish and install the following for all mechanical and plumbing equipment:
  1. Line voltage conduit and wiring.
  2. Disconnect switches.
  3. Manual line motor starters.

- D. Automatic line voltage controls and magnetic starters shall be furnished by the Mechanical and/or Plumbing Contractor and installed and connected by the Electrical Contractor. When subcontracted for by the Mechanical and/or Plumbing Contractor, all line voltage control wiring installed by the Electrical Contractor shall be done per directions from the Mechanical and/or Plumbing Contractor.
- E. All low voltage control wiring for Mechanical and Plumbing equipment shall be installed in conduit. Furnishing, installation and connection of all low voltage conduit, boxes, wiring and controls shall be by the Mechanical and/or Plumbing Contractor.
- F. Disconnects (Motor And Circuit)
  - 1. Disconnect switches shall be as manufactured by ITE- Siemens, General Electric or Square D.
- G. Disconnects (Motor: Fused):
  - 1. Disconnect switches shall be provided and located at all motors.
  - 2. Switches for three-phase motors shall be heavy-duty, horsepower rated three-pole, and surface mounted except as noted on drawings.
  - 3. Switches containing more than three poles shall be as specified on the drawings.
  - 4. Switches for single-phase, fractional horsepower motors shall be heavy-duty, horsepower rated.
  - 5. Switches shall be horsepower rated.
- G. Manual motor starters, where required, shall have toggle type operators with pilot light and melting alloy type overload relays, SQUARE D COMPANY, Class 2510, Type FG-1P (surface) or Type FS-1P (flush) or ITE, WESTINGHOUSE or GENERAL ELECTRIC equal.

END OF SECTION

## **SECTION 26 05 19**

### **LINE VOLTAGE WIRE AND CABLE**

#### **PART 1 - GENERAL**

##### **1.01 Description of Work:**

- A. The work of this Section consists of providing all wire and cable rated 600 volts or less, including splices and terminations, as shown on the Drawings and as described herein.

##### **1.02 Related Work:**

- A. See the following Specification Section for work related to the work in this Section:
  - 1. 26 05 42 Conduits, Raceways and Fittings.
  - 2. 26 05 33 Junction and Pull Boxes.

##### **1.03 Quality Assurance**

- A. Field tests shall be performed as specified in paragraph 3.04 of this Section.

#### **PART 2 - PRODUCTS**

##### **2.01 Conductors:**

- A. Conductors shall be copper, type THHN/THWN/MTW oil and gasoline resistant, 600 volt rated insulation.
- B. Conductors shall be stranded copper.
- C. Minimum power and control wire size shall be No. 12 AWG unless otherwise noted.
- D. All conductors used on this Project shall be of the same type and conductor material.

##### **2.02 Cables:**

- A. All individual conductors shall be copper with type THHN/THWN, 600 volt rated insulation.
- D. Insulation Marking - All insulated conductors shall be identified with printing colored to contrast with the insulation color.
- E. Color Coding - As specified in paragraph 3.03.
- F. Special Wiring - Where special wiring is proposed by an equipment manufacturer, submit the special wiring requirements to the Owner's Representative and, if approved, provide same. Special wire shall be the type required by the equipment manufacturer.
- G. Other Wiring - Wire or cable not specifically shown on the Drawings or specified, but required, shall be of the type and size required for the application and as approved by the Owner's Representative.
- H. Manufacturer - Acceptable manufacturers including Cablec, Southwire, or equal.

## 2.03 Terminations:

- A. Manufacturer - Terminals as manufactured by T&B, Burndy or equal.
- B. Wire Terminations – Stranded conductors shall be terminated in clamping type terminations which serve to contain all the strands of the conductor. Curling of a stranded conductor around a screw type terminal is not allowed. For screw type terminations, use a fork type stake-on termination on the stranded conductor. Use only a stake-on tool approved for the fork terminals selected.
- C. End Seals - Heat shrink plastic caps of proper size for the wire on which used.

## 2.04 Tape:

- A. Tape used for terminations and cable marking shall be compatible with the insulation and jacket of the cable and shall be of plastic material.

## PART 3 - EXECUTION

### 3.01 Cable Installation:

- A. Clean Raceways - Clean all raceways prior to installation of cables as specified in Section 260542 - Conduits Raceway and Fittings.
- B. All line voltage wiring shall be installed in conduit.
- C. All feeder conductors shall be continuous from equipment to equipment. Splices in feeders are not permitted unless specifically noted or approved by the Electrical Engineer.
- D. All branch circuit wiring shall be run concealed in ceiling spaces, walls, below floors or in crawl spaces unless noted otherwise.
- E. Cable Pulling - Exercise care in pulling wires and cables into conduit or wireways so as to avoid kinking, putting undue stress on the cables or otherwise abrading them. No grease will be permitted in pulling cables. Only soapstone, talc, or UL listed pulling compound will be permitted. The raceway construction shall be complete and protected from the weather before cable is pulled into it. Swab conduits before installing cables and exercise care in pulling, to avoid damage to conductors.
- F. Bending Radius - Cable bending radius shall be per applicable code. Install feeder cables in one continuous length.
- G. Equipment Grounding Conductors - Provide an equipment grounding conductor, whether or not it is shown on the Drawings, in all conduits or all raceways.
- H. Panelboard Wiring - In panels, bundle incoming wire and cables which are No. 6 AWG and smaller, lace at intervals not greater than 6 inches, neatly spread into trees and connect to their respective terminals. Allow sufficient slack in cables for alterations in terminal connections. Perform lacing with plastic cable ties or linen lacing twine. Where plastic panel wiring duct is provided for cable runs, lacing is not necessary when the cable is properly installed in the duct.

3.02 Cable Terminations and Splices:

- A. Splices - UL Listed wirenuts.
- B. Terminations - Shall comply with the following:
  - 1. Make up and form cable and orient terminals to minimize cable strain and stress on device being terminated on.
  - 2. Burnish oxide from conductor prior to inserting in oxide breaking compound filled terminal.

3.03 Circuit and Conductor Identification:

- A. Color Coding - Provide color coding for all circuit conductors. Insulation color shall be white for neutrals and green for grounding conductors. Conductor colors shall be as follows:

<u>VOLTAGE</u>	<u>208/120V</u>
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Ground	Green

- B. Color coding shall be in the conductor insulation for all conductors #10 AWG and smaller; for larger conductors, color shall be either in the insulation or in colored plastic tape applied at every location where the conductor is readily accessible.
- C. Circuit Identification - All underground distribution and service circuits shall be provided with plastic identification tags in each secondary box and at each termination. Tags shall identify the source transformer of the circuit and the building number(s) serviced by the circuit.

3.04 Field Tests:

- A. All systems shall test free from short circuits and grounds, shall be free from mechanical and electrical defects, and shall show an insulation resistance between phase conductors and ground of not less than the requirements of the CEC. All circuits shall be tested for proper neutral connections.
- B. Insulation Resistance Tests: Perform insulation resistance tests on circuits with #2 AWG and larger conductors to be energized with a line-to-neutral voltage of 120 volts or more. Make these tests before all equipment has been connected. Test the insulation with a 500Vdc insulation resistance tester with a scale reading 100 megohms. The insulation resistance shall be 2 megohms or more. Submit results for review.

END OF SECTION

**SECTION 26 05 42**

**CONDUITS, RACEWAYS AND FITTINGS**

**PART 1 - GENERAL**

**1.01 Description of Work:**

- A. The work of this section consists of furnishing and installing conduits, raceways and fittings as shown on the Drawings and as described herein.

