Poudre School District
Fire Alarm Phase 2
Fort Collins, Colorado

Project Manual
Cache La Poudre Middle School
Lincoln Middle School
Traut Elementary School
Weber Middle School
Fort Collins High School
Poudre High School
Rocky Mountain High School

Project Manual
October 7, 2020

SECTION 00 01 10 - TABLE OF CONTENTS

POUDRE SCHOOL DISTRICT
FIRE ALARM PHASE 1

SPECIFICATIONS

DIVISION 0

DIVISION 1

DIVISION 2

DIVISION 7

DIVISION 26

SECTION 00 01 15 - LIST OF DRAWINGS

BID PACKAGE – CACHE LA POUDRE MIDDLE SCHOOL, FORT COLLINS HIGH SCHOOL, LINCOLN MIDDLE SCHOOL, POUDRE HIGH SCHOOL, ROCKY MOUNTAIN HIGH SCHOOL, TRAUT ELEMENTARY SCHOOL, WEBER MIDDLE SCHOOL

SHEETS APPLICABLE TO EACH SCHOOL

1.	FA000	COVER PAGE – FIRE ALARM SYSTEM
2.	FA001	CONCEPTUAL SEQUENCE & ADS CHART
3.	FA-200	EXAMPLE RISER DIAGRAM/DETAILS – FIRE ALARM SYSTEM
4.	FA-300	TECHNICAL GUIDELINES
5.	FA-301	TECHNICAL GUIDELINES
6.	FA-302	TECHNICAL GUIDELINES

CACHE LA POUDRE MIDDLE SCHOOL

7.	CL.FAO101	OVERALL – FIRE ALARM SYSTEM PLAN
8.	CL.FA101A	AREA A – FIRE ALARM SYSTEM PLAN
9.	CL.FA101B	AREA B – FIRE ALARM SYSTEM PLAN
10.	CL.FA101C	AREA C – FIRE ALARM SYSTEM PLAN

FORT COLLINS HIGH SCHOOL

11.	FC.FAO101	LOWER LEVEL - OVERALL – FIRE ALARM SYSTEM PLAN
12.	FC.FAO102	UPPER LEVEL - OVERALL – FIRE ALARM SYSTEM PLAN
13.	FC.FA101A	LOWER LEVEL - AREA A – FIRE ALARM SYSTEM PLAN
14.	FC.FA101B	LOWER LEVEL - AREA B – FIRE ALARM SYSTEM PLAN
15.	FC.FA101C	LOWER LEVEL - AREA C – FIRE ALARM SYSTEM PLAN
16.	FC.FA101D	LOWER LEVEL - AREA D – FIRE ALARM SYSTEM PLAN
17.	FC.FA101E	LOWER LEVEL - AREA E – FIRE ALARM SYSTEM PLAN
18.	FC.FA101F	LOWER LEVEL - AREA F – FIRE ALARM SYSTEM PLAN
19.	FC.FA101G	LOWER LEVEL - AREA G – FIRE ALARM SYSTEM PLAN
20.	FC.FA101H	LOWER LEVEL - AREA H – FIRE ALARM SYSTEM PLAN
21.	FC.FA101I	LOWER LEVEL - AREA I – FIRE ALARM SYSTEM PLAN
22.	FC.FA101J	UPPER LEVEL - AREA J – FIRE ALARM SYSTEM PLAN
23.	FC.FA101K	UPPER LEVEL - AREA K – FIRE ALARM SYSTEM PLAN
24.	FC.FA101L	UPPER LEVEL - AREA L – FIRE ALARM SYSTEM PLAN
25.	FC.FA101M	UPPER LEVEL - AREA M – FIRE ALARM SYSTEM PLAN

LINCOLN MIDDLE SCHOOL

26.	LI.FAO101	OVERALL – FIRE ALARM SYSTEM PLAN
27.	LI.FA101A	AREA A – FIRE ALARM SYSTEM PLAN
28.	LI.FA101B	AREA B – FIRE ALARM SYSTEM PLAN
29.	LI.FA101C	AREA C – FIRE ALARM SYSTEM PLAN
30.	LI.FA101D	AREA D – FIRE ALARM SYSTEM PLAN

POUDRE HIGH SCHOOL

31.	PH.FAO101	OVERALL – FIRE ALARM SYSTEM PLAN
32.	PH.FA101A	AREA A – FIRE ALARM SYSTEM PLAN
33.	PH.FA101B	AREA B – FIRE ALARM SYSTEM PLAN
34.	PH.FA101C	AREA C – FIRE ALARM SYSTEM PLAN
35.	PH.FA101D	AREA D – FIRE ALARM SYSTEM PLAN
36.	PH.FA101E	AREA E – FIRE ALARM SYSTEM PLAN
37.	PH.FA101F	AREA F – FIRE ALARM SYSTEM PLAN
38.	PH.FA101G	AREA G – FIRE ALARM SYSTEM PLAN
39.	PH.FA101HI	AREA H & I – FIRE ALARM SYSTEM PLAN

40. PH.FA101J AREA J – FIRE ALARM SYSTEM PLAN
41. PH.FA101K AREA K – FIRE ALARM SYSTEM PLAN

ROCKY MOUNTAIN HIGH SCHOOL
42. RM.FAO101 FULL VIEW – FIRE ALARM SYSTEM PLAN
43. RM.FA101A AREA A – FIRE ALARM SYSTEM PLAN
44. RM.FA101B AREA B – FIRE ALARM SYSTEM PLAN
45. RM.FA101C AREA C – FIRE ALARM SYSTEM PLAN
46. RM.FA101D AREA D – FIRE ALARM SYSTEM PLAN
47. RM.FA101E AREA E – FIRE ALARM SYSTEM PLAN
48. RM.FA101F AREA F – FIRE ALARM SYSTEM PLAN
49. RM.FA101G AREA G – FIRE ALARM SYSTEM PLAN
50. RM.FA101H AREA H – FIRE ALARM SYSTEM PLAN
51. RM.FA101I AREA I – FIRE ALARM SYSTEM PLAN

TRAUT ELEMENTARY SCHOOL
52. TR.FAO101 OVERALL – FIRE ALARM SYSTEM PLAN
53. TR.FA101A AREA A – FIRE ALARM SYSTEM PLAN
54. TR.FA101B AREA B – FIRE ALARM SYSTEM PLAN
55. TR.FA101C AREA C – FIRE ALARM SYSTEM PLAN

WEBER MIDDLE SCHOOL
56. WB.FAO101 OVERALL – FIRE ALARM SYSTEM PLAN
57. WB.FA101A AREA A – FIRE ALARM SYSTEM PLAN
58. WB.FA101B AREA B – FIRE ALARM SYSTEM PLAN
59. WB.FA101C AREA C – FIRE ALARM SYSTEM PLAN
60. WB.FA101D AREA D – FIRE ALARM SYSTEM PLAN

SECTION 00 31 43

PERMIT APPLICATION

Permit application, processing, fees, record keeping, compliance, and management are the exclusive responsibility of the Contractor.

END SECTION 00 31 43

SECTION 00 45 00

REPRESENTATIONS AND CERTIFICATIONS

Submit bidder, contractor, supplier, and/or worker qualification statements as required by individual specification sections within 10 calendar days of the bid opening.

END SECTION 00 45 00

SECTION 01 10 00

SUMMARY OF WORK

PART 1 - GENERAL

1.0 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section.

1.1 SUMMARY

A. Section Includes: General description of the work of the entire Project with limitations or coordination with other contracts, if any.

1.2 GENERAL

A. The work to be done under this Contract is the construction in a workmanlike manner, to the satisfaction of the Engineer, of the Work as shown, documented, and set forth in the Contract Documents.

B. If these documents or job conditions make it impossible to produce first class work or to warranty the work or its performance, or should discrepancies appear among the Contract Documents, request interpretation, correction or clarification prior to bidding as set forth in the Bidding Requirements. If the Contractor fails to make such request, work must be performed in a satisfactory manner and no request shall be made for added cost or extension of time. Should conflict occur in or between Drawings and Specifications, Contractor (or Installer) is deemed to have estimated on the more expensive way of doing work unless he shall have asked for and obtained written decision before Submission of Bid as to which method or materials will be required.

C. The Contractor represents that he fully understands the nature and extent of the work, all factors and conditions affecting or which may be affected by it and characteristics of its various parts and elements and their fitting together and functioning.

1.3 PROJECT DESCRIPTION

General: Briefly and without force and effect upon the contract documents, the Work of the Contract can be summarized as follows:

Bid Package:
CLPM, FCHS, Lincoln MS, PHS, RMHS, Traut ES, Weber MS: The goal of this limited notification upgrade is to provide NFPA compliant visual notification and to include additional horn/strobes to provide audibility (60 dba minimum) throughout the schools. Utilize notifier by tech electronics.

1. Existing horn/strobes and strobes shall be replaced with the latest system sensor model, to produce a synchronized flash and temporal 3 tone. The contractor is responsible for converting four wire notification appliances to two wire, synchronized notification circuits. Maintain circuit integrity of the unused circuit utilizing wire nuts or WAGO connectors. Spare wires shall be identified with type-written, heat-shrink labels as "SPARE". The means and methods used by the contractor shall comply with the NEC (2017) and NFPA 72 (2016). Horn/strobes and strobes shall be red and labeled “FIRE”.
2. Add additional power supplies where required. All power supplies shall be protected with a smoke detector. Also, the supplemental intercom non-compliant tone shall be removed. Additional power supplies, if required, shall be compatible with existing power supplies to achieve synchronized notification circuits. If power supplies must be replaced to achieve synchronization, utilize intelligent power supplies or Potter PSN-106 10A as approved by PSD.

3. Provide updated graphic map and include additional smoke detectors and power supplies.
4. The contractor shall carry a budget for 10% additional added devices to be installed at the owner's request or to be used as spare parts. The additional devices may be used to replace strobes with horn/strobes in order to achieve 60 dba minimum. The contractor is responsible for providing additional components, if necessary, to achieve the goals stated herein.

Alternates:

Note: The scope of work for this alternate includes, but is not limited to, work outlined in this narrative. Any omissions do not relieve the contractor's responsibility to provide a complete and properly functioning system as required by Poudre school district.

1. The intent of this alternate is to upgrade the fire alarm control panel.
   A. Program fire system with point by point contact id reporting to district monitoring station.
   B. Provide and install dialer capture ethernet module to MDF room.
   C. Provide and install FACP web card.
   D. Modify FACP programming to match field signage.
   E. Add new graphic maps at FACP and annunciator (coordinate with PSD).
   F. Provide fire watch for buildings occupied during the FACP swap-out during out of service time in accordance with the fire watch procedure located in the fire alarm log book. Contractor shall provide a dedicated individual for fire watch.
      a. Existing wiring shall be reused except where additional wire is required for new devices.
   G. Provide and install new batteries and power supply in FACP.
   H. Dialer: provide digital alarm communicator transmitter (DACT) that shall transmit all control panel off normal condition, including alarm, water flow, supervisory, or trouble. The DACT shall utilize one (1) cat6e voice line to comply with NFPA 72 requirements, shall utilize contact id type point-by-point communication format. The DACT shall be notifier model uDACT-2 or district approved equivalent transmitter (DACT). The contractor shall provide all point-by-point programming to support transmission of all control panel off normal conditions, including alarm, supervisory, water flow and trouble.
   I. Fire alarm contractor shall upgrade all firmware in fire alarm system to most recent versions.
      a. Replace existing CPU with latest technology (CPU-2)
      b. Replace existing SLC cards with flash scan technology.
      c. Replace existing FACP power supplies with latest technology.
      d. Replace existing panel components with latest technology.
   J. Existing devices that are above and beyond the current standards shall remain in place.
   K. Ethernet communications (NWS-3): provide ethernet topology data communications module (LAN) that shall transmit all control panel off normal condition, including alarm, water flow, supervisory, or trouble via email. The LAN module shall utilize a category 6 rj45 data ethernet connection port for interconnection to the district LAN/wan network. The LAN module shall support remote web browsing and email alert functions.

2. Contractor shall provide and install new voice evacuation notification appliances in accordance with PSD design criteria and project specifications. Added audible notification may be accomplished by adding speaker only devices or utilization of spare circuit and replacing horns/strobes with speaker/strobes or a combination of the aforementioned methods.
   A. Add digital voice command and daa2-series amplifiers.
   B. Contractor shall include design-build notification appliance layout.
   C. Contractor shall replace existing sound system shutdowns with low level audio and ducking modules (aux gymnasium, gymnasium, cafeteria/auditorium,etc.).

3. Bosch communicator:
   A. Provide two (2) phone line from the nearest telecom 66 blocks (provide additional block if required) and terminated in the FACP in rj31x boxes and one data line from closest network patch panel in a IDF or MDF room. Bosch 465 dialer capture ethernet module:
      a. Extend DACT phone line from MDF 66 block to Bosch 465 module. Phone line shall return to 66 block for connection to a leased voice line.
      b. The Bosch 465 shall utilize a category 6 rj45 data ethernet connection port for

interconnection to the district LAN/wan network.

c. Provide three (3) fire alarm monitor modules to supervise Bosch b465 system trouble, b465 loss of 120vac, b465 battery fail.
d. Electrical contractor is responsible for coordinating the install location of the Bosch communicator, phone and data drops with owner and engineer.

B. Electrical contractor is responsible for all raceway, boxes, sleeves, etc. As required. Coordinate with low voltage cabling contractor for requirements.

C. Electrical contractor shall employ district approved telecom\data cabling contractor to run all data and telephone cabling and drops. District it department shall make all final cross-connects to ensure line seizure at the FACP.

4. Provide carbon monoxide detection in accordance with the IFC.

1.4 PROJECT LOCATION

The following schools are included in this project:

Bid Package

- Cache La Poudre Middle School – 3515 CO RD 54G, Laporte, CO 80535
- Fort Collins High School – 3400 Lambkin Way, Fort Collins, CO 80525
- Lincoln Middle School – 1600 Lancer Dr, Fort Collins, CO 80521
- Poudre High School – 201 South Impala Dr, Fort Collins, CO 80521
- Rocky Mountain High School - 1300 W Swallow Rd, Fort Collins, CO 80526
- Traut Elementary School – 2515 Timberwood Dr, Fort Collins, CO 80528
- Weber Middle School – 4201 Seneca St, Fort Collins, CO 80526

1.5 SITE ACCESS

Access to the site is controlled. Prior to bid there will be a pre-bid walk-through with questions addressed during the meeting and confirmed in writing after the meeting with addenda.

1.6 SEQUENCE OF WORK

Scheduling and coordinating the work areas with the Owner or Owner representative is critical to the success of this project. A minimum of two weeks notice will be provided to the Owner or Owner representative prior to beginning work in an area.

1.7 SPECIAL REQUIREMENTS

A. Work must be completed during times when the building is unoccupied. As such, the contractor may work under the following parameters
   1. 3:00p.m. to 10:00p.m. (MDT), Monday through Friday, excluding holidays.
   2. 6:00a.m. to 10:00p.m. (MDT), weekends.
   3. 6:00a.m. to 10:00p.m. (MDT), designated “District Recess” days.
   4. Any other work shifts, such as double shifts, holidays or change in work hours, must be approved in writing by the Owners Representative 48 hours in advanced.

B. Available “District Recess” days are as follows:
   1. March 15-19, 2021

C. No additional compensation will be granted for working nights, weekends, split shifts or other hours.

D. Work Phasing: Each facility will be occupied during construction. Coordination with the building Owner and representatives is required.

1.8 JOB CONDITIONS

A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with the Owner's operations. Provide and update construction schedules for Owner's information and approval at weekly meetings.

B. Interruption of building access and facilities by the Contractor will not be permitted to whatever extent such interruptions might interfere with Owner's occupancy. Limit construction operations to those methods and procedures which will not adversely and unduly affect the working environment of Owner's occupied spaces, including noise, dust, odors, air pollution, ambient discomfort, poor lighting, hazards and other undesirable effects and conditions.

C. Do not interrupt power, lighting, plumbing, telephone and HVAC services to occupied areas except for minor interruptions of short duration (less than one hour). Fire Alarm and fire sprinklers shall be restored to operational condition at the end of each workday. Such interruptions are classified as "short" and "long" term.
   1. Short Term interruptions are 1-hour or less.
   2. Long Term outages are longer than 1-hour.
   3. Short Term outages must be scheduled and have Owner's approval at least 3 days in advance.
   4. Long Term outages must be scheduled and have Owner's approval at least 10 days in advance.

D. Access way to fire lanes and Owner's operations must be maintained at all times. Contractor will provide flag personnel during the ingress or egress of large equipment if access way is to be temporarily disrupted.

E. Provide temporary barriers and/or partitions required to protect the occupants of the building and the general public from injury due to the work of this project; and/or to protect adjacent areas of the building from the spread of dust and dirt caused by the work of this project. Remove temporary barriers and partitions upon completion of the project.
   1. The Contractor shall provide protection for all existing floor coverings, walls, and other building finishes in the area of work and access way to the project area. The method of protection shall be at the Contractor's discretion; however, the Contractor shall be liable for leaving the building in the same condition as existed at the start of the Project. The Contractor shall schedule a walk-through with the Building Manager to document existing conditions.
   2. The Contractor shall provide protection for all furniture, office equipment, files, books and other office supplies and mechanical and electrical equipment in the area of work and access way to the project area. The method of protection shall be at the Contractor's discretion; however, the Contractor shall be liable for leaving the building in the same condition as existed at the start of the Project.
   3. The contractor shall relocate and replace in the original position, all furnishings, equipment, files and bookshelves as required to provide access to the work.

F. Use of the Existing Building: Maintain the existing building in a weather-tight condition throughout the construction period. Repair damage caused by construction operations. Take all necessary precautions to protect the building and its occupants during the construction period.
   1. All damages to existing finished and construction by the Contractor or his subcontractors, shall be promptly repaired within 14 days of notification of damage by the Owner. If repairs are not completed by the Contractor within 14 days of notification, the Owner may elect to have the project completed by another Contractor and have the expense of such repairs deducted from the Contract Amount.

2. All damages must be repaired and/or replaced by qualified subcontractors.

G. Contractor is required to submit a construction schedule which defines, to the best of their ability, those areas of the buildings where disruptions will occur at specific times and to assist in coordinating this information with the building tenants. This schedule must be submitted at least 10 working days prior to the commencement of on-site construction. Update and coordinate the schedule weekly.

1.9 CONTRACTOR'S ACCESS, PARKING, AND STAGING AREAS

A. Work included in this project will need to be performed within the limitations of available access at this site. Contractor shall adjust the means and methods of construction to allow for the restrictions surrounding the site. Parking will be provided for personal or company vehicles. Access to the building and staging areas for the Contractors and sub-contractor's operations will be covered in the pre-bid conference and further detailed during the pre-construction meeting.

1.10 CONTRACTOR USE OF PREMISES

A. General: Limit use of the premises to construction activities inside the building.
1. Keep driveways and entrances serving the premises clear and available to the Owner and the Owner's employees at all times. Do not use these areas for parking or storage of materials. Deliveries are prohibited for the 45-min prior to and 45-min after bell times. Bell times vary from school to school and must be verified with the Owner.
2. All areas of contractor staging and storage must be closely coordinated with the Owner's Representative at all times.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION (Not applicable)

END OF SECTION 01 10 00

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

PART 1 -GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section.

1.2 SUMMARY

A. Section Includes:

1. Contract Modification Procedures.
2. Unit Prices. Requirements and descriptions for those items for which indefinite quantities can be expected and, therefore, pre-agreed prices per unit of work are established as a means to determine adjustments to the Contract Price after actual quantities are determined. Unit prices include all necessary material, overhead, profit and applicable taxes.
3. Payment Procedures.

B. Related Sections: Refer to the Drawings and individual specification sections for the work requirements for each unit cost.

1.3 SUBMITTALS

A. Contract Modification Procedures: Per General Conditions of the Contract. Submit the name of individual authorized to accept changes, and to be responsible for informing others in the Contractor's employ of changes in the work.

B. Substitutions: Per General Conditions of the Contract.

C. Unit Prices: Submit documentation of quantities by Change Order.

D. Payment Procedures: Per General Conditions of the Contract.

1.4 CONTRACT MODIFICATION DOCUMENTATION

A. Contract Modification Procedures: Per General Conditions.

B. Maintain detailed records of the work completed. Provide complete information for evaluation of proposed changes and to substantiate changes in costs or Contract time.

C. If requested by Engineer or Owner, provide the following additional data to support calculations:

1. Quantities of products, labor and equipment
2. Taxes, insurance and bonds.
3. Overhead and profit.
4. Justifications for any change in Contract time.
5. Credit for deletions form the Contract and similar documentation.

D. Include with requires for change order the following additional information:

1. Origin and date of claim.

2. Dates, time and by whom work was performed.
3. Time records and wage rates paid.
4. Invoices and receipts for products, equipment and subcontracts.

1.5 CONTRACT MODIFICATION PRELIMINARY PROCEDURES

A. The Engineer may submit a Proposal Request which may include description of change with supplementary or revised drawings and specifications, projected time for execution, and the time period for which the request will be valid. The Contractor may initiate a change by submitting a request to the Engineer which describes the proposed change with a statement of the reason for the change, change in Contract Sum and Contract Time and full documentation. For requested substitutions of products, follow procedures and documentation specified in Section 013300.

1.6 CONTRACT MODIFICATION AUTHORIZATION

A. After preliminary procedures, the Engineer may issue a directive, signed by the Owner, instructing the Contractor to proceed with the Changes in the Work for inclusion in subsequent Change Order. Directive will describe the changes in the Work and designate the method of determining the change in the Contract Sum or Contract Time. Where the change order is not based upon pre-determined costs or quantities, changes in the Contract Sum or Contract Time will be computed on the basis of a force account change order.

1.7 LUMP SUM CHANGE ORDER

A. Lump sum change orders will be based upon the Proposal Request and the Contractor's quotation, or Contractor's request for change order as approved by the Engineer. When requested by Engineer submit detailed breakdown of costs as listed above under Paragraph 1.3, "DOCUMENTATION".

1.8 EXECUTION

A. The Engineer will prepare all Change Orders and submit 3 signed copies to the Owner. Owner will sign all copies, retain one copy, and return two copies to the Engineer. Engineer will retain one copy and forward one copy to the Contractor.

1.9 CORRELATION

A. Promptly revise the Schedule of Values on the Application for Payment Form by indicating each authorized Change Order as a separate line item and adjusting the Contract Sum as shown on the accepted Change Order. Promptly revise the Progress Schedule to reflect any change in the Contract Time and resubmit. Promptly enter changes in the Project Record Documents.

