SPECIFICATIONS
Attachment 'A'
1.1 Application of Special Conditions. These Special Conditions are a part of the Contract Documents for the Work generally described as: GEORGE PEABODY ELEMENTARY SCHOOL and CLARENDON ELEMENTARY SCHOOL.

1.2 Contract Time/Milestone Schedule and Description of Phases

All Phase times indicated are from start of Contractor’s access to work area to Substantial Completion for each Phase. All punch list work shall be completed within 30 days of Substantial Completion for each phase.

Contract Time and Milestone Schedule:

- Notice To Proceed (NTP): August 15, 2016
- Construction Start: August 16, 2016
- Substantial Completion: October 31, 2016
- Final Completion: November 30, 2016. All work must be achieved within 30 days of Substantial Completion, (October 31, 2016), 107 calendar days from Notice to Proceed.

1.3 Description of General Milestone Requirements:

A. These descriptions of the phases are general in nature and in no way offer the complete and concise description of all the work required by the Contract Documents.
B. The start dates represented in the milestone schedule are preliminary and the District reserves the right to modify these dates based on when the Notice to Proceed is issued.
C. The Contractor is responsible for providing the manpower and scheduling the shifts necessary to complete the work in accordance with the Contract Time and Milestone Schedule.
D. School shall be in session during the entire duration of the project. Work shall be restricted only during non-school hours, holidays, and weekends.
E. Non-School hours are defined as hours before 7:00 AM and after 3:30 PM on days when school is in session.
F. Hazmat work prohibited on days when school is in session. Haz-Mat Abatement cannot be performed while students or school staff is on site.
G. Follow City of San Francisco Noise Ordinance
H. Work that is hazardous, noisy, or that causes vibration may not be performed in the buildings or on the site during school hours, without written approval from the District Representative. This includes but is not limited to the following work activities:
   1. Haz-Mat Abatement
   2. Concrete bushing, chipping, grinding, jack hammering.
   3. The use of powder-actuated fasteners (PAF’s)
   4. Floor grinding to remove adhesive.
5. Chemicals used in quantities that cause excessive odor and can not be effectively ventilated. As determined by the Owners Representative.
6. Wall tile removal. Hand scraping or chipping may be acceptable as approved by the Owners Representative.
7. Electric Tile Cutter, may be used if isolated in a temporary sound deadening room constructed by the Contractor as approved by the Owners Representative.
8. Large impact drills for use in concrete.
9. Smaller Bulldog type impact drills for ¼” holes or less.
10. Operation of cranes in occupied areas, including drilling rigs, and concrete pump trucks unless the occupants can be sufficiently isolated from the swing zone.
11. Chop Saws for metal studs or other metal cutting. These may be used if isolated in a temporary sound deadening room constructed by the Contractor as approved by the Owner’s representative.
12. The use of abrasive or “hot” saws to cut steel decking.
13. Earthwork compaction, including the operation of vibratory compaction equipment.

I. School Academic Testing: No work which creates noise or a vibration in the structure which can be heard and/or felt in occupied classrooms may be done on the following dates between 7:00 a.m. and 12:30 p.m. due to academic testing. These dates are approximate and Contractor shall confirm each school with the District during the school year. <VERIFY THE ACADEMIC TESTING SCHEDULE BELOW FOR EACH PROJECT WITH THE PRINCIPAL>

1. English Learners: 3 days between September and October.
2. STAR Testing: 15 days between April and May.
3. Other Testing: To be verified with the District

J. All work remaining on a phase after the Substantial Completion date of that phase shall be done during non-school hours.

K. Temporary hard barriers as necessary for each phase shall be constructed prior to the start of each phase of work in accordance with section 01520 “Construction Facilities”. On a site plan indicate lay down areas, pedestrian walkways, and contractor parking areas. Snow fencing is not acceptable as hard fencing. The Contractor shall submit diagrams for each phase one week prior to start of construction of that phase, indicating the construction zone, and barricades and access for students and School Personnel, for approval by the District Representative. The Contractor must provide and maintain access and code compliant egress to and from all occupied spaces. Contractor shall post temporary signage (appropriate and secure) shall be posted to redirect students and staff for emergency exiting.

L. The Contractor shall diligently maintain all construction zone barricades and fencing. Fence panels shall be secured with two fence clamps per joint. The Contractor shall secure end panels in a manner acceptable to the District Representative. The use of tie wire will not be an acceptable method for securing fence panels. Construction zone gates shall be secured with chains and District provided padlocks.

M. When school is in session any work that occurs in the building and cannot be safely segregated from students must be performed during non-school hours.
N. The existing fire alarm system and fire sprinkler system shall remain operational twenty four (24) hours/day, seven (7) days/week until such time as the new fire alarm system is fully functional, tested and accepted, and tied into the entire campus’s fire alarm system. If at any time during the Project the existing system is not fully operational the Contractor, at its own expense, shall provide a “Fire Watch” acceptable to the District Representative until either the existing system is made fully operational or the new system is fully installed, tested and accepted.

O. Liquidated damages are assessed per phase.

P. The Contractor's Construction Schedule shall reflect the work sequence and time period for each phase of the Project.

Q. Contractor to verify the dates and obtain approval for the timing, demolition, and construction of the Work in each area and phase with the District.

R. The Work of each phase shall include the building or buildings indicated (if applicable) and the adjacent site work required for safe access and egress for District Occupancy at Substantial Completion of each phase.

S. The Contractor shall carefully review the Drawings and other Contract Documents to fully understand the interdependency of the phases, the buildings, and the site work.

T. Work on weekends, evenings or holidays may be required to meet the project phasing schedules. Provide 72 hours notification to the District representative to ensure necessary inspections, monitoring, testing, etc. are provided during these work hours.

U. The District may withhold payments for late submittals. The District is willing to consider alternate means of phasing the project proposed by the Contractor. The acceptance of any alternate means of phasing is at the sole discretion of the District.

V. The District may withhold payments for late submittals.

1.4 Liquidated Damages

A. **Substantial Completion:** The delayed Substantial Completion of any phase of the Work will result in the assessment and withholding of Liquidated Damages for each day of delayed Substantial Completion beyond the Contract Time for Substantial Completion of that phase of the Work in the amount of $500 (Five Hundred Dollars) per day.

B. **Final Completion.** The delayed Final Completion of the Work will result in the assessment and withholding of Liquidated Damages for each day of delayed Final Completion beyond the Contract Time for Final Completion of the Work in the amount of $500 (Five Hundred Dollars) per day until all punch list items are completed.

1.5 **Labor Compliance Program (LCP).** A LCP is required for this project (see section 00350).

1.6 **Building Access.** Access to the school buildings and entry to buildings, classrooms, restrooms, mechanical rooms, electrical rooms, or other rooms, for construction purposes, must be coordinated with District and onsite District personnel before Work is to start.
A. Upon request, the District may, at its own discretion, provide a master key to the school site for the convenience of the Contractor. The Contractor agrees to pay all expenses to re-key the entire school site and all other affected District buildings if the master key is lost or stolen or if any unauthorized party obtains a copy of the key or access to the school.

1.7 Utility Work.

A. The Contractor is advised that Work is to be performed in spaces regularly scheduled for instruction. Interruption and/or periods of shutdown of public access, electrical service, water service, lighting, or other utilities shall be only as arranged in advance with the District. Contractor shall provide temporary services to all facilities interrupted by Contractor’s Work.

B. The Contractor shall maintain in operation during duration of Contract, drainage lines, storm drains, sewers, water, gas, electrical, steam, irrigation systems and other utility service lines (including but not limited to low voltage systems and fire sprinkler systems) within working area.

1.8 Weather Days. Delays due to adverse weather conditions will only be permitted in compliance with the provisions in the General Conditions, 00 70 00 Article 8.02.A and only if the number of days of adverse weather exceeds the following parameters and only if Contractor can verify that adverse weather caused delays exceeds the following number of calendar days:

January, [11]; February [10]; March [10]; April [6]; May [3]; June [1]; July [0]; August [0]; September [1]; October [4]; November [7]; December [10].

1.9 Standardized Forms. Each and every document generated and/or submitted by the Contractor relating to cost breakdowns, applications for payment, change order requests, requests for information, submittals, verified reports, progress reports, and all other matters relating to the administration of the Work as set forth in the General Conditions, shall be prepared by the Contractor on such forms as may be directed by the District. Unless otherwise expressly provided for in the Contract Documents, all such documents shall be submitted to the District with such frequency as the District may require in its sole reasonable discretion.

1.10 District Tests/Inspections. Pursuant to Article 13.05 of the General Conditions, within fourteen (14) calendars days of the date of award of the Contract, the Contractor, the District, and the Architect shall meet and confer to establish, by mutual agreement, the specific tests/inspections to be conducted by or on behalf of the District and to establish limits on costs incurred by the District to complete such test/inspections. If mutual agreement is not reached as to tests/inspections to be completed by or on behalf of the District or the limitations on the District’s costs to complete such tests/inspections, the Architect shall issue a final binding determination. The Contractor shall be responsible for all costs of tests/inspections exceeding those established pursuant to the forgoing.

1.11 Allowed Number of Hazardous Material Abatement Shifts. Within the overall
construction schedule, the total allotted time for completion of all identified hazardous material abatement work of the Project shall be limited to the number of work shifts (of stated duration) specified in Appendix A, Section 01011. The Contractor shall be responsible for all additional Environmental Consultant and analytical laboratory costs associated with exceeding the specified total number of work shifts allowed in accordance with the 00 70 00 General Conditions, Article 9.09 Related Damages.