**1.02 Related Work:**

- A. See the following specification sections for work related to the work in this section:
  - 1. 26 05 43 Underground Ducts
  - 2. 26 05 44 In Grade Pull Boxes
  - 3. 26 05 19 Line Voltage Wire and Cable
  - 4. 26 05 33 Junction and Pull Boxes

**PART 2 - PRODUCTS**

**2.01 Conduits, Raceways:**

- A. Electrical Metallic Tubing (EMT) shall be hot-dip galvanized after fabrication. Couplings shall be compression or set-screw type.
- B. Flexible Conduit: Flexible metal conduit shall be galvanized steel.
- C. Galvanized Rigid Steel Conduit (GRS) shall be hot-dip galvanized after fabrication. Couplings shall be threaded type.
- D. Rigid Non-metallic Conduit: Rigid non-metallic conduit shall be PVC Schedule 40 (PVC-40 or NEMA Type EPC-40) conduit approved for underground use and for use with 90° C wires.

**2.02 Conduit Supports:**

- A. Supports for individual conduits shall be galvanized malleable iron one-hole type with conduit back spacer.
- B. Supports for multiple conduits shall be hot-dipped galvanized Unistrut or Superstrut channels, or approved equal. All associated hardware shall be hot-dip galvanized.
- C. Supports for EMT conduits shall be galvanized pressed steel single hole straps.
- D. Clamp fasteners shall be by wedge anchors. Shot in anchors shall not be allowed.

**2.03 Fittings:**

- A. Provide threaded-type couplings and connectors for rigid steel conduits; provide steel compression (watertight), or steel set-screw type for EMT, (die-cast zinc or malleable iron type fittings are not allowed). Provide threaded couplings and Meyers hubs for rigid steel conduit exposed to weather.
- B. Fittings for flexible conduit shall be Appleton, Chicago, IL, Type ST, O-Z Gedney Series 4Q by General Signal Corp., Terryville, CT, T & B 5300 series, or approved equal.
- C. Fittings for use with rigid steel shall be galvanized steel or galvanized cast ferrous metal; access fittings shall have gasketed cast covers and be Crouse Hinds Condulets, Syracuse, NY, Appleton Unilets, Chicago, IL, or approved equal. Provide threaded-type couplings and connectors; set-screw type and compression-type are not acceptable.
- D. Fittings for use with rigid non-metallic conduit shall be PVC and have solvent-weld-type conduit connections.
- E. Union couplings for conduits shall be the Erickson type and shall be Appleton, Chicago, IL, Type EC, O-Z Gedney 3-piece Series 4 by General Signal Corp., Terryville, CT, or approved equal. Threadless coupling shall not be used.
- F. Bushings:
  - 1. Bushings shall be the insulated type.
  - 2. Bushings for rigid steel shall be insulated grounding type, O-Z Gedney Type HBLG, Appleton Type GIB, or approved equal.
- G. Conduit Sealants:
  - 1. Fire Retardant Types: Fire stop material shall be reusable, non-toxic, asbestos-free, expanding, putty type material with a 3-hour rating in accordance with UL Classification 35L4 or as specified on the Drawings.

## PART 3 - EXECUTION

### 3.01 Conduit, Raceway and Fitting Installation:

- A. For conduit runs exposed to weather provide rigid metal (GRS).
- B. For conduit run underground, in concrete or masonry block wall and under concrete slabs, install minimum 3/4" size nonmetallic (PVC) with PVC elbows. Where conduits transition from underground or under slab to above grade install wrapped rigid metal (GRS) elbows and risers.
- C. For conduit runs concealed in steel or wood framed walls or in ceiling spaces or exposed in interior spaces above six feet over the finished floor, install EMT.
- D. Flexible metal conduit shall be used only for the connection of recessed lighting fixtures and motor connections unless otherwise noted on the Drawings. Liquid-tight steel flexible conduit shall be used for motor connections.
- E. The minimum size raceway shall be 1/2-inch unless indicated otherwise on the Drawings.
- F. Installation shall comply with the CEC.

- G. From pull point to pull point, the sum of the angles of all of the bends and offset shall not exceed 360 degrees.
- H. Conduit Supports: Properly support all conduits as required by the NEC. Run all conduits concealed except where otherwise shown on the drawings.
  - 1. Exposed Conduits: Support exposed conduits within three feet of any equipment or device and at intervals not exceeding NEC requirements; wherever possible, group conduits together and support on common supports. Support exposed conduits fastened to the surface of the concrete structure by one-hole clamps, or with channels. Use conduit spacers with one-hole clamps.
    - a. Conduits attached to walls or columns shall be as unobtrusive as possible and shall avoid windows. Run all exposed conduits parallel or at right angles to building lines.
    - b. Group exposed conduits together. Arrange such conduits uniformly and neatly.
  - 2. Support all conduits within three feet of any junction box, coupling, bend or fixture.
  - 3. Support conduit risers in shafts with Unistrut Superstrut, or approved equal, channels and straps.
- I. Moisture Seals: Provide in accordance with NEC paragraphs 230-8 and 300-5(g).
- J. Where PVC conduit transitions from underground to above grade, provide rigid steel 90's with risers. Rigid steel shall be half-lap wrapped with 20 mil tape and extend minimum 12" above grade.
- K. Provide a nylon pull cord in each empty raceway.
- L. Provide galvanized rigid steel factory fittings for galvanized rigid steel conduit.
- M. Slope all underground raceways to provide drainage; for example, slope conduit from equipment located inside a building to the pull box or manhole located outside the building.
- N. Conduits shall be blown out and swabbed prior to pulling wires, or installation of pull cord in empty conduits.

END OF SECTION

**SECTION 26 05 43**

**UNDERGROUND DUCTS**

**PART 1 - GENERAL**

**1.01 Description of Work:**

- A. The work of this section consists of furnishing and installing raceways, and raceway spacers with necessary excavation.

**1.02 Related Work:**

- A. See the following specification sections for work related to the work of this section.

- 1. 02200 Excavation and Backfill
- 2. 26 05 42 Conduit Raceway and Fittings

**1.03 Standards and Codes:**

- A. Work and material shall be in compliance with and according to the requirements of the latest revision of the following standards and codes.
  - 1. National Electrical Code (NEC) (Latest Revision)
  - 2. California Electrical Code (CEC).
  - 3. Underground Installations CEC - Article 300.5
  - 4. Rigid NonMetallic Conduit CEC - Article 347

**PART 2 - PRODUCTS**

**2.01 Raceways:**

- A. As specified in Section 26 05 42 Conduits, Raceways and Fittings.

**PART 3 - EXECUTION**

**3.01 Excavation:**

- A. As specified in Section 02200, Excavation and Backfill and as required for the work shown on the Drawings.

**3.02 Install raceways as indicated on drawings.**

**3.03 Sand Encasement:**

- A. As specified in Section 02200 - Excavation and Backfill.

**3.04 Backfill:**

- A. As specified in Section 02200 - Excavation and Backfill.

**END OF SECTION**

**SECTION 26 05 44**

**IN GRADE PULL BOXES**

**PART 1 - GENERAL**

**1.01 Description of Work:**

- A. The work of this section consists of providing all labor, supervision, tools, materials, and performing all work necessary to furnish and install pre-cast concrete vaults, and pull boxes with necessary excavation.

**1.02 Related Work:**

- A. See the following specification sections for work related to the work of this section.

- 1. 02200 Excavation and Backfill.
- 2. 26 05 43 Underground Ducts.

**1.03 Submittals:**

- A. As specified in Section 26 05 00 and Division 01.

- 1. Catalog Data: Provide manufacturer's descriptive literature - Pre-cast Vaults, Pull Boxes and Accessories.