1.10 PAYMENT PROCEDURES

A. Payment Procedures: Per General Conditions.

B. Schedule of Values:

1. Format: Identify each line item with number and title of each specification section listed in the Table of Contents of the Project Manual.
2. Include a line item for overhead and profit by site.

C. Progress Payments:

1. Submit typed or printed information on standard AIA document G702 with G703 continuation sheets no more frequently than monthly intervals. Pay applications are to be dated the last day of month.

D. Final Payment: Submit two separate applications as follows:

1. 100% completion, less retainage.
2. Retainage release: Per General Conditions.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION (Not applicable)

END OF SECTION 012000

SECTION 01 22 00 - UNIT COSTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements governing the following:

1. Unit Cost Prices.

1.2 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Engineer of the date when final selection and purchase of each product or system identified by unit costs must be completed to avoid delaying the Work.

1.3 SUBMITTALS

A. Coordinate and process submittals for unit cost items in same manner as for other portions of the Work.

B. The installing company shall provide a unit price list for the addition or deletion of fire alarm system devices.

1. The unit price list will be utilized for any modifications/spare parts for the project and shall include overhead and profit.
2. The unit price list values for additions must not exceed the values indicated in the current MSRP price list. Deletion values used for credits must be at least 50% of the MSRP current price list value. The fire alarm system vendor shall provide a copy of the MSRP at request.
3. The base bid shall include additional programming and engineering costs associated with adding or deleting devices equal to 10% of the base bid quantities. Additional programming, shipping and engineering costs shall not be approved unless more than 10% of the base bid device quantities have been added.
4. The unit price columns are defined as follows:
    a. Unit Price Add: The cost of a single component delivered to the project site.
    b. Unit Price Add with Install: The cost of a installing a single component. This column must include the cost of the component. For example: If PSD directs the contractor to install one smoke detector, the contractor will receive payment indicated in this column. (The contractor will not receive payment for Unit Price Add + Unit Price Add with Install.)
    c. Unit Price Delete: The credit the owner will receive for removing a device from the bid plans. (Equipment credit only per listed device.)
    d. Unit Price Delete with install: The credit the owner will receive for removing a device from the plans. (Installation credit only per listed device).

1.4 COORDINATION

A. Coordinate unit cost items with other portions of the Work.

1.5 LUMP-SUM UNIT COSTS

A. Unit Cost shall include cost to Contractor of specific products and materials under description and shall include costs for receiving and handling at Project site, labor, installation, overhead and profit, taxes, freight, and delivery to Project site.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by unit costs promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each unit cost item with related materials and installations to ensure that each item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF UNIT COSTS

A. The fire alarm system equipment distributor shall provide a unit price list of all components of the proposed fire alarm system for both additions and deletions. This unit price list will be utilized for any modifications/spare parts for the project.

END OF SECTION 01 22 00

SECTION 01 28 00

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY:

A. Work Included: Provide all necessary cutting and patching of the Work as required to make materials and components fit together properly; to uncover work to provide for the installation of new work or the inspection of previously installed work; or to remove and replace defective or non-conforming work.

1.2 REFERENCES:

A. Related Documents: Drawings and general provisions of Contract, including General Conditions and other Division-1 Specification Sections, apply to this Section.

1.3 DEFINITIONS:

A. Cutting and Patching: As used herein, the term "cutting and patching" is defined to include, but is not necessarily limited to, demolition and repair of nominally completed and previously existing work in order to accommodate the coordination, installation and uncovering of work for access or inspection and to obtain samples for testing or similar purposes. It is further defined to included integral cutting and patching during manufacturing, fabricating, erecting and installation processes for individual units of work. Drilling to install fasteners and similar operations is not considered cutting and patching.

1.4 SUBMITTALS:

A. Submittal Procedures: Refer to Section 01 33 00.

B. Proposals:

1. Where prior review of cutting and patching is required, submit proposal well in advance of timework will be performed for Architect's review and confirmation.

2. Include description of why cutting and patching cannot reasonably be avoided, how it will be performed, how structural elements, if any will be affected and reinforced; products to be used; firms and tradesmen to perform work; approximate dates of work; and anticipated results in terms of variations from work as originally completed (structural, operational, visual and other qualities of significance).

3. Where applicable, include cost proposal, suggested alternatives to cutting-and-patching procedure proposed, and description of circumstances which lead to need for cutting and patching.

4. Review by Architect prior to proceeding with proposed cutting and patching does not waive right to later require complete removal and replacement of work found to be cut and patched in an unsatisfactory manner.

1.5 QUALITY ASSURANCE:

A. Requirements For Structural Work:

1. Do not cut and patch structural work in manner resulting in reduction of load-carrying capacity or load/deflection ratio.

2. Prior to cutting and patching structural steel, structural concrete, foundation construction, basement or retaining walls, pressurized piping, and equipment, submit proposed procedures for Architect's review.

B. Operational And Safety Limitations:

1. Do not cut and patch operational elements or safety-related components in manner resulting in reduction of capacities to perform as intended or resulting in decreased operational life, increased maintenance, or decreased safety.

2. Prior to cutting and patching primary operational systems and equipment; water, moisture, vapor, air, or smoke barriers; membranes and flashings; noise and vibration control elements and systems; control communication, conveying, and electrical wiring systems; and similar categories, submit proposed procedures and materials for Architect's review.

C. Visual Requirements:

1. Do not cut and patch work which is exposed on the exterior or in occupied spaces of the building in a manner resulting in reduction of visual qualities or substantial evidence of the cut and patch work, both as judged by the Architect.

2. Remove and replace work judged by Architect to be cut and patched in a visually unsatisfactory manner.

D. Installer/Fabricator: Engage original installer or fabricator to perform cutting and patching of masonry, roofing, curtain wall or storefront systems, exterior insulation and finish systems, acoustical ceilings, floor finishes, etc. Where original installer or fabricator is not available, engage recognized expert entities to perform cut and patch work.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Patching Materials: Except as otherwise indicated, provide materials for cutting and patching which will result in equal or better work than the work being cut and patched, in terms of performance characteristics and including visual effect where applicable. Comply with requirements and use materials identical with original materials where feasible and where recognized that satisfactory results can be produced.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verification of Conditions: Examine areas and conditions under which the work of this Section will be performed. Do not proceed with the work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and conditions.

3.2 PREPARATION:

A. Temporary Support: Provide adequate temporary shoring, bracing, or other means of support for work to be cut to prevent failure. Do not endanger other work.

B. Protection: Provide adequate protection of other work during cutting and patching to prevent damage and provide protection of work from adverse weather exposure.

3.3 PERFORMANCE:

A. General: Employ skilled tradesman to perform cutting and patching. Except as otherwise indicated, proceed with cutting and patching at earliest feasible time in each instance, and perform work promptly.

B. Cutting:

1. Cut work by methods least likely to damage work to be retained and adjoining work.

2. Review proposed procedure with original installer where possible, and comply with his recommendations.

3. In general, where physical cutting action is required, cut work with sawing and grinding tools, not with hammering and chopping tools. Core drill openings through concrete work.

4. Comply with the requirement of applicable Sections of Division 2 where cutting and patching requires excavating and backfilling.

C. Patching: Patch with seams, which are durable and as invisible as possible. Comply with specified tolerances for the work. Where feasible, inspect and test patched areas to demonstrate integrity of work.

D. Restoring:

1. Restore exposed finishes of patched areas, and where necessary, extend finish restoration onto retained adjoining work in a manner, which will eliminate evidence of patching.

2. Where patch occurs in painted surfaces, extend final paint cover over entire unbroken surface containing patch after patched area has received prime and base coats. Color shall match finished surface. Coordinate with Owner.

END OF SECTION 01 28 00

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to work of this Section.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Administrative and supervisory personnel.
2. Project meetings.
3. Requests for Interpretation (RFI's).

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations that depend on each other for proper installation, connection, and operation.

B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Project closeout activities.
7. Startup and adjustment of systems.
8. Project closeout activities.

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 SUBMITTALS

A. Key Personnel Names: Within 10 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Engineer, within three days of the meeting.

B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Engineer, but no later than 10 days after Notice to Proceed. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner; Engineer; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Procedures for processing field decisions and Change Orders.
    f. Procedures for RFIs.
    g. Procedures for testing and inspecting.
    h. Procedures for processing Applications for Payment.
    i. Distribution of the Contract Documents.
    j. Submittal procedures.
    k. Preparation of Record Documents.
    l. Use of the premises.
    m. Work restrictions.
    n. Owner's occupancy requirements.
    o. Responsibility for temporary facilities and controls.
    p. Construction waste management and recycling.
    q. Parking availability.
    r. Office, work, and storage areas.
    s. Equipment deliveries and priorities.
    t. First aid.
    u. Security.
    v. Progress cleaning.
    w. Working hours.
3. Minutes: Record and distribute meeting minutes.

C. Progress Meetings: Conduct progress meetings at weekly intervals.

1. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
        1) Review schedule for next period.
    b. Review present and future needs of each entity present, including the following:
        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.

8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) RFIs.
16) Status of proposal requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

3. Minutes: Record the meeting minutes.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
   a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

1.8 REQUESTS FOR INTERPRETATION (RFI's)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFI's submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFI's in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Engineer.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
    a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Engineer's Action: Engineer will review each RFI, determine action required, and return it. Allow seven working days for Engineer's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:
    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for interpretation of Engineer's actions on submittals.
    f. Incomplete RFIs or RFIs with numerous errors.
2. Engineer's action may include a request for additional information, in which case Engineer's time for response will start again.
3. Engineer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer in writing within five days of receipt of the RFI response.

D. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within five days if Contractor disagrees with response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Engineer.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Engineer's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section.

1.2 SUMMARY

A. Section Includes: Administrative and procedural requirements for submittal and review of product data, shop drawings, samples and similar items required by the specifications.

B. Related Sections: Refer to appropriate sections of Divisions 28 for additional submittal requirements (if any) of fire alarm and electrical work, respectively.

1.3 ADMINISTRATIVE SUBMITTALS

A. Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

1. Schedules.
2. Permits.
3. Applications for payment.
4. Performance and payment bonds.
5. Insurance certificates.
6. List of Subcontractors.
7. Schedule of Values.
8. Inspection and test results.
9. Closeout documents.
10. Manufacturer’s certificates, instructions, manuals.

B. Such submittals are for information and record and do not require action on the part of the Engineer except where not in conformity with the Contract Documents. If such non-conformity is observed the Engineer will notify the Contractor within two weeks of receipt of document. Failure to observe or notify by the Engineer does not relieve Contractor of compliance with Contract Documents.

1.4 SUBMITTAL PROCEDURES

A. General: Make submittals from Contractor to the Engineer after Contractor has reviewed each submittal and indicated his action thereon except for samples and selection submittals. Contractor shall carefully review and coordinate all work. Unreviewed submittals will be returned until properly reviewed and coordinated.

B. Coordination: Coordinate the preparation and processing of submittals with the performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination. The Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing:

1. Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.
2. Allow 3 weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Engineer will advise the Contractor when a submittal being processed must be delayed for coordination.
3. If an intermediate submittal is necessary, process the same as the initial submittal.
4. Allow 2 weeks for reprocessing each submittal. No extension of Contract Time will be authorized because of failure to transmit submittals to the Engineer sufficiently in advance of the Work to permit processing.

D. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block. Provide a space approximately 4" x 5" on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken. Include the following information on the label for processing and recording action taken.

1. Project name.
2. Date.
3. Name and address of Engineer.
4. Name and address of Contractor.
5. Name and address of Subcontractor.
6. Name and address of supplier.
7. Name of manufacturer.
8. Number and title of appropriate Specification Section.
9. Drawing number and detail references, as appropriate.

E. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Engineer using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.

1. On the transmittal record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

1.5 SHOP DRAWINGS

A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings. Shop Drawings include installation drawings, calculations, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:

1. Dimensions.
2. Identification of products and materials included.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.

B. Submit initially, one reproducible print for the Engineer. Final submittal shall be delivered to the Engineer with sufficient copies so that desired distribution can be made by Contractor, one copy each to the Owner, the Engineer, and other consulting engineers where applicable, the Contractor's field office, his home office, the Record Documents, the fabricator, and any others involved in the submittal. If initial submittal becomes final submittal, provide sufficient

additional copies that may be needed to meet these requirements. Where shop drawings are indicated to be submitted for "information only", submit three sets of prints to Engineer and retain one set for Project Record Documents.

C. Submit to the agency contracted by the State for Code Review. Submit four copies to the reviewing authority. Coordinate requirements with the reviewing authority.

1.6 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, rough-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings". Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information.

1. Manufacturer's printed recommendations.
2. Compliance with recognized trade association standards.
3. Compliance with recognized testing agency standards.
4. Application of testing agency labels and seals.
5. Notation of dimensions verified by field measurement.
6. Notation of coordination requirements.

B. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

C. Submittal is for information and record, unless otherwise indicated. Therefore, initial submittal is final submittal unless returned promptly by the Engineer marked with an “action” which indicates an observed non-compliance.

D. Submit copies as above specified for final shop drawings. Where applicable, include additional copies for maintenance manual. Submit a cover letter to show Contractor’s review and action.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION (Not applicable)

END OF SECTION 01 33 00

SECTION 01 35 23 – HAZARDOUS MATERIALS NOTIFICATIONS AND FORMS

PART 1 GENERAL

1.0 DESCRIPTION

A. Each Contractor is required to read and review the Hazardous Materials documents.
B. Each Contractor shall comply with the requirements outlined in these documents.
C. Documents that require completion by the Contractor, must be completed and returned to the Owner contact person prior to the start of construction. Loose forms will be available from the Owner's Representative and/or Architect. A copy of the form will then be returned to the Contractor.
D. If the Contractors request a third party Environmental Inspection, Owner must be notified prior to the inspection. An Owner representative must be present during any site inspections. Building material samples may not be taken by the contractor or its subcontractors without written approval from Owner.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

Poudre School District
Construction Management and Support Department
Design and Construction Branch

Asbestos Containing Building Materials and Lead Based Paint

Facility: _____

The removal of asbestos containing building materials (ACBM) and lead based paint (LBP) will be done under a separate contract by a certified environmental contractor, unless otherwise specified in this document. Any remaining ACBM/LBP shall not be disturbed.

Should the Contractor encounter any unidentified or suspected asbestos material or LBP during construction, the Contractor shall notify Owner's Representative immediately. If required, the Contractor shall coordinate a work schedule with Owner's Representative to arrange for this work to be carried out in connection with any asbestos containing materials/LBP.

The attached Contractor Acknowledgment Letter must be filled out, signed, and returned to Owner Design and Construction Branch environmental contact person prior to commencement of Work.

Notification of Asbestos Containing Building Materials/Lead Based Paint

In accordance with requirements of federal and state law, Poudre School District has conducted an inspection of _____ to identify and locate ACBM and LBP. As a condition of work performed at the Poudre School District District, the Contractor is required to notify any persons or entities acting in its behalf of the following:

1. Asbestos
    a. Federal and State agencies have determined that asbestos presents a significant health risk and has classified asbestos as a hazardous air pollutant.
    b. If asbestos–containing building materials are disturbed, asbestos fibers may be released.

2. Lead
    a. Federal and State agencies have determined that lead-based paint presents a significant health risk.
    b. If lead-based paint is disturbed, lead contaminated dust may be released.

3. ACBM/LBP has been discovered at the Poudre School District facility identified above. ACBM/LBP is in various materials and locations throughout the facility. Before performing any work that may disturb building materials, either inside or outside, the Contractor must know the locations of ACBM/LBP within the facility. The Contractor will be provided a drawing, a written description, or both, which will indicate the material types and locations of asbestos within the facility.

4. The Contractor must complete Poudre School District Contractor's Acknowledgment Letter and return it to the Design and Construction Branch contact person.

5. The Contractor is required to take precautions that insure ACBM/LBP is not disturbed during the work. The Contractor is not authorized to disturb or clean up ACBM/LBP unless written approval from Poudre School District contact person is given prior to performing such actions.

6. In the event that ACBM/LBP is disturbed during the work, the Contractor must immediately stop work, leave all materials and equipment in the work area, isolate the area to prevent entry, and call Poudre School District security dispatch at 303–367–3060. The Contractor must notify security dispatch personnel that ACBM/LBP has been disturbed and request that they contact the Owner contact person to respond to the incident. Work in the area will not resume until Owner has provided a written statement that the area can be re–occupied.

7. The Poudre School District District will not be responsible to the Contractor and disclaims any and all liability whatsoever for any failure on your part to warn persons or entities acting on its behalf of the presence of ACBM/LBP and to instruct them to follow the procedures stated above or imposed by federal and state law.

Poudre School District
Construction Management and Support Department
Design and Construction Branch

Contractor Acknowledgment Letter

School or Facility:_____

Designated Work Area(s): _____

Company Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

The Contractor has been notified of locations which ACBM/LBP have been identified within the designated Work Area. The Contractor shall be responsible for notifying any persons or entities acting on its behalf of the presence of ACBM/LBP within the Work Area. The Contractor shall perform work only in the area designated above. If the Contractor needs to work outside the designated Work Area, for any reason, the Contractor will notify Poudre School District prior to performing work in the unauthorized area. If ACBM/LBP is disturbed during the course of the Work, the Contractor shall be financially responsible for all associated expenses to clean up and repair the area.

_____ _____
Company Representative's Signature Company Representatives Title

_____
Date

Poudre School District Design and Construction contact person for asbestos:

Rita Davis
Rita can be contacted by calling: Work Phone: (303) 326-2115, Ext. 28685; After Hours: (303) 437-8671

_____ _____
Signature Date

Poudre School District AHERA Designated Person:

Rita Davis
Rita can be contacted by calling: Work Phone: (303) 326-2115, Ext. 28685; After Hours: (303) 437-8671

_____ _____
Signature Date

After Hours Contact Information – Poudre School District Security
Security can be contacted by calling (303) 367–3060. Please inform security that ACBM/LBP materials may have been disturbed.

Poudre School District
Construction Management and Support Department
Environmental Compliance Branch

Hazardous Substance Letter

The use of asbestos containing building materials (ACBM), lead based paint (LBP), and PCBs shall not be used in any building materials supplied under this Contract with Poudre School District. Toxic foam shall not be used if said foam may be subject to fire.

As a part of this Contract, upon completion of the project, the Contractor shall supply a written certification that none of the above mentioned hazardous substances were used on this project. The written certification shall be delivered to Poudre School District Construction Management & Support. See Design Appendix AA for letter template.

Hazard Communication Standard

All General Contractors and/or Subcontractors performing Work for the District at sites owned or occupied by Poudre School District (Owner) shall comply with OSHA Hazard Communication Standard 29 CFR Part 1910.1200 and 29 CFR 1926.1101 Section (d)(1) Multi–Employer Work–Site as applicable. In order to provide a safe and healthy environment to all site occupants, the District requires the following:

1. For each chemical product used on a District site, the Contractor and/or Subcontractor shall provide a copy of the Safety Data Sheet (SDS) to Owner CM&S **prior to starting work**.

2. For each chemical product used on a District site, the Contractor and/or Subcontractor shall maintain on the work site a copy of the Safety Data Sheet (SDS) throughout the duration of the project.

3. Report to Owner CM&S all spills and personnel exposures occurring in the course of Work on District property. The Contractor and/or Subcontractor will be responsible for all spills, personnel exposures, and will bear the cost of cleanup. Such reports will be first reported by telephone, 367–3060, and immediately following discovery of the incident and followed up in writing no later than five (5) working days after the initial telephone report.
   When reporting a spill, the Contractor and/or Subcontractor shall supply the following information:

   1) Substance(s) spilled
   2) Quantity of spill
   3) Personal injury involved
   4) Exact location of spill
   5) Containment procedures initiated
   6) Anticipated clean up and disposal procedures
   7) Disposal location of spill residue
   8) Assistance required
   9) Narrative summarizing all communication with Local, State, and Federal offices and media contacts with their names and telephone numbers or addresses.

4. The Contractor and/or Subcontractor shall take immediate action to clean up the spill unless directed otherwise by Owner CM&S.

SECTION 01 35 43 – HAZARDOUS MATERIALS STANDARD OPERATING PROCEDURES

PART 1 GENERAL

1.0 DESCRIPTION

A. Each Contractor shall read and review all Standard Operating Procedures.

B. Each Contractor shall comply with the requirements outlined in the Standard Operating Procedures if applicable to the project.

C. Removal Logs shall be completed and maintained during the project as outlined in the Standard Operating Procedure and returned to PSD CM&S upon completion of the project.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

Poudre School District
Standard Operating Procedures
for Hazardous Materials Management

Mercury Lamp Disposal Program

Removal by Contractors

Summary

This work practice covers the procedure for removing mercury–containing lamps (fluorescent, green-tipped and specialty lamps) by a General Contractor and/or Subcontractor.

Examples

The following are examples of work that can be performed using this procedure. If job conditions vary from the examples, stop work and notify the Environmental Compliance Branch.

A. Removal of spent or faulty mercury containing lamps (fluorescent, high pressure sodium, mercury vapor, metal halide, and high intensity discharge).

B. Removal of mercury containing lamps during renovations, upgrades and replacement programs.

Related Work Practices for Environmental Compliance Personnel

A. Transportation of Mercury Containing Lamps.

B. Storage and Disposal of Mercury Containing Lamps.

Worker Recommendation

A. One worker is required for this procedure.

Note:

Fluorescent, green-tipped and specialty lamps contain mercury. Approximately 100 lamps contain 4 grams of mercury. One gram of mercury can contaminate a 20–acre lake so severely the fish are inedible. As a result of possible mercury contamination in landfills, the Colorado Department of Public Health and Environment (CDPHE) has regulated spent mercury lamps as a hazardous waste.
All General Contractors and/or Subcontractors performing work for the District at sites owned or occupied by Poudre School District shall comply with Environmental Protection Agency (EPA), and CDPHE regulations when removing and disposing of mercury containing lighting lamps.

Rev 050803

Poudre School District

Standard Operating Procedures
for Hazardous Materials Management

Mercury Lamp Disposal Program

Removal by Contractors

Work Practice

1. Contractors are responsible for the collection and storage of mercury lamps removed during renovations, upgrade and replacement programs. The lamps must be stored in the boiler room, mechanical room, custodial room, or an area, which limits access by the students.