1.12 Identification Vests/Badges.

A. The District reserves the right to require the Contractor to do the following:

No employee or independent contractor to the Contractor or any Subcontractor, of any tier, shall be permitted access to the Site at any time unless such individual wears, in a prominent visual manner, a photographic identification badge issued by the District. The identification badge shall be prominently worn at all times while at the Site. Any person performing any Work at the Site without wearing a duly issued District photographic identification badge will be immediately removed from the Site. The District will issue photographic identification badges only to those individuals who are identified on a Fingerprinting Certification of the Contractor or a Subcontractor. The photographic identification badges are the sole and exclusive property of the District. The Contractor shall promptly return to the District each photographic identification badge once an employee or independent contractor to the Contractor or any Subcontractor of any tier has completed his Work at the Site or is absent from the Site for a period of thirty (30) consecutive days, whichever first occurs.

All cost associated with this requirement are at the Contractor’s expense.

B. No employee or independent contractor to the Contractor or any Subcontractor, of any tier, shall be permitted access to the Site at any time unless such individual wears, in a prominent visual manner, a safety vest that has been approved by the District. All vests must include the General Contractors company logo, with an area is at least 144 square inches. Any person performing any Work at the Site without wearing an approved safety vest will be immediately removed from the Site.

C. The Contractor’s compliance with the requirements of this Paragraph and/or the District’s enforcement of the requirements of this Paragraph shall not result in adjustment of the Contract Time or the Contract Price.

1.13 Parking: The Contractor is responsible for off site parking for their personnel. The Contractor is not permitted to park any vehicles on campus. Catering Trucks: No catering trucks are permitted on District property.

1.14 Emergency Shut off Survey. Before construction begins Contractor shall field survey the building/buildings and site and contact the appropriate SFUSD personnel to develop an Emergency Shut-off Plan. The plan will show graphically all shut-off locations for utilities clearly identified along with any special instructions and contact procedures. The plan will include an emergency contact list for the Contractor, SFUSD Project Manager,
Construction Manager, Building and Grounds, Fire Department, PUC, PG & E and Water District. The Contractor shall assemble any specialty tools required and keys for any locked areas. The Emergency Shut-off Plan shall be posted in Contractor’s construction office with a copy of all items to be located in the CM office.

1.15 **Theatrical Equipment and Furnishings.** The Contractor is prohibited from using any existing theatrical equipment and furnishings in the auditorium and/or multi-purpose room during construction. The Contractor is required to protect and/or remove theatrical equipment and furnishings as directed by the District and at their own expense. The Contractor, at its own expense will provide any and all temporary lighting necessary to accomplish the work.

1.16 **District Standards.** In accordance with California Public Contract Code section 3400, a designee of the District has made a finding that particular materials, products, things, and/or services are to be designated in the Contract Documents by specific brand or trade name for the following purpose: in order to match other products in use on a particular public improvement either completed or in the course of completion (“District Standards”). The District Standards are set forth in Section 00 01 13 San Francisco Unified School District Construction Standards. The particular materials, products, things, and/or services designated in the District Standards shall be used in the Work.

1.17 The Environmental Protection Agency (EPA) regulation 40 CFR Part 745 became fully effective June 23, 2008 which requires all firms, including sub-contracted firms who impact lead-based paint (LBP) at Child Occupied Facilities to be EPA certified; have an EPA “Certified Renovator”; provide “on-the-job” training for workers; conduct pre-renovation notifications; follow specific work practice procedures for containment, disturbance and final clean-up; and inspection requirements. Renovation is defined as the modification to any existing structure or portion that results in the disturbance of LBP surfaces, unless the activity is performed as part of an abatement. In essence this regulation includes all work construction activities that disturb LBP surfaces.

**END OF SECTION 00 80 00**
SAN FRANCISCO UNIFIED SCHOOL DISTRICT CONSTRUCTION STANDARDS

The following construction products, materials, and systems have been approved as a District Standard by the Board of Education or the Board of Education's official designee. In accordance with the Public Contract Code, the products, materials, and systems listed below are specified to match others in use on District sites, either completed or in the course of construction. No substitutions will be allowed or permitted for these District construction standards unless approved in writing by the District. Substitutions from these standards will only be granted if the specific products, materials, or systems are no longer manufactured or are unavailable. District construction standards include the following:

DIVISION 0

None

DIVISION 1 - GENERAL REQUIREMENTS

None

DIVISION 2 - SITE WORK

None

DIVISION 3 - CONCRETE

None

DIVISION 4 - MASONRY

None

DIVISION 5 - METALS

None

DIVISION 6 - WOOD AND PLASTIC

CASEWORK
1. Cabinet door and drawer locks: National Cabinet Lock, C8173, C8174, C8175 for cabinets and C8177, C8178, and C8179 for drawers

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

None
DIVISION 8 - DOORS AND WINDOWS

DOOR HARDWARE

2. Locksets: Schlage Lock
   a. General Cylindrical Locksets: Schlage Lock ND Vandlgard Series, Rhodes Trim
   b. All instructional rooms and other rooms with 5 or more occupants without exit devices: ND95PD Vandlgard, Rhodes Trim
4. Exit Devices:
   a. Interior Single Door Rim Exit Devices:
      Unrated – Von Duprin AX99L-2 / 20-057
      Fire-rated – Von Duprin AX99L-F-2 / 20-057
   b. Interior Pair of Doors Rim Exit Devices with Mullion:
      Unrated – Von Duprin AX99L-2 x 4954 Mullion / 20-057
      Fire-rated – Von Duprin AX99L-F-2 x 4954 Mullion / 20-057
   c. Exterior Single Door Rim Exit Devices:
      Unrated – Von Duprin AX99NL Series x VR900 Series Trim
      Fire-Rated – Von Duprin AX99NL-F x VR900 Series Trim
   d. Exterior Pair of Doors Rim Exit Devices:
      Unrated – Von Duprin AX99NL x AX98EO Series x VR900 Series Trim x 4954 Mullion
      Fire-rated – Von Duprin AX99NL-F x AX98EO-F Series x VR900 Series Trim x 4954 Mullion
   e. Exterior Single Door Electrified Exit Device
      EL-AX99NL-OP x VR900 Series trim
   f. Exterior Pair of Doors Electrified Exit Device
      EL-AX99NL-OP x AX99EO x VR900 Series Trim x 4954 mullion
5. Surface Closers: LCN 4040XP x EDA x ST3596
6. Automatic Door Openers: LCN 9500
7. Rated Hold-Open Electromagnetic Holders: LCN SEM 7800 Series

WINDOW HARDWARE

1. Window Handles:
   a. Cam Handles: Bronze Craft
   b. Project-Out Vent (Awning Type): Bronze Craft #162-001-4504 (right handle)
      #162-003-4504 (left handle) in conjunction with #282 series strikes
   c. Project-In Vent (Hopper Type):
      i. Hand-Operated Handles: Bronze Craft #156-001-4504 (right handle)
         #156-003-4504 (left handle)
      ii. Pole-Operated Handles: Bronze Craft #158-001-4504 (right handle) #158-003-4504 (left handle) in conjunction with #210 series keepers
2. Window Hinges: Bronze Craft 851 Series stainless steel storm hinges
3. Pole:
a. Pole Ring: Bronze Craft #233-005-4504 (aluminum bronze)  
b. Pole Hook Assembly (aluminum tube with rubber end): Bronze Craft #234-007-4504 (7 feet long)  
c. Pole Hanger: Bronze Craft #231-002-0125  
d. Pole Tip: Bronze Craft #232-004-0125

DIVISION 9 - FINISHES

None

DIVISION 10 - SPECIALTIES

TOILET ACCESSORIES
1. Paper Towel Dispensers:
   a. EES, Elementary, Middle and High Schools, all locations: Georgia Pacific SofPull Dispenser Model #59010 (Black)
2. Toilet Paper Dispensers:
   a. Georgia Pacific Compact Vertical 2 Roll High Capacity Bathroom Tissue Dispenser model 56790 for standard (not accessible) toilet stall locations
   b. Multi-roll toilet paper dispensers for accessible toilet stalls:
      i. Recessed, wall-mounted: Bobrick B-3888
      ii. Recessed, wall-mounted: Bobrick B-6977 (Pre-K restrooms)
3. Soap Dispensers: Bobrick B-2111 (vertical) or B-2112 (horizontal) 40 oz. stainless steel tank liquid soap dispenser
4. Grab Bars: Bobrick B-6806 – 42” long at rear and 48” long at side

DIVISION 11 - EQUIPMENT

EVACUATION CHAIRS
1. Garaventa Evacu-Trac CD7 with manufacturer-supplied storage cabinet and manufacturer-provided labeling

DIVISION 12 - FURNISHINGS

None

DIVISION 13 - SPECIALTIES

None

DIVISION 14 - CONVEYING SYSTEMS

HYDRAULIC ELEVATORS
1. Control Manufacturers: Motion Control Engineering
2. Motion 2000 Hydraulic Elevator Control as manufactured by Motion Control Engineering, Inc.
3. Door Operating Equipment: G.A.L. Manufacturing Corporation

5. Lock box keyed to the San Francisco Fire Department standards from E.M. Hundley Hardware, 617 Bryant St., San Francisco, (415) 777-5050

DIVISION 15 - MECHANICAL

MECHANICAL EQUIPMENT
1. Domestic Hot Water Circulating Pumps: Grundfos
2. In-Line Circulators: Grundfos Pump UP Series 100
3. Hot Water Boilers: Cast iron by Peerless Heater Company
4. Expansion Tanks: Bell & Gossett
5. Chemical Feeder: J.L. Wingert
6. Energy Management System: Vykon JACE-545 router, as manufactured by Tridium
7. Controls: Any upgrade or new addition to the existing system shall be fully integrated with the graphical user interface of the existing Circon controls system and the Wide Area Network of the San Francisco Unified School District.