**PART 2 - PRODUCTS**

**2.01 Materials and Equipment:**

**A. General Requirements:**

- 1. Pull boxes for electrical power, controls and other communication circuits shall consist of pre-cast reinforced concrete boxes, extensions' bases, and covers as specified herein and as indicated on the Drawings. Pre-cast units shall be the product of a manufacturer regularly engaged in the manufacture of pre-cast vaults and pull boxes. Acceptable manufacturers are Christy, Utility Vault, Brooks, Associated Concrete or equal.

**B. Construction:**

- 1. Pre-cast concrete vaults and pull boxes for electrical power distribution and communication circuits with associated risers and tops shall conform to ASTM C478 and ACI 318. Pull boxes shall be the type noted on the Drawings and shall be constructed in accordance with the applicable details as shown. Tops and walls shall consist of reinforced concrete. Walls and bottom shall be of monolithic concrete construction. Duct entrances and windows shall be located near the corners of structures to facilitate cable racking.

**C. Covers:**

- 1. The word "ELECTRICAL" shall be cast in the top face of all electrical cable boxes. The word "Signal" or "Fire Alarm" shall be cast in the top of the boxes utilized for these systems.

### PART 3 - EXECUTION

#### 3.01 Installation:

- A. Install pull boxes where required to limit bends in conduit runs to not more than 360 degrees or where pulling tension achieved would exceed the maximum allowable for the cable to be installed. Note that these boxes are not shown on the Drawings.
- B. Pre-cast pull boxes shall be installed approximately where indicated on the Drawings. The exact location of each pull box shall be determined after careful consideration has been given to the location of other utilities, grading, and paving. All cable boxes and secondary pull boxes shall be installed with a minimum of 6-inch thick crushed rock or sand bedding.
- C. Paved areas - Vaults and pull boxes located in areas to be paved shall be installed such that the top of the cover shall be flush with the finished surface of the paving.
- D. Unpaved Areas - In unpaved areas, the top of vaults and pull box covers shall be approximately 2 inches above finished grade.
- E. Joint Seals - Section joints of pre-cast vaults and pull boxes shall be sealed with compound as recommended by the manufacturer.
- F. Trenching, Backfilling, and Compaction - Trenching, backfilling and compaction shall be as specified in Section 02200 - Excavation and Backfill.

END OF SECTION

**SECTION 28 31 00**

**FIRE ALARM/VOICE EVACUATION SYSTEM**

**PART 1 - GENERAL**

**1.01 Description of Work:**

- A. Furnish and install all materials and equipment including all required equipment, panels, raceways, conductors and connections, and provide all labor required and necessary to complete the work shown on the drawings and/or specified in all Sections of Division 26 and all other work and miscellaneous items, not specifically mentioned, but reasonably inferred for a complete addressable fire alarm installation including all accessories and appurtenances required for testing the systems. It is in the intent of the drawings and specifications that all systems will be complete, and ready for operation. No extra charge will be paid for furnishing items required by regulations, but not specified herein, or on drawings.
- B. Fire Alarm system shall include a main fire alarm control panel, digital communicator for backup phone communication, a remote annunciator[s] and all devices, wiring, etc as indicated on the plans.
- C. The contractor shall include all costs to de-commission the existing system before any new construction can start. The District School District shall be advised in writing the date as to when the existing system will be de-commissioned. The contractor scope of work shall not degrade any function or operation of the remaining site fire alarm system.

**1.02 Related Work:**

- A. Division 26 General Requirements.
- B. See the following specification sections for work related to the work in this section.
  - 1. All other sections of Division 26.

**1.03 Codes and Standards:**

- A. Devices and equipment for fire alarm systems shall be U.L. listed.
- B. UL 864 Control Units, Fire Protective Signaling Systems.
- C. Devices and equipment for fire alarm system shall be listed by the California State Fire Marshal for the specific purpose the device or equipment is used.
- D. Work and material shall be in compliance with and according to the requirements of the latest version of the following standards and codes:
  - 1. California Fire Code (CFC) based on the International Fire Code (IFC) with California Amendments.

2. California Building Code (CBC) based on the International Building Code (IBC) with California Amendments.
3. California Electric Code (CEC) based on the National Electric Code (NEC) and California Amendments.
4. California Mechanical Code (CMC) based on the Uniform Mechanical Code (UMC) and California Amendments.
5. California Plumbing Code (CPC) based on the Uniform Plumbing Code (UPC) and California Amendments.
6. Title 19 C.C.R., Public Safety, State Fire Marshals Regulations.
7. NFPA 72, National Fire Alarm and Signaling Code.

1.04 Submittals:

- A. In accordance with Division 26.
- B. Submit the following items:
  1. Manufacturer's Catalog Data: Manufacturer's original catalog cuts and original description of data of all material and equipment with sufficient information provided so that the exact function of each device is known. Each item supplied shall be clearly identified including both U.L. number and a copy of the State Fire Marshal's listing.
- C. Description of conductors to be used with a statement that all wire shall be in conduit. Where accessible ceiling occurs, plenum rated wire on J-hooks is acceptable.

1.05 Quality Assurance:

- A. Installer: The installation firm shall be an established communications and electronics contractor with at least 10 years successful installation experience of products utilizing integrated communications systems and equipment specific to that required for this project. Only California Certified fire alarm technicians or California Certified electrician shall be used to install the fire alarm system. Provide proof to District that all employees are California Certified to install the fire alarm system.
- B. All materials, unless otherwise specified, shall be new, and free from any defects. All items of equipment including wire and cable shall be designed by the manufacturer unless otherwise specified, shall function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.
- C. The Contractor shall show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The contractor shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

- D. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

1.06 Warranties:

- A. The contractor shall warrant all equipment and wiring free from inherent mechanical and electrical defect for one year (365 days) from the date of final acceptance. The contractor shall without additional expense to the School District, replace any defective materials or equipment provided by him under this contract within the warranty period.

PART 2 - PRODUCTS

2.01 System Description

- A. The contractor shall furnish and install a complete 24 VDC, electrically supervised, addressable analog, microprocessor-based fire alarm control panel as specified herein. The fire alarm system shall include but not be limited to all control equipment, power supply, initiating devices, audible and visual indicating appliances as appropriate, conduit, wiring, fittings, and all other accessories necessary to provide a complete and operable system.

B. General System Operation:

1. When an alarm occurs on a zone the control panel indicates the alarm condition until manually reset.
2. An alarm may be acknowledged by actuating the "ACKNOWLEDGE" switch. This shall silence the control panel buzzer, and change the "SYSTEM ALARM" LED and the individual zone LED from flashing to steadily lit.
3. All alarm signals may be silenced by actuating the "SILENCE" switch. This shall steadily illuminate the "SIGNAL SILENCE" LED. If a subsequent alarm is activated, the alarm signal shall "resound" until again silenced. Once silenced, all alarm signals may be restored again by activating the "SILENCE" switch. Waterflow zones shall be non-silenceable.
4. If the microprocessor fails, the system shall execute a default signaling program. This program will enable the panel to sound the audible signals and summon the Fire Department. In addition, a yellow "DEGRADE" LED shall light to indicate the programming failure. Inability of the system to sound signals or summon the fire department during microprocessor failure shall not be acceptable.

C. Alarm Operation:

1. Operation of a manual pull station or automatic activation of any smoke detector, heat detector, or water flow switch zone shall cause the FACP to:
2. Sound all indicating appliances in a temporal pattern.
3. Flash all strobes.

4. Shut down all air handling units as specified herein.
5. Flash the panel "System Alarm" LED and pulse a panel audible signal.
6. Display a description of the specific analog/addressable device in alarm via an 80-character alpha-numeric display.
7. Display a description of the specific analog/Addressable device in alarm on the administrations Remote 80-character Annunciators.
8. Notify the Fire Department via the UDACT [and AES-Intellinet Radio].