2. Mercury lamps which will not be reinstalled must be placed into an appropriate lamp container for proper disposal.

3. Examples of lighting lamps used throughout the District which contain mercury include the following list:

    a. Fluorescent Lamps – 2', 3', 4', 6', 8', and U–tubes

    b. High Pressure Sodium Lamps

    c. Mercury Vapor Lamps

    d. Metal Halide Lamp

    e. High Intensity Discharge (HID) Lamps

4. Incandescent lamps do not contain mercury. The contractors and/or subcontractors shall properly dispose of non–mercury lighting lamps as general waste, as per contract documents.

5. TRY NOT TO BREAK LAMPS DURING REMOVAL.

6. Remove mercury lamp and place into cardboard shipping box, which contained the new lamps. If the original cardboard boxes are not in good condition, capable of transporting the lamps, or are not the correct size, call the Environmental Compliance Secretary at 303–326-2115, Ext. 28621 for additional cardboard lamp boxes to be delivered or pickup of boxes at completion of project.

7. All lamps must be segregated by size and type. Any type or size of mercury lamp (sodium, high intensity discharge, mercury vapor, and metal halide) that is removed must be placed into the appropriate cardboard lamp box. When cardboard boxes are full, they must be properly secured with tape, to ensure lamps will not slide out during transport.

Note: The District is responsible for pick up and disposal of the mercury lamps. Lamp boxes that are not properly segregated and/or sealed will not be picked up. The Contractor will make appropriate corrections, prior to rescheduling a pick up.

Rev 050803

Poudre School District
Standard Operating Procedures
for Hazardous Materials Management

PCB and Electronic Ballasts Removal by Contractors

Summary

This work practice covers the procedure for removing a polychlorinated biphenyl (PCB) and electronic ballasts from a light fixture by a General Contractor and/or Subcontractor.

Examples

The following are examples of work that can be performed using this procedure. If job conditions vary from the examples, stop work and notify the Environmental Compliance Branch.

A. Removal of non–leaking faulty PCB ballast.

B. Removal of leaking and/or smoking faulty PCB ballast.

C. Removal of PCB ballast during renovations, upgrades, and replacement programs.

D. Removal of electronic ballasts during renovations, upgrades and replacement programs.

Related Work Practices for Environmental Compliance Personnel

A. Transportation of PCB or Electronic Ballasts

B. Storage and Disposal of PCB or Electronic Ballasts

Worker Recommendation

A. At least one electrician is required for this procedure.

Notes

A. Ballast consists of a transformer coil and a capacitor. The capacitor is immersed in approximately 20 milliliters of dielectric fluid and is sealed inside a metal container. The dielectric fluid may or may not contain PCBs.
B. Electronic ballasts do not contain PCB's but may contain regulated heavy metals and are considered eWaste and must be recycled as a means of disposal.

All General Contractors and/or Subcontractors performing work for the District at sites owned or occupied by Poudre School District shall comply with Environmental Protection Agency (EPA), and the Toxic Substance Control Act (TSCA) when removing and disposing of PCB containing lighting ballasts.

Rev 2015

Poudre School District
Standard Operating Procedures
for Hazardous Materials Management

PCB and Electronic Ballasts Removal by Contractors

Work Practice

1. Determine if the ballast contains PCBs or is electronic.

A. PCB - The ballast must be clearly marked NO PCBs to be considered non–PCB containing ballast. Regardless of manufacture date, if ballast is not marked in this manner, it must be considered to be a PCB containing ballast.

B. Non-PCB - The contractors and/or subcontractors shall properly dispose of non–PCB lighting ballasts as general waste, or per the contract documents.

C. Electronic – The ballast must be placed in appropriate container for recycle.

2. Non–leaking PCB Ballast

A. Clip off the connecting wires on the ballast as close as possible to the PCB ballast. (PCB disposal services charge by the pound).

B. Remove PCB ballast and place in 55–gallon drum provided by the District.

C. Do NOT fill the drum more than 3/4 full.

D. Complete Poudre School District PCB ballast removal log (see attachment 1). A PCB ballast removal log must be completed as the drum is filled.

E. When the drum is 3/4 full or the project is complete, put on the lid and secure the lock ring.

F. Contact the Environmental Compliance Branch when additional drums are needed, to schedule a drum pick up, or when the project is complete. The contractor must provide the completed PCB removal ballast logs when the drums are picked up.

3. Leaking and/or smoking PCB ballast

A. Latex gloves must be worn.

B. Use putty knife to remove bulk of residue.

C. Use WD–40 lubricant and a paper towel to clean up any remaining residue.

D. Clip off the connecting wires on the ballast as close as possible to the PCB ballast. (PCB disposal services charge by the pound).

E. Place PCB ballast, gloves, and contaminated cleaning materials into a plastic zip lock bag and place into 55 gallon drum labeled A Leaking PCB Ballast@, provided by the District.

F. Do NOT fill the drum more than ¾ full.

G. Complete Poudre School District PCB Ballast Removal Log (See Attachment 1). A PCB ballast removal log must be completed as the drum is filled.

H. When the drum is ¾ full, or the project complete, put on the lid and secure the lock ring.

I. Contact the Environmental Compliance Branch, when additional drums are needed to schedule a drum pick up, or when the project is complete. The contractor must provide the completed PCB removal ballast logs when the drums are picked up.

J. Pickup / Disposal
The District is responsible for pickup and disposal of the PCB ballasts. Contact the Environmental Compliance Branch at (303) 326-2115, X 28621 to schedule pick up of the full drums.

PCB BALLAST REMOVAL LOG

Date	Site	Room	Manufacturer	Date Manufactured	Leaking?

Comments

_____

_____

_____

Signature _____ Date _____

Please return signed and dated log(s) to the Environmental Compliance Branch.
Contact: (303) 326-2115, X28621.

Poudre School District
Standard Operating Procedures
for Hazardous Materials Management

Mercury Devices Removal by Contractors

Summary

This work practice covers the procedure for removing mercury containing devices by a General Contractor and/or Subcontractor.

Examples

The following are examples of work that can be performed using this procedure. If job conditions vary from the examples stop work and notify the Environmental Compliance Branch.

A. Removal of a mercury device, such as a thermometer, thermostat, gauge, manometer, switch or relay.

B. Removal of mercury devices during renovations, upgrades, and replacement programs. Such as; replacement of the boiler.

Related Work Practices for Environmental Compliance Personnel

A. Storage and Disposal of Mercury Devices

Worker Recommendation

A. One worker is required for this procedure.

Note

Mercury devices can contain from 0.5 grams to 4 grams of mercury. The Colorado Department of Public Health and Environment (CDPHE) and the Environmental Protection Agency (EPA) has regulated mercury as a hazardous substance. Therefore any associated mercury components must be managed and disposed of properly.

All General Contractors and/or Subcontractors performing work for the district at sites owned or occupied by Poudre School District shall comply with EPA and CDPHE regulations when removing and disposing of mercury containing devices.

Rev 050803

Mercury Devices Removal by Contractors

Work Practice

1. Many commonly used devices which contain mercury are used throughout the District. The following list identifies examples of these:

   A. Mercury thermometers – fever/oral and laboratory thermometers.

   B. Mercury switches and relays – are found in many motion or position sensitive devices. Tilt switches can be found in or under the lids of clothes washers, chest freezers, or car trunks. Float switches are used in sump and bilge pumps to turn the equipment on and off. Relays can be found in thermostats, boilers, and other heating devices as well.

   C. Mercury containing thermostat probes – can be found in gas–fired appliances that have a pilot light. These include; ranges ovens, clothes dryers, heaters, furnaces, and space heaters. Mercury probes are also known as flame sensors or gas safety valves.

   D. Mercury Gauges – can be found in machinery and appliances, which use air pressure as a means of measure. These include manometers, barometers, sphygmomanometers (blood pressure units), and vacuum gauges.

2. Remove mercury switch, relay, thermostat, probe or gauge from appliance, vehicle or machinery and store in zip lock plastic bag. If the component is too large for a zip lock plastic bag, larger bags will be provided.

3. Store mercury thermometers in zip lock plastic bags as well.

4. The District is responsible for pick up and disposal of the mercury containing devices. Contact the Environmental Compliance Branch at (303) 326-2115 X28621 to schedule pickup of the mercury devices once they have been removed and placed into plastic bags.

Rev 050803

Poudre School District
Standard Operating Procedures
for Asbestos Containing Materials

Asbestos Containing Roofing Materials Removal by Contractor

Summary

This work practice covers the procedures for removing asbestos containing roofing materials by a General Contractor and/or Subcontractor.
Examples

The following are examples of work that can be performed using this procedure. If job conditions vary from the examples, stop work and notify your PSD Project Coordinator.

A. Removal of built up roofs with asbestos containing materials in the field (felts and insulations) that may become friable.
B. Removal of asbestos containing roof flashings or shingles.

Methods of Compliance

The following methods of compliance shall be followed for all asbestos containing roofing

materials:

A. An OSHA competent person must supervise all work. The competent person must inspect onsite at least once during each work shift and upon employee request.
B. Workers must have completed an 8 hour OSHA training that can include hands–on experience as required for OSHA Class II work.
C. All requirements for employee medical surveillance, periodic monitoring, and exposure monitoring should be complied as outlined for OSHA Class II work methods.
D. The following engineering controls and work practice shall be used for ALL types of asbestos containing roofing material removal operations:
    a. Vacuum cleaners equipped with HEPA filters to collect all asbestos containing debris and dust.
    b. Wet methods or wetting agents to control employee exposures except when infeasible.
    c. Prompt cleanup and disposal in leak–tight containers of asbestos–contaminated wastes and debris.

Work Practices

A. Built Up Roofs (Removal With a Power Cutter with Mister or Wet Methods)
    a. Isolate roof level heating and ventilation air intake sources or shut down the ventilation system
    b. Use power cutters equipped with HEPA dust collectors or perform HEPA vacuuming along the cut line for roofs that have asbestos containing roofing felts and an aggregate surface.
    c. Use power cutters equipped with HEPA dust collectors, or perform HEPA vacuuming along the cut line, or gently sweep along the cut line and then

carefully and completely wipe up the still–wet dust and debris that was acquired for roofs that have asbestos containing roofing felts and a smooth surface.

d. Do not drop or throw to the ground ACM that has been removed from a roof.
e. Carry or pass the ACM to the ground by hand, or lower the material to the ground via covered, dust–tight chute, crane or hoist.
f. Lower both intact ACM and non–intact ACM to the ground as soon as it is practicable, but no later than the end of the work shift.
g. Keep material wet if it is not intact, or place it in impermeable waste bags, or wrap it in plastic sheeting while it remains on the roof.
h. Lower to the ground, as soon as possible or by the end of the work shift, any unwrapped or unbagged roofing material using a covered dust–tight chute, crane or hoist
i. Place unwrapped materials in closed containers to prevent scattering dust after the materials reach the ground.
j. Material shall be labeled, manifested and disposed of as asbestos containing waste.
k. Poudre School District shall be named as the generator of the waste. Manifests shall be returned to Poudre School District.
l. If properly equipped power cutters are not used, the work practices outlined for roof flashings shall be used.

B. Roof Flashing or Shingles
   a. Isolate roof level heating and ventilation air intake sources or shut down the ventilation system.
   b. Do not grind, abrade or break the material unless infeasible. Use non–mechanical means to remove the material such as pry bars.
   c. Wet the material thoroughly with amended water before and during removal.
   d. Remove the material intact, if possible.
   e. Bag or wrap removed material immediately or keep it wet until transferred to a closed receptacle no later than the end of the work shift.
   f. Bags or wrapped materials shall be lowered to the ground and placed in a closed receptacle.
   g. Material shall be labeled, manifested and disposed of as non–friable asbestos containing waste.
   h. Poudre School District shall be named as the generator of the waste. Manifests shall be returned to Poudre School District.

C. Prohibited Work Practices
   a. Grinding
   b. Abrading
   c. Dry Removal
   d. Dry Sweeping
   e. No compressed Air

Note

All General Contractors and/or Subcontractors performing work for the District at sites owned or occupied by Poudre School District shall comply with all OSHA, EPA, CDPHE, NESHAP and DOT regulations regarding the removal, transportation and disposal of all asbestos containing roofing materials.

Rev052013

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Engineer or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:

1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
2. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
3. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Engineer.

C. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

D. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

E. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
11. Name and signature of inspector.
12. Recommendations on retesting and reinspecting.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.7 QUALITY CONTROL

A. Owner Responsibilities: Owner shall not bear responsibility for quality control.

B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
2. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.

3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for commencement of the Work.

1. Distribution: Distribute schedule to Owner, Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.8 SPECIAL TESTS AND INSPECTIONS

A. None.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 ACCEPTABLE TESTING AGENCIES

A. Local Fire Marshal or AHJ Representative.

3.2 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Owner’s and Engineer’s reference during normal working hours.

3.3 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 41 00

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY:

A. Work Included: This Section contains a list of applicable building codes, mechanical codes, plumbing codes, electrical codes, fire codes, and other regulations applicable to the work.

B. Related Work:

1. Permits, fees, and tax-exempt status of the Owner are referenced in the General Conditions and Supplementary Conditions.

2. Applicable reference standards are specified in Section 01095.

3. Code compliance testing and inspections are referenced in Section 01410.

1.2 REFERENCES:

A. Jurisdictional Agencies: For the purpose of plan review and permitting the following governmental agencies or authorities have jurisdictional and review authority over work associated with installation of utilities.

1. See instruction to Bidders.

B. Applicable Codes:

1. International Building Code (IBC) Latest Edition.

2. International Mechanical Code (IMC) Latest Edition.

3. International Plumbing Code (IPC) Latest Edition.

4. National Electric Code (NEC) Latest Edition.

5. International Fire Code (IFC) Latest Edition.

6. State of Colorado

a. Division of Fire Safety

7. Federal Requirements and guidelines

a. American National Standards Institute Specifications to Make Buildings and Facilities Accessible to and Usable by Physically Handicapped People ADA(ANSI A117.1-1986)

b. National Fire Protection (NFPA) Code applicable sections of current publication.

c. Occupational Safety and Health Administration (OSHA)

d. Environmental Protection Agency (EPA)

8. Underwriters Laboratories (UL)

9. Additional codes, standards, or other requirements as stated within the technical sections of the Specifications or noted on the Drawings.

C. Conflicts Between Requirements: In the event of a conflict between any of the applicable or stated regulatory requirements or reference standards, or between the regulatory requirement or reference standards and the requirements of the Contract Documents, the more stringent requirements shall take precedence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 41 00

SECTION 01 41 23– LARIMER COUNTY BUILDING DEPARTMENT FEE SCHEDULE FOR POUDRE SCHOOL DISTRICT

MATCH STATE OF COLORADO FEES AS CALCULATED AT:

https://www.colorado.gov/pacific/dfpc/school-construction

SECTION 01 42 00

REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section.

1.2 SUMMARY

A. Section Includes: Definitions of certain terms used in the specifications, and explanations of the language, abbreviations thereof, format and certain conventions used in the specifications and associated Contract Documents.

B. Limitations of Scope: The definitions and explanations of this section are not necessarily either complete or exclusive, but are general for the work to the extent such as definitions or explanations are not stated more explicitly in other provisions of the Contract Documents.

1.3 DEFINITIONS

A. General Requirements: Provisions and requirements of other Division 1 Sections apply to the entire work of the Contract and to other elements of work which are included in the Project.

B. Indicated: The term "indicated" refers to graphic representations, notes or schedules on the drawings, to other paragraphs or schedules in the specifications, and to similar requirements in the Contract Documents. Where terms such as "shown", "noted", "scheduled" and "specified" are used, it is to help locate the reference, no limitation on location is intended.

C. Directed: Terms such as "directed", "requested", "authorized", "selected", approved", "required", "accepted", and "permitted" mean "directed by the Engineer", "requested by the Engineer", and similar phrases. However, no such implied meaning will be interpreted to extend the Engineer's responsibility into the Contractor's area of construction supervision.

D. Installer: The entity (person or firm) engaged by the Contractor, either as an employee, Subcontractor or lower tier for the performance of a particular construction activity, including installation, erection, application and similar required operations. Installers are required to be experienced in the operations they are engaged to perform. The term "experienced", when used with the term "Installer" means having completed a minimum of 5 successful previous projects similar in size and scope to this Project, and being familiar with the precautions required, and having complied with requirements of the authorities having jurisdiction.

1. Where the specifications require Installer experience or other qualifications, such requirements apply to the firm and not to its employees or individual members. Where firm ownership has changed after the required experience occurred, Engineer and Owner reserve the right to consider the ownership change as invalidating the experience requirements.

E. Specialists: The Specification requires that certain specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and the assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.

1. These requirements shall not be interpreted to conflict with the enforcement of the building codes and similar regulations governing the Work. They are also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

F. Trades: The use of certain titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter". It also does not imply that the requirements specified apply exclusively to tradespersons of that corresponding generic name.

G. Project Site: The space available to the Contractor for the performance of the Work, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the project site is shown on the drawings, and may or may not be identical with the description of the land upon which the project is to be built.

H. Testing Agency or Laboratory: An independent entity engaged to perform specific inspections or tests of the work, either at the project site or elsewhere; and to report on, and if required, interpret the results of those inspections or tests.

I. Approve: Where used in conjunction with the Engineer's action on the Contractor's submittals, applications and requests, is limited to the Engineer's responsibilities and duties as specified in the General and Supplementary Conditions. Such approval shall not release the Contractor from responsibility to fulfill requirements of the Contract Documents, unless otherwise provided in the Contract Documents.

J. Regulation: The term "Regulations" includes laws, statutes, ordinances and lawful orders issued by authorities having jurisdiction, as well as rules, conventions and agreements within the construction industry that control performance of the Work.

K. Contractor's Option: Where materials, products, systems or methods are specified to be at the Contractor's option, the choice of which material, method, product or system will be used is solely the Contractor's. There will be no change in Contract Sum or Time because of such choice.

L. Furnish: The term "furnish" is used to mean, "supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations".

M. Install: The term "install" is used to describe operations at the project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations".

N. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use".

O. Guarantee: The narrow definition of the term "warranty" is hereby established as applying to both "warranty" and "guarantee" which terms are used interchangeably.

1.4 SPECIFICATION EXPLANATIONS

A. Specification Content Conventions: In certain circumstances language used in specifications and other Contract Documents is of the abbreviated type. Implied words and meanings will be appropriately interpreted. Singular words will be interpreted as plural and plural words will be interpreted as singular where applicable and where the full context of the Contract Documents so indicates.

B. Specification Format: These specifications are organized into Divisions and Sections based on the CSI 50 Division format, generally conforming to CSI "Masterformat" for section titles and numbers.

C. Imperative Language: Imperative language is used generally in the specifications. Requirements expressed imperatively are to be performed by the Contractor. At certain locations in the text, for clarity, contrasting subjective language is used to describe the responsibilities which must be fulfilled either indirectly by the Contractor or, when so noted, by others.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 42 00

SECTION 01 45 00

QUALITY CONTROL

PART 1 - GENERAL

1.1 SUMMARY:

A. Work Included: This Section defines the responsibilities of the various agencies or parties performing testing and inspection services as specified herein or required by the Contract Documents.

B. Related Work: Additional or specific testing and inspection requirements may be described in the various individual Sections of these Specifications. Failure to list specific testing or inspection requirement in this Section does not relieve the Contractor from providing all tests which are indicated to be his responsibility, or from cooperating with the testing and inspections agency or others who may be performing quality assurance tests or inspections.

C. Testing and Inspections Agency: Quality assurance testing and inspections will be provided by an independent testing and inspections agency selected and paid for by the Owner.

D. Limitation of Authority: The testing and inspections agency is not authorized to release, revoke, or alter the requirements of the Contract Documents, or to approve or accept any portion of the Work without the Architect's written consent.

1.2 REFERENCES:

A. Related Documents: As stipulated in Section GC 21.2. of the General Conditions

B. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

C. Reference Standards: Comply with requirements of all reference standards, codes, ordinances, rules and regulations contained in the various Sections of these Specifications, except where more stringent requirements are listed herein or otherwise required by the Contract Documents. A complete listing of applicable reference standards, including full name of publishing agency and date or edition number is contained in Section 01095.

D. Perform testing and inspection in manner that will not interfere with Contractor's obligation to comply with requirements of General Conditions and Division 1 - General Requirements, as well as the provision of all applicable laws, codes, ordinances, rules, and regulations.

E. Conform to general requirements of reference information listed below for testing and inspection as well as specific requirements listed in Specification Sections listed under 1.2 Services in this Section.

1. American Society for Testing and Materials (ASTM):

a. ASTM E329-77 (1983) Standard recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

1.3 DEFINITIONS:

A. Quality Assurance Tests and Inspections: All tests and inspections specified herein or elsewhere in the Contract Documents which are performed by the independent testing and inspections agency to determine compliance of materials, products, equipment, or complete work with the requirements of the Contract Documents.

B. Code Compliance Tests and Inspections: Mandatory tests or inspections required by codes or ordinances, or by building officials or other authorities having jurisdiction over the Work.

C. Contractor's Convenience Tests and Inspections: Tests or inspections performed exclusively for the Contractor's convenience or information. Additional concrete test cylinders taken on behalf of the Contractor to determine early break strength are considered Contractor convenience tests.

D. Re-Testing: Subsequent testing or inspections of the Work or any portion of the Work for which initial testing has indicated non- compliance with the Contract Documents or with applicable codes, ordinances, rules, and regulations.

1.4 SUBMITTALS:

A. Test and Inspection Reports: Copies of all test and inspection reports will be promptly delivered by the testing and inspections agency directly to all interested parties as follows:

1. Owner - one copy

2. Architect - two copies

3. Architect's consultant - one copy

4. Contractor - two copies

1.5 PAYMENT FOR TESTS AND INSPECTIONS (Reference GC 21.2):

A. Initial Quality Assurance Tests and Inspections: Paid for by the Owner.

B. Code Compliance Tests and Inspections: Paid for by the Contractor.

C. Contractor's Convenience Tests and Inspections: Paid for by the Contractor.

D. Additional or Alternative Test and Inspections: Paid for by the Owner if the materials or work tests is found to be in compliance with the Contract Documents; otherwise paid for by the Contractor.

E. Re-Testing: Paid for by the Contractor.

1.6 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications - The testing and inspection agency shall have a minimum 5 years continuous experience preceding date of these Contract Documents, and be qualified in accordance with the following American Society for Testing and Materials (ASTM) publications:

1. ASTM D3666-83 Standard Practice for Evaluation of Inspection and Testing Agencies for Bituminous Paving Materials.

2. ASTM D3740-80 Standard Practice for Evaluation of Agencies engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

3. ASTM E548-84 Standard Practice for Generic Criteria for Use in the Evaluation of Testing and Inspection Agencies.

4. ASTM E699-79 (1984) Standard Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee E-6.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 COOPERATION WITH TESTING AND INSPECTIONS AGENCY:

A. Access To The Work: Representatives of the testing and inspections agency or other legally constituted testing or inspections personnel shall have unrestricted access to the site and all other locations where the Work is in progress, including borrow pits batch plants, material yards, or other locations where materials are being obtained or stored.