PLUMBING FIXTURES
1. Drinking Fountains:
   a. Exterior and Interior Wall-Mounted Fixture: Haws 1117L with lead filter for interior and exterior wall-mounted installations
   b. Free-Standing Fixture: Haws 3150 adjustable-height pedestal fountain with exposed aggregate finish, or Haws 3300, pedestal fountain with powdercoat finish; and lead filter when no building plumbing wall surfaces are available
2. Eyewashes: HAWS 7360BTWC with acid-resistant drains and dust cover 9102 for middle school and high school science labs that use chemicals
3. Emergency Shower and Eye/Face Wash Units: Combination Unit HAWS 8309WC with emergency test kit 9010 and dust cover 9102
4. Faucets (refer to Division 15, Plumbing Fixtures where each type of faucet is applicable):
   a. Single-Temperature Metering:
      Chicago 3400-ABCP (ECAST) (3-hole, 4” centers, 4¾” spout)
      Moen M-Dura 8884 with 99550 (3-hole, 4” centers, 4-1/2” spout)
   b. Single-Temperature Metering for retrofits at existing single-hole lavatories:
      Chicago 333-665PSHABCP (ECAST) (single-hole, 3-3/8” spout) for use at Moen M-Dura 8884 (single hole, 4-1/2” spout)
   c. Single wrist blade handle, single-hole, deck-mounted 5-1/4” gooseneck:
      Chicago 350-317XXKABCP (ECAST)
      Moen M-Dura 8103
   d. Dual wrist blade handles, single-hole, deck-mounted 5-1/4”gooseneck:
      Chicago 50-317XXKABCP (ECAST)
      Moen M-Dura 8113
   e. Dual wrist blade handles, 2-hole, 8” centers, deck-mounted gooseneck:
      Moen M-Dura 8285 w/S0030 spout
5. Service Sinks:
a. Fixture: Fiat MSB-2424 24"x24"x10" molded stone mop service basin with 3" drain  
b. Faucet: Lever style handles with hot and cold indicators, vacuum-breaker spout with garden hose thread, wall bracket, backflow preventer, chrome finish (at service sinks-custodial closets): Moen M-Dura 8124

6. Encased/Recessed Narrow Wall Hydrant: Zurn Z1350VB encased narrow wall hydrant type keyed hose bib

7. Floor or Shower Drains: Jay R. Smith 2005Y floor drain with adjustable strainer heads, vandal proof screws, nickel bronze strainer

8. Toilets, Wall-Hung – Elementary (K-5), Middle, and High School student restrooms, adult/staff restrooms:
   a. Fixtures – white vitreous china, elongated bowl, 1.28-gallon, 1½" top spud:
      i. New construction or full restroom remodel: American Standard Afwall FloWise 3351.128
      ii. Retrofit in existing wall: American Standard Afwall FloWise ADA Retrofit 3355.128
   b. Toilet Seats – 1" total thickness including bumper, stainless steel hinge, concealed check, solid plastic, open front: Bemis 1955SSCT-047 black
   c. Flush valve (for 1.28 gal fixtures):
      Sloan Royal 111-1.28
      Moen M-Dura 8310M128
   d. Carrier: Jay R. Smith for siphon jet toilets. Waste 4", vent 2", CW 1"

9. Toilets, Floor-Mounted:
   a. Fixtures – white vitreous china, elongated bowl, 1.28-gallon, 1½" top spud
      i. Pre-K (EES): American Standards “Baby Devoro” – Flowise: 2282.001
      ii. Elementary student restrooms (K-5): American Standards “Madera Youth” – Flowise: 2599.001 14
      iii. Middle and High School student restrooms, adult/staff restrooms: American Standard Madera FloWise 3461.128
   b. Toilet Seats – 1¼" total thickness including bumper, stainless steel hinge, concealed check, solid plastic, open front:
      i. Pre-K (EES): Bemis 126-CC white
      ii. Elementary (K-5), Middle, and High Schools, adult/staff toilets: Bemis 1955SSCT-047, black
   c. Flush valve (for 1.28 gal fixtures):
      Sloan Royal 111-1.28. Waste 4", vent 2", CW 1"
      Moen M-Dura 8310M128, Waste 4", vent 2", CW 1"

10. Urinals:
    a. Fixtures – 1/8-gallon (1-pint)
        i. Elementary student restrooms (K-5, new construction or full restroom remodel only): Zurn Z5738.207 “The Small Pint”
        ii. Middle and High School student restrooms, adult/staff restrooms (new construction or full restroom remodel only): American Standard Washbrook FloWise 6590.125
    b. Flush valve (manual):
       Sloan Royal 186-0.125
Moen M-Dura 8312M0125
American Standard 6045.013.002-0.125 (AS Washbrook)
c. Carrier: Manufactured by Jay R. Smith, waste 2", vent 2", CW ¾"

11. Water Heaters:
a. Local Instantaneous Type: AO Smith, electric 10 gallon, 110 volt.
b. Local Gas Type Heaters: AO Smith BT Series water heater.

12. Plaster Trap (for art classrooms): Zurn solid interceptor Z-1181

13. Differential Pressure Switches: Honeywell

DIVISION 16 - ELECTRICAL

CLOCK/BELL/PUBLIC ADDRESS
1. Integrated Clock/Bell/PA: Simplex 5110 Building Communication System (BCS), wired, low-voltage, with Valcom 24V round analog clocks
2. Wireless Clocks: American Time and Signal SiteSync IQ round analog clocks

FIRE ALARM SYSTEM
1. Fire Alarm Control Panel Simplex 4100ES and related addressable components:
a. Smoke Detectors – 4098 Series
b. Heat Detectors – 4098 Series
d. Monitoring Modules – 4090 Series
e. Control Modules – 4090 Series
f. Horn/Strobe Units – 4906 Series
g. Strobe Only Units – 4906 Series
h. Remote Power Supplies – 4009 Series
i. Remote Annunciator Panels – 4603 Series

SECURITY SYSTEM
1. Security Integration, Inc. Camera System
a. Software Package SI-VI.76
b. Digital Video Recording Management and Network Software
c. DVR Hardware
d. Camera models 3895IR and SI-PTZ-DN-MT
2. Door Contacts: Sentrol 2505A by GE
3. Control Panels: Ademco Vista 50P by Honeywell
4. Keypads: Ademco Alpha #6160 by Honeywell

END OF SECTION 000130
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary
   Conditions of Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are
   required for swing, sliding, and folding doors, except special types of unique
   hardware specified in the same sections as the doors and door frames on which they
   are installed.

B. This Section includes the following, but is not necessarily limited to:

   1. Door Hardware, including electric hardware.
   2. Power supplies for electric hardware.
   3. Low-energy door operators plus sensors and actuators.
   4. Thresholds, gasketing and weather-stripping.
   5. Door silencers or mutes.

C. Related Sections: The following sections are noted as containing requirements that
   relate to this Section, but may not be limited to this listing.

   1. Division 26: Section – Electrical Basic Materials and Methods
   3. Division 27: Section – Access Control.

1.03 REFERENCES  (Use date of standard in effect as of Bid date.)

A. 2013 California Building Code, CCR, Title 24.

B. BHMA - Builders’ Hardware Manufacturers Association.

C. DHI - Door and Hardware Institute.


   1. NFPA 80 - Fire Doors and Other Opening Protectives
   2. NFPA 105 - Smoke and Draft Control Door Assemblies

E. UL - Underwriters Laboratories.
1. UL 10C - Fire Tests of Door Assemblies
2. UL 305 - Panic Hardware

F. WHI - Warnock Hersey Incorporated

G. SDI - Steel Door Institute

1.04 SUBMITTALS & SUBSTITUTIONS

A. General: Submit in accordance with Conditions of the Contract and Division 1 Specification sections.

B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Submit six (6) copies of schedule organized vertically into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:

1. Include a Cover Sheet with:
   a. Job Name, location, telephone number.
   b. Architects name, location and telephone number.
   c. Contractors name, location, telephone number and job number.
   d. Suppliers name, location, telephone number and job number.
   e. Hardware consultant's name, location and telephone number.

2. Job Index information included;
   a. Numerical door number index including; door number, hardware heading number and page number.
   b. Complete keying information (referred to DHI hand-book "Keying Systems and Nomenclature"). Provision should be made in the schedule to provide keying information when available; if it is not available at the time the preliminary schedule is submitted.
   c. Manufacturers' names and abbreviations for all materials.
   d. Explanation of abbreviations, symbols, and codes used in the schedule.
   e. Mounting locations for hardware.
   f. Clarification statements or questions.
   g. Catalog cuts and manufacturer's technical data and instructions.

3. Vertical schedule format sample:

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July 12, 2016  08 71 00 - 3 Door Hardware

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(a) - Single or pair with opening number and location.  (b) - Degree of opening  (c) - Hand of door(s)  (d) - Door and frame dimensions and door thickness.  (e) - Label requirements if any.  (f) - Door by frame material.  (g) - (Optional) Hardware item line #.  (h) - Keyset Symbol.  (i) - Quantity.  (j) - Product description.  (k) - Product Number.  (l) - Fastenings and other pertinent information.  (m) - Hardware finish codes per ANSI A156.18.  (n) - Manufacture abbreviation.

D. Make substitution requests in accordance with Division 1. Substitution requests must be made prior to bid date. Include product data and indicate benefit to the project. Furnish samples of any proposed substitution.

E. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner’s final instructions on keying of locks has been fulfilled.

F. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

G. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers’ installation and adjustment and maintenance information.

H. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

1.05 QUALITY ASSURANCE

A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
1. Responsible for detailing, scheduling and ordering of finish hardware.
2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing.
3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.

C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.

D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.

1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

E. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

1.06 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.

B. Hardware items shall be individually packaged in manufacturers’ original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.

C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.

D. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

1.07 WARRANTY

A. Provide warranties of respective manufacturers’ regular terms of sale from day of final acceptance as follows:

1. Locksets: Ten (10) years.
2. Closers: Thirty (30) years, except electronic closers shall be two (2) years.
3. Exit devices: Three (3) years.
4. All other hardware: Two (2) years.

1.08 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner’s continued adjustment, maintenance, and removal and replacement of door hardware.

1.09 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference at least one week prior to beginning work of this section.

B. Attendance: Architect, Construction Manager, Contractor, Hardware Supplier, Installer, Key District Personnel, and Project Inspector.