D. Electrical Supervision:

1. Each initiating and signal circuit shall be electronically supervised for opens, shorts, and ground faults in the wiring. The occurrence of any fault shall activate the system trouble circuitry but shall not interfere with the proper operation of any circuit that does not have a fault connection.
2. Each initiating circuit shall be capable of being wired using Class "B" (Style B) supervised circuits (a break or ground fault in any conductor shall be reported as a trouble condition) at no extra cost.

E. Normal Power Supply:

1. Connections to the normal electrical service shall be on a dedicated branch circuit in accordance with the California Electrical Code (CEC) the circuit and connections shall be mechanically protected. The circuit disconnecting means shall be accessible only to authorized personnel and shall be clearly marked "FIRE ALARM CIRCUIT CONTROL."

2.02 Fire Alarm Control Panel:

A. The FACP is a new Notifier NFS2-3030 with Emergency Voice Evacuation Digital Voice Command:

1. Auxiliary SPDT alarm and trouble dry contacts.
2. Auxiliary circuitry in the control panel to operate remote relays for control of air handling equipment.
3. A solid-state power transfer circuit that shall switch to standby power automatically and instantaneously if normal power fails or falls below 15% of normal ("brown out" conditions).
4. This electronic circuit shall allow the batteries to be effectively "floated" on the operating system to avoid upsetting normal microprocessor operation and minimize resultant nuisance troubles and /or alarms. This circuit shall be physically isolated from the power supply to facilitate service.

5. A ground fault detector to detect positive or negative grounds on the initiating circuits, signal circuits, power circuits, and telephone line circuit. A ground fault LED shall be illuminates and shall operate the general trouble devices as specified herein but shall not cause an alarm to be sounded.
6. Short circuit LED's for all notification appliance circuits shall be a standard feature of the fire alarm control panel. Each circuit shall be monitors for short circuits and shall have a distinct LED for visual indication of the circuit.
7. Operating trouble devices as specified herein but shall not cause an alarm to be sounded.
8. Individual circuit fuses shall be provided from the following: smoke detector (resettable) power, main power supply, battery standby power, and auxiliary (non-resettable) output.
9. A common reset and lamp test switch, labeled "RESET/LAMP TEST" shall be provided to reset the system.
10. Circuitry shall be provided in the control panel to permit transmission of trouble alarm signals over leased or privately owned telephone cables to a remote receiving panel. There shall be a remote disconnect switch to allow testing of the fire alarm signal without transmitting an alarm signal to the central station.

#### 2.03 System Cabinet:

- A. The system cabinet shall be surface mounted with a texture finish and shall be made of these three parts: backbox, backplate, and door.
- B. The cabinet shall be of dead-front construction and 16-gauge cold rolled steel. The door lock system shall consist of two locks which will accept two different keys. One "OPER" key shall allow dead front access to the module display for all operator functions while one "TECH" key shall allow access to all pane electronics without further dismantling of the cabinet, control unit, or wiring.

#### 2.04 Power Supply:

- A. All AC line connections shall be isolated from the power supply unit and transformer by means of a cable-connected AC Unit per U.L. 864.
- B. The 120 VAC main power shall be transformer converted to low voltage, rectified and filters 24 VDC nominal for system operation and to eliminate the possibility of line voltage being present on any internal panel components. The power supply shall be integral, filtered, nominal 24 VDC at 5 Amps, and comply with U.L. 864.
- C. Primary Power outputs shall be as follows:
  1. A green LED on the power supply card shall indicate the presence of primary power.
- D. Power Supply outputs shall be as follows:

1. 24 VDC Non-Resettable, 3.2 Amps max., Power Limited.

2. 24 VDC Resettable, 3.2 Amps max., Power Limited.

E. NOTE: maximum combined output for both is 8.0 Amp.

#### 2.05 Battery Charger:

A. The power supply shall contain a supervised and fused battery charger with a maximum average charging current of 1.5 Amp (this current shall be sufficient to maintain the system batteries at full charge).

B. If the system loses AC power, a System Trouble shall occur.

C. The battery charger shall be capable of charging up to 34 ampere/hour capacity, lead-acid batteries. If batteries are mounted within the control panel enclosure provide a battery shelf.

#### 2.06 Detection Circuits:

A. Each Analog Detection Loop Unit shall provide communication with all analog/addressable devices (initiating/control) connected to the system through two (2) analog/addressable communications loops. Each loop shall communicate with a maximum of ninety-nine analog detectors and ninety-eight addressable monitor/control devices.

B. The first nine-nine addressed (1-99) on each loop shall be dedicated to analog detectors, while addresses 101-198 shall be reserved for addressable monitor/control devices.

#### 2.07 Analog/Addressable Communications Loops:

A. All initiating devices shall be connected to their addressable loop via a two wire style 4 (class B) circuit.

#### 2.08 Notification Appliance circuits:

A. Four (4) independent (class B) notification appliance circuits shall be provided on the SCU, each polarized and rated at 1.75 Amps DC, individually fused and supervised for opens, grounds, and short circuits. They shall be capable of being wired Class "A" (style Z) or class "B" (style Y) supervised and fused @ 2 Amps. Specifications are as follows:

Voltage	Current
24VDC Non-Regulated	3.2 Amps: Maximum Alarm
	.001 Amps: Normal Standby

#### 2.09 Trouble Input:

A. Trouble input shall be provided rated at 5-24 Volts input and, if used, shall accept a trouble from an external source.

2.10 Trouble Dry Contacts:

- A. Trouble dry contacts (form A or Form B; jumper selectable) shall be provided rated at 2 Amps at 24 VDC (resistive) and shall transfer whenever a system trouble occurs.

2.11 Alarm Dry Contacts:

- A. Alarm dry contacts (form C) shall be provided rated at 2 Amps at 24 VDC (resistive) and shall transfer whenever a system alarm occurs.

2.12 Central Station Monitoring:

- A. The entire fire alarm system shall be connected via leased telephone lines and radio communications to a central station and in accordance with the requirements of the fire department.

2.13 Alarm Signals:

- A. All alarm signals shall be automatically "locked in" at the control panel until the operated device is returned to its normal condition and the control panel is manually reset. When used for Water flow, the silence switch shall be bypassed.
- B. Alarm or Trouble Activation of Initiating Zones.
- C. Alarm or Trouble activation of initiating zones shall be indicated by zone alarm and trouble LED's.

2.14 Detection Devices:

A. Manual Pull Stations:

- 1. Provide non coded, addressable, semi-recessed, double-action type manual pull station with mechanical reset features. Where installed in existing buildings, boxes may be surface-mounted. Surface mounted boxes shall be the same color as the pull stations.
- 2. Provide separate screw terminal for each conductor connected to the manual alarm pull station. Break-glass-front pull stations will not be permitted. Provide red aluminum, housing labeled "fire". The pull stations shall not be resettable without the use of a key.

B. Detectors:

- 1. Each photoelectric smoke detector and heat detector shall be interchangeable via twist-lock mounting base, to ensure matching the proper sensor to the potential hazards of the areas being protected. The system shall recognize when an improper sensor type has been installed in a previously programmed sensor type location.

C. Photoelectric Smoke Detector:

1. Provide white flame retardant plastic, addressable, analog, photoelectric type, smoke detectors. Detectors shall operate using an optical sensing chamber principal which complies with UL 268.
2. Each detector shall be capable of being set at two sensitivity settings.
3. Each detector shall have two LED visual indicators providing local 360 degree visibility of operating status and alarm indication.
4. Each detector shall be supported independently of wiring connections, and connected by separate screw terminals of each conductor.
5. The detector screen and cover assembly must be easily removable for field cleaning.