B. Facilities For Testing: Provide all necessary facilities required for testing and inspecting the Work, including but not limited to, safe hoists or scaffolding, lighting, lifts, suitable safe storage areas for freshly poured concrete test cylinders, and incidental labor required to assist the testing and inspections agency in field testing or inspections.

C. Notifications: Notify the testing and inspections agency not less than forty-eight (48) hours prior to tentative date or time when testing and inspection services will be required. Re-confirm date and time not less than twenty-four (24) hours prior to time when such services will be required.

3.2 TEST AND INSPECTION PROCEDURES:

A. General: Gathering of specimens or samples, measuring, and testing of all materials, products, or other work shall be performed according to the procedures of the referenced standard test method.

B. Taking Specimens: Unless otherwise indicated, all specimens and samples for testing will be taken by the testing and inspections agency personnel, either at the source of the material or at the site for work in progress.

C. Delivery of Specimens: Unless otherwise indicated, pick-up and delivery of specimens or samples to the testing and inspections agency's laboratory will be done by the agency's personnel. This includes concrete test cylinders which have been stored on site for the initial curing period.

D. Re-Testing: When initial tests or inspections indicate non- compliance of the Work or any portion thereof, the non-complying portion shall be removed, replaced, or re-worked (re-compacted in the case of subgrade, fill, or backfill material), and re-tested by the same agency performing the initial test or inspection. Do not proceed with additional work until the non-complying work has re- tested and found to be in compliance.

E. Additional Or Alternative Tests:

1. The Owner and the Architect reserve the right to require additional or alternative tests or inspections of materials or work for which either has reason to believe may not be in compliance with the requirements of the Contract Documents.

2. Examples of such additional tests may include, but are not limited to, additional sieve analysis of aggregates or granular fill material; additional field density tests of subgrade, fill, or backfill materials; additional core tests asphaltic concrete paving; additional slump tests of concrete as it is being placed; core tests of in-place structural concrete; load testing of concrete structures; ultrasonic, X- ray, or other non-destructive testing of structural steel; and field cut test strips of membrane roofing.

3. Payment for additional or alternative tests will be determined as provided herein above.

3.3 SCHEDULE OF QUALITY ASSURANCE TESTS AND INSPECTIONS:

A. General Notes:

1. Carefully examine the individual Sections of these Specifications for additional or complete quality assurance testing and inspections requirements. Failure to include any test or inspection in this schedule does not relieve the Contractor of his responsibility for timely notification of the testing and inspections agency for quality assurance tests or inspections which may be listed in the individual Sections of the Specifications but not in this schedule.

2. This schedule includes quality assurance tests and inspections only, which will be performed by the selected testing and inspections agency and paid for by the Owner. Code compliance tests and inspections, Contractor's convenience tests and inspections, and additional or alternative tests and inspections requested by the Owner are not included.

B. Soils - Materials and Compaction:

1. Fill and Backfill Materials: Test existing on-site soils and borrow materials proposed for use in filling and backfilling operations as follows:

a. Moisture Content: ASTM D2216

b. Maximum Index Density: ASTM D4253

c. Moisture Density Relations: ASTM D698 (Standard Proctor), ASTM D1557 (Modified Proctor), or ASTM D4253, as specified herein or as applicable for soil types.

d. Plasticity Index: ASTM D4318

e. Particle Size Analysis (borrow materials only): ASTM D422

3. Moisture and Density Analysis: Prepare not less than one optimum moisture and maximum density curve for each type of existing or imported soil proposed for use in filling or backfilling, including structural fill and base courses for paving.

4. Field Tests:

   a. Perform field density tests in accordance with ASTM D1556, ASTM D2167, or ASTM D2922.

   b. Perform field moisture tests in accordance with ASTM D3017.

5. Test Quantities:

   a. Trenching:

      i. Perform one field density and moisture test for every 150 lf or major fraction thereof, of trench backfill, taken at the trench bottom and at two ft. vertical intervals in the compacted fill depth. In no case will less than eight tests be made.

      ii. Where underground utility lines penetrate foundations, perform field density tests at the trench bottom and at every two feet of vertical rise in compacted fill elevation, at points two feet and ten feet in horizontal distance from the foundation wall.

   b. Site Grading and Miscellaneous Fills: One test for every 100 cy of fill and for every foot of vertical rise in compacted fill elevation, but in no case less than two tests for each day's work.

6. Failings: If, based on the testing and inspection agency reports and inspections, compacted subgrade or fills are found to be below specified density, provide additional compaction and testing in accordance with the "Re-Testing" provisions of this Section.

C. Concrete:

1. Referenced Sections: Tests and inspections are limited to:

   a. Section 03 30 00 – Cast-In-Place Concrete

D. Miscellaneous Metal Fabrications:

Visually inspect shop and field welding and bolting of kiln enclosure structural connections. Welds or bolts which do not pass visual inspection will be tested as specified above at the Contractor's expense.

E. Drilled-in Anchors:

a. Equipment: Prior to installation of drilled-in anchors, verify that the Contractor has the proper equipment for drilling holes of the required diameter and length in the applicable substrate.

b. Epoxy-bonded Anchors: Observe on-site the installation of the first fifty anchors; verify that drilled holes are of proper diameter and depth, that holes are properly cleaned prior to installation of anchors, and that holes are completely filled with properly mixed epoxy after installation.

c. Visual Inspection: Visually inspect all anchors after installation to ensure installation perpendicular to the substrate and to proper depth.

d. Inspect not less than 20 randomly selected anchors of each type at each structural level for tightness using a method recommended by the testing and inspections agency and approved by the Architect. If at any time the number of rejectable anchors exceeds 5% of that type anchor tested at that level, test all inserts at that level using the same test method. Continue testing at the 100% rate on all succeeding levels until 5% or less of the anchors tested at any level are found to be rejectable. All costs of additional testing shall be borne by the Contractor.

F. Radiographic (X-ray) testing may be substituted for ultrasonic testing at the option of the testing agency and with the approval of the Project Manager.

END OF SECTION 01 45 00

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include the following:

1. Division 01 Section "References" for applicable industry standards for products specified.
2. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
3. Divisions 02 through 49 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
2. Form: Tabulate information for each product under the following column headings:
   a. Specification Section number and title.
   b. Generic name used in the Contract Documents.
   c. Proprietary name, model number, and similar designations.
   d. Manufacturer's name and address.
   e. Supplier's name and address.
   f. Installer's name and address.
   g. Projected delivery date or time span of delivery period.
   h. Identification of items that require early submittal approval for scheduled delivery date.
3. Initial Submittal: Within 30 days after Notice to Proceed, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
   a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
4. Engineer's Action: Engineer will respond in writing to Contractor within 15 days of receipt of completed product list. Engineer's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Engineer's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.
5. Completed List: Within 30 days prior date of commencement of the Work, submit 2 copies of AHJ-approved submittals.
6. Engineer's Action: Engineer will respond in writing to Contractor with a notice to proceed.

B. Substitution Requests: Where substitutions are allowed submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use CSI Form 13.1A.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
   a. Statement indicating why specified material or product cannot be provided.
   b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
   c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
   d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
   e. Samples, where applicable or requested.

f. List of similar installations for completed projects with project names and addresses and names and addresses of engineers and Owners.
g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
j. Cost information, including a proposal of change, if any, in the Contract Sum.
k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Engineer will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
a. Form of Acceptance: Change Order.
b. Use product specified if Engineer cannot make a decision on use of a proposed substitution within time allocated.

C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Engineer will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
b. Use product specified if Engineer cannot make a decision on use of a comparable product request within time allocated.

D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.

2. If a dispute arises between contractors over concurrently selectable but incompatible products, Engineer will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
5. Protect stored products from damage and liquids from freezing.
6. Provide a secure location and enclosure at Project site for storage of materials and equipment. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Engineer will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Engineer's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.

7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Engineer's sample. Engineer's decision will be final on whether a proposed product matches.
    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, and textures" or a similar phrase, select a product that complies with other specified requirements.
    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Engineer will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Engineer will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Engineer will consider requests for substitution if received 30 days prior to commencement of the Work. Requests received after that time may be considered or rejected at discretion of Engineer.

B. Conditions: A Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.

8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

A. Conditions: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of Engineers and Owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 73 00

EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Sections include the following:

1. Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 01 Section "Submittal Procedures" for submitting surveys.
3. Division 01 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
4. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 SUBMITTALS

A. Qualification Data: For installers and specialists.

B. Certificates: Submit copies of certifications required in Division 1 and Divisions 02-49.

1.4 QUALITY ASSURANCE

A. Specialist Qualifications: A specialist holding a NICET Level II or higher certification in the subfield of Fire Alarms.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of electrical systems.

B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   a. Description of the Work.
   b. List of detrimental conditions, including substrates.
   c. List of unacceptable installation tolerances.
   d. Recommended corrections.
2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls and ceilings for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Engineer. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests on CSI Form 13.2A**.**

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Engineer promptly.

B. Record Log: Maintain a log of layout control work. Record deviations from required layouts. Make the log available for reference by Engineer.

3.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produces harmful noise levels.

F. Templates: Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Engineer.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 OWNER-INSTALLED PRODUCTS

3.6 No Requirements

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section.

1.2 SUMMARY

A. Section Includes: Administrative and procedural requirements for project closeout, including but not limited to:

1. Inspection procedures.
2. Project record document submittal.
3. Operating and maintenance manual submittal.
4. Submittal of warranties.

B. Specific requirements for individual units of work are specified in sections of Divisions 2 through 28.

C. Contractor's responsibility is to complete the project in accordance with the Contract Documents and to enforce their requirements on his employees, suppliers and Subcontractors.

D. Time of Closeout: Time of closeout is directly related to "Final Completion", and therefore may be either a single time period for entire work or a series of time periods for individual parts of the work which have been certified as complete at different dates.

E. That time variation shall be applicable to other provisions of this section, regardless of whether resulting from phased completion originally specified by the Contract Documents or subsequently agreed upon by Owner and Contractor.

1.3 FINAL COMPLETION (See General Conditions)

A. Preliminary Procedures: Contractor will notify Engineer of his claim for final completion in accordance with the General Conditions.

B. In the Application for Payment that coincides with, or first follows the date Final Completion is claimed, show 100% completion, less retainage, for the portion of the Work claimed as complete. Include supporting documentation for completion as indicated in the Contract Document. If 100% completion cannot be shown, include list of incomplete items, the value of incomplete construction, and reasons for the Work being incomplete. Submit statement showing accounting of changes to the Contract Sum.

C. Submit specific warranties, maintenance agreements, final certifications and similar documents. Obtain and submit releases enabling Owner unrestricted use of the Work and access to services and utilities, including occupancy permits, operating certificates, and similar releases.

D. Submit Record Drawings, maintenance manuals, and similar final record information. Refer to Sections 01 78 23, 28 13 16 and 28 31 00.

E. Deliver tools, spare parts, extra stocks of materials, and similar physical items to Owner.

F. Complete startup and testing of systems and instructions for Owner's operating/maintenance personnel. Discontinue or change over and remove from project site temporary facilities and services, along with construction tools and facilities, mock-ups, and similar elements.

G. Complete final cleaning up requirements including touch-up painting. Touch up and otherwise repair and restore marred exposed finishes.

H. In order to act upon the Contractor's claim of Final Completion, the Owner and Engineer(s), as appropriate, will inspect the Project, provided specified prerequisites are met. If they find it complete, Owner will prepare a letter of Acceptance, or advise the Contractor by means of a "punch list" inspection report of items required for completion and acceptance. If Work is not complete, Contractor will be advised of general reasons for this judgment or specific areas of non-compliance with the Contract Documents requiring correction or completion for the Work to be considered complete. If during the "punch list" inspection more than 20 items are identified, the inspection will be canceled.

I. The "punch list" inspection will not be made until Project Record Documents, test reports and operating and maintenance manuals have been delivered to the Engineer and found by him to be complete.

J. The Contractor will proceed immediately to complete all items and will transmit to the Engineer weekly a report of the progress on or completion of each item on the "punch list" and the Contractor's list. Any non-conforming or incomplete work coming to the Engineer's attention during this period will be added to the list.

1.4 FINAL ACCEPTANCE (See General Conditions)

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List known exceptions in the request.

1. Submit final payment request (refer to Section 01 31 00) with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
2. Submit updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit copy of Engineer's final punch list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, endorsed and dated by Engineer.
4. Submit consent of surety to final payment. Submit final liquidated damages settlement statement. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Final Inspection: The Engineer will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Engineer. Upon completion of this inspection, the Engineer will prepare a letter certifying that the Project is finally and satisfactorily complete, or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance. If necessary, inspection will be repeated.

C. Reinspections: Should Engineer be required to perform more than two final completion inspections or more than one final inspection because of failure of Work to comply with original certifications of Contractor, Contractor will compensate Engineer for additional services.

D. Warranty Inspections: Refer to General Conditions.

1.5 CLOSEOUT DOCUMENTS

A. In order to complete the Project, provide the following documents:

1. Project Record Documents as set forth in General and Supplementary Conditions and Sections 01 78 23, 28 13 16 and 28 31 00.
2. Three copies of Operating and Maintenance Manuals for Equipment, Systems and Mechanical and Electrical Systems as specified in Division 28 sections.
3. Printed Warranties and instructions for use or maintenance as specified in the appropriate Sections.
4. Parts and Maintenance materials as specified in the appropriate sections.

1.6 START UP AND INSTRUCTIONS

A. Refer to Section 28 31 00.

1.7 REPLACEMENT MATERIALS

A. Assemble and deliver to Owner all specified extra or replacement materials as specified in Division 28 sections. Accompany with written list in triplicate itemizing each material, pattern, color; quantity; specification section. Obtain Owner's signature on list acknowledging receipt of materials and transmit signed copy to Engineer.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION (Not applicable)

END OF SECTION 01 77 00

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 -GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 SUMMARY

A. Section Includes: Administrative and procedural requirements for operating and maintenance manuals for mechanical, electrical and other equipment or systems.

B. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.

1.3 FORM OF SUBMITTALS

A. Prepare data in form of an instructional manual for use by Owner's personnel.

1. Format size: 8.5" x 11", 20 lb. minimum weight white paper for typed pages, either manufacturer's printed data, or neatly typewritten.
2. Drawings: Provide reinforced punched binder tab, bind in with text. Fold larger drawings to size of text pages. Provide indexed tabs and fly-leaf for each separate product, or each piece of operating equipment. Include typed description of product, and major component parts of equipment.
3. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
    a. Title of Project.
    b. Identity of separate structures as applicable.
    c. Identity of general subject matter covered in the manual.

B. Binders: Commercial quality three-ring binders with durable and cleanable plastic covers, 1" minimum, 2" maximum ring size. When multiple binders are used, correlate the data into related consistent groupings.

1.4 CONTENT OF MANUALS

A. Neatly typewritten table of contents for each volume, arranged in systematic order.

B. Contractor, name of responsible principal, address and telephone number.

C. A list of each product required to be included, indexed to content of the volume.

D. List, with each product, name, address and telephone number of:

1. Subcontractor or Installer.
2. Maintenance contractor, as appropriate.
3. Identify area of responsibility of each.
4. Local source of supply for parts and replacement.

E. Identify each product by product name and other identifying symbols as set forth in Contract Documents.

F. Product Data: Include only those sheets which are pertinent to the specific product. Annotate each sheet to clearly identify specific product or part installed, data applicable to installation.

G. Drawings: Supplement product data with drawings as necessary to clearly illustrate relations of component parts of equipment or systems and control diagrams. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.

H. Written Text: As required to supplement product data for the particular installation organized into consistent format under separate headings for different procedures. Provide logical sequence of instructions for each procedure.

I. Other Data: Copy of each warranty, bond and service contract issued. Provide information sheet for Owner's personnel, covering proper procedures in event of failure and instances which might affect validity of warranties or bonds.

1.5 MANUALS FOR EQUIPMENT AND SYSTEMS

A. Provide complete information for products specified in.

1. Fire alarm and detection systems: Section 28 31 00.
2. Access control systems: Section 28 13 00.

B. Submit manuals with complete data as required, including the following as applicable.
C. Description of Unit and Component Parts: Function, normal operating characteristics, and limiting conditions; calculations, engineering data and tests; complete nomenclature and commercial number of replaceable parts.

D. Operating Procedures: alarm, trouble, supervisory and normal operating instructions; and emergency instructions; special operating instructions.

E. Maintenance Procedures: Include routine operations, guide to "trouble-shooting", disassembly, repair and reassembly, alignment, adjusting and checking.

F. Instructions: Submit manufacturer's printed operating and maintenance instructions with description of sequence of operation, original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance covering predicted life of parts subject to wear and items recommended to be stocked as spare parts.

1. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel or when specified in respective sections.

G. Diagrams, Charts: Submit as-installed control diagrams by controls manufacturer, content for each electric and electronic system, as appropriate, circuit directories of panelboards, electrical service and distribution, controls, and communications systems with as-installed color coded wiring diagrams.

1.6 SUBMITTAL SCHEDULE

A. Submit one copy of completed data in final form fifteen days prior to final completion inspection. Copy will be returned after final completion inspection with comments. Submit 3 copies in final corrected form 10 days prior to final inspection or acceptance.

1.7 START UP AND INSTRUCTIONS

A. Prior to final inspection or acceptance, provide four hours of training for Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems.

B. Test and start up all systems as specified in the appropriate sections here so specified; arrange for each Installer to provide instructions to the Owner's personnel in the operations of such systems. Notify both the Engineer and the Owner, in writing, at least seven days in advance of such start-ups, tests, and demonstrations.

C. Include instructions by manufacturer's representatives when so specified or where installers are not expert in the required procedures. Review maintenance manuals, record documentation, tools, spare parts and materials, identification system, control sequences, hazards, cleaning and similar procedures and facilities.

D. For operational equipment, demonstrate start-up, shut-down, emergency operations, noise and vibration adjustments, safety, and similar operations. Review maintenance and operations in relation with applicable warranties, agreements to maintain, bonds, and similar continuing commitments.

1.8 FRAMED OPERATING AND MAINTENANCE INSTRUCTIONS

A. All mechanically and electrically operated equipment and controls shall be provided with legible and complete wiring diagrams, schematics, operating instructions, and pertinent preventative maintenance instructions in a sturdy frame with clear glass or plastic cover. Utilize non-fading, permanent media. Frames shall be located in the same room or service enclosure as the equipment, or in the nearest mechanical or electrical room.

B. Submit proposed instructions to Engineer for review and acceptance prior to installation.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION (Not applicable)

END OF SECTION 01 78 23

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 -GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 SUMMARY

A. Section Includes: The recording, maintenance, preparation and submittal of Project Record Documents.
B. Project Record Documents required include:
   1. Marked-up copies of contract drawings
   2. Marked-up copies of shop drawings
   3. Newly prepared drawings
   4. Marked-up copies of specifications and addenda
   5. Marked-up product data submittals
   6. Field records for variable and concealed conditions
   7. Record information on Work that is recorded only schematically

1.3 DOCUMENTS

A. General: Store Documents apart from documents used for construction and maintain documents in clean, dry, legible condition. Do not use record documents for construction purposes. Label each document "PROJECT RECORD" in 1" or larger printed letters. Make documents available at all times for inspection by Engineer, his Professional Consultants, and Owner.
B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
   1. Submit as-built shop drawings 24" x 36" or larger on reproducible media. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
   2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings. Note related Change Order numbers where applicable, in addition to showing actual changes. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
   3. Record drawing information with opaque lines and symbols conforming to Contract Drawings. Note where positions of elements have been changed. Follow methods directed by Engineer. Keep Record Documents current. Update at least weekly.
   4. Do not permanently conceal any work, including lay-in ceiling panels, until required information has been recorded.
   5. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
   6. Location of concealed valves, dampers, controls, balancing devices, junction boxes and other items requiring access or maintenance.
C. Record Specifications: Maintain three complete copies of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and

modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

D. Upon completion of the Work, submit record Specifications to the Engineer for the Owner's records.

E. Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendation. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark-up of record drawings and Specifications. Upon completion of the mark-up, submit complete set of record Product Data to the Engineer for the Owner's records.

F. Maintain product listing furnished under Section 01 33 00 and record any changes made to it, either brand, model, Subcontractor or Installer so that final listing will accurately reflect the materials, equipment and systems incorporated in the Work.

G. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Final Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Engineer for the Owner's records. Include manufacturer's certifications, field test records, copies of permits, licenses, certifications, inspection reports, releases, notices, receipts for fee payments, and similar documents.

1.4 SUBMITTAL

A. Complete this work and submit as specified in Section 01 77 00. Submit marked-up drawing prints and final product listing as part of final Completion Documents.

B. Submit revised and corrected mark-ups if initial submittal is unsatisfactory as part of Final Completion Documents.

C. Deliver record documents to Engineer including all items listed above under "Documents".

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION (Not applicable)

END OF SECTION 01 78 39

SECTION 01 94 00

FACILITY DECOMMISSIONING

PART 1 - GENERAL

1.1 SUMMARY:

A. Coordinate Facility Decommissioning with Owner:

1. General Conditions of the Contract

2. Coordinating Architect/Project Manager

B. Poudre School District will be provided the opportunity to reclaim salvageable materials/equipment. In the event waives the right to reclaim the used equipment then it becomes the property of the general contractor. Items included but not limited to the following:

1. Division 23: Mechanical units and equipment including components such as motors, fans, and compressors. No chillers.

2. Division 25: Thermostats

3. Division 26: Electrical panels, breakers, and fuses

4. Division 28: Fire/ Security Detection and Alarm components

1.2 RELATED WORK:

A. Section 02 41 00 – Demolition

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 94 00

SECTION 02 22 00

EXISTING CONDITIONS ASSESSMENT

PART 1 - GENERAL

1.1 DESCRIPTION:

A. A video to thoroughly document pre-construction existing conditions is mandatory for all Poudre School District capital construction projects, regardless of scope or contract amount.

B. For work at developed sites, test and document the performance of the irrigation system in the presence of Poudre School District personnel before commencing any excavation or irrigation system work.

C. Contact the Utility Notification Center of Colorado (UNCC) no less than 72 hours before commencing excavating or earth moving activity on Owner property.