C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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<tr>
<th>Item</th>
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<tr>
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<td>C. Exit Devices</td>
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July 12, 2016 08 71 00 - 5 Door Hardware
2.02 MATERIALS

A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.

1. Hinges shall be sized in accordance with the following:
   a. Height:
      1) Doors up to 41" wide: 4-1/2" inches.
      2) Doors 42" to 48" wide: 5 inches.
   b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
   c. Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.

2. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.

B. Continuous Hinges: As manufactured by Ives, an Ingersoll-Rand Company. UL rated as required.

C. Heavy Duty Cylindrical Locks and Latches: Schlage "ND" Series as scheduled with "Rhodes" design, fastened with through-bolts and threaded chassis hubs.

1. Locksets to comply with ANSI A156.2, Series 4000, Grade 1; tested to exceed 3,000,000 cycles. Locksets shall meet ANSI A117.1, Accessible Code.
2. Chassis: One piece modular assembly and multi-functional allowing function interchange without disassembly of lockset.
3. Spindle shall be deep-draw manufactured not stamped. Spindle and spring cage to be one-piece integrated assembly.
4. Anti-rotation plate to be interlocking to the lock chassis. Lock design utilizing bit-tabs are not acceptable.
5. Lever Trim: Accessible design, bi-directional, independent assemblies.
6. Locks shall be of such construction that when locked, the door may be opened from within by using lever and without the use of a key or special knowledge.
7. Thru-bolts to secure anti-rotation plate without shear line. Fully threaded thru-bolts are not acceptable.
8. Spring cage to have double compression springs. Manufacturers utilizing torsion springs are not acceptable.
9. Latchbolt to be steel with minimum ½” throw deadlatch on keyed and exterior functions; ¾” throw anti-friction latchbolt on pairs of doors.
10. Strikes: ANSI curved lip,1-1/4” x 4-7/8”, with 1” deep dust box (K510-066). Lips shall be of sufficient length to clear trim and protect clothing.
D. Exit devices: Von Duprin as scheduled.

1. Provide certificate by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 - 2001 standards.
2. All internal parts shall be of cold-rolled steel with zinc dichromate coating.
3. Mechanism case shall have an average thickness of .140”.
4. Compression spring engineering.
5. Non-handed basic device design with center case interchangeable with all functions.
6. All devices shall have quiet return fluid dampeners.
7. All latchbolts shall be deadlocking with ¾” throw and have a self-lubricating coating to reduce friction and wear.
8. Device shall bear UL label for fire and or panic as may be required.
9. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
10. All Exit Devices to be sex-bolted to the doors.
11. Panic Hardware shall comply with CBC Section 11B – 404.2.7 and shall be mounted between 34” and 44” above the finished floor surface. The unlatching force shall not exceed 15 lbs. applied in the direction of travel PER CBC 11B – 404.2.9 Exception 3.

E. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.

1. Door closer cylinders shall be of high strength cast iron construction with double heat treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.
2. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16 inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.
3. All parallel arm closers shall incorporate one piece solid forged steel arms with bronze bushings. 1-9/16” steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel main arms for strength, durability, and aesthetics for versatility of trim accommodation, high strength and long life.
4. Closers shall be installed to permit doors to swing 180 degrees.
5. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.
6. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed.
7. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When
fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Door shall take at least 3 seconds to move from an open position of 70 degrees to a point of 3 inches from the latch jamb. Reference CBC 2013 Sections 11B – 404.2.8

8. Provide sex-bolted or through bolt mounting for all door closers.

F. Flush Bolts & Dust Proof Strikes: Automatic Flush Bolts shall be of the low operating force design. Utilize the top bolt only model for interior doors where applicable and as permitted by testing procedures.

1. Manual flush bolts only permitted on storage or mechanical openings as scheduled.
2. Provide dust proof strikes at openings using bottom bolts.

G. Door Stops:

1. Unless otherwise noted in Hardware Sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
2. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 1133B.8.6).
3. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

H. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10” high and 2” LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.

I. Thresholds: As Scheduled and per details.

1. Thresholds shall not exceed 1/2” in height, with a beveled surface of 1:2 maximum slope.
2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 “Thermal and Moisture Protection”.
3. Use ¼” fasteners, red-head flat-head sleeve anchors (SS/FHSL).
4. Thresholds shall comply with CBC Section 11B – 404.2.5.

J. Seals: Provide silicone gasket at all rated and exterior doors.

1. Fire-rated Doors, Resilient Seals: UL10C Classified, Category “J” listed seals complying with NFPA 80 & NFPA 252 Standards. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Category “G” furnish fire-labeled opening assembly complete and in full compliance with NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.


K. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.

L. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.03 KEYING

A. Furnish a Schlage masterkey system as directed by the owner or architect.

B. The General Contractor shall be responsible in providing the District cut keys for all new locksets installed at the following rooms: entry doors, classroom, offices, lounges, corridors, multi-purpose rooms and staff restrooms/lounges and workrooms.

C. KEYING SYSTEM: Provide keyed cylinders to provide master and grand master keying system. Design system to provide highest possible security consistent with type of system being used.

D. Furnish all cylinders in the Schlage conventional style except the exit device and removable mullion cylinders which will be supplied in Schlage Full Size Interchangable Core (FSIC).

F. Furnish mechanical keys as follows:

1. Lock, Group or Set of Locks – 3 each.
2. Each Cylinder Lock (except keyed-alike Locks – 3 each.
3. Each Keyed-alike Group – 3 each.
4. Each Master Keyed Set – 3 each.
5. Each Grand Master Keyed Set – 3 each.
6. Control Keys for Removable Core System.

G. Provide change keys in individual envelopes for each cylinder delivered. Envelopes shall have respective door identification numbers. Stamp each change key with change number and stamp set symbol, and stamp each master key with set symbol as applicable. In addition to change number stamp keys “Do Not Duplicate” and tag. In addition to above keys, provide fifty (50) blank keys to the District Lock Shop Supervisor. Any extra keys requested by the school administration beyond the stated number of blank keys will be provided by the District Lock Shop.

2.04 FINISHES
A. Generally to be satin chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.

B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless otherwise noted.

C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.

D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

2.05 FASTENERS

A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.

B. Screws for butt hinges shall be flathead, countersunk, full-thread type.

C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.

D. Provide expansion anchors for attaching hardware items to concrete or masonry.

E. All exposed fasteners shall have a phillips head.

F. Finish of exposed screws to match surface finish of hardware or other adjacent work.

G. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of existing conditions.

C. Fire-Rated Door Assembly Inspection: Upon completion of the installation, all fire door assemblies shall be inspected to confirm proper operation of the closing device and latching device and that only the manufacturer’s furnished fasteners are used for installation and that it meets all criteria of a fire door assembly per NFPA 80 (Standard for Fire Doors and Other Opening Protective) 2007 Edition. A written record shall be maintained and transmitted to the Owner to be made available to the
Authority Having Jurisdiction (AHJ). The inspection of the swinging fire doors shall be performed by a certified FDAI (Fire Door Assembly Inspector) with knowledge and understanding of the operating components of the type of door being subjected to the inspection. The record shall list each fire door assembly throughout the project and include each door number, an itemized list of hardware set components at each door opening, and each door location in the facility.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.

B. Use the templates provided by hardware item manufacturer.

C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 30" and 44" AFF.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Set thresholds for exterior doors in full bed of butyl-rubber sealant.

G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.

3.03 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Clean adjacent surface soiled by hardware installation.

C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.

E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant,
shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner’s personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.04 HARDWARE LOCATIONS

A. Conform to 2013 CBC 11B and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

3.05 FIELD QUALITY CONTROL

A. Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and it's installation have been furnished and installed in accordance with manufacturer's instructions and as specified herein.

3.06 SCHEDULE

A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.

B. The Door Schedule on the Drawings indicates which hardware set is used with each door.

Manufacturers Abbreviations (Mfr.)

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AIPHONE, DOOR BELL & WIRING FURNISHED BY ACCESS CONTROL SUPPLIER

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ALL OTHER HARDWARE BY GATE MFR
GEORGE PEABODY & CLARENDON ELEM. SCHOOLS
DOORBELL ENTRY SYSTEM & DOOR/GATE REPLACEMENTS
SFUSD PROJECT NO. 11851
SAN FRANCISCO UNIFIED SCHOOL DISTRICT

July 12, 2016  08 71 00 - 14 Door Hardware

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REUSE EXISTING AIPHONE

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PART 1 - GENERAL

1.1 SECTION INCLUDES
   A. Conduit, raceways, and fittings
   B. Wires and Cables for 600 Volts and less.
   C. Wire connections and devices.
   D. Outlet boxes.
   E. Pull and junction boxes.
   F. Disconnect switches and fuses.
   G. Supporting devices.
   H. Identifying devices.
   I. Grounding and bonding.

1.2 RELATED SECTIONS
   A. Section 27 93 00, Access Controls
   B. Section 26 06 00, Pathways and Sleeves for Electronic Safety and Security

1.3 SUBMITTALS
   A. An as-built wiring diagram must be submitted at time of completion.
   B. Submit five (5) copies of the following:
      1. List of conduit types indicating where each type of conduit will be used. Indicate conduit manufacturers and fittings to be used.
      2. Wires and cables.
      3. Wiring devices and plates.
      4. Nameplates, including engraving schedules where engraved plates are specified.
      5. Fused disconnect switches.
1.4 DRAWINGS

A. Drawings provided in the bid documents are diagrammatic and show general extent and arrangement of the work required which shall be followed as closely as the actual construction site conditions and work of the other trades will permit.

1.5 QUALITY ASSURANCE

A. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

B. Coordination of the work: Contractor shall become familiar with the conditions of the job site, and with the landscape drawings, drawings of other disciplines and specifications and plan the installation of the electrical work to conform with that shown and specified so as to provide the best possible assembly of the combined work of the trades.