D. Combination Fixed Temperature, rate of Rise Heat Detectors:

1. Provide off-white flame retardant plastic, addressable, combination 140 degree F fixed temperature, rate of rise heat dual thermistor detectors. Detector shall initiate an alarm when temperature rises at a rate of over 15 degrees F per minute or above 140 degrees F.
2. Each detector shall have two LED visual indicators providing local 360 degree visibility of operating status and alarm indication.
3. Contacts shall be self-resetting after response to rate or rise principal. Locate detectors in accordance with UL FPD or FM P7825 listing and the requirements of NFPA 72. Temperature rating of detectors shall be in accordance with NFPA 72.

E. Addressable Monitor Module: provide addressable monitor module wired as style B (class "B") to provide an address for normally open contact devices.

1. Provide Addressable Monitor Module to monitor status of all Water flow Switches, Valve tamper Switches and Post Indicator Valves.

2.15 Alarm Notification Devices:

- A. Color of notification appliances shall be red, unless otherwise noted by District.
- B. All alarm notification devices shall be synchronized throughout the school campus building.
- C. Strobe Lights: Provide recessed mounted strobe light assembly suitable for use in electrically supervised circuit. Lamps shall be xenon flashtube type, powered from the fire alarm control panel alarm signaling circuit. Strobes shall provide candela ratings as indicated on the drawings candelas and flash 60 times per minute unless otherwise noted. Strobes in toilets shall provide a minimum of 15 candelas. Lamps shall be protected be a clear polycarbonate lens. Housing shall be labeled "FIRE" in red vertical lettering.

- D. Speaker/Strobes: Provide recessed mounted, grille face, vibrating diaphragm type, audio alarm devices consisting of an electro-mechanical horn suitable for use in an electrically supervised circuit. Speaker/Strobes shall be provided with a red, tamper resistant grill. Speaker shall have a minimum sound rating of 90 DBA at 10 feet and have field selectable sound levels. Speakers shall be capable of providing a synchronized, field selectable, temporal code 3 tone. Strobes shall have a separate minimum candela as shown on the drawings and flash 60 times per minute unless otherwise noted. Lamps shall be protected by a clear polycarbonate lens. Housing shall be labeled "FIRE" in red vertical lettering.
- E. Speakers: Provide recessed mounted, grille face, vibrating diaphragm type, audio alarm devices consisting of an electro-mechanical horn suitable for use in an electrically supervised circuit. Horns shall be provided with a red, tamper resistant grill. Horn shall have a minimum sound rating of 90 DBA at 10 feet and have field selectable sound levels. Horns shall be capable of providing a synchronized, field selectable, temporal code 3 tone. Horns shall have a separate screw terminal for each conductor connection.
- F. Exterior Speakers: Provide recessed mounted, grille face, vibrating diaphragm type, audio alarm devices consisting of an electro-mechanical horn suitable for use in an electrically supervised circuit. Horns shall be provided with a red, tamper resistant grill, and a weatherproof backbox. Horn shall have a minimum sound rating of 90 DBA at 10 feet and have field selectable sound levels. Horns shall be capable of providing a synchronized, field selectable, temporal code 3 tone. Horns shall have a separate screw terminal for each conductor connection. Horns located in areas subject to moisture or exterior atmospheric conditions, shall be approved for such locations.
- G. Field Charging Power Supply (FCPS):
  - 1. The FCPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.
  - 2. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 60 hour standby.
  - 3. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.
  - 4. The FCPS shall include an attractive surface mount backbox.
  - 5. The Field Charging Power Supply shall include the ability to delay the AC fail delay per NFPA requirements.
  - 6. The FCPS include power limited circuitry, per 1995 UL standards.

## 2.16 Wiring and Conduit:

- A. Provide wiring in accordance with NFPA 72.
- B. Conductors shall be solid copper. Conductors for 120 volt circuits shall be No. 12 AWG minimum; conductors for low-voltage DC circuits shall be No. 14 AWG minimum for annunciation circuits and No. 14 AWG minimum for initiation circuits. All cables shall be rated and code compliant for their use.
  - 1. All low voltage wiring not installed in conduits shall be plenum rated.
  - 2. Provide color-coded conductors. Identify conductors by plastic-coated, self-sticking, printed markers or by heat-shrink type sleeves. Each conductor used for the same specific function shall be distinctly color coded. Use different color codes for each interior circuit. Each circuit color code wire shall remain uniform throughout the circuit.
  - 3. Pigtail or "T" tap connections to the evacuation alarm horns, horn/strobes and strobes are not acceptable.
  - 4. Underground circuit or circuits in wet areas shall be gel filled cables in scheduled 40 PVC conduit. There shall be no splicing of any underground cables.
- C. Conduits:
  - 1. Identification of Conduit: New conduits containing fire alarm system conductors shall be red,  $\frac{3}{4}$ " minimum. Junction-boxes, covers, gutters, and terminal cabinets, containing fire alarm system conductors, shall be painted red or provided red in color with engraved plastic identification signs permanently attached to the equipment.
  - 2. Do not run fire alarm circuits in the same conduit with the non-fire alarm circuits.
  - 3. Do not run AC circuits in the same conduit with the fire alarm circuits.
  - 4. Provide wiring in rigid metal conduit for exterior installations or where exposed to damage.
  - 5. Conceal conduit in finished areas of new construction and wherever practical in existing construction. Conduit runs shall be straight, neatly arranged properly supported and parallel or perpendicular to walls and partitions. Identify conductors within each enclosure where a tap, splice, or termination is made.

### PART 3 - EXECUTION

#### 3.01 Installation:

- A. Equipment, materials, installation, workmanship, inspection, and testing shall be in accordance with the NFPA publications and as modified herein.
- B. Follow manufacturer's directions in all cases for installation, testing and energizing.
- C. Accurately set, level, support, and fasten all equipment.

D. Smoke and heat detectors:

1. No detector shall be located closer than 12 inches to any part of any lighting fixture. Detectors, located in areas subject to moisture or exterior atmospheric conditions, or hazardous locations as defined by NFPA 70, shall be approved for such locations.
  2. Provide guards for all detectors mounted in any high athletic activity areas such as gym's, wrestling rooms, shower rooms.
- E. Conduit where exposed shall be installed parallel with the walls or structural elements; vertical runs to be plumb; horizontal runs to be level or parallel with structure; conduit grouped neatly together with straight runs, all bends parallel and uniformly spaced.
- F. Earthquake Resistant installation/fastening of all electrical equipment shall conform to the general requirements of section 1614A of the California Building Code.

3.02 Preliminary Tests:

- A. Conduct the following tests during installation of wiring and system components. Correct deficiency pertaining to these requirements prior to formal functional and operational tests of the system, preliminary tests shall be performed in the presence of the Local Fire Authority and Project inspector of Record to determine the conformance with the specified requirements.
- B. Ground Resistance: Measure the resistance of each connection to ground. Ground resistance shall not exceed 10 ohms.
- C. Dielectric Strength insulation Resistance: Test the dielectric strength and the Insulating resistance of the system interconnecting wiring by means of an instrument capable of generating 500 volts of DC and equipped to indicate leakage current 1000 megohms. For the purpose of this test, connect the instrument between each conductor on the line and between each conductor and ground at the control panel end of the line, with the other extremity open circuited and all series-connected devices in place. The system shall withstand the test without breakdown and shall indicate a resistance of not less than 1.0 minute with a DC potential of not less than 100 volts and not more than 500 volts.
- D. Standby Battery Test: prior to formal inspection and tests, place the fire alarm system on standby battery power for 24 hours; immediately thereafter, sound the building evacuation alarm signaling devices for 5 minutes. When the test is complete, the fire alarm system battery charger shall be fully recharged within 24 hours.
- E. Field Inspection and Test:
1. Before final acceptance of the work, pre-test system to demonstrate compliance with the contract requirements. System shall be subjected to complete functional and operational tests, including tests in place of each detector. When tests have been completed and corrections made, submit a signed and dated NFPA Certificate of Completion along with a completed testing matrix with the request for formal inspection and tests.