D. Submittals:
   1. Submit reports, photographs, VHS or DVD within 7 calendar days of Notice to Proceed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 02 22 00

SECTION 02 41 00

DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. The work covered by this section consists of furnishing all labor, materials and equipment necessary to perform the demolition and removal specified herein or indicated on the drawings.

1.2 RELATED WORK:

A. Section 01 28 00 - Cutting and Patching

1.3 REFERENCES:

A. The Contractor shall comply with all codes and regulations of Poudre School District, City of Fort Collins and State of Colorado, and other governing authorities.

1.4 SUBMITTALS:

A. The procedures proposed for the accomplishment of demolition work shall be submitted for approval prior to the commencing work.

B. The procedures shall provide for safe conduct of the work, protection of property that is to remain undisturbed, coordination with other work in progress, non-interference with other contractors, and timely disconnection of utility services.

PART 2 – PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PREPARATION:

A. Coordinate the removal of debris with Owner's representative, a trash dumpster will not be allowed outside the construction area.

3.2 DEMOLITION AND REMOVAL:

A. All items to be removed unless otherwise noted on the drawings shall become the Contractor's property and shall be removed from the property and disposed of at the Contractor's expense.

B. Where removal to a line or point is required, except where toothing is specified, neatly and completely cut through material and remove demolished material as carefully as possible.

C. Partial removal will be permitted only when an item extends beyond the limits of the project.

D. Electrical work shall be removed as indicated or required with conduit and wire removed to the nearest junction. Remove controls and switches in conjunction with removed items. Abandoned boxes shall be blanked with stainless steel cover plates with finished edges.

E. Mechanical work shall be removed as indicated or required with abandoned and piping capped. Remove abandoned exposed piping and cap or plug at nearest main or junction. Remove all controls along with equipment.

3.3 UTILITIES:

A. Disconnection of Utilities: Utilities shall be disconnected at points required or as indicated on the drawings. Removal shall terminate in a manner and at a time satisfactory to the Architect and Owner. Where such disconnection will interrupt the utility services to an area not included in the contract, arrangements for such interruption shall be made with the Architect and Owner at least forty-eight (48) hours in advance of the interruption.

B. Utilities Not Indicated: When utility lines are encountered that are not indicated on the drawings, they shall be removed and/or relocated, as required, to the extent that they would project into or interfere with the new construction. Removal shall be approved by Poudre School Districts.

C. All pipes and conduits that remain in service shall be protected or rerouted, as required.

D. Take necessary precautions to avoid damage to all existing electrical, plumbing, heating and other service lines during breakthrough.

3.5 DISPOSITION OF MATERIALS AND EQUIPMENT:

A. Title to Materials: Title to all material and equipment to be demolished, is vested in the Contractor upon receipt of notice to proceed unless material or equipment is to be returned to Owner. The Contractor will be responsible for the condition, loss, or damage to such property after the notice to proceed.

B. Material and Equipment for Contractor Salvage: Salvage materials and equipment shall be promptly removed from the property.

C. Unsalvageable Materials: Concrete, masonry, and other non- combustible materials shall be disposed of by the Contractor at a suitable disposal site and not on the property. The Contractor shall comply with and obtain all necessary permits and licenses required for disposal of unsalvageable materials.

D. All materials indicated to be returned to Owner shall be delivered to Owner's storage facility. The facility shall be located within five (5) miles of the project. Verify exact location of storage unit with Owner.

3.6 PROTECTION:

A. The Contractor shall protect utility lines or appurtenances that are to remain and shall repair any construction-related damage.

B. The dust resulting from demolition shall be controlled to prevent it from spreading and to avoid creating a nuisance in the surrounding area. If the dust creates a nuisance in the operating portions of the facility, the demolition shall be suspended until the dust ceases to be a problem. The use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions.

3.7 REMODELING PATCH AND REPAIR WORK:

A. Review drawings and trade sections carefully to determine extent of all remodeling and patch and repair work. It shall be the Contractor's responsibility to establish the extent of such work by each trade and to see that all such work is completed as required by the drawings and these specifications.

B. Where shown or required as part of the work hereunder patching and repair work shall match in materials and finishes the adjoining or abutted surfaces. Although not specifically noted, sections of the detail specifications following shall apply to and govern the installation of such patching and repair work to the same extent as for new work of similar type and character.

C. Where new partitions or remodeling work is shown within existing rooms or spaces of the building, or where existing rooms or spaces are expanded or enlarged by removal of existing partitions, existing finishes shall be patched, repair or replaced as required either to match new finishes if so scheduled or to match existing work to remain.

D. Where minor alteration or remodeling work is required in an existing wall or partition to remain (such as a new door, cabinets, equipment, mechanical and electrical fixtures) such items shall be patched, repaired, or replaced as required to match existing adjacent finishes.

E. Walls, and partitions to be removed, shall be removed carefully in small sections in order that adjacent surfaces and equipment to remain will not be damaged.

F. Remove existing finish floor or walls surfaces where shown or scheduled; patch and repair concrete slabs as required due to demolition.

1. Protect all existing floors or walls to remain in areas to be remodeled from damage due to construction operations of every nature.

2. Where existing floors or walls must be drilled or cut to accommodate mechanical ductwork and piping, cut necessary openings, set necessary sleeves (for piping), and patch and repair around new opening, as required to match existing adjacent construction.

3.8 CLEANUP:

A. Debris and Rubbish: The Contractor shall remove debris and rubbish from the site as soon as practicable. Accumulation in buildings or on site will not be permitted.

B. Local regulations regarding hauling and disposal shall apply.

END OF SECTION 02 41 00

SECTION 07 80 00

FIRE AND SMOKE PROTECTION

1.1 PRODUCTS AND MATERIALS:

Work in this Section is open to any product or material.

1.2 PROJECT CRITERIA:

Work in this Division is to be performed by a single source specialized individual or firm for project meeting the following criteria:

A. New construction and building additions, regardless of contract amount.
B. Renovation/remodel involving more than 5,000 gross square feet.
C. HVAC, plumbing, electrical, and communications projects involving more than 100 square inches of penetrations of fire-rated walls, floors or ceilings.

1.3 DEFAULT STANDARDS:

In the absence of other information, standards of the following organizations apply: Underwriters Laboratories Fire Resistance Directory, current edition

1.4 SUBMITTALS REQUIRED:

A. Product Data
B. Shop drawings or schedule is preferred and mandatory for projects with total contract value exceeding $1,000,000.
C. Manufacturer instructions and Field Reports.

1.5 CLOSEOUT:

All submittals listed above updated to Record status

1.6 THERMAL AND MOISTURE PROTECTION:

A. Specify Underwriters Laboratories fire rated assembly designations in the contract documents
B. Firestops are required at every construction joint and penetration in fire rated assemblies.
C. Sprayed cementitious fireproofing as required per IBC.
    1. Minimum bond strength per ASTM E736: 200 psf
    2. Air erosion per ASTM 859: 0.00 grams loss
    3. Surface Burning per ASTM E84: Smoke = 0, Flame = 0, Fuel = 0
    4. Use W/D ratio to determine application thickness
    5. Remove paint, lubricant, compounds and other contaminants from substrate metal as recommended by the fireproofing manufacturer to assure specified bond strength.
    6. Mineral fiber fireproofing is prohibited.

1.7 INSPECTION:

The Owner reserves the right to perform a separate commissioning inspection and/or retain the services of an independent testing agency to inspect, sample, and confirm compliance with work in this section.

END SECTION 07 80 00

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 PROJECT SCOPE

A. Requirements for the electrical features being furnished and installed under these Specifications shall be in accordance with the requirements of this Section.

B. These Specifications, including the Drawings, outline the general requirements for the electrical design and are based on proposed equipment ratings, locations, and conditions to provide for estimated equipment loads and proposed power and lighting circuit ratings.

C. The CONTRACTOR shall coordinate all electrical installations and designs, and shall place the electrical equipment accurately in position; level and plumb, connect, and adjust the electrical equipment; and make the electrical installations ready for service.

D. The CONTRACTOR shall furnish and install all materials and equipment and provide all labor required and necessary to complete the work shown on drawings and/or listed below and all other work and miscellaneous items, not specifically mentioned, but inferred for a complete installation, including all accessories and appurtenances required for testing the system. It is the intent of drawings and Specifications that all systems be complete and ready for operation.

E. The CONTRACTOR shall perform electrical systems demolition, cutting and patching for electrical construction, and provide touchup painting.

F. The CONTRACTOR shall contact UNCC 1-800-922-1987 two full working days prior to any digging to request utility system locates. Any system, wire, cable, or piping damaged during the construction process shall be repaired or replaced to the Owner’s satisfaction without additional cost to the Owner.

G. The CONTRACTOR shall contact the Owner’s Project Manager to request Owner system locates (irrigation systems and/or other buried Owner systems). Any system, wire, cable, or piping damaged during the construction process shall be repaired or replaced to the Owner’s satisfaction without additional cost to the Owner.

H. The CONTRACTOR shall notify the Engineer and District’s Project Manager a minimum of 48 hours prior to any inspection as well as prior to covering up any work.

1.02 REFERENCES

A. The latest edition of the following standards and codes, standard publications of professional organizations, and the State of Colorado are the minimum requirements for this work.

1. American National Standards Institute (ANSI)
2. American Society for Testing and Materials (ASTM)
3. Association of Edison Illuminating Companies (AEIC)
4. Code of Federal Regulations (CFR)
5. Insulated Cable Engineer's Association (ICEA)
6. Institute of Electrical and Electronic Engineers (IEEE)
7. National Electrical Manufacturer's Association (NEMA)

8. National Fire Protection Association (NFPA)
9. NFPA 70, The National Electrical Code (NEC-Latest Edition)
10. International Energy Conservation Code (IECC-Latest Edition)
11. Underwriters' Laboratories, Inc. (UL)
12. State, City, and Local Authorities

1.03 CONTRACTOR SUBMITTALS

A. General

1. All submittals shall be in accordance with the requirements of this Section and Section 01 33 00 – Submittal Procedures.
2. All drawings and technical data are required to be furnished by the CONTRACTOR shall be written in English, and all units of measurements shall be in the English system. All drawings shall be made expressly for this Contract. Typical drawings are not acceptable. The drawings and data shall be complete and accurate in their content. Originals and all copies shall be legible. Drawings shall be prepared using AutoCAD format and shall be drawn to scale, and shall have neat lettering. Freehand sketches will not be accepted.
3. Shop Drawings shall include bills of material, front views, assembly drawings, mounting details, schematic diagrams, elementary diagrams, block diagrams, and wiring diagrams. Shop Drawings shall show overall dimensions and minimum clearances for all electrical equipment. Full-size drawings shall be submitted.
4. The drawings shall be prepared using graphical symbols and device function numbers conforming to the latest applicable standards of ANSI.

B. Approval Shop Drawings and Data
1. The CONTRACTOR shall furnish Shop Drawings, data, and instructions for the equipment for approval by the ENGINEER.
2. Approval drawings shall show:
    a. Bills of material: Bills of material shall give information of each piece of equipment including type, style, manufacturer, and other pertinent information such as scales, trip ratings, settings, and other information, as applicable.
    b. Nameplates: Nameplate lists shall provide information on material, sizes, and engraved lettering.
    c. Schematic Diagrams: Schematic diagram drawings shall show complete functional operation of the equipment including equipment devices and components that are identifiable by reference to the bill of material item.
    d. Wiring diagram: Wiring diagram drawings shall show complete wiring of the equipment devices and components including terminal block numbers and wire (conductor) designations.
    e. Manufacturer's data: Manufacturer's data, such as catalog cut sheets, shall be clearly marked to indicate the item being provided. The data shall provide sufficient comprehensive product information to fully demonstrate that the product meets the requirements of these specifications.

C. Final Drawings

1. The CONTRACTOR shall furnish final drawings for all electrical systems. All final drawings shall show all changes and revision dates made up to the time the drawings are furnished. The drawings shall show "as-built" equipment and installations. All drawings furnished shall apply specifically to the equipment actually furnished. No equipment shall be shipped until the drawings have been updated to show the equipment at the time of shipment. The final drawings shall include the requirements of 01 33 00 – Submittals. The following final drawings shall be furnished.
    a. Outlines and location of equipment relative to the structure.

b. Grounding plan and location of ground rods and grounding connections.
c. Nameplate lists.
d. Panel Directories.
e. Location of conduit hubs, knockouts, openings, and pull boxes.
f. Schematic diagrams.
g. Wiring diagrams.

D. Operation and Maintenance Instructions, Descriptive Data, and Bills of Material

1. Each set of material shall be assembled into one binder with a cover and front index sheet.
2. The operation and maintenance instructions shall be descriptive data that apply specifically to the equipment furnished and shall include the features pertaining to operation, maintenance, control, relaying, instrumentation, programming, and other features.
3. Descriptive data and bills of material shall describe the components furnished. These data shall be such that the components can be identified as to manufacturer, type, rating, characteristics, and other identification so that a component to be replaced could be ordered from the description furnished.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to State of Colorado, and marked for intended use.

B. Comply with NFPA 70, the National Electrical Code (latest edition).

C. All equipment and materials will be new and unused and shall conform with the current applicable industry standards. All equipment and materials shall be installed in compliance with manufacturer's recommendations and requirements. Workmanship and neat appearance shall be as important as electrical and mechanical operation. Defective or damaged materials shall be replaced or repaired prior to final acceptance in a manner meeting approval of Architect and/or Engineer and at no additional cost to Owner.

D. The State of Colorado Department of Regulatory Agencies (Electrical Board) is the Authority Having Jurisdiction for the electrical work associated with this project.

1.05 DEFINITIONS

A. Instructions such as "Provide" shall mean the same as though the words "This Contractor shall" preceded each such instruction. "Provide" shall mean "Furnish and Install." Where the words "Accepted" or "Acceptable" are used, such "Accepted" or "Acceptable" action by the Engineer and/or Architect denotes that the work or equipment item is in conformance with the design concept of the project and, in general, complies with pertinent information given in the Contract Documents.

1.06 SEQUENCING AND COORDINATION

A. The electrical system construction sequence shall follow the general project sequence.

B. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installation.

C. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

D. No work shall be concealed until after inspection and approval by proper authorities. If work is concealed without inspection and approval, Contractor shall be responsible for all work required to expose and restore the concealed work in addition to all required modifications.

E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 – PRODUCTS

2.01 EQUIPMENT AND MATERIALS

A. Electrical equipment and materials shall be as specified on the drawings and in accordance with standards referenced in Article 1.03.

B. All equipment nameplates shall be in English. All signs and symbols shall be in accordance with ANSI Y32.2.

C. Mounting bolts, nuts, and washers for items of electrical equipment shall be ASTM A276Type 316 stainless steel. Cadmium-plated mounting hardware will not be permitted.

D. In addition to the electrical materials specified herein, the CONTRACTOR shall furnish and install shims, grout, expansion anchors, wood blocking, anchor bolts, screws, nuts, washers, and all other hardware and incidentals required to complete the electrical installation.

E. If the CONTRACTOR-furnished electrical equipment and materials are of such size, type, ratings, or other physical properties that changes are required in the approved CONTRACTOR's designs, it shall be the responsibility of the CONTRACTOR to effect all changes necessary as required and approved by the ENGINEER without additional compensation.

F. Nameplates shall be provided in compliance with Section 26 05 53 Identification for Electrical.

2.02 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

2.03 TOOLS

A. The CONTRACTOR shall furnish all special tools and appliances as required for maintenance and adjustment of electrical equipment. The CONTRACTOR shall furnish all additional tools and equipment as necessary to properly install, adjust, and check the operation of the electrical equipment. The CONTRACTOR shall furnish all lifts.

PART 3 - EXECUTION

3.01 ELECTRICAL EQUIPMENT INSTALLATION

A. General

1. Installation of electrical equipment shall be in accordance with the manufacturer's installation instructions. Nuts and bolts used in electrical equipment assembly and installation shall be tightened by the use of torque wrenches to torque values recommended by the equipment manufacturer.
2. The CONTRACTOR shall make all electrical wire, cable, conduit, and grounding connections and furnish all miscellaneous materials that are required for making these connections to the equipment.
3. The CONTRACTOR shall drill all holes and provide all fastenings required for mounting or installing electrical equipment and materials.
4. Any electrical equipment installed on concrete foundations shall be given full and even bearing by being grouted in place. Grouting shall be in accordance with Section 03 30 00 – Concrete
5. Repair of damage to painted and/or galvanized surfaces shall be made in accordance with manufacturer’s recommendations.
6. Repair or replacement of damaged parts shall be in accordance with Article 1.05

B. Equipment Identification

1. The completed electrical installation shall be provided with adequate identification of circuits and equipment to assist personnel during maintenance.
2. Nameplates shall be provided for all panelboards, panels, starters, switches, and push button stations. In addition to the nameplates shown, control devices shall be equipped with standard collar type legend plates, as required.
3. Control devices within enclosures shall be identified with nameplates.
4. Terminal strips shall be identified by imprinted marker strips

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Adhere to clearances required by the NEC-latest edition, NFPA 70. Connect for ease of disconnecting, with minimum interference with other installations.

E. Right of Way: Give to raceways and piping systems installed at a required slope.

3.02 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly.

3.03 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Coordinate the repair and refinish of disturbed finish materials and other surfaces with the appropriate trade to have areas restored to match adjacent undisturbed surfaces. This contractor is responsible for all costs of repairs required by work performed by this contractor.

Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.04 FIELD TESTING AND STARTUP

A. After the electrical installations have been completed, the CONTRACTOR shall operationally test the electrical equipment and circuits installed under these specifications, unless specifically indicated otherwise herein, to demonstrate that the requirements of these specifications have been fulfilled.

B. The CONTRACTOR shall have available, at the construction site, drawings that show the electrical installation at the time of the examination, instruction books, equipment tests reports, coordination curves, and data.

C. Immediately prior to the acceptance tests, the CONTRACTOR shall service all electrical equipment in accordance with manufacturer's instructions.

D. While performing the functions of testing and checkout, the CONTRACTOR shall retain full responsibility for the removal and replacement of any wiring connections. The CONTRACTOR shall make wiring changes, setting adjustments, equipment replacements, or other revisions, which are necessary for the proper and adequate functioning of the installation. The CONTRACTOR shall be responsible for and shall replace at the CONTRACTOR’s own expense any wiring, instruments, or equipment which may be damaged in the checkout process.

3.05 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Raceways
2. Conductors and Cables
3. Supporting Devices for Electrical Components
4. Electrical Identification
5. Electrical Demolition
6. Cutting and Patching for Electrical Construction
7. Touchup Painting

3.06 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Final Acceptance.

3.07 WARRANTY

A. The CONTRACTOR shall warranty all electrical workmanship and materials for a minimum of two years or for the warranty period specified in individual sections whichever is greater. The warranty period shall extend from the date of Final Acceptance.

B. In addition to the standard warranties the CONTRACTOR shall attend a warranty walk through meeting to be held at eleven and twenty-two months from the date of Final Acceptance.

END OF SECTION 26 05 00

SECTION 26 05 19

LOW-VOLTAGE POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SCOPE

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600V and less.

B. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section. The District Guideline “Data, Communication, and Alarm Diagram” shall also apply to this section.

1.02 RELATED SECTIONS

A.	Submittals Procedures	Section 01 33 00
B.	Common Work Results for Electrical	Section 26 05 00
C.	Raceways and Boxes for Electrical	Section 26 05 33
D.	Identification for Electrical	Section 26 05 53
E.	Testing for Electrical	Section 26 08 00

1.03 REFERENCES

A. The latest edition of the following standards and codes are the minimum requirements for this work.

1. Insulated Cable Engineer's Association (ICEA)
2. InterNational Electrical Testing Association (NETA ATS)
3. National Electrical Contractors Association (NECA)
4. National Electrical Manufacturer's Association (NEMA)
5. National Fire Protection Association (NFPA)
6. NFPA 70, The National Electrical Code (NEC-Latest Edition)
7. Underwriters' Laboratories, Inc. (UL)

1.04 SUBMITTALS

A. The CONTRACTOR shall submit manufacturers’ catalog data for the wire and cables in accordance with the requirements of this Section, Section 26 05 00 – Common Work Results for Electrical, and Section 01 33 00 –Submittal Procedures.

1.05 QUALITY ASSURANCE

A. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 MATERIALS

A. The insulated conductors furnished shall be of the proper voltage rating, type, and size for the application, and shall have been manufactured within twenty four (24) months prior to receipt of the notice to proceed under this contract. All conductors shall be stranded copper unless specifically stated otherwise. All conductors shall be suitable for installation in a vertical position. All conductors shall have an AWG or kcmil designation.

B. 600-Volt, Single Conductor for General Use Other Than Direct Burial: The insulated conductors shall conform to the requirements of NEC-latest edition, shall bear the UL label, shall be suitable for general use other than direct burial, and shall be NEC-latest edition type THW, THWN/THHN or XHHW.

C. Polyethylene warning tape: Polyethylene warning tape for installation above buried power feeders shall be 6 inches wide, yellow in color, with CAUTION printed continuously the full length of the tape.

D. Multiconductor Power and Control Cable: Multiconductor cables shall be provided as noted on the Drawings. The multiconductor cables shall be as follows:

1. 600 volts insulated.
2. Multiconductor type suitable for installation in trays and conduits.
3. Individual conductors shall be insulated with NEC-latest edition type THHN insulation and color-coded.
4. Polyester tape, or equivalent, over the conductor group.
5. Shielded with 100 percent aluminum foil taper and with minimum No. 18 AWG tinned and copper drain wire.
6. An overall covering (jacket) of thermoplastic or neoprene.

    a. Cable with No. 14 AWG individual conductors:
        (1) 3/C and smaller - 45 mils thick.
        (2) 4/C to 12/C - 60 mils thick.
        (3) Over 12/C - 80 mils thick.

E. Instrumentation Cable: The instrumentation cable shall be suitable for all uses and shall be as follows:

1. Twisted pair, individually shielded, having varying lengths of lay to minimize crosstalk.
2. UL listed and labeled, Type TC.
3. Voltage: 300V.
4. Conductors tinned copper, stranded, and No. 18 AWG minimum.
5. Pair Shield: Aluminum coated Mylar with tinned copper drain wire, No. 18 AWG minimum.
6. Jacket: Plenum Rated.
7. Conductor Identification: ICEA S-61-402, black and white in pairs. White conductor printed numerically for group identification.

F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Wires and Cables:

    a. Southwire Company.
    b. The Okonite Company
    c. USA Wire & Cable, Inc.

2. Connectors for Wires and Cables:

    a. AMP Incorporated.
    b. General Signal; O-Z/Gedney Unit.
    c. 3M Company; Electrical Products Division.