C. Attendance” Security contractor, District’s representatives and other parties affected by work of this section.

1.6 REFERENCES

A. ANSI C80.1 – Rigid Steel Conduit, Zinc Coated

B. ANSI C80.3 – Electrical Metallic Tubing, Zinc Coated

C. ANSI C80.5 – Rigid Aluminum Conduit.

D. NECA (INST) – Standard of Installation; National Electrical Contractors Association.

E. NEMA FB 1 – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

F. NFPA 70 – National Electrical Code

1.7 Provide as-built reproducible drawings showing all outlets with circuit numbers at each outlet and maintenance manuals for all new equipment.

1.8 Warranties for labor and materials – 1 year from the date of final completion of the work.

1.9 In addition to materials and equipment specified, also provide all incidental materials required to effect complete installation. Such incidental materials include solders, tapes, caulking, mastics, gaskets, etc.
1.10 The contractor will be held responsible to have examined the site and premises and satisfied himself as to existing conditions under which he will be obligated to operate in performing his part of the work or that which will in any manner affect the work under this contract.

1.11 Provide wiring tests upon completion of work and make adjustments as necessary for satisfactory operation of system.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT GENERAL

A. Materials and equipment shall be new, current models of manufacturers, Bare complete identification by manufacturer and Bare UL labels where applicable.

2.2 CONDUIT, RACEWAYS, AND FITTINGS

A. Rigid Steel Conduit
1. Rigid steel conduit shall be full weight, pipe size, finished inside and out by hot-dip galvanizing after fabrication, and shall conform with ANSI C80 and UL.
2. Couplings shall be electroplated steel compression type.
3. Insulating Bushings: Threaded polypropylene or thermos-setting phenolic rated 150 degree C minimum.
4. Insulated Grounding Bushings: Theraded cast malleable iron body with insulated throat and steel lay-in ground lug with compression screw.
5. Insulated Metallic Bushings: Threaded case malleable iron body with plastic insulated throat rated 150 degree C.

B. Non-Metallic Conduit
1. Schedule 40 PVC underground is an acceptable conduit material.

2.3 CONDUIT AND FITTINGS

A. Rigid galvanized steel or IMC shall be galvanized. Couplings and connectors shall be galvanized or cadmium plated; Allied Tube and Conduit, Triangle, or equal.

B. Conduit Fittings: Provide watertight compression type conduit fittings for electrical metallic tubing installed in wet location. Fittings for rigid galvanized steel or IMC shall be threaded.

2.4 CONDUCTORS
A. Conductors for within dwelling unit and garage shall be NM cable complying with NEC Article 334.

B. Conductors for exterior shall be soft drawn, annealed copper wire 98% conductivity bearing UL label.

C. Insulation: Provide the following (600 volt)

D. Type THW, XHHW insulated wire for conductors #2 or larger.

E. Type THHN/THWN for all wire smaller than #2.

F. Manufacturers: Southwire, Anaconda, Rome, General Cable, Cerro Wire, or equal.

2.5 WIRE CONNECTION

A. Wire Joints: Wires in sizes from #18 to #8 AWG, stranded conductor, with insulation rated 105 degrees C or less shall be joined with electrical spring connectors of three part construction incorporating a non-restricted, zinc coated steel spring enclosed in a steel shell with an outer jacket of vinyl plastic with a flexible insulating skirt.

B. Mechanical Compression Connectors and Taps: Stranded conductors from #6 AWG to 750 Kcmil shall be joined or tapped using bolted pressure connectors having cast bronze compression bolts. Fittings shall be wide range-taking and designed to facilitate the making of parallel taps, tees, crosses, or end-to-end connections. Split bolt connectors will not be acceptable.

C. Fixture Connections: Splice fixture wire to circuit wiring with solderless connectors as specified above in paragraph A.

D. Terminating Lugs: Conductors from size No. 6 AWG to 750 MCM, copper, shall be terminated using tin plated hydraulically operated crimping tools and dies as stipulated by the lug manufacturer. Lugs shall be 3M Scotchlok series 30014, Burndy Type Ya-L series or equal.

E. Splicing and Insulating Tape (600 volts and below): General purpose electrical tape shall be suitable for temperatures from minus 18 degrees C to 105 degrees C, shall be black, ultraviolet proof, self-extinguishing, 7 mil thick vinyl with dielectric strength of 10,000 volts. Apply 4 layers half-lap with 2” overlay on each conductor.

F. Insulating Putty (600 volts and below): Pads or rolls of non-corrosive, self-fusing, 1/8-inch thick rubber putty with PVC backing sheet. Putty shall be suitable for temperatures from minus 17.8 degrees C to 37.8 degrees C and shall have a dielectric strength of 570 volts/mil minimum.

G. Insulating resin: Two Part liquid epoxy resin with resin and catalyst in pre-measured, sealed mixing pouch. Resin shall have a set up time of approximately 30 minutes at 21.1
degrees C and shall have thermal and dielectric properties equal to the insulation properties of the cables immersed in the resin.

H. Terminal Strip Connectors: Terminate wire in locking tongue style, pressure type, solderless lug where applicable.

2.6 WIRE CONNECTORS

A. #6 AWG and Larger: Thomas and Betts “Lock-Tite”, Burndey, Quicklug or OZ Type PT/PTC.

B. #8 AWG and Smaller: Scotch spring steel with insulated cap, Thomas and Betts, STA-KON Piggy with insulator or ideal, wire nut or wing nut type.

2.7 OUTLET BOXES

A. Standard Outlet Boxes: Galvanized, die formed or drawn steel, knock-out type of size and configuration best suited to the application indicated on the plans. Minimum box size, 4-inch square by 1-1/2 inch deep, indoor use. FS cast boxes are required for outdoor use.

B. Cast Metal Outlet Boxes: FS cast boxes are required for outdoor use. Four-inch round, galvanized cast iron alloy with threaded hubs and mounting lugs as required. Boxes shall be furnished with cast cover plates of the same material as the box and neoprene cover gaskets. Thomas and Betts, Crouse Hinds VXF series, Appleton JBX series, or equal.

C. Conduit Outlet Bodies: Cadmium plated, case iron alloy. Obround conduit outlet bodies with threaded conduit hubs and neoprene gasketed, cast iron covers. Outlet bodies shall be used to facilitate pulling of conductors or to make changes in conduit direction only. Splices are not permitted in conduit outlet bodies. Thomas and Betts, Crouse Hinds Form 8 Condulets, Appleton from 35 Unilets, or equal.

2.8 WIRING DEVICES

A. Duplex Receptacles: 20A, 125V, 3-wire, ground, NEMA 5-15R, tamper resistant, Pass & Seymour S885TRWCC14 decorator style or equal.

B. GFCI Receptacles: 20A, 125V, 3-wire, NEMA 5-15R, tamper resistant, Pass & Seymour S1595NTLTRWCC8 or equal.

C. Outdoor Receptacles: Shall be 20A, 125V, 3-wire, NEMA 5-15R, Pass & Seymour S1595TRWCC8 with while in use cover or equal.

D. Switches: Lighting switches shall be 20A, 3-wire. Shall be Pass & Seymour 2601-W decorator style or equal. 3-way switches shall be Pass & Seymour 2603-W or equal.
E. Dimmer Switches: Dimmer have full-on bypass mode. Shall be Pass & Seymour 91180-W decorator style or equal. 3-way dimmer switch shall be Pass & Seymour 91183-W or equal.

2.9 PULL AND JUNCTION

A. Sheet Metal Boxes: Use standard outlet or concrete ring boxes wherever possible; otherwise use minimum 15 gauge get metal, NEMA 1 boxes, sized to code requirements with covers secured by cadmium plated machine screws located 6-inches on centers. Circle AW Products, Hoffman Engineering Co., or equal.

B. Cast Metal Boxes: Use standard cast malleable iron outlet or device boxes wherever possible; otherwise use cadmium plated, cast malleable iron junction boxes with bolt-on, interchangeable conduit hub plates with neoprene gaskets. Appleton RS series: Crouse Hinds RS series, or equal.

2.10 DISCONNECTS

A. Small Motors and Water Heaters: Provide 30A, 600V AC rated double-pole toggle switch for equipment disconnects. Switch shall be rated for 2HP motors at 120V and 5HP motors at 240V. Toggle switch shall be horsepower rated. Devices shall have silver cadmium oxide contacts. Device shall be fully enclosed. Device shall have quick make, slow break design. Device shall be listed as a manual motor controller. Device shall be Bryant 30002B for interior installation and Bryant 30302B for exterior installations or equal.

B. Large Motors: Provide switches rated from 30A to 60A. Switches shall have switch blades which are visible when the switch is OFF and the cover is open. The switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started. The operating handle shall be an integral part of the box, not the cover. Switches enclosures shall be rated NEMA 3R for exterior installations. Switches shall be Square D – Class 3120 or equal.

2.11 DISCONNECT SWITCHES

A. All disconnect switches shall be heavy-duty type and have the number of poles, voltage rating, and horsepower rating as required by the motor or equipment. Disconnect switches shall be in enclosures to suit conditions, NEMA 3R for outdoor and NEMA 1 for indoor. Disconnect switches shall be fused unless otherwise noted on the drawings. As manufactured by: Square D – Class 3110, ITE Seimens, or equal.

2.12 FUSES

July 12, 2016  26 05 00 - 6  Electrical Basic Materials And Methods
A. Dual Element, Time Delay, UL Class RK5. Rejection type. Size and Voltage as indicated on equipment. Bussman, Little Fuse, or approved equal.

2.13 ELECTRICAL SUPPORTING DEVICES

A. Concrete Fasteners: Philips “Red0Head” or equal, self-drilling expansion type concrete anchor.

B. Conduit Straps: Hot-dip galvanized, cast malleable iron, two hole type strap with cast clamp-backs and spacers as required. OZ/Gedney No. 14-50G strap and #141G spacer, Efcor No. 231 strap, and No. 131 spacer, or equal.