2. Where application of heat would destroy a heat detector, it may be manually activated.
3. Verify the proper receipt of the alarm signals at the central station for the UDACT provide printout of test reports. It shall be the sole obligation of the contractor to coordinate and to provide all testing documentation from the central station.
4. The communication loops and the indicating appliance circuits shall be opened in at least two locations per zone to check for the presence of correct supervisory circuitry.
5. Perform the field inspection and test in the presence of the manufacturer's representative, the School District's representative, local Fire Authority and Project Inspector of Record (IOR).
6. Test equipment: It shall be the responsibility of the installing Contractor to furnish tools, instruments, and materials required for a thorough test of the system. This includes, but is not limited to, the following:
  - a. VOM meter
  - b. Manufacturer's recommended smoke detector testing device and sensitivity test equipment.
  - c. Heat source for testing heat detectors.
  - d. Keys to all control panels.
  - e. Ladders

### 3.03 Project Closeout:

#### A. As Built Drawings:

1. Provide a complete set (full size scalable) of reproducible "as-built" and AutoCAD format drawings showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment, and internal wiring of the equipment upon completion of system.

#### B. Operating and Instruction Manuals:

1. Operating and Instruction manuals shall be submitted prior to testing of the system. Four complete sets of operation and instructions manuals shall be delivered to the School District upon request.
2. Complete, accurate, step-by-step testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, and troubleshooting manual explaining how to test the preliminary internal parts or each piece of equipment shall be delivered upon completion of the system.

- C. Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:
1. Instructions on replacing any components of the system, including internal parts.
  2. Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions.
  3. A complete list of all equipment and components with information as to the address and telephone number of both the manufacturer and local supplier of each item.
  4. User operating instructions shall be provided prominently displayed on a separate sheet located next to the control unit in accordance with U.L. Standard 864.

## **EMERGENCY VOICE EVACUATION SYSTEM**

### **PART 1.0 - GENERAL**

#### **1.1. DESCRIPTION:**

A. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled Voice Evacuation/Mass Notification control panel.

B. The Voice Evacuation/Mass Notification panel shall comply with NFPA 72 requirements.

1. The Secondary Power Source of the Voice Evacuation/Mass Notification panel will be capable of providing at least 24 hours of backup power with the ability to sustain 15 minutes in alarm at the end of the backup period.

C. The Voice Evacuation/Mass Notification panel shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC, Q9001-1994.

D. The Voice Evacuation/Mass Notification panel and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).

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Underwriters Laboratories Inc. (UL) - USA:

UL 864 Standard for Control Units for Fire Protective Signaling Systems

UL 1711 Amplifiers for Fire Protective Signaling Systems

UL 2572 Communication and Control Units for Mass Notification Systems

Other:

NEC Article 250 Grounding

NEC Article 300 Wiring Methods

NEC Article 760 Fire Protective Signaling Systems

Compliant with Unified Facilities Criteria UFC 4-021-01

1. The Voice Evacuation/Mass Notification panel shall be ANSI 864, 9th Edition Listed. Systems listed to ANSI 864, 8th edition (or previous revisions) shall not be accepted.

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

#### 1.2. SCOPE:

A. A microprocessor-controlled Voice Evacuation/Mass Notification control panel shall be installed in accordance with the project specifications and drawings.

#### 1.3. SUBMITTALS

##### A. General:

1. Two copies of all submittals shall be submitted to the Architect/Engineer for review.
2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

##### B. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

3. Show system layout, configurations, and terminations.

C. Manuals:

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

D. Software Modifications

1. Provide the services of a qualified technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
2. Provide all hardware, software, programming tools and documentation necessary to modify the Voice Evacuation/Mass Notification Control Panel on site. Modification includes addition and deletion of messages, circuits, zones and changes to system operation. The system structure and software shall place no limit on the type or extent of software modifications on-site.

1.4. GUARANTY:

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

1.5. MAINTENANCE:

- A. Maintenance and testing shall be on a semi-annual schedule or as required by the local AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance. The Voice Evacuation/Mass Notification Control Panel shall be tested in accordance with the requirements of NFPA 72.
- B. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

1.6. POST CONTRACT EXPANSIONS:

- A. The contractor shall have the ability to provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.
- B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of speakers zones or wattage by ten percent (10%).

- C. The quotation shall include installation, test labor, and labor to reprogram the system for this 10% expansion. If additional Voice Evacuation/Mass Notification Control Panel hardware is required, include the material and labor necessary to install this hardware.
- D. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the Voice Evacuation/Mass Notification Control Panel.
- E. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

#### 1.7. APPLICABLE STANDARDS AND SPECIFICATIONS:

The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

##### A. National Fire Protection Association (NFPA) - USA:

No. 70 National Electric Code (NEC)

No. 72 National Fire Alarm Code

No. 101 Life Safety Code

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

C. Local and State Building Codes.

D. All requirements of the Authority Having Jurisdiction (AHJ).

#### 1.8. APPROVALS:

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

UL Underwriters Laboratories Inc (Ninth Edition)

CSFM California State Fire Marshal

MEA Material Equipment Acceptance (NYFD COA)

### PART 2.0 PRODUCTS

#### 2.1. EQUIPMENT AND MATERIAL, GENERAL:

A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a fire protective signaling system, meeting the National Fire Alarm Code.

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

C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place

(e.g., speakers shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

D. All equipment must be available "over the counter" through the Security Equipment Distributor (SED) market and can be installed by dealerships independent of the manufacturer.

## 2.2. CONDUIT AND WIRE:

### A. Conduit:

1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
2. Where required, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760.
4. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
5. Conduit shall not enter the Voice Evacuation/Mass Notification Control Panel, or any other remotely mounted panel equipment or backboxes, except where conduit entry is specified by the Voice Evacuation/Mass Notification Control Panel manufacturer.
6. Conduit shall be 3/4 inch (19.1 mm) minimum.

### B. Wire:

1. All Voice Evacuation/Mass Notification Control Panel wiring shall be new.
2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the Voice Evacuation/Mass Notification Control Panel. Number and size of conductors shall be as recommended by the Voice Evacuation/Mass Notification Control Panel, but not less 14 AWG (1.63 mm) for Notification Appliance Circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NEC 760 (e.g., FPLR).
5. All field wiring shall be electrically supervised for open circuit and ground fault.

### C. Terminal Boxes, Junction Boxes and Cabinets:

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

D. The Voice Evacuation/Mass Notification Control Panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as Voice Evacuation/Mass Notification Control Panel. Voice Evacuation/Mass Notification Control Panel

primary power wiring shall be 12 AWG. The panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.

1. The Voice Evacuation/Mass Notification Control Panel notification circuit (NACs 1) shall also automatically synchronize any of the following manufacturer's notification appliances connected to them: System Sensor, Wheelock, or Gentex with no need for additional synchronization modules.

2.3. Voice Evacuation/Mass Notification Control Panel:

A. The Voice Evacuation/Mass Notification Control Panel is a new Silent Knight 6820EVS (with Digital Voice Command Center) and contains a microprocessor-based Central Processing Unit (CPU). The CPU shall distribute and control emergency voice messages over the speaker circuits.

B. The system shall provide the capability to interface to **LOC (Local Operator Console)**, Distributed Audio Amplifiers, Remote Page Unit, Remote Microphone, Fire Fighter Telephone Unit and Remote Telephone Zone Module from the same manufacturer.