2.02 WIRES AND CABLES 600-VOLT NOMINAL OR LESS

A. UL-listed building wires and cables with appropriate ratings for installed application.

B. Rubber Insulation Material: Comply with NEMA WC 3.

C. Thermoplastic Insulation Material: Comply with NEMA WC 5.

D. Cross-Linked Polyethylene Insulation Material: Comply with NEMA WC 7.

E. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC 8.

F. Factory applied color coded insulation the entire length of conductors for all wire.

G. Conductor Material: Copper.

H. Stranding: Solid conductor for No. 10 AWG and smaller (except for Engine/Generator Control Wiring); stranded conductor for larger than No. 10 AWG.

I. Insulation Color: All insulated conductors (service entrance, feeder, and branch circuit) shall have full colored insulation, colors as specified in Section 26 05 53 Identification For Electrical Systems, for the entire length of the conductor. Neutral conductors installed, in compliance with the NEC- latest edition for each single pole breaker, shall have a tracer stripe to match the phase conductor color.

1. Color-code 208/120-volt system as follows:
    a. Phase A: Black
    b. Phase B: Red
    c. Phase C: Blue
    d. Neutral: White with a phase colored stripe
    e. Ground: Green

2. Color-code 480/277-volt system as follows:
    a. Phase A: Brown
    b. Phase B: Orange
    c. Phase C: Yellow
    d. Neutral: Gray with a phase colored stripe
    e. Ground: Green

3. Lighting Controls:
    a. Yellow

J. Use of MC cable is prohibited except for luminaire connection whips.

K. Use of AC, NM, ENT, or other manufactured pre-wired systems cable is prohibited.

2.03 CONNECTORS AND SPLICES 600-VOLT NOMINAL OR LESS

A. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated. Comply with Project's installation requirements and as specified in Part 3 “Wire and Insulation Applications" Article.

B. Electrical Tape:

1. Plastic tape, 8.5 mils maximum thickness, 1,000,000 megohms minimum insulation resistance, oil-resistant vinyl backing, oil-resistant acrylic adhesive, incapable of supporting combustion per ASTM D-568 Test Method B.
2. 3M +33 Type.

C. Cable Lubricants:

1. Wire pulling lubricants shall be specifically recommended by the cable manufacturer for assisting in pulling jacketed cables. Cable lubricants shall be soapstone, graphite, or talc for rubber or plastic-insulated cables. Lubricants shall be rated for use in low temperatures (-20º F). Lubricant shall not be deleterious to the cable sheath, jacket, or outer coverings.
2. Ideal Yellow #77, Aqua Blue, Poly Water, Dyna Blue or equivalent.

2.04 MISCELLANEOUS WIRING MATERIAL

A. Miscellaneous Connecting and Splicing Devices: Miscellaneous products, such as heat shrink tubing, electrical insulation, plug caps, splices and kits, tapes, terminal blocks, and terminations, shall be approved for the specific application.

B. Joint compounds shall be approved for the specific type metal joint to be prepared.

C. Cable ties, clamps, and identification shall be nylon, self-locking.

D. Fire-seal fittings, certified by UL, for installation where sleeves penetrate fire-rated walls, floors, etc., as required by NEC-latest edition Article 300-21. Size fire seals for the application.

PART 3 - EXECUTION

3.01 GENERAL

A. All wiring shall be in compliance with the NEC-latest edition: All single phase branch circuits originating at single pole or multi-pole breakers (120V single phase circuits, or 277V single phase circuits) shall be installed with a dedicated neutral conductor for each phase conductor. The neutral conductor shall have a tracer stripe (the stripe color shall match the color of the phase conductor).

B. All wiring shall be routed through an UL-listed raceway regardless of voltage application, unless specified otherwise on the drawings or under other sections of these Specifications.

C. Derate conductor ampacities based on the NEC-latest edition when more than three current carrying conductors are installed in one raceway.

D. No conductors or cable shall be pulled into any portion of conduit system until all construction work, which might damage the wire, has been completed and raceways have been swabbed. In no case shall wire be left exposed where students and staff may have access.

E. Lubricate cables to facilitate pulling. Lubrication material shall be inert to cable and raceways and rated for -20°F for pulling #4AWG and larger wires.

F. Install compression connectors with hydraulic die, embossing die code into connector. Connect to bus with Belleville type washers for positive pressure over complete contact area. Insulate with heat shrink tubing.

G. Sizes of conduits, unless specifically shown otherwise, shall be determined from Chapter 9 of the latest National Electrical Code based on THW wire in electric metallic tubing.

3.02 INSTALLATION 600 VOLTS, NOMINAL OR LESS GENERAL

A. Unless otherwise indicated, all wiring for branch circuits shall be #12 AWG protected by 20-ampere circuit breakers. Wire size shall be increased to account for voltage drop for all 120-volt circuits over 75 feet, and all 277-volt circuits over 150 feet to the first outlet. Wire size shall be uniform for the entire length of the circuit unless noted otherwise. Homeruns which indicate upgrading circuit conductors for voltage drop, e.g. #10AWG wire on 20-ampere circuit, shall have the conductor size indicated carried throughout the circuit to the last device or fixture.

B. Do not splice feeders or dedicated branch circuits unless otherwise indicated. Install all wire continuous from outlet to outlet or terminal to terminal. Splices in cables when required shall be made in handholes, pull boxes or junction boxes and shall be in strict accordance with cable manufacturer's recommendations utilizing solderless connectors UL approved for the use (splices for pole mounted luminaires shall be made in the curved carlon box installed in the pole base unless the pole base is flush with grade in which case splices shall be made in the pole handhole). Make up splices in outlet boxes with 8 inches of correctly color-coded tails left in box. Splices in wires size #10AWG and smaller shall be made with insulated spring type wire connectors, "Scotchlok." Use U.L. listed compression connectors (Ilsco Clear Tap or Burndy Hi Press), for wire splices and taps, #8AWG and larger. All insulating tape used on circuits of 600 volts and less shall be 3-M +33. Tape or heat shrink uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of the conductor. Terminate spare conductors with electrical tape.

C. Make connections, splices, taps and joints with solderless devices, mechanically and electrically secure.

D. Provide a separate neutral for dimmer branch circuits, ground fault interrupter branch circuits, lighting branch circuits serving electronic ballasts.

E. All phase, neutral, and ground conductors shall be tagged with corresponding circuit numbers at panelboard as well as at all junction and outlet boxes.

F. Make all ground, neutral, and line connections to receptacle and wiring device terminals by means of the side terminal screw connections. Branch conductors shall not be connected to the device with backside “push-in” connectors. Provide ground jumper from outlet box to ground terminal of receptacle.

3.03 STORAGE AND HANDLING

A. Store wiring materials in a protected environment not subject to physical damage or the effects of sunlight or inclement weather.

END OF SECTION 26 05 19

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL

PART 1 - GENERAL

1.01 SCOPE

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

B. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section. The District Guideline “Data, Communication, and Alarm Diagram” shall also apply to this section.

1.02 RELATED SECTIONS

A. Low-Voltage Power Conductors and Cable Section 26 05 19

B. Raceways and Boxes for Electrical Section 26 05 33

1.03 REFERENCES

A. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
ANSI/ASTM B3 Soft or Annealed Copper Wire
ANSI/ASTM B8 Concentric-Lay –Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ANSI/UL 467 Grounding and Bonding Equipment

B. NFPA70 – NATIONAL ELECTRICAL CODE (NEC-Latest Edition)

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the State of Colorado, and marked for intended use.

1. Comply with UL 467.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Grounding Conductors, Cables, Connectors, and Rods:
   a. ILSCO.
   b. Kearney/Cooper Power Systems.
   c. Lyncole XIT Grounding.
   d. O-Z/Gedney Co.; a business of the EGS Electrical Group.
   e. Raco, Inc.; Division of Hubbell.

f. Thomas & Betts, Electrical.

2.02 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 26 Section "Low-Voltage Power Conductors and Cables."

B. Material: Copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

E. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B 3.
2. Assembly of Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

2.0 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type. Burndy Hi-Press series lugs, ILSCO Clear Taps may be used for wire sizes #8 through 500kcmil.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

PART 3 - EXECUTION

3.01 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.

D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

3.02 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and branch circuits. This grounding conductor shall be in addition to the ground path provided by the continuously grounded metallic raceway system that encloses the phase and neutral conductors. Where there are parallel

feeders installed in more than one raceway, each raceway shall have a green insulated equipment ground conductor. Provide ground bushings bonded to grounding conductor at both ends of all feeder conduits.

C. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

3.03 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

3.04 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

B. All connections to ground buses shall be by mechanical means.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors. Use Burndy QGFL 34 B1 type connectors for attachment to building steel

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate both ends of conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

F. Compression-Type Connections (#8 and Larger): Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

END OF SECTION 26 05 26

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 SCOPE

A. The CONTRACTOR shall furnish and install supports, fasteners, and anchors for all electrical conduits; boxes, switchboards, panelboards, transformers, and accessories required for a complete and secure electrical system. The term "conduit" shall be considered synonymous with the term "raceway" as defined in Article 100 of the NEC-latest edition.

B. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section. The District Guideline “Data, Communication, and Alarm Diagram” shall also apply to this section.

1.02 RELATED SECTIONS

A.	Finishes	Section 09 90 00
B.	Grounding and Bonding for Electrical	Section 26 25 26

1.03 REFERENCES

A. The latest edition of the following standards and codes, are the minimum requirements for this work.

NFPA No. 70 National Electrical Code (Latest Edition)

PART 2 - PRODUCTS

2.01 SUPPORTING DEVICES FOR ELECTRICAL COMPONENTS

A. Provide hangers and supports to support raceways, fixtures, cabinets, boxes, etc. as manufactured by B-Line, Unistrut, Binkley or Kindorf.

B. Material: Cold-formed steel, with corrosion-resistant coating.

C. Metal Items for Use Outdoors or in Damp Locations: Steel, hot-dip galvanized after fabrication.

D. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- (14-mm-) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs.

1. Channel Thickness: Selected to suit structural loading.
2. Fittings and Accessories: Products of the same manufacturer as channel supports.

E. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

F. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

G. Fabricated supports, use structural steel or steel channel, rigidly welded or bolted to present a neat appearance.

H. Expansion Anchors: Carbon-steel wedge or sleeve type. Anchors shall be removable type.

I. Toggle Bolts: All-steel springhead type.

J. Mounting bolts, nuts, and washers for items of electrical equipment shall be ASTM A276Type 316 stainless steel. Cadmium-plated mounting hardware will not be permitted.

K. Perforated pipe strap and wire supports are prohibited.

L. Powder-actuated anchors are prohibited without specific written permission.

PART 3 – EXECUTION

3.01 GENERAL

A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC-latest edition requirements.

1. Fasten supports directly to structure. Do not fasten supports to piping, ductwork, mechanical equipment, conduit, or ceiling system suspension wires or wire of any type.
2. Drilling or other modification of structural steel members is prohibited without specific written permission from the structural engineer.

B. Coordinate with the building structural system and with other electrical installation.

C. Electrical system layouts indicated on drawings are generally diagrammatic, but shall be followed as closely as actual construction and work of other trades will permit. Govern exact routing of raceways and locations of outlets by structure and equipment served. Take all dimensions from architectural drawings.

D. Consult all other drawings. Verify all scales and report any dimensional discrepancies or other conflicts to Architect before submitting bid.

E. Avoid cutting and boring holes through structure or structural members wherever possible. Obtain prior approval of Architect, and conform to all structural requirements when cutting or boring structure is necessary and permitted.

F. Raceway Supports: Comply with the NEC-latest edition and the following requirements:

1. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits. Provide a minimum of 20% space available for future raceways for all multiple raceway supports.
2. Support parallel runs of horizontal raceways together on trapeze-type hangers.
3. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings. For hanger rods with spring steel fasteners, use 1/4-inch-diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.

4. Space supports for raceways in accordance with NEC-latest edition, but in no case shall support spacing exceed 8-feet between supports or 2-feet from any box or conduit body.
5. Support raceway within 1 foot of box and access fittings.
6. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway connections.
7. Wire will not be allowed for conduit support.

G. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors or preset inserts.

H. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls.

I. Use expansion anchors or preset inserts in solid masonry walls

J. Use self-drilling anchors or expansion anchor on concrete surfaces

K. Use sheet metal screws in sheet metal studs.

L. Use hexagon head bolts with spring lock washers under all nuts.

M. Sleeves: Install in concrete slabs and walls for raceways and cable installations. All penetrations through walls and floors shall be sealed. For non-rated walls and floors apply additional materials used in penetrated wall construction (grout, gyp-board and tape, etc…) or non-rated gap sealant.

For sleeves through fire rated-wall or floor construction, apply UL- listed fire-stopping sealant in gaps between sleeves and enclosed conduits and cables in accordance with sealant manufacturer's requirements.

END OF SECTION 26 05 29

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL

PART 1 - GENERAL

1.01 SCOPE

A. The CONTRACTOR shall furnish and install all electrical conduits; boxes, and accessories required for the installation of conductors for the power, control, and instrumentation services. The term "conduit" shall be considered synonymous with the term "raceway" as defined in Article 100 of the NEC-latest edition.

B. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section. The District Guideline “Data, Communication, and Alarm Diagram” shall also apply to this section.

1.02 RELATED SECTIONS

A.	Grounding and Bonding for Electrical	Section 26 05 26
B.	Wiring Devices	Section 26 27 26
C.	Identification for Electrical	Section 26 05 53
D.	Finishes	Section 09 90 00

1.03 REFERENCES

A. The latest edition of the following standards and codes, are the minimum requirements for this work.

ANSI C80.1	Rigid Steel Conduit, Zinc-coated
ANSI C80.6	Intermediate Metal Conduit, Zinc-coated
ANSI C80.3	Electrical Metallic Tubing, Zinc-coated
NEMA FB 1	Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies
NEMA RN 1	Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
NEMA TC2	Rigid Nonmetallic Conduit (Schedule 40 and Schedule 80)
NEMA TC 3	PVC Fittings for Use with Rigid PVC Conduit and Tubing
NFPA No. 70	National Electrical Code (NEC-latest edition)
UL-651	Standard for Safety Schedule 40 and 80 PVC Conduit

B. Sizes of conduits, unless specifically shown otherwise, shall be determined from Tables in Chapter 9 of latest National Electrical Code (Latest Edition).

PART 2 - PRODUCTS

2.01 RACEWAYS AND FITTINGS

A. Metallic Conduit Systems:

1. Electrical Metallic Conduit (EMT). EMT shall be zinc-coated steel, galvanized on the outside and coated on the inside with a hard smooth lacquer finish. EMT fittings shall be steel set-screw type with insulated throats.
2. Flexible Metal Conduit (FMC): FMC shall be single strip, continuous, flexible interlocked double-wrapped steel, zinc-coated inside and out forming smooth internal wiring channel with steel compression fittings.
3. Intermediate Metal Conduit (IMC): IMC shall be hot-dipped galvanized with a zinc-coating. Fittings shall be steel threaded type.
4. Liquidtight Flexible Steel Conduit (LFSC): FLSC shall be zinc-coated steel the same as FMC except with sunlight-resistant and mineral-oil-resistant plastic jacket.. Fittings shall be cast malleable iron or steel body and gland nut, cadmium-plated with one-piece brass grounding bushings threaded to interior of conduit. Provide spiral molded vinyl sealing ring between gland nut and bushing and nylon insulated throat.
5. Rigid Steel Conduit (RSC): RSC shall be heavy wall, hot dipped galvanized steel inside and out with threaded ends. RSC fittings shall be steel, threaded type. Plastic-coated Rigid Steel Conduit shall be rigid galvanized steel conduit having a 0.030"(.762 mm) minimum thick factory-bonded PVC jacket, using pre-jacketed couplings as manufactured by Pittsburgh Robroy, Plastic Applicator, Occidental or approved equal.

B. Nonmetallic Conduit Systems:

1. Rigid Nonmetallic Conduit (RNC): RNC shall be polyvinyl chloride (PVC) Schedule 40 or 80 suitable for 90°C. Provide solvent cemented type fittings matched to conduit type and material**.**
2. Liquidtight Flexible Nonmetallic Conduit (LFNC): LFNC shall comply with UL3.

C. Metal Wireways: Wireways shall be hinged cover or screw cover complete with all necessary manufactured fittings which shall be of one manufacturer. Wireway shall be G.E. Type HS or ITE KEL Duct or acceptable equal.

1. Material: Sheet metal sized and shaped as indicated.
2. 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. Provide wire retainers at not greater than 12 inches (300 mm) on center.
3. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
4. Wireway Covers: Hinged type
5. Exterior, wet, or damp locations shall be NEMA 250 Type 3R
6. Finish: Manufacturer's standard enamel finish

D. Bushings: For steel conduit larger than 1/2-inch size, provide insulated type bushings, designed to prevent abrasion of wires without impairing the continuity of the conduit grounding system. Grounding bushings shall be locking type and shall be provided with a feed-through compression lug for securing the ground cables. Unions shall be electro-galvanized ferrous alloy type Appleton UNF or UNY, Crouse-Hinds UNF or UNY, or equal.

Grounding bushings shall be steel type and installed at both ends of the conduit on all feeders, as well as all transformer, motor, motor controller, kitchen, and TVSS equipment branch circuits.

E. Sealing Fittings: Provide threaded, zinc or cadmium coated, cast or malleable iron type for steel conduits. Fittings used to prevent passage of water vapor shall be of the continuous drain type.

F. Provide minimum ¾” conduit for all circuit homeruns from the source panel to the first device

G. Use of MC cable is prohibited except for luminaire connection whips.

H. Use of AC, NM, ENT, or other manufactured pre-wired systems cable is prohibited.

2.02 SURFACE METAL RACEWAYS

A. Surface metal raceway components, fittings, and accessories shall be of one manufacturer, designed and listed for use together as surface metal raceway.

1. Sheet metal channel with fitted cover.
2. Couplings, elbows and connectors shall be designed for use with the raceway system.
3. Boxes and extension rings shall be designed for use with the raceway systems. (extension rings are not allowed on new construction, one extension ring is allowed on existing recessed boxes where conductor length will still comply with the latest NEC requirements)
4. Use flat head screws to fasten channel to surfaces.
   a. Option: Use suitable clips and straps
5. Use insulating bushings and inserts at connections to outlets and corner fittings.
6. Maintain grounding continuity between raceway components.

B. Acceptable Manufacturers:

1. Carlton, Hubbell, IsoDuct, Panduit, Square D, Walker, Wiremold, or equivalent.

2.03 OUTLET, JUNCTION AND PULL BOXES

A. Acceptable Manufacturers:

1. Boxes and Cabinets; Bell, Bowers, Raco, Steel City, Appleton, Carlton, Lew Electric, National Electric Products, or equivalent.
2. Floor boxes; Walker, Hubbell, Raceway Components Inc., Bowers, Rotco Inc., Steel City, Appleton, Lew Electric, or equivalent.

B. Outlet, Junction and Pull Boxes:

1. Cast Type Boxes: Cast type boxes shall be ferrous alloy and have gasketed cast covers and inside threaded hubs with adapters as necessary. Cast-metal boxes shall comply with NEMA 3R.
2. Galvanized Pressed Steel Type Boxes: Boxes shall be pressed steel, galvanized or cadmium-plated (4-inch x 2 1/8” deep minimum square for all wall locations, 4 11/16-inch x 2 1/8” deep minimum square for all above ceiling locations), with galvanized cover or extension ring as required (extension rings are not allowed on new construction, one extension ring is allowed on existing recessed boxes where conductor length will still comply with the latest NEC requirements). Knockout type shall be used with knockouts removed only where necessary to accommodate the conduit entering. Boxes shall comply with NEMA OS 1. Provide a grounding terminal in each box containing a green equipment ground conductor, or serving motors, lighting fixtures, or receptacles. Grounding terminal shall be green-colored washer-in-head machine screw or grounding bushing.
3. Field gang type boxes are prohibited in all applications and extension boxes are prohibited on new construction.
4. Floor Boxes and Fittings:
   a. General: Provide surface floor boxes and fittings of the types, ratings, and configurations as shown on the Drawings.
5. Cover and Device Plates: Provide device plates for each switch, receptacle, signal and

telephone outlet, and special purpose outlet. Do not use sectional gang plates. Provide multi-gang outlet plates for multi-gang boxes. Provide high impact thermoplastic or nylon for devices in finished areas, and galvanized steel on surface-mounted devices in unfinished areas, unless otherwise selected by Architect. Surface outlet coverplates shall be stainless steel and have beveled edges.

6. Cut-in/after-set boxes are not allowed.

C. Metal Pull boxes: Pullboxes shall be screw cover complete with all necessary manufactured fittings which shall be of one manufacturer.

1. Material: Sheet metal sized and shaped as indicated.
2. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
3. Exterior, wet, or damp locations shall be NEMA 250 Type 3R
4. Finish: Manufacturer's standard enamel finish

D. Flush with grade enclosures and pull boxes shall be QUAZITE® as manufactured by Strongwell or approved equal. The pull/splice box shall be constructed of polymer concrete consisting of sand and aggregate bound together with a polymer resin. Internal reinforcement may be provided by means of steel, fiberglass, or a combination of the two. Boxes and covers shall be concrete gray, and sustain a minimum vertical test load of 22,568# over a 10" square. Boxes shall be stackable for extra depth.

PART 3 - EXECUTION

3.01 GENERAL

A. Electrical system layouts indicated on drawings are generally diagrammatic, but shall be followed as closely as actual construction and work of other trades will permit. Govern exact routing of raceways and locations of outlets by structure and equipment served. Take all dimensions from architectural drawings.

B. Consult all other drawings. Verify all scales and report any dimensional discrepancies or other conflicts to Architect before submitting bid.

C. All home runs to panelboards are intended to be started from outlet nearest panel and continuing in general direction of that panel. Continue such circuits to panel as though routes were completely indicated. Terminate homeruns of signal, alarm, and communications systems in a similar manner.

D. Avoid cutting and boring holes through structure or structural members wherever possible. Obtain prior approval of Architect, and conform to all structural requirements when cutting or boring structure is necessary and permitted.

E. Furnish and install all necessary hardware, hangers, blocking, brackets, bracing, runners, etc. required for equipment specified under this section.

F. Raceways shall be installed and complete prior to pulling any wire into raceway.

3.02 RACEWAYS - GENERAL

A. Protect all non-PVC coated metallic raceway in earth or fill from corrosion with two coats of corrosion resistant paint or tape wrap.

B. Elbows for conduit installed below grade or floor slabs and vertical conduit risers to above grade or floor slabs shall be rigid steel conduit with factory PVC coating or two coats of corrosion resistant paint or tape wrap.