C. Construction Channel: 1-1/2 inch by 1-1/2 inch 12 gauge galvanized steel channel with 17/32 inch diameter bolt holes, 1-1/2 inch on center, in the base of the channel. Kindorf 905 series, Unistrut P-1000-HS or equal.

D. Cable Ties and Clamps: Thomas and Betts Co., “Ty-Raps” Panduit “Pan-Ty” or equal one piece, nylon, reusable type lashing ties.

E. Fasteners (General): Wood screws for fastening to wood. Machine screws for fastening to steel. Toggle bolts for fastening to hollow concrete block, gypsum board, or plaster walls. Expansion anchors for attachments to pre-poured concrete.

2.14 IDENTIFYING DEVICES

A. Nameplates: Type NP: Engraved bakelite, 1 inch by 3-1/2 inch, 1/8 inch high white letters, machine screw retained. For permanent identification of all switchboards, panelboards, circuit breakers in separate enclosures, motor starters, relays, time switches, disconnect switches and other cabinet-enclosed apparatus including terminal cabinets or match existing as closely as possible.

B. Legend Plates: Type LP: Die-stamped metal legend plate with mounting hole and positioning key for attachment to panel mounted operators’ devices. Engraved paint-filled characters as specified.

C. Wire and Terminal Markers: Self-adhering, pre-printed vinyl with self-laminating wrap around strip. Markers shall be legible after termination. Brady B191 series, Thomas and Betts WSL series or equal.

D. Conductor Phase Markers: Thomas and Betts WCPHAS series or similar in addition to colored marking as specified under this section of the specifications.

2.15 GROUNDING AND BONDING

A. Ground Rods
B. Manufacturer: Blackburn, Erico, or approved equal.
C. Size: 3/4 inch x 10-feet Ground Rods
D. Grounding Electrode Conductor, 2/0 for foundations foots, and per NEC
E. Grounding Well – Christy Box, Valve Box

PART 3 - EXECUTION

3.1 GENERAL
A. General: Exact locations of distances and devices shall be taken from field measurements and approved by the architect prior to rough in.
B. Provide all wiring connections for equipment furnished under other sections of the contract documents.

3.2 CONDUIT AND RACEWAY APPLICATIONS
A. Rigid Steel Conduit: For all exterior applications, all conduits larger than 2" trade diameter, indoor, below 8-feet.
B. Electrical Metallic Tubing (EMT): Interior only and above 8-feet or when entering a panel from above.
C. Liquidtight Flexible Metallic Conduit: In damp and wet locations for connections to motors, transformers, vibrating equipment and machinery. Connections to all pump motors, flow switches, and similar devices.
D. Rigid Galvanized: Install for all underground and exterior runs. Minimum conduit size shall be 3/4-inch.

3.3 WIRE
A. Wire Sizes: Provide no wire smaller than #12 for lighting, receptacles or other circuits. Provide stranded wire for wire larger than #10.
B. Wires installed in exterior locations shall be THWN. NM-B conductors shall not be installed in exterior locations.
C. NM-B conductors shall be installed in interior locations only.

3.4 CONDUIT INSTALLATION
A. General:
1. All conduit runs shown on the plans are sized based on the use of rigid steel conduit and THWN copper conductors. If conductor type is changed the contractor shall be responsible for resizing conduits to meet code. In no case is conduit to be sized smaller than 3/4-inch trade diameter.
2. Low voltage wiring shall be installed in conduit, minimum 3/4-inch trade diameter
3. Conduits shall be tightly covered and well protected during construction using metallic bushings and bushing pennies to seal open ends.
4. In making joints in rigid steel conduit, ream conduit smooth after cutting and threading.
5. Clean any conduit in which moisture or any foreign matter has collected before pulling in conductors. Paint all field threaded joints to prevent corrosion.
6. Paint all exposed conduits and boxes to match existing adjacent surfaces.
7. In all empty conduits or ducts, install an 1100 pound tensile strength polyethylene pulling rope.
8. Conduit systems shall be electrically continuous throughout. Install code size, uninsulated, copper grounding conductors in all conduit runs, grounding conductor shall be bonded to conduit, equipment frames and properly grounded.

B. Layout
1. All new conduits shall be concealed unless otherwise noted. Any field conditions that does not allow concealment of conduits shall be reviewed with the Architect and Owner prior to rough-in.
2. Locations of conduit runs shall be planned in advance of the installation and coordinated with concrete work, asphalt concrete work, plumbing, and framing.
3. Where practical, install conduits in groups in parallel vertical or horizontal runs and at elevations that avoid unnecessary off-sets.
4. Low voltage conduit shall be grouped separately and labelled every 10-feet interval as to system (i.e. fire, control, etc.).
5. Exposed conduit shall run parallel or at right angles to the centerlines of the columns and beams.
6. Conduits shall not be placed closer than 12-inches from a parallel hot water or steam line or 3-inches from such lines crossing perpendicular to the runs
7. In long runs of conduit, provide sufficient pull boxes per NEC inside buildings to facilitate pulling wires and cables. Support pull boxes from structure independent of conduit supports. These pull boxes are not shown on the plans.

C. Supports
1. All raceway systems shall be secured to building structures using specified fasteners, clamps and hangers, spaced according to code.
2. Support single runs of conduit using two hole pipe straps. Where run horizontally on walls in damp or wet locations, install “clamp blocks” to space conduit off the surface.
3. Multiple conduit runs shall be supported using “trapeze” hangers fabricated from 3/8-inch diameter, threaded steel rods secured to building structures. Fasten conduit to construction channel with stander two hole pipe clamps
4. Locate and install fasteners, and supports in accordance with NECA “Standard of Installation”.

July 12, 2016
San Francisco Unified School District
5. Do not fasten support to pipes, ducts, mechanical equipment, or conduit.
6. Do not drill or cut structural members.
7. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
8. Install surface mounted cabinets and panelboards with minimum of 4 anchors.
9. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1-inch off wall.
10. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

D. Termination and Joints
1. Raceways shall be joined using specified couplings or transition couplings where dissimilar raceways systems are joined.
2. Rigid conduit connection to enclosures shall be made with compression connector with grounding lock-nuts or bushings.
3. Conduit terminations exposed at weatherproof enclosures and cast outlet boxes shall be made watertight using appropriate connectors and hubs. Install expansion couplings where any conduit crosses a building separation or expansion joint.
4. Install cable sealing bushings on all conduits originating outside the building walls and terminating in switchgear, cabinets or gutters inside the building. Install cable sealing bushings or caulk conduit terminations in all grade level or below grade exterior pull, junction, or outlet boxes.

E. Penetrations
1. Furnish and install metal sleeves for all exposed interior conduit runs passing through concrete floors or walls. Following conduit installation, seal all penetrations using non-iron bearing, chloride-free, non-shrink, dry-pack, grouting compound.
2. Install specific watertight conduit entrance seals and membrane clamps at all below grade wall and floor penetrations. Conduits penetrating exterior building walls and building floor slab shall be insulated rigid steel.
3. Conduits penetrating rated walls, floors, etc., shall be fireproofed.

3.5 WIRING DEVICES

A. Receptacles
1. General Areas: General provisions for receptacles shall comply with NEC Article 210.52.

B. Switches
1. Controls for lighting shall comply with applicable edition of Title 24.

3.6 CABLE AND WIRE INSTALLATION

A. Examination
1. Verify that interior of building has been protected from weather,
2. Verify that mechanical work likely to damage wire and cable has been completed.
3. Verify that raceway installation is complete and supported.
4. Verify that field measurements are as indicated.

B. Preparation
1. In existing conduits that will be reused, pull out existing conductors.
2. Completely and thoroughly swab raceway before installing wire.
3. Use 50/50 solution of Simple green. Use CO2 to blow water and soap into conduit – let soak to break up dried out pulling compounds, then pull conductors. Pull one conductor at a time if will not pull all out together.

C. General
1. Conductors shall not be in conduit until all work of any nature that may cause injury is completed. Care should be taken in pulling conductors that insulation is not damaged. U.L. approved non-petroleum base and insulating type pulling compound shall be used as needed.
2. All cables shall be installed and tested in accordance with manufacturer’s requirements and warranty.
3. Block and tackle, power driven winch or other mechanical means shall not be used in pulling conductors of size smaller than AWG #1.

D. Splicing and Terminating
1. All aspects of splicing and terminating shall be in accordance with cable manufacturer’s published procedures.
2. Make up all splices in outlet boxes with connectors as specified herein with separate tails of correct color to be made up to splice. Provide at least six (6) inches of tails in box after splice is made up.
3. All wire and cable in panels, control centers, and equipment enclosures shall be bundled and clamped.
4. Encapsulate splices in exterior outlet, junction and pull boxes using insulating resin kits. All splices for exterior equipment in pump rooms shall be made up watertight.
5. Insulate mechanical compression taps AWG #1/0 and larger using pre-molded, snap-on insulating boots or specified conformable insulating putty overwrapped two half-lapped layers of insulating tape.

E. Identification
1. Securely tag all branch circuits, noting the purpose of each. Mark conductors with vinyl wrap-around markers. Where more than two conductors run through a single outlet, mark each circuit with the corresponding circuit number at the panelboard.
2. Color code conductors size #6 and larger using specified phase color markers and identification tags.
3. All terminal strips are to have each individual terminal identified with specified vinyl markers.
4. All identification shall be legible and readable after completion of installation.

3.7 ELECTRICAL CONNECTIONS
A. Make electrical connections in accordance with equipment manufacturer’s instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

3.8 INSTALLATION OF BOXES

A. General
1. Leave no unused openings in any box. Install close-up plugs as required to seal openings.
2. Exposed outlet boxes and boxes in damp or wet locations shall be cast metal with gasketed cast metal cover plates.

B. Box Layout
1. Outlet boxes shall be installed at the locations and elevations shown on the drawings or specified herein. Make adjustments to locations as required by structural conditions and to suit coordination requirements of other trades.
2. Install junction or pullboxes where required to limit bends in conduit runs to not more than 360 degrees or where pulling tension achieved would not exceed the maximum allowable for the cable to be installed. Consult wire and cable manufacturer.