C. Shall have as minimum requirements:

1. Integral 50 Watt, 25 Vrms audio amplifier with optional converter for 70.7 volt systems. The system shall be capable of expansion to 100 watts total via the insertion of an additional 50-watt audio amplifier module (can be used as a backup amplifier) into the same cabinet and expandable over 1100 watts.
2. Speaker circuit that can be wired both Class A and B.
3. Integral Digital Message Generator with a memory capacity for up to 60 seconds per messaging. The Digital Message Generator shall be capable of producing fourteen distinct messages (60 seconds each). Field-selectable message and custom message recording capability using the local microphone, a USB port, or an external audio input.
4. Built in alert tone patterns with ANSI, March Code, California,

Steady, Alert Tone, Hi-Lo, ANSI Whoop, Continuous Whoop, or No Tone is field programmable. Tone Prior to transmitting a message, the Voice Evacuation/Mass Notification Control Panel can be programmed to produce a pre-announce and post-announce tone.

- a. Leading Tone Duration If a pre-announce tone is desired, select the length of time it will play before a message is broadcasted. Select 4, 8, 12, 16, 20, 24, or 28 seconds. In a pre-announce tone is not desired, select 0 seconds.
  - b. Trailing Tone Duration Select the length of time for the post-message announcement tone. Select 4, 8, 12, 16, 20, 24, 28, or 32 seconds from the drop-down menu.
  - c. Repeat Cycle Select the number of times the message will be repeated during an alarm. A message can be repeated 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or an *Infinite* amount of times.
5. The Voice Evacuation/Mass Notification Control Panel will be capable of detecting and annunciating the following conditions: Loss of Power (AC and DC), System Trouble, Ground Fault, Alarm, Microphone Trouble, Message Generator Trouble, Tone Generator Trouble, and Amplifier Fault.
6. The Voice Evacuation/Mass Notification Control Panel shall be fully supervised including microphone, amplifier output, message generator, speaker wiring, and tone generation.

7. Speaker outputs shall be fully power-limited.
8. Amplifiers will be supplied power independently to eliminate a short on one circuit from affecting other circuits.
9. The Voice Evacuation/Mass Notification Control Panel will provide full supervision on both active (alarm or music) and standby conditions.
10. An optional zone splitter version shall be available that permits splitting speaker circuits into 8 specific zones.
11. An optional distributed amplifiers unit shall be available that permits splitting speaker circuits up to a total of 24 speaker zones.
12. Wiring terminals shall be removable terminal blocks (Wire Gauge 12 – 18 AWG) for ease of servicing.
13. Voice Evacuation/Mass Notification Control Panel will provide 2 amp Notification Appliance Circuit (NAC) output with sync generator or follower for System Sensor, Wheelock or Gentex protocols. The NAC shall be capable of One (1) Style Y (Class B) or Style Z (Class A) circuit.
14. Shall have eight Command Input Circuits to activate messages via reverse polarity or contact closures.
15. Built in External Audio Input can be used for background music.
16. On-board battery charger which supports charging up to 26 AH batteries (cabinet holds up to 18AH batteries).
17. Programmable delay of immediate, 2 hours or 6 hours reporting of AC Loss.
18. Built in Piezo sounder for local trouble.
19. Stores the events in the 100 Event History log
20. Shall have Console Lamp Test switch and shall activate all system LEDs including Remote Consoles.
21. Shall have three Form-C relays:
  - AC Power Loss Relay
  - System Trouble Relay
  - MNS Active (For Mass Notification signage)
22. Shall have a Special Application (auxiliary power) output for addressable modules when interfaced with compatible addressable FACPs and End-of-Line power supervision relays.
23. Shall be capable of Speaker Volume Control. The Supervised

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Volume Control will allow manual volume setting for telephone paging and background music for a specific speaker or speaker zone.

24. Shall have a Night Ring input allows a building's Private Branch Exchange (PBX) to activate the Voice Evacuation/Mass Notification panel.
25. The Voice Evacuation/Mass Notification panel can communicate in any combination up to eight (8) external remote consoles:

Optional Remote Microphone

Optional Remote Page Unit

Optional Local Operator Console

26. The Voice Evacuation/Mass Notification panel can communicate in any combination up to eight (8) external distributed audio amplifiers:

Optional Distributed Amplifier, 50 watts.

Optional Distributed Amplifier, 125 watts.

27. Shall be capable of integrating with firefighter telephone system that provides secure and reliable communications. The firefighter telephone system will allow for up to ten users to plug in to a remote telephone jack and communicate simultaneously within a building.
28. Shall be capable of secure access to the Voice Evacuation/Mass Notification panel via cell phone or other remote telephone.
29. The Voice Evacuation/Mass Notification panel can be integrated by an FACP via the ANN/ACS (EIA-485) link. Compatible FACP's include the MS-9200UDLS and MS-9600(UD)LS.
30. The Voice Evacuation/Mass Notification shall report Mass Notification events to the Central Station.
31. The Voice Evacuation/Mass Notification panel can be interface with other UL Listed Fire Alarm Control Panels via activation of reverse polarity or by contact closure.

D. Speakers:

1. All speakers shall operate on 25 or 70 VRMS with field selectable output taps from 0.25 to 2.0 Watts.
2. Speakers in corridors and public spaces shall produce a minimum sound levels of 75 dBA output at 10 feet (3m).
3. The plug-in speaker allows the installer to pre-wire mounting plates and dress the wires before plugging in the speakers.
4. Flush mount applications are achievable without the need for an extension ring.
5. Frequency response shall be a minimum of 400 HZ to 4000 HZ.
6. Rotary switch simplifies field selection of speaker voltage and power settings.

E. Enclosures:

1. The Voice Evacuation/Mass Notification panel shall be housed in a UL-listed cabinet suitable for

surface mounting. The cabinet and front shall be corrosion protected and painted red via the powder coat method with manufacturer's standard finish.

2. The back box and door shall be constructed of steel with provisions for electrical conduit connections into the sides and top.

The door shall provide a key lock and shall provide for the viewing of all indicators.

#### F. Power Supply:

1. The main power supply for the Voice Evacuation/Mass Notification panel shall provide up to 7.5 amps of available power for the panel and peripheral devices.
2. Provisions will be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies.
3. The power supply shall provide an integral battery charger or may be used with an external battery and charger systems. Battery arrangement may be configured in the field.
4. The main power supply shall continuously monitor all field wires for earth ground conditions.
5. The main power supply shall operate on 120 VAC, 60 Hz or 240 VAC, 50 Hz, and shall provide all necessary power for the Voice Evacuation/Mass Notification panel.

#### G. BATTERIES:

1. Upon loss of Primary (AC) power to the Voice Evacuation/Mass Notification panel, the batteries shall have sufficient capacity to power the Voice Evacuation/Mass Notification panel for required standby time (24 or 60 hours) followed by 15 minutes of alarm.
2. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.

### PART 3.0 - EXECUTION

#### 3.1. INSTALLATION:

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

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect speakers from contamination and physical damage.

#### 3.2. TEST:

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

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

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

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

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

E. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying voice messages.

### 3.3. FINAL INSPECTION:

A. At the final inspection a minimum NICET Level II technician shall demonstrate that the system functions properly in every respect.

### 3.4. INSTRUCTION:

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

B. The contractor or installing dealer shall provide a user manual indicating "Sequence of Operation."

END OF SECTION

## **SECTION 31 23 00**

### **TRENCHING, BACKFILLING, AND COMPACTING**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Trench, backfill, and compact as specified herein and as needed for installation of underground utilities associated with the Work.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division I of these Specifications.

##### **1.2 QUALITY ASSURANCE**

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.
- C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the construction soil engineer.