C. Tie embedded raceways securely in place prior to concrete placement. Raceways installed below floor slabs shall extend a minimum of 4 inches (100 mm) above the finished slab or housekeeping pad to the first connector. Install capped bushings on conduit stub ups.

D. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb. (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of the pull wire. Tag both ends noting destination.

E. Use temporary raceway caps to prevent foreign matter from entering conduits.

F. Make all bends using an approved bending tool. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated. Cut all conduits square and ream all cuts to remove burrs. Exercise all necessary precautions during the construction period to prevent entry or accumulation of moisture, dust, concrete, and all foreign matter into the raceway system. The contractor shall pull a mandrel through each raceway to ensure the raceway interior is clean and dry prior to pulling conductors or cable.

G. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.

H. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72 inch (183 cm) liquid tight flexible conduit. Install separate ground conductor across flexible connections.

I. Above grade - defined as areas above finished grade for a building exterior and above top surface of any slabs (or other concrete work on grade) for a building interior. Installation of and materials for above-grade raceways shall conform with the following:

1. Install conduit concealed within finished walls, ceilings, and floors except at surface cabinets, for motor and equipment connections, and in building service equipment rooms unless otherwise indicated. Surface metal raceways shall be used where raceways are specified or allowed to be installed exposed in finished areas.
2. Route all conduit/raceways, exposed and concealed, parallel or perpendicular to building lines with right angle turns and symmetrical bends.
3. Paint all surface conduit, installed in finished areas, to match the adjacent surfaces on which it is mounted.
4. Install raceways a minimum of 6 inches (150 mm) away from parallel runs of flues and steam pipes or other heated lines. Locate horizontal raceway runs above water and steam piping.
5. Install raceways a minimum of 6 inches below the roof deck.
6. Provide for waterproofing of all raceways, outlets, fittings, etc. which penetrate exterior walls or the roof to preserve the weatherproof integrity of the building. Provide pockets for waterflashing and counterflashing or pitch pockets for waterproofing of all raceways, outlets, fittings, etc. which penetrate roof. Wherever conduits penetrate concrete walls to outdoors, the Contractor shall provide a watertight seal as manufactured by O.Z. Gedney Company, Type CSMC; Thunderline Corporation, Link Seal, or equal.
7. Raceways between cabinets, fittings or boxes shall not exceed 200 feet (60 m) for straight runs or 100 feet (30 m) for runs with the maximum number of bends.
8. Provide one empty 3/4-inch (20 mm) conduit for each set of three spare circuit breakers

or spaces in flush-mounted panelboards into the overhead accessible ceiling space.

9. Raceways Above Suspended Ceilings:
    a. Raceways shall not be supported from ceiling support wires. Provide independent support of raceways.
    b. Install conduit 1 foot (300 mm) minimum above top of ceiling.
10. Rigid metallic steel conduit shall be installed in the following above-grade areas:
    a. Where exposed/surface mounted, exterior locations, and where subject to damage. Rigid steel conduit shall extend to a minimum of 8-feet above finished floor/grade.
    b. Where specifically required by the National Electrical Code – Latest Edition.
11. Electrical Metallic Tubing (EMT): May be installed in:
    a. Concealed locations in furred or masonry walls or ceilings.
    b. Embedded in poured insulating fills.
    c. Exposed areas at least 4 feet (2.5 m) above floor.
12. Liquid tight flexible metal conduit shall be provided in sufficient lengths for makeup of motors, transformers, or equipment, and/or raceway connections where isolation of sound and vibration transmission is required. Liquid-tight flexible metal conduit shall contain a separate equipment grounding conductor, sized per NEC-latest edition requirements.
13. Flexible metallic 3/8-inch (10 mm) fixture whip connections to recessed lighting fixtures shall not exceed 6 feet (1.8 m) in length.
14. Surface raceways, where indicated on drawings, shall be metal and of a size approved for number and size of wires to be installed and shall be installed in a neat, workmanlike manner, with runs parallel or perpendicular to walls and partitions. Raceways, elbows, fittings, outlets and devices shall be of same manufacturer, and designed for use together.
15. Conduit Supports and Fasteners:
    a. Supports: Provide supports for horizontal steel conduits and EMT not more 2 feet from boxes and conduit bodies, and not more than 8 feet (2.5 m) apart with one support near each elbow or bend, including runs above suspended ceilings.
    b. Individual: Install spring steel fasteners with hanger rods on conduits 1-1/2 inch (40 mm) or smaller. Install individual pipe hangers for conduits larger than 1-1/2 inch (40 mm).
    c. Trapezes: Install multiple (trapeze) pipe hangers where two or more horizontal conduits run parallel and at the same elevation. Secure each conduit to the horizontal hanger member by a U-bolt, one-hole strap or other specially designed and approved fastener. Install 3/16-inch (5 mm) diameter or larger steel rods for trapezes, spring steel fasteners, clips and clamps. Wire or perforated strapping shall not be used for the support of any conduit.
    d. Roof Top Conduit Support: Fasten pipe to stands specifically manufactured for support of pipes installed on roofs. Stands shall support pipe a minimum of 6 inches above the roof and be resistant to damage from environmental conditions and other causes such as birds. Stands shall be Caddy Pyramid 50 series or equivalent. Support stands requiring fastening through the roof membrane are prohibited.
    e. Fastening: Fasten pipe straps and hanger rods to concrete by means of inserts or expansion bolts, to brickwork by means of expansion bolts, and to hollow masonry by means of toggle bolts. Wooden plugs and shields shall not be used. Power-driven fasteners may be used to attach pipe straps and hanger rods to concrete where approved by Architect. Install raceway on steel construction with approved clamps which do not depend on friction or set-screw pressure alone.
16. Fittings: Use approved type couplings and connectors in all conduit runs, and make all joints tight. Provide insulated bushings or rain-tight connections with insulated throats for all terminations in pipe sizes 1-1/4" (32 mm) and larger. Provide waterproof fittings for all runs in wet locations, such as exposed to weather, buried in slabs, etc. Provide raceway expansion joints, in compliance with NEC-latest edition and approved by the State, with

necessary bonding conductor at building expansion joints, between structures and where required to compensate for raceway or building thermal expansion and contraction.

17. Firestops and seals shall be provided for penetrations through fire-rated walls and floors. Firestops and seals shall be 3M's fire barrier sealant CP 25WB and/or composite sheets #CS195, or equal, and shall be applied in accordance with manufacturer's recommendations. Products which are affected by water are not acceptable.

3.04 OUTLET, JUNCTION AND PULL BOXES

A. Provide galvanized or zinc-coated, pressed steel outlet boxes for all locations except where otherwise indicated or where cast metal boxes are required by the NEC-latest edition. Provide plaster or tile rings for all flush outlets installed where wood, drywall, tile, plaster, etc. types of finishes are applied. All outlets for exterior application shall be cast, weatherproof type, with gasket and cast coverplate. Tile boxes of extra depth may be used for interior, dry applications where masonry block or brick walls constitute the finished wall surface. In any event, provide outlet boxes of proper type and design for the particular fixture or device to be installed. Structural conditions and obstructions or other equipment items shall govern exact location of outlets and equipment. When necessary, relocate outlets so that when fixtures or equipment are installed, they will be symmetrically located according to room layout and will not interfere with other work or equipment. Verify final location of all outlets, panels, equipment, etc. with Architect and/or Engineer.

B. Equip light fixture outlet boxes with 3/8-inch (10 mm) no-bolt fixture studs. Provide a minimum 4-inch (100 mm) octagon box. Where fixtures are mounted on or in an accessible type ceiling, provide a junction box and extend flexible conduit to each fixture. Outlet boxes in finished ceilings or walls shall be fitted with appropriate covers, set to come flush with the finished surface. Where more than one switch or device is located at one point, use gang boxes and covers unless otherwise indicated. Sectional switch boxes or utility boxes will not be permitted. Provide tile box or a 4-inch (100 mm) square box with tile ring in masonry walls which will not be plastered or furred, or where "drywall" type materials are applied.

C. Except as otherwise noted, locate outlet boxes as follows: Dimensions given are from finished floor to center line of outlets. Adjust heights of outlets in masonry walls to correspond with consistent brick or block course. Outlets in block walls shall be installed in core of block.

1.	Wall switch outlets	44 inches (112 cm)
2.	Convenience outlets, long axis vertical-ground pole up or horizontal-ground pole on left side	18 inches (46 cm)
3.	Phone and data outlets	18 inches (46 cm)

D. Over counters, benches, special equipment, baseboards, fin tube radiators, wainscoting, etc., outlets shall be at a height (6 inches (150 mm)) above the interfering item, or as noted on drawings.

E. Junction and Pull Boxes: Use outlet boxes as junction boxes wherever possible. Larger junction and pull boxes over 12 inches (300 mm) in any dimension shall be fabricated from sheet steel, sized according to NEC-latest edition, and have screw-on covers. All junction boxes shall be accessible.

F. Surface-mounted device boxes mounted below 8 feet shall be Surface Metal Raceway boxes or (Bell) cast-type boxes with threaded knock-outs (with knock-outs only as required by conduit entering/leaving).

END OF SECTION 26 05 33

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL

PART 1 - GENERAL

1.01 SCOPE

A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and the State of Colorado.

B. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section. The District Guideline “Data, Communication, and Alarm Diagram” shall also apply to this section.

1.02 RELATED SECTIONS

A. Common Work Results for Electrical Section 26 05 00

1.03 REFERENCES

A. NFPA 70 National Electrical Code (NEC-latest edition)

B. NESC National Electrical Safety Code

1.04 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. All submittals shall be in accordance with the requirements of this Section, Section 26 05 00- Common Work Results for Electrical, and Section 01 33 00 – Submittal Procedures.

1.05 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70.

C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 - PRODUCTS

2.01 RACEWAY AND CABLE LABELS

A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Pretensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.

C. Aluminum, Wraparound Marker Bands: Bands cut from 0.014-inch- (0.4-mm-) thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.

D. Plasticized Card-Stock Tags: Vinyl cloth with preprinted and field-printed legends. Orange background, unless otherwise indicated, with eyelet for fastener.

E. Tape Labels: Embossed adhesive tape, with 3/16 inch white characters.

F. "Kroy" Labels: Kroy tape with 3/8 inch minimum characters.

2.02 NAMEPLATES AND SIGNS

A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16-inch (1.6 mm) thick for signs up to 20 square inches (129 square cm) and 1/8-inch (3.2 mm) thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.

C. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

2.03 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.

B. Paint: Formulated for the type of surface and intended use.

1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.
2. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

C. Polyethylene warning tape: Polyethylene warning tape for installation above buried power feeders shall be 6 inches wide, yellow in color, with CAUTION printed continuously the full length of the tape.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

C. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations. Use consistent designations throughout Project.

1. White characters on black background for "Normal",

2. White characters on red background for "Emergency" and fire alarm devices
3. White characters on green background for "Ground".

D. Install painted identification according to manufacturer's written instructions and as follows:

1. Clean surfaces of dust, loose material, and oily films before painting.
2. Prime surfaces using type of primer specified for surface.
3. Apply one intermediate and one finish coat of enamel.

E. Color Banding Raceways and Exposed Cables: Band exposed and accessible raceways of the systems listed below:

1. Apply the following colors to the systems listed below:
   a. Fire Alarm System: Red
   b. Emergency Power System: Red

F. Device Coverplates: Use preprinted label for identification of circuits at all individual wall switches and receptacles, control device stations. Locate label on the front side of the coverplate as well as identify circuits with permanent ink on the backside of the coverplate.

G. Wire Identification: Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number as indicated on equipment manufacturer’s shop drawings for control wiring.

H. Junction Box and Pull Box Identification: Use indelible black marker to inscribe circuit or bus, switch numbers and source panel on the outside of each junction and pullbox cover.

I. Secondary Service, Feeder, and Branch-Circuit Conductors: Color-code throughout the secondary electrical system.

1. Color-code 208/120-volt system as follows:
   a. Phase A: Black
   b. Phase B: Red
   c. Phase C: Blue
   d. Neutral: White with a phase colored stripe
   e. Ground: Green

2. Color-code 480/277-volt system as follows:
   a. Phase A: Brown
   b. Phase B: Orange
   c. Phase C: Yellow
   d. Neutral: Gray with a phase colored stripe
   e. Ground: Green

3. Lighting Controls:
   a. Yellow

4. Factory apply color the entire length of all conductors.

J. Equipment Identification Labels: Engraved plastic laminate. Install on ceiling grid or access door below each electrical device or electrical unit of equipment installed above the ceiling. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

K. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Distribution and control equipment
   a. Identify equipment as well as loads served
   b. 1/4 inch lettering for equipment designation.
   c. 1/8 inch lettering to identify voltage rating, fault current rating, and source.
   d. 1/8 inch lettering for individual switches identifying loads served

2. Panelboards, Switchboards, electrical cabinets, and enclosures:
   a. 1/4 inch lettering for equipment designation
   b. 1/8 inch lettering to identify voltage rating, fault current rating, and source.

3. Individual Control Equipment (timeclocks, lighting control relay cabinets and contactors) Circuit Breakers and Switches in Panelboards and Switchboards:
   a. 1/8 inch lettering to identify circuit and load served, including location.
   b. 1/8 inch lettering to identify voltage rating, fault current rating, and source.

4. Individual Circuit Breakers, Enclosed Disconnect Switches, and Motor Starters:
   a. 1/8 inch lettering to identify load served.
   b. 1/8 inch lettering to identify voltage rating, fault current rating, and source.

END OF SECTION 26 05 53

SECTION 26 08 00

TESTING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 PROVISIONS

A. The drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A.	Common Work Results for Electrical	Section 26 05 00
B.	Low-Voltage Power Conductors and Cables	Section 26 05 19
C.	Grounding and Bonding for Electrical	Section 26 05 26

1.03 TEST REPORT SUBMITTALS

A. Provide a single submittal with examples of test reports for each system to be tested to the Owner/Architect/Engineer prior to testing in accordance with Division 1.

B. Submit results of testing (1 hard copy and 1 electronic (PDF) copy) for each system to the Owner/Architect/Engineer when complete in accordance with Division 1.

1.04 SAFETY AND PRECAUTIONS

A. Safety practices shall include, but are not limited to, the following requirements:

1. Occupational Safety and Health Act
2. Accident Prevention Manual for Industrial Operations, National Safety Council
3. Applicable state and local safety operating procedures
4. Owner's safety practices
5. National Fire Protection Association - NFPA 70E
6. American National Standards for Personnel Protection

B. All tests shall be performed with apparatus de-energized (Thermographic Survey shall be performed under load). Exceptions must be thoroughly reviewed to identify safety hazards and devise adequate safeguards.

C. The testing firm shall coordinate with the Contractor's safety representative on the project to supervise the testing operations with respect to safety.

1.05 APPLICABLE CODES, STANDARDS, AND REFERENCES

A. All inspections and tests shall be in accordance with the following codes and standards except as provided otherwise herein:

1. National Electrical Manufacturer's Association - NEMA
2. American Society for Testing and Materials - ASTM
3. Institute of Electrical and Electronic Engineers - IEEE
4. InterNational Electrical Testing Association - NETA Acceptance Testing Specifications - ATS

5. American National Standards Institute - ANSI C2: National Electrical Safety Code
6. Codes and ordinances of the State, County, and City
7. Insulated Cable Engineers Association - ICEA
8. Association of Edison Illuminating Companies - AEIC
9. Occupational Safety and Health Administration - OSHA
10. National Fire Protection Association - NFPA
    a. ANSI/NFPA 70: National Electrical Code
    b. ANSI/NFPA 70B: Electrical Equipment Maintenance
    c. NFPA 70E: Electrical Safety Requirements for Employee Workplaces
    d. ANSI/NFPA 780: Lightning Protection Code
    e. ANSI/NFPA 101: Life Safety Code

PART 2 – PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 PANELBOARDS

A. Visual and Mechanical Inspection:

1. Inspect for physical damage.
2. Verify proper installation. This includes alignment, anchorage, clearances, grounding, bending radius of cables, wiring aesthetics, etc.
3. Inspect for proper identification, nameplate ratings, sizes of protective devices, switches, and busses, and adherence to one-line diagrams.
4. Check tightness of accessible bolted bus joints, cable connections, and anchor bolts.
5. Physically test all electrical or mechanical interlocks to assure proper function.
6. Inspect for proper operation of space heaters and thermostat settings (if applicable)
7. Clean interior and insulator surfaces.
8. Exercise all active components and verify proper barrier and shutter installation and operation.
9. Verify proper neutral and ground connections.
10. Implement settings of overcurrent protective devices per the coordination study.

3.02 CABLES - LOW-VOLTAGE - 600V MAXIMUM

A. Visual and Mechanical Inspection:

1. Inspect cables for physical damage and proper connection in accordance with single-line diagram.
2. Test cable mechanical connections to manufacturer's recommended values using a calibrated torque wrench.
3. Check cable color coding with applicable Engineer's specifications and National Electrical Code standards.

B. Electrical Tests:

1. Perform continuity test to insure proper cable connection.
2. Perform phase rotation tests. Color code conductors.

3.03 GROUNDING SYSTEMS

A. Visual and Mechanical Inspection:

1. Inspect ground system for compliance with codes, drawings and specifications.

3.04 LOW VOLTAGE CIRCUIT BREAKERS

A. Visual and Mechanical Inspection:

1. Inspect for physical damage.
2. Mechanical operational test will be made in accordance with manufacturer's instructions.
3. Check tightness of all hardware connections.
4. Check cell fit and element alignment (if applicable).

3.05 WIRING DEVICES

A. Visual and Mechanical Inspection:

1. Inspect relays for physical damage, presence of foreign material, moisture, and corrosion.
2. Clean cover glass and relay components as required.
3. Check for freedom of movement, proper travel and alignment and tightness of mounting hardware and tap screws.

B. Electrical Tests:

1. Perform wiring continuity test on each receptacle.
2. Perform ground fault interruption test on each GFI receptacle using external ground fault simulation testing equipment.

3.06 SYSTEM FUNCTION TESTS

A. General: Perform system function tests upon completion of equipment component tests as defined in this specification. It is the purpose of system function tests to prove the proper interaction of all sensing, processing, and action devices.

B. Implementation: Contractor is to notify the Engineer when system testing is to begin. Commissioning Agent shall provide to the Contractor a test procedures for the equipment and systems to be functionally tested. The test procedure shall be reviewed and approved by the Owner and Engineer 10 days prior to beginning the system testing.

END OF SECTION 26 08 00

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.01 SCOPE

A. The CONTRACTOR shall furnish and install all wiring devices shown on the Drawings and as required for the electrical distribution systems.

B. Wiring devices shall include lighting switches, plug receptacles, multi-outlet assemblies, and miscellaneous wiring devices including cover plates and all other materials and accessories required for the complete wiring device installations as shown on the Drawings and as described in this Section.

1.02 RELATED SECTIONS

A.	Low-Voltage Power Conductors and Cables	Section 26 05 19
B.	Grounding and Bonding for Electrical	Section 26 05 26
C.	Raceways and Boxes for Electrical	Section 26 05 33
D.	Identification for Electrical	Section 26 05 53

1.03 REFERENCES

A. NEMA WD 1-83: General Requirements for Wiring Devices.

B. NEMA WD 6-88: Wiring Device – Dimensional Requirements.

C. UL 486A-91: Wire Connectors and Soldering Lugs for Use with Copper Conductors.

D. UL 20: General-Use Snap Switches.

E. UL 498: Electrical Attachment Plugs and Receptacles.

F. UL 943: Ground-Fault Circuit Interrupters.

1.04 SUBMITTALS

A. The CONTRACTOR shall submit drawings, data, and descriptive information in accordance with the requirements of this Section, Section 26 05 00 – Common Work Results for Electrical, and Section 01 33 00 – Submittal Procedures.

B. Samples:

1. Submit physical sample of each type of device used and device coverplate product samples to illustrate materials, equipment or workmanship, for color selection coordination and compliance with technical specifications

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Provide products specified in this Section that are “listed and labeled” (as defined by the National Electrical Code, Article 100).
2. Comply with NEMA WD 1. Comply with NFPA 70.

1.06 DEFINITIONS

A. GFCI: Ground-Fault Circuit Interrupter

1.07 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

B. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Items of material furnished for the Work, subject to compliance with requirements, items listed or equal approved from manufacturers offering products that may be incorporated into the Work include the following:

B. Wiring Devices:

1. Bryant Electric, Inc.
2. Arrow-Hart
3. Eagle Electric Manufacturing Co., Inc.
4. Hubbell, Inc.; Wiring Devices Div.
5. Leviton Manufacturing Co., Inc.
6. Pass & Seymour/Legrand; Wiring Devices Div.
7. Lutron
8. Raceway Components, Inc. – for floor mounted service fittings
9. Wood Head – for cord drops

C. Multioutlet Assemblies:

1. Carlton
2. IsoDuct
3. Panduit
4. Pass & Seymour
5. Walker
6. Wiremold

2.02 COMPONENTS

A. Straight-Blade Receptacles: 20-Ampere, Heavy-Duty grade, nylon, flat faced Comply with NEMA WD 6.

B. Locking Receptacles: Heavy-Duty grade, Comply with NEMA WD 6.

C. Tamper Guard Receptacles: Specification Grade, nylon, flat faced, feed-through type, with integral NEMA WD 6 Configuration 5-20R duplex receptacle. Manufactured with thermoplastic dual mechanism shutter system to help prevent insertion of foreign objects. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter. GFCI type tamper guard receptacles shall also meet GFCI requirements.

D. Tamper Guard GFCI Receptacles: Specification Grade, nylon, flat faced, feed-through type, with integral NEMA WD 6 Configuration 5-20R duplex receptacle. Manufactured to protect connected downstream receptacles on same circuit (when downstream receptacles are located in the same room). Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter.

E. Cord and Plug Sets: Match voltage and current ratings and number of conductors to requirements of equipment being connected. Rubber-insulated cord, stranded-copper conductors, with type SOW-A jacket. Green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent. Nylon plug body and integral cable-clamping jaws. Match cord and receptacle type for connection.

F. Snap Switches: General-duty, nylon, quiet type. Switch shall be rated at 20 A, 120/277-VAC.

G. Multioutlet Assemblies: Products from a single manufacturer designed as a complete, matching assembly of raceway, and receptacles. Raceway shall be constructed of sheet metal with manufacturer's standard finish.

H. Wall Plates: Single and combination types match corresponding wiring devices. Metal plate-securing screw with head color to match plate finish. Material for Finished Spaces: Nylon, color to match wiring devices, color to be selected by architect.