3.9 INSTALLATION OF WIRING DEVICES

A. General
1. Install all devices flush-mounted unless otherwise noted on the drawings. Comply with layout drawings for general locations. Consult Architect or Owner for locations
that have conflict with other devices or manner not suitable for installation. Avoid placing devices behind open doors.

2. Align devices vertically and horizontally. Device plates shall be aligned vertically with tolerance of 1/16-inch. All four edges of device plates shall be in contact with wall surface.

3. Mounting height as indicated on the drawings and according to ADA requirements.

4. Install device plates on outlet boxes. Provide blank plates for all empty, spare, and boxes for future use.

5. Securely fasten devices into boxes and attach appropriate cover plates.

6. Caulk around edges or outdoor device plates and boxes when rough wall surfaces prevent raintight seal. Use caulking materials approved by the Architect or Engineer.

7. Fireproof around opening of devices located or penetrating fire-rated construction assemblies.

B. Identification

1. Label all outlets and switches. Mark each wiring device where circuits and panel supply is derived from.

2. All identification shall be legible and readable after completion of installation.

3.10 INSTALLATION OF FUSES AND DISCONNECT SWITCHES

A. Fuses shall be installed where noted on plans. Sizes are based on design data provided by air conditioning mfg. Listed or labeled equipment must be in accordance with instructions included in the listing or labeling. Be sure to observe maximum branch circuit fuse size labels.

B. Disconnect switches shall be mounted on the units. Coordinate with mechanical contractor to ensure switches are not mounted on removable access panel.

C. Label each disconnect fuse with equipment tag as indicated in the single line diagram or as directed.

3.11 ELECTRICAL EQUIPMENT GROUNDING

A. Ground non-current carrying metal parts of electrical equipment enclosures, frames, conductor raceways or cable trays to provide a low impedance path for line-to-ground fault current and to bond all non-current carrying metal parts together. Install a ground conductor in each raceway system in addition to conductors shown. Equipment ground conductor shall be electrically and mechanically continuous from the electrical circuit source to the equipment to be grounded. Size ground conductors per NEC 250 unless larger conductors are shown on the drawings.

B. Grounding conductors shall be identified with green insulation, except where a bare ground conductor is specified. Where green insulation is not available, on larger sizes,
black insulation shall be used and suitably identified with green tape at each junction box or device enclosure.

C. Install metal raceway couplings, fittings, and terminations secure and tight to insure good ground continuity. Provide insulated grounding bushing and bonding jumper where metal raceway is not directly attached to equipment on the metal frame.

D. Conduit terminating in concentric knockouts at panelboards, cabinets and gutters shall have insulated grounding bushings and bonding jumpers installed interconnecting all such conduits and the panelboard cabinet, gutter, etc.

E. Performance: Measure ground resistance, 25 Ohms or less.

3.12 BONDING

A. Bonding shall be provided to assure electrical continuity and the capacity to conduct safely any fault current likely to be imposed.

B. Bonding shall be in accordance with NEC Article 250, Part V.

3.13 WORKMANSHIP

A. Preparation, handling, and installation shall be in accordance with manufacturer’s written instructions and technical data particular to the product specified and/or accepted equal except as otherwise specified. Coordinate work and cooperate with others in furnishing and placing this work. Work to reviewed shop drawings for work done by others and to field measurements as necessary to properly fit the work.

B. Conform to the national Electrical Contractors Association “Standard of Installation” for general installation practice.

3.14 INSTALLATION

A. Install in accordance with manufacturer’s instructions.
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provision of the Contract including General and Supplementary Conditions apply to this Section

B. Section 27 93 00 Access Control.

C. Section 26 05 00 Electrical Basic Materials and Methods

1.2 SUMMARY

A. Section Includes:
   1. Metal conduits, tubing, and fittings
   2. Non-metallic conduits, tubing, and fittings
   3. Metal wireways and auxiliary gutters
   4. Surface pathways
   5. Boxes, enclosures, and cabinets
   6. Sleeves for pathway and cable penetration of non-fire-rated construction walls, ceilings, and floors
   7. Sleeve-seal systems
   8. Sleeve-seal fittings
   9. Grout
   10. Silicone sealants

1.3 SUBMITTALS

A. Product Data: For surface pathways, wireways, and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets, and corridor conduit routing. Include plans, elevations, sections, and attachment details.

C. Samples: For wireways and surface pathways and for each color and texture specified, 12-inches long.

1.4 INFORMATIONAL SUBMITTALS
A. Coordination Drawings: Pathway routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
1. Structural members in pathways of pathway groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Seismic Qualification Certificates: For pathway racks, enclosures, cabinets, and equipment racks and their mounting provisions, including those for internal components from manufacturers.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outlined Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which certification is based and their installation requirements.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturer offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Allied Tube and Conduit, a part of Atkore International.
2. Southwire Company
3. Thomas & Betts Corporation, a member of the ABB Group
4. Or Approved Equal

B. General Requirements for Metal Conduits and Fittings:
1. Listed and labeled as defined in NFPA 70 by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. EMT: Comply with ANSI C80.3 and UL 797.

D. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
   1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
   2. Fittings for EMT
      a. Material: Steel or Die cast
      b. Type: Setscrew or Compression
3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 467, rated for environmental conditions where installed, and including flexible external bonding jumper.

2.2 NON-METALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturer offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Allied Tube and Conduit, a part of Atkore International.
   2. Southwire Company
   3. Thomas & Betts Corporation, a member of the ABB Group
   4. Or Approved Equal

B. General Requirements for Metal Conduits and Fittings:
   1. Listed and labeled as defined in NFPA 70 by a qualified testing agency, and marked for intended location and application.
   2. Comply with TIA-569-B.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Fittings for ENT and RNC: Comply with NEMA TC 3, match to conduit tubing or tubing type and material.

E. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPS Method 24).

F. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services “Standard Practice for the testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers”.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. B-Line, and Eaton Business
   2. Hoffman, a brand of Pentair Equipment Protection
   3. Square D
   4. Or Approved Equal

B. Description: Sheet metal complying with UL 870 and NEMA 250, Type 3R unless otherwise indicated and sized according to NFPA 70.
1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70 by a qualified testing agency and marked for intended locations and application.
2. Comply with TIA-569-B.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type unless otherwise indicated.

E. Finish: Manufacturer’s standard enamel finish.

2.4 SURFACE PATHWAYS

A. General Requirements for Surface Pathways:
   1. Listed and labeled as defined in NFPA 70 by a qualified testing agency and marked for intended location and application.
   2. Comply with TIA-569-B.

B. Surface Metal Pathways: galvanized steel with snap-on covers complying with UL 5. Manufacturer’s standard enamel finish in color to be selected by Owner.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. MonoSystems Inc.
      b. Niedax Inc.
      c. Wiremold / Legrand
      d. Or Approved Equal

2.5 BOXES, ENCLOSURE, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Cooper Technologies Company
   2. Thomas & Bett Corporation
   3. Wiremold / Legrand
   4. Or Approved Equal

B. General Requirements for Boxes, Enclosures, and Cabinets:
   1. Comply with TIA-569-B
   2. Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Device Box Dimensions: 4-inches square x 2-1/8 inches deep.
D. Gangable boxes are allowed.

E. Cabinets:
   1. NEMA 250, Type 3R, galvanized-steel box with removable interior panel and removable front finished inside and out with manufacturer’s standard enamel finish.
   2. Hinged door in front cover with flush latch and concealed hinges.
   3. Key latch to match panelboards.
   4. Metal barriers to separate wiring of different systems and voltage.
   5. Accessory feet where required for freestanding equipment.
   6. Non-metallic cabinets shall be listed and labeled as defined in NFPA 70 by a qualified testing agency and marked for intended location and application.

2.6 SLEEVES

A. Wall Sleeves:

B. Sleeves for Conduits Penetrating Non-Fire-rated Gypsum Board Assemblies: Galvanized steel sheet, 0.0239-inch minimum thickness, round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

2.7 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Sealing Elements: EPDM rubber interlocking links shape to fit surface of pipe. Include type and number required for pipe material and size of pipe.
      b. Pressure Plates: Stainless steel.
      c. Connecting Bolts and Nuts: Stainless steel or length required to secure pressure plates to sealing elements.

2.8 SLEEVE-SEAL FITTINGS

A. Description: manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber stop collar with center opening to match piping OD.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work.
2.9 GROUT

A. Description: Non-shrink; recommend for interior and exterior sealing openings in non-fire-rated walls or floors.


C. Design Mix: 5000-psi, 28-day compressive strength

D. Packaging: Premixed and factory packaged.

2.10 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
   2. Sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. Sealant shall comply with the testing and product requirements of the California Department of Health Services “Standard Practice for the testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers”.

B. Silicone Foams: Multicomponent, silicone-based, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

PART 3 - EXECUTION

3.1 PATHWAY AND APPLICATION

A. Rigid Steel Conduit: For all exterior applications, all conduits larger than 2” trade diameter, indoor, below 8-feet.

B. Electrical Metallic Tubing (EMT): Interior only and above 8-feet or when entering a panel from above.

C. Liquidtight Flexible Metallic Conduit: In damp and wet locations for connections to motors, transformers, vibrating equipment and machinery. Connections to all pump motors, flow switches, and similar devices.

D. Rigid Galvanized: Install for all underground and exterior runs. Minimum conduit size shall be 3/4-inch. Minimum size for optical-fiber cables is 1-inch.

E. Pathway Fittings: Compatible with pathways and suitable for use and location
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by the manufacturer.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface pathways only where indicated on Drawings.

H. Do not install non-metallic conduit where ambient temperature exceeds 120 degrees F.

3.2 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls.
   1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
      a. Seal annular space between sleeve and pathway or cable using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in “Joint Sealants” section.
      b. Seal space outside of sleeves and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
   2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
   3. Size pipe sleeve to provide 1/4-inch annular clear space between sleeve and pathway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
   4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of the walls. Cut sleeves to length for mounting flush with both surface of walls. Deburr after cutting.
   5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finish floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-rated Gypsum Board Assemblies:
   1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
   2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
E. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Above-ground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeves size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at pathway entries into the building.