#### **PART 2 - PRODUCTS**

##### **2.1 SOIL MATERIALS**

- A. Fill and backfill materials:
  - 1. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps over 2" in greatest dimension, and with not more than 10% of the rocks or lumps larger than 1" in their greatest dimension.
  - 2. Fill material is subject to the approval of the construction soil engineer, and is that material removed from excavations or imported from off-site borrow areas, predominantly granular, non- expansive soil free from roots and other deleterious matter.
  - 3. Imported fill material shall, in addition, have 10 to 40% by weight passing the #200 sieve, a plasticity index of less than 12, and a liquid limit of less than 30%.

##### **2.2 OTHER MATERIALS**

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

#### **PART 3 - EXECUTION**

### 3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

### 3.2 FINISH ELEVATIONS AND LINES

- A. Comply with documents.

### 3.3 PROCEDURES

- A. Utilities:
  - 1. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the School District.
  - 2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.
  - 3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the School District.
  - 4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Architect and secure his instructions.
  - 5. Do not proceed with permanent relocation of utilities until written instructions are received from the Architect.
- B. Protection of persons and property:
  - 1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.
  - 2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
  - 3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.
- C. De-watering:
  - 1. Remove all water, including rain water, encountered during trench and sub-structure work to an approved location by pumps, drains, and other approved methods.
  - 2. Keep trenches and site construction area free from water.
- D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- E. Maintain access to adjacent areas at all times.

### 3.4 TRENCHING

- A. Provide sheeting and shoring necessary for protection of the Work and for the safety of personnel.
  - 1. Prior to backfilling, remove all sheeting.
  - 2. Do not permit sheeting to remain in the trenches except when, in the opinion of the Architect, field conditions or the type of sheeting or methods of construction such as use of concrete bedding are such as to make removal of sheeting impracticable. In

such cases, the Architect may permit portions of sheeting to be cut off and remain in the trench.

- B. Open cut:
  - 1. Excavate for utilities by open cut.
  - 2. If conditions at the site prevent such open cut, and if approved by the Architect, trenching may be used.
  - 3. Short sections of a trench may be tunneled if, in the opinion of the Architect, the conductor can be installed safely and backfill can be compacted properly into such tunnel.
  - 4. Where it becomes necessary to excavate beyond the limits of normal excavation lines in order to remove boulders or other interfering objects, backfill the voids remaining after removal of the objects as directed by the construction soil engineer.
  - 5. When the void is below the subgrade for the utility bedding, use approved earth materials and compact to the relative density directed by the construction soil engineer, but in no case to a relative density less than 90%.
  - 6. When the void is in the side of the utility trench or open cut, use approved earth or sand compacted as approved by the construction soil engineer, but in no case to a relative density less than 85%.
  - 7. Remove boulders and other interfering objects, and backfill voids left by such removals, at no additional cost to the School District.
  - 8. Excavating for appurtenances:
    - a. Excavate for manholes and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.
    - b. Overdepth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel, or lean concrete as directed by the construction soil engineer, and at no additional cost to the School District.
- C. Trench to the minimum width necessary for proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing for the utility.
- D. Depressions:
  - 1. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.
  - 2. Except where rock is encountered, do not excavate below the depth indicated or specified.
  - 3. Where rock is encountered, excavate rock to a minimum overdepth of 4" below the trench depth indicated or specified.
- E. Where utility runs traverse public property or are subject to governmental or utility company jurisdiction, provide depth, bedding, over, and other requirements as set forth by legally constituted authority having jurisdiction, but in no case less than the depth shown in the Contract Documents.
- F. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace turf upon completion of the backfilling.
- G. Cover:
  - 1. Provide minimum trench depth indicated below to maintain a minimum cover over the top of the installed item below the finish grade or subgrade, unless specifically designed and shown otherwise on the drawings:

- a. Areas subject to vehicular traffic:
  - 1) Sanitary sewers: 24";
  - 2) Storm drains: 24".
- b. Areas not subject to vehicular traffic:
  - 1) Sanitary sewers: 18";
  - 2) Storm drains: 18".
- c. All areas:
  - 1) Water lines: 18";
  - 2) Natural gas lines: 18";
  - 3) Electrical cables: 24";
  - 4) Electrical ducts: 18".
- d. Concrete encased:
  - 1) Pipe sleeves for water and gas lines: 18";
  - 2) Sanitary sewers and storm drains: 12";
  - 3) Electrical ducts: 18".
- e. Where utilities are under a concrete structure slab or pavement, the minimum depth need only be sufficient to completely encase the conduit or pipe sleeve, and electrical long-radius rigid metal conduit riser, provided it will not interfere with the structural integrity of the slab or pavement.
- f. Where the minimum cover is not provided, encase the pipes in concrete as indicated. Provide concrete with a minimum 28 day compressive strength of 3000 psi.

### 3.5 BEDDING

- A. Provide bedding as indicated on the Drawings.

### 3.6 BACKFILLING

- A. General:
  - 1. Do not completely backfill trenches until required pressure and leakage tests have been performed, and until the utilities systems as installed conform to the requirements specified in the pertinent Sections of these Specifications.
  - 2. Except as otherwise specified or directed for special conditions, backfill trenches to the ground surface with selected material approved by the construction soil engineer.
  - 3. Reopen trenches which have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified, or otherwise correct to the approval of the construction soil engineer.
  - 4. Do not allow or cause any of the Work performed or installed to be covered up or enclosed by work of this Section prior to required inspections, tests, and approvals.
  - 5. Should any of the Work be so enclosed or covered up before it has been approved, uncover all such Work and, after approvals have been made, refill and compact as specified, all at no additional cost to the School District.
- B. Lower portion of trench:
  - 1. Deposit approved backfill and bedding material in layers of 3" minimum thickness, and compact with suitable tampers to 90% relative density (85% in landscape areas), until there is a cover of not less than 24" over sewers and 12" over other utility lines.
  - 2. Take special care in backfilling and bedding operations to not damage pipe and pipe coatings.
- C. Remainder of trench:
  - 1. Except for special materials for pavements, backfill the remainder of the trench with approved backfill.

2. Deposit backfill material in layers not exceeding the thickness specified, and compact each layer to the minimum density indicated by the construction soil engineer.

- D. Adjacent to buildings: Mechanically compact backfill within ten feet of buildings.
- E. Consolidation of backfill by jetting with water may be permitted, when specifically approved by the construction soil engineer, in areas other than building and pavement areas.

### 3.7 TEST FOR DISPLACEMENT OF SEWERS AND STORM DRAINS

- A. Check sewers and storm drains to determine whether displacement has occurred after the trench has been backfilled to above the pipe and has been compacted as specified.
- B. Flash a light between manholes or, if the manholes have not yet been constructed, between the locations of the manholes, by means of a flashlight or by reflecting sunlight with a mirror.
- C. If the illuminated interior of the pipe line shows poor alignment, displaced pipes, or any other defects, correct the defects to the specified conditions and at no additional cost to the School District.

### 3.8 PIPE JACKING

- A. The Contractor may, at his option, install steel pipe casings, tongue-and-groove reinforced concrete pipes, and steel pipes under existing roads or pavements by jacking into place using procedures approved by the governmental agencies having jurisdiction and approved by the construction soil engineer.

### 3.9 TUNNELING OPERATIONS

- A. The Contractor may, at his option, tunnel pipes into position using procedures approved by the construction soil engineer and the governmental agencies having jurisdiction.

### 3.10 FIELD QUALITY CONTROL

- A. The construction soil engineer will inspect open cuts and trenches before installation of utilities, and will make the following tests:
- B. Assure that trenches are not backfilled until all tests have been completed;
- C. Check backfilling for proper layer thickness and compaction;
- D. Verify that test results conform to the specified requirements, and that sufficient tests are performed;
- E. Assure that defective work is removed and properly replaced.

**END OF SECTION 312300**