B. Install type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flushed with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

3.5 Using grout, seal the space around outside of sleeve-seal fittings.

3.6 INSTALLATION PROCEDURES

A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

B. Keep pathways at least 6-inches away from parallel runs of flues and steam or hot water pipes. Install horizontal pathway runs above water and steaming piping.

C. Complete pathway installation before starting conductor installation.

D. Comply with requirements in “Hangers and Supports for Electrical Systems” section.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications wiring conduits for which only two 90-degree bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceiling, and floor unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12-inches of enclosures to which attached.

I. Pathways Embedded in Slabs:
   1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot intervals.
   2. Arrange pathways to cross building expansion joints at right angles with expansion fittings.
   3. Arrange pathways to keep a minimum of 1-inch of concrete cover in all directions.
   4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

J. Stub-ups to Above recessed Ceilings
   1. Use EMT, IMC, or RMC for pathways
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathways before making up joints. Follow compound manufacturer’s written instructions.

L. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

N. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate non-conductive coatings on enclosures. Remove coatings in the locknut area prior to conduit assembly to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

Q. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 2-lb. tensile strength. Leave at least 12-inches of slack at each end of pull wire. Cap underground pathways designated as spare above grade alongside pathways in use.
R. Surface Pathways:
   1. Install surface pathway for surface electrical outlet boxes only where indicated on Drawings.
   2. Install surface pathway with a minimum 2-inch radius control at bend points.
   3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than 2 supports per straight pathway section. Support surface pathway according to manufacturer’s written instructions. Tape and glue are not acceptable support methods.

S. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and non-metallic, rigid and flexible, as follows:
   1. 3/4-inch Trade Size and Smaller: Install pathways in maximum lengths of 50-feet.
   2. 1-Inch Trade Size and Larger: Install pathways in maximum length of 75-feet.
   3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

T. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway sealing fittings according to NFPA 70.

U. Install devices to seal pathway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where an underground service pathway enters a building or structure.
   3. Where otherwise required by NFPA 70.

V. Comply with manufacturer’s written instructions for solvent welding PVC conduit and fittings.

W. Expansion-Joint Fittings:
   1. Install in each run above ground RNC that is located where environmental temperature change may exceed 30 degrees F, and that has straight-run length that exceeds 25-feet. Install in each run of aboveground RMC (and EMT) conduit that is located where environmental temperature may exceed 100 degrees F and that has a straight run length that exceeds 100-feet.
   2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
      a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
      b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
      c. Indoor Spaced Connected with Outdoors without Physical Separation: 125 deg F temperature change.
d. Attics: 135 deg F temperature change.

3. Install fittings that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F of temperature change for PVC conduits. Install fittings that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per degree F temperature change for metal conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

5. Install each expansion joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow expansion movement.

X. Flexible Conduit Connections: Comply with NEMA RV 3. Use maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaries, equipment subject to vibration, noise transmission, or movement, and for transformers and motors.

Y. Mount boxes at heights indicated on drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of boxes unless otherwise indicated.

Z. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surface to provide a flat surface for a rain-tight connection between boxes and cover plate or supported equipment and box.

AA. Horizontally separate boxes mounted in opposite sides of walls so they are not in the same vertical channel.

BB. Support boxes of 3 gangs or more than one side by spanning 2 framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

DD. Set metal floor boxes level and flush with finished floor surface.

EE. Set non-metallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.7 INSTALLATION OF UNDERGROUND HANDOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flushed with finished grade. Set covers of other enclosures 1-inch above finished grade.

D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arms lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.

E. Field cut openings for conduits according to enclosure manufacturer’s written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.8 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRONIC SAFETY AND SECURITY PENETRATIONS

A. Install sleeves and sleeve-seals at penetrations of exterior floor and wall assemblies. Comply with CBC and NFPA requirements.

3.9 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with CBC and NFPA requirements.

3.10 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

B. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION
MINOR ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 SCOPE INCLUDES

A. Electrical demolition.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work. As specified in individual sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that abandon wiring and equipment serve only abandoned facilities.

B. Demolition drawings are based on casual field observation and existing record documents.

C. Report discrepancies to Engineer before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Disconnect electrical system in walls, floors, and ceilings to be removed.

B. Coordination utility services outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
D. Existing Electrical Services: Maintain existing systems in service until new systems is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.

E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Notify Owner before partially or completely disabling system.
   2. Make notifications at least 24 hours in advance.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove abandoned wiring to source supply.

C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors and patch surfaces.

D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover plate for abandoned outlets which are not removed.

E. Repair adjacent construction and finishes damaged during demolition and extension work.

F. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be used.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION
PART 1 - GENERAL

1.1 SCOPE OF WORK SUMMARY

A. All components installed in this section are designed for a fully functional access control and video/doorbell entry system including cabling, connections and terminations, mounting all devices and programming. Contractor is responsible for a fully functional system in the event of omission in this section for George Peabody and Clarendon Elementary Schools.

B. This system must match the District's standard.

C. All installation must comply with manufacturer's specifications.

D. Only specified equipment or specified alternates are permitted.

E. District will provide location for all head-end equipment.

F. All questions must be submitted in writing to the District 5 days prior to bid date.

G. At the completion of this section of installation, George Peabody and Clarendon Elementary Schools will have a fully functional access controlled door with the ability to remotely see persons needing entry and either granting or denying entry.

1.2 SUBMITTALS

A. An as-built wiring diagram must be submitted at time of completion.

1.3 COORDINATION

A. If network or electrical service is to be disconnected for any reason, the contractor must make the District technology department aware and not commence until site personnel has been notified and given permission to contractor.

B. The contractor must coordinate and cooperate with the District's security department for the completion of this system.

1.4 PRE-INSTALLTION CONFERENCE
A. Schedule a pre-electrical installation conference with the manufacturer to review this section’s needs specifically.

B. Schedule a conference a minimum of five calendar days prior to beginning work of this section to clarify questions related to work to be performed, scheduling, coordination, etc.

C. Attendance” Security contractor, District’s representatives and other parties affected by work of this section.

1.5 WARRANTY

A. All products including installation and workmanship in this section shall carry a warranty for a period of one year.

B. Provide up to 1-hour in-service training for school personnel.

C. All programming and integration into the District’s existing access control solution must be completed and tested.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. AIPHONE.

B. All server/software and HTML components shall be programmed and configured upon arrival.

C. Quantities and Components (per site):
   1. (1) Aiphone Center Exchange Unit     AX-084C
   2. (1) Aiphone camera door station   AX-DV
   3. (2) Aiphone Master Station     AX-8MV
   4. (1) Back Box        AX-SBX
   5. (1) Aiphone power supply       PS-2420UL
   6. (1) Aiphone relay for door release AX-DVF
   7. (1) Von Duprin power supply     PS-902 24V

2.2 CABLE REQUIREMENTS

A. Aiphone connection from the AX-DV to the AX-084C and from the AX-DVF to the PS-1820 shall be the Aiphone AWG 18/2 conductor cable model #871802.

B. Cable connection from AX-8MV to the AX-804C is Cat 5E.
C. The power supply (Aiphone PS-2420UL is cord and plug)

D. The Von Duprin PS-902 shall reside close to the door and be cabled back to the electrical panel.

E. Door strike cable to door station power supply to AX-084C shall be sized according to distance from head-end to strike. This is typically 18ga. conductor cable.

F. All cables used shall be suited to environment. Use cables with exterior rating for exterior use. Use cables with interior rating for interior use.

PART 3 - EXECUTION

3.1 SYSTEM SPECIFIC INSTRUCTIONS

A. The AX-8MV master station will be mounted in the main office on the secretary’s desk and principal’s office, or to be verified with the District.

B. The AX-DV camera/doorbell shall be mounted at 48” AFF on the side entry door and shall be ADA accessible.

C. All devices shall be installed per manufacturer’s specifications.

D. All device locations to be confirmed by District representative prior to installation.

E. All cables must be labeled indicating destination and device it connects.

3.2 INSTALLATION PROCEDURES

A. Conduit and Cable
   1. Minimum conduit size is 3/4”. No exposed cable allowed unless otherwise noted on plans.
   2. Leave a 3-foot coil of all cables on the peripheral end and a 10-foot coil of all cables at the panel end prior to installation of these devices and head end equipment.
   3. A pull string must be left in all conduits and labeled to indicate destination of conduit.
   4. All horizontal cable must have support, the cable should never be lain freely and resting on the structural supports nor should they use ceiling grid or lighting support wires.
   5. Pathways should ensure that a maximum pulling tension of 25 lb-ft. is not exceeded and pathways should not deform the cable jacket.
   6. Acceptable pathways are cable trays, j-hooks, conduit and surface-mounted raceway.
   7. Cables should not be attached to ceiling grid or lighting support wires.
8. If cable tray is used, follow manufacturer guidelines for installation and use a product that is designed specifically for communications cabling.

9. When using j-hooks, locate them staggered between 4-feet to 5-feet to adequately support and distribute the cable’s weight.

10. When pulling through conduit, cable pulling lubricants shall be continuously applied to all cables and be specifically approved by the cable manufacturer.

11. All exterior devices shall be sealed and watertight.

3.3 TESTING

A. Upon completion of the installation of the system, a satisfactory test of the entire system shall be conducted in the presence of a representative of the District.

B. Test includes activation of doorbell with video verification at main office and door lock release from AX-8MV.

3.4 CLEANING

A. At the end of each work day the contractor shall clean up waste and dispose. Excess materials should be stored in a limited access area.

B. After punch list is complete the contractor should clean/dust racks, cabinets, and faceplates. As well, contractor shall ensure that all excess tape and/or non-essential tags are removed.

END OF SECTION