2.03 FINISHES

A. Color: Manufacturers standard ivory (or match existing color prevalent in facility).

PART 3 - EXECUTION

3.01 INSTALLATION

A. Secure all devices and assemblies plumb and secure

B. Arrange devices and assemblies, unless otherwise noted, mounted flush with long dimension vertical, and grounding terminal of receptacles on top.

C. Provide adequate protection for devices and assemblies prior to commencement of painting. Install device wall plates and assembly cover plates upon completion of painting.

D. Connect wiring device and assembly grounding terminal to outlet box with bonding jumper. Connect wiring device and assembly grounding terminal to branch circuit conductors and equipment grounding wire with six inch wire pigtails.

E. Tighten all electrical connectors and electrical terminals according to manufacturers publishes torque-tightening values. If torque values are not published, use torque values as specified in UL 486A and UL 486B.

3.02 IDENTIFICATION

A. Comply with Section 26 05 53 “Identification for Electrical”

3.03 FIELD QUALITY CONTROL

A. Site Tests, Inspections:

1. Test wiring devices for proper polarity and ground continuity. Operate each device and assembly at least six times.
2. Test GFCI operation with both local and remote fault simulations in accordance with manufacturer’s written testing procedures.

3.04 ADJUSTING

A. Replace damaged and/or defective components.

3.05 CLEANING

A. Keep all items protected before, during, and after installation. Clean area and remove all debris. Remove all paint overspray and/or spattering from devices and assemblies.

3.06 DEMONSTRATION

A. The Contractor shall provide for demonstration and complete instruction to the Owners’ operating personnel as to the operation, maintenance, and repair procedures of all installed devices and assemblies.

END OF SECTION 26 27 26

SECTION 280500 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY, FIRE ALARM SYSTEM

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Cable Material Requirements.

B. Cable Installation Requirements.

1.2 GENERAL REQUIREMENTS

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

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

1.3 SUBMITTALS

A. Submittal Procedures

1. Product Data: Provide manufacturer's data sheets showing product appearance, electrical characteristics, and connection requirements.

2. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use, as stipulated by the product-testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and start-up or products.

3. Exceptions: Provide a detailed listing of any and all exceptions, variances, and non-conformances to the specifications and contract design drawings. Failure to disclose any such items shall be grounds for immediate disapproval of submittals without comment.

4. Samples: Provide samples of the following items.

a. Provide a minimum of two (2) samples of all cable supporting devices, metal bridle rings, metal mounting brackets, plastic plenum rated wire bushings, and other applicable cable installation equipment to be utilized on the project.

1.4 QUALIFICATIONS

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

B. Fire Alarm Installer: Installing Company shall use only Notifier for programming and final testing. The Bidding Company must specialize in installing the products specified in this section with a minimum three (3) years documented experience. The installer shall employ NICET Level 2

trained technicians to install the products specified in this Section.

PART 2 – PRODUCTS

2.1 SAFETY ALARM SYSTEM WIRE AND CABLE

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

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

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

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

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

PART 3 – EXECUTION

3.1 INSTALLATION

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

B. Fire alarm cable in new construction shall be installed in conduit.

C. Plenum rated cable.

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

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

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

E. Minimum size for back boxes shall be 4” x 4” x 2-1/8”.

F. Combination speaker/strobe back boxes shall be ORBIT 4” x 4” x 3-1/2” with associated BH3 mounting bracket or approved equivalent.

G. Adjustable Caddys are not permitted.

H. The use of extension rings on new or retrofit construction shall be approved on a “case-by-case

basis" by the Engineer and Owner.

I. Wire runs may not be spliced. Pull continuous lengths from device terminal to device terminal in order to maintain the integrity of the electrically supervised system.

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

K. Knockouts are not permitted in exposed back boxes installed in public areas.

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

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

N. All box knock outs and exposed conduit edges shall have plastic edge protection. (RCR50 or equivalent.)

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

P. Provide marking paint on support hardware. Red for Fire Alarm. Do not allow paint to contaminate any wire.

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

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

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

T. Automatic Detector Installation: Conform to NFPA 72.

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

3.2 CONDUIT INSTALLATION REQUIREMENTS

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

B. Conduit shall be utilized for fire alarm system cable in all exposed areas and where subject to physical damage.

C. New installation of fire alarm wire shall be installed in conduit.

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

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

F. Where required, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.

G. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-29.

H. Wiring for 24 volt DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

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

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

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

L. Conduit shall be provided for all inaccessible spaces.

M. Conduit edge protection shall be provided for all transitions from conduit to bridle rings.

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

3.3 OPEN (PLENUM) CABLE INSTALLATION REQUIREMENTS

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

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

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

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

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

F. Conduits and device back boxes shall have appropriate plastic plenum rated strain relief wire

bushings where open cable routing occurs. Do not use Romex type connectors.

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

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

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

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

3.4 LABELING

A. All fire devices shall have the room number/location description provided in the software programming. Example L1-M001 AHU-1 Return Classroom 201. When necessary to distinguish the locations of two or more detectors, compass directions shall be incorporated in the device location description in programming.

B. Label each initiating device with device ID address (L1-D001 format), and control module or monitor module with device ID address and circuit function (L1-M001, Strobes format). Use Kroy lettering machine with ¼-inch minimum black lettering on white background, unless alternate labeling approved by Owner. Do not place label on sensor.

C. Label each notification appliance with notification appliance (NAC) circuit number and device number in circuit (NAC 1:1-1, NAC 1:1-2, etc.). Label notification appliance (NAC) circuit and or line (EOL) device location on the notification appliance where the EOL is located (NAC 1:1 EOL). Use Kroy lettering machine with ¼-inch minimum black lettering on white background, unless alternate labeling approved by Owner.

D. Label each remote duct detector or beam detector test station with device ID address and associated HVAC unit or beam detector designated (L1-M001 RTU-1 format). Label location of the device associated with the test station, if the test station is not in the direst vicinity of the associated device (L1-M1 RTU-1 Classroom 201 format). Use Kroy lettering machine with ¼-inch minimum black lettering on white background, unless alternate labeling approved by Owner.

E. Label each concealed device location with device ID address and circuit function (L1-M001 Door Holder format) at the adjacent ceiling tile grid T-bar. Use plastic laminate with engraved ¼-inch lettering. Laminate shall be of red on white core construction (white lettering on red background), unless alternate labeling approved by Owner.

3.5 FIRE ALARM WIRE AND CABLE COLOR CODE

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

1. SLC wire shall be RED(+)/Black(-). (FPLP jacket with preprinted SLC)

2. IDC wire shall be RED(+)/Black(-). (FPLP jacket with Brown stripe)

3. 24 VDC Power Circuit; #14/2 Solid, Red with Purple Stripe

4. Notification Appliance Circuit (NAC): #14/2 or 14/4 Solid, Red w/Green Stripe

    a. NAC Strobe only wire shall be RED(+)/Black(-). Red w/Green Stripe

b. NAC Horn\Speaker only wire shall be RED(+)Black(-) Red w/Blue Stripe (16AWG)

5. Miscellaneous Fire Circuit: #18/4 Solid, Red w/Yellow Stripe

6. Conductor sizing and numbers subject to equipment manufacturer recommendations.

B. Wire size shall be as follows:

1. NAC strobe wire shall be 14AWG.
2. NAC speaker wire shall be 16AWG TW. Shield as required by manufacturer.
3. SLC wire shall be 16AWG.
4. IDC wire shall be 16AWG
5. HVAC wire shall be 16AWG.
6. Network audio shall be 16AWG.
7. All 120VAC shall meet NEC standards.
8. Conductor sizing and numbers subject to equipment manufacturer recommendations.

3.6 DEDICATED CIRCUIT

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

B. Provide dedicated circuits for amplifiers and power supplies.

3.7 FIELD QUALITY CONTROL

A. Fire Alarm System

1. Test in accordance with NFPA 72, Owner, State, and Authority Having Jurisdiction (AHJ) fire department requirements.
2. Provide forty-eight (48) hours prior notice to the Engineer and Owner personnel for rough inspection, prior to installing ceiling tiles, devices or drywall.
3. Provide seven (7) day prior notice to the Engineer and Owner personnel for scheduled contractor pre-testing of the system.
4. Provide three (3) day prior notice to the Engineer and Owner personnel for the scheduled Authority Having Jurisdiction (AHJ) testing of the system.
5. Provide three (3) original copies of the NFPA 72 - Certificate of Completion Form.
   a. One for Owner, one for the Authority Having Jurisdiction (AHJ), and one for the facility's Fire Alarm System Logbook.
   b. Voltage and current values must be true measured values not estimates.
6. Provide two (2) detailed records of the pre-testing of the system.
   a. One for Owner and one for the facility's Fire Alarm System logbook.
   b. Pre-testing record must contain a minimum of the device ID, proper annunciator description, proper functionality of the device (audible/visual signaling, shutdown, etc.), and date of the testing.

3.8 MANUFACTURER'S FIELD SERVICES

A. Prepare and start systems.

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

C. Provide two (2) hard copies and two (2) electronic copies in CD ROM or flash drive format of the

final system programming. One set to be delivered to Owner Project Manager for Owner Central Reporting System programming, and one set to be left at the facility.

3.9 DEMONSTRATION

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

3.10 TRAINING

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

1. On-Site Training: Provide a minimum of two (2) hours of on-site training of the facility's school staffing in the basic operations and functionality of the access control panel, and field devices. Review field panel locations, typically device locations, and 120vAC power locations (panels, breakers, and circuits). Demonstrate the various system responses to the field off-normal conditions. Simulate card access conditions, supervisory conditions, trouble conditions, and ground fault conditions of the various field devices. Demonstrate how to reset various building systems (HVAC units, fire doors, etc.). Provide written instructions of basic system operating instructions in Fire Alarm Log Book, located adjacent to the fire alarm control panel.
   a. On-Site System Training shall be completed within six (6) days of completion of the system and Owner Acceptance of the system.
   b. Schedule on-site training with Owner at least three (3) days in advance.

END OF SECTION

INTENTIONALLY LEFT BLANK

SECTION 28 46 00- FIRE ALARM & DETECTION SYSTEM

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

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

B. The owner will not accept exceptions to the specifications or any variances to the contract drawing design. The contractor is responsible for a complete fire alarm system, acceptable to the AHJ and owner.

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

1.2 SCOPE

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

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

1.3 APPLICABLE CODES AND STANDARDS

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

1. All equipment shall be listed and classified by Underwriters Laboratories, under the latest edition of the following standards:
    a. Signaling Systems.
    b. UL 228 – Door Closers-Holders, With or Without Integral Smoke Detectors.
    c. UL 639 – Intrusion – Detection units.
    d. UL 268 – Smoke Detectors of Fire Protective Signaling Systems.
    e. UL 268A – Smoke Detectors for Duct Applications.
    f. UL 464 – Audible Signal Devices for Fire Alarm and Signaling Systems, Including Accessories.
    g. UL1638 – Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories.
    h. UL 1480 – Speakers for Fire Alarm and Signaling Systems, Including Accessories.
    i. UL 38 – Standard for Manual Signaling Boxes for Fire Alarm Systems.
    j. UL 346 – Standard for Waterflow Indicators for Fire Protective Signaling Systems.
    k. UL 521 – Standard for Heat Detectors for Fire Protective Signaling Systems.
    l. UL 1481 – Standard for Power Supplies for Fire-Protective Signaling Systems.
    m. UL 1711 – Standard for Amplifiers for Fire Protective Signaling Systems.
    n. UL 521 – Heat Detectors for Fire Protective Signaling Systems.

o. UL 864 – Control Units for Fire Protective Signaling Systems.
p. UL 1076 – Proprietary Burglar Alarm Units and Systems.
q. UL 1971 – Signaling Devices for the Hearing Impaired.
r. FM P7825a – Approval Guide Fire Protection
s. NFPA 70 - National Electrical Code Current Version adopted By Colorado.
t. NFPA 72 - National Fire Alarm Code Current Version adopted By Colorado.
u. NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems.
v. IFC - International Fire Code. Current Version adopted By Colorado
w. IBC International Building Code. Current Version adopted By Colorado
x. IMC – International Mechanical Code. Current Version adopted By Colorado
y. ANSI S3.41 – Audible Emergency Evacuation Signals.
z. EIA ANSI/EIA/TIA2323 – Interface between Data Terminal Equipment and Data Circuit Terminating Equipment employing Serial Binary Data Interchange.
aa. IEEE C6.41 – Surge Voltages in Low Voltage AC Power Circuits.
bb. Owner Technical Guidelines.
cc. Local AHJ shall enforce State of Colorado Requirements only State of Colorado Requirements.
dd. Americans with Disabilities Act (ADA)

1.4 SPECIAL REQUIREMENTS

A. Submittal Procedures.

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

1.5 SUBMITTALS

A. Submittal Procedures.

1. Shop Drawings: Provide shop drawings of Annunciator map graphic layout and system wiring diagrams showing all equipment, device placement, and wiring connection required. Drawings include one-line riser diagrams, device ID numbers (manufacturer’s format) and zone schedules, operational matrix, and location of all end-of-line (EOL) devices. Each initiating device and notification appliance device shall include signaling loop circuit or notification appliance circuit number and device ID numbers (manufacturer’s format).
2. Product Data: Provide manufacturer’s data sheets showing product appearance, electrical characteristics, and connection requirements.
3. Load Calculations: Provide load calculations for all visual appliance circuits, audible notification appliance circuits, audible/visual notification appliance circuits, system power supplies, and battery standby systems.
4. Control Panel and Power Supply: Show fire alarm control panel layout, configurations and terminations.
5. Manufacturer’s Installation Instructions: Indicate application conditions and limitations of use, as stipulated by the product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and start-up of products.

6. Samples: Provide samples of various items, when requested.
    a. Provide a minimum of two (2) samples of all fire alarm cable to be installed on the projects. Cable samples shall be of sufficient length to identify cable marking (striping) and cable listing identification.
    b. Provide a minimum of two (2) samples of all cable supporting devices, metal bridle rings, metal mounting brackets, plastic plenum rated wire bushings, and other applicable cable installation equipment to be utilized on the project.

1.6 CLOSEOUT SUBMITTALS

A. Record Drawings

1. Record “as-built” locations of all system components, initiating devices, signaling appliances, and end-of-line devices. Include “as-built” conduit routing and wire counts. The design engineer and Owner representative shall walk through the building and spot check 5-10% of device locations against the as-builts. If devices are not as shown, drawings will be rejected for a redraw. Upon resubmittal, another spot check will be performed. If deficiencies are found on the second check, an independent audit to the system by the system manufacturer shall be required. The contractor shall bear the cost of any such audit.
2. As-Built drawings shall consist of two hard copy bond sets and one electronic AutoCAD file copy on CD or flash drive format.
3. As-Built system load and battery calculations shall consist of two full size hard copy bond sets and one electronic copy on CD or flash drive format. Load calculations shall include all audible, visual, and audible/visual notification appliance circuits with calculated voltage drop levels, calculated maximum circuit distance measurements, actual recorded circuit length distance measurements, and actual measured voltage drop levels.
4. Provide two (2) hard copies of all system programming (software).
5. Provide two (2) electronic copies of all system programming (software); on CD ROM or flash drive format.
6. Provide Contractor redline construction drawing set, with mark-ups.
7. Provide two (2) full size hard copy bond sets of As-Built record drawing set.
8. Provide one (1) 11x17 hard copy bond sets of As-Built record drawing set.
9. Provide one (1) electronic copy of As-Built record drawing sets; on CD or flash drive format.
10. Provide all special test equipment, filters, test leads, cords, etc. required to test the system.
11. Record document box shall be located adjacent to FACP and shall contain contractor working set (actual field set – not cleaned up version) along with electronic copies as indicated above.

B. Operation and Maintenance (O&M) Manuals

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

C. Warranty

1. The manufacturer shall guarantee the system equipment for a minimum period of one (1) year from the date of final acceptance of the system. Any additional warranty periods shall be

listed in the Operation and Maintenance Data manuals. Any defective equipment, material, or software shall be replaced at no cost to the Owner during this warranty period.

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

D. Maintenance Service

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

E. Spare Parts

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

1.7 QUALIFICATIONS

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

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

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

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

E. Installer: Installing Company shall use only Notifier for programming and final testing. The Bidding Company must specialize in installing the products specified in this section with a minimum three

(3) years documented experience. The installer shall employ NICET Level 2 trained technicians to install the products specified in this Section.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with specified requirements, products of the following manufacturers shall be acceptable:

1. FACP: Shall be based upon Notifier-2 3030 by Tech Electronics.
2. Substitutions: No substitutions allowed.

2.2 MATERIALS

A. Fire Alarm Control Panel

1. The fire alarm control panel shall incorporate all control electronics, relays, necessary modules, and components in a semi-flush mounted cabinet. The operating controls and zone/supervisory indicators shall be located for the Fire Department and other authorized operating personnel. The fire alarm control panel shall consist of a base panel, system power supply, and battery charger, with optional modules suitable to meet the requirements of these specifications.
2. The fire alarm control panel shall be supervised, site programmable, and of modular design with expansion modules to provide analog addressable loop modules as required. Allow for 20% spare on both detector and modules. The expansion modules be configurable to either Class A or Class B wiring.
3. The fire alarm control panel shall store all basic system functionality and job specific data in nonvolatile memory, and shall survive a complete power failure intact. The fire alarm control panel shall be capable of automatic system operation with support of alarm silence, trouble silence, drill, lamp test and reset common controls. The fire alarm control panel shall allow downloading of job specific custom programming, and shall support programming of any input point to any output point, or using initiating events to start actions and sequences.
4. The fire alarm control panel shall utilize full digital communications to supervise all addressable loop detectors and modules for proper operation. The fire alarm control panel shall have a UL Listed Detector Sensitivity test feature, and shall support 100% of all remote detectors, remote alarm indicators and modules in alarm at any time.
5. The fire alarm control panel shall supervise all system modules for placement, and shall have a digital display for reporting system status and abnormal conditions. The fire alarm control panel shall provide common control indicators (normal, alarm, monitor, ground fault, supervisory, trouble), common control switches (reset, alarm silence, trouble silence, and drill), and zone alarm and trouble LEDs, as required for the system zoning requirements. The fire alarm control panel shall provide system function keys for status, reports, enable, disable, activate, restore, program and test.
6. Provide a Owner approved Fire Alarm Document Enclosure adjacent to the FACP.
7. Provide a wall mounted 3 ring binder holder for Owner provided Fire Alarm Log Book adjacent to the FACP.

B. Power Supplies:

1. The fire alarm power supply shall be switch mode type with line monitoring to automatically switch to batteries upon power failure or brown out conditions, and shall be adequate to service all control panel modules, all fire alarm system powered smoke sensors and modules, remote annunciators, control relays, and all fire alarm signaling appliances. The fire alarm power supply shall contain an integral battery charger capable of recharging the standby

batteries per NFPA 72 requirements, and shall provide battery supervision for placement and low voltage.

2. Provide booster power supply panels as required, to meet project requirements. The booster power supply shall activate via dry contact from the fire alarm control panel. The booster power supply shall generate a fault condition at the main fire alarm control panel, when any fault condition occurs on circuits connected to the booster power supply, or a trouble condition occurs at the booster power supply panel. The booster power supply shall contain an integral battery charger capable of recharging the standby batteries per NFPA 72 requirements, and shall provide battery supervision for placement and low voltage.
3. Multiple power supplies may share monitor and control modules ONLY if they are mounted in the same room, not to exceed 3 power supplies per monitor point. Activation of a power supply from another power supply is not permitted.
4. Provide a dedicated booster power supply for 24VDC magnetic door holders. Configure power supply for control only. Do not monitor this power supply and do not provide batteries as magnetic door holders are fail safe.

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

1. Batteries shall be dated with month and year of installation in the system.
2. Dedicated battery cabinets (when required) shall be located below the fire alarm control panel. Do not locate these panels above finished ceilings.
3. For existing fire alarm system upgrades, provide new batteries for existing power supplies.

D. System Design Parameters:

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

shall provide all power for the audible, visual, and audible/visual notification appliances, and shall by Style Y (Class B).

6. Audible and Visual (NAC) Appliance Circuits: Provide audible and visual notification appliance (NAC) circuits, such that the visual notification appliances continue to flash until the fire alarm control panel has been reset, even though the audible notification appliances have been silenced.
7. Design the fire alarm system such that the Beam and Duct smoke detectors are intelligent/analog devices. Conventional devices shall not be used without written permission from the engineer and Owner Project Manager. If conventional devices are approved, a separate 24vDC power source that is resettable from the fire alarm control panel must be installed, as applicable.

POUDRE SCHOOL DISTRICT DESIGN STANDARDS

Design standards have been truncated for the notification upgrade projects and existing initiating devices may not comply with state code requirements (International Building Code 2018 and NFPA 72 2016). The fire alarm system design incorporates the following design criteria. (Exceptions for schools protected throughout with automatic sprinklers are noted where applicable.)

Smoke Detection

1. Smoke detectors shall be located throughout all common corridors. These smoke detectors shall control magnetic door hold opens. Door holders shall release upon general alarm. (Fully sprinklered schools shall only have smoke detectors within 5 feet of magnetic door holders.)
2. A smoke detector shall be located in the main electrical room.
3. Smoke detectors shall be located at all fire alarm remote power supply panels and fire alarm control panel locations unless the environment is unsuitable for smoke detectors in which case 135 degree fixed temperature heat detectors shall be utilized.
4. Smoke detectors shall be located in all computer classrooms. (Not required if the building is protected throughout with automatic sprinklers.)
5. Smoke detectors shall be located in the Library/Media Center. (Not required if the building is protected throughout with automatic sprinklers.)
6. A smoke detector shall be located in each MDF/IDF room.
7. A smoke detector shall be located in each modular classroom and shall be non-intelligent.
8. Smoke detectors shall be located in elevator lobbies, elevator machine room, and the top of shaft for elevator control purposes as required by ANSI A 17.1.
9. Smoke detectors shall be provided as required by the International Mechanical Code for fire/smoke dampers if applicable to the school.
10. Provide wire guards for all gym and cafeteria smoke detectors. Contractor shall notch wire guards to allow for magnetic testing. Note: magnet testing is not a substitute for smoke chamber entry testing.

Heat Detection:

1. When the FACP is located in the vestibule, an intelligent 135 degree fixed temp heat detector shall be located in the vestibule.
2. Heat detectors shall be located in all code required areas, not suitable for smoke detection.

Carbon Monoxide (CO) Sensors (Alternate 4):

1. Carbon monoxide (CO) sensors shall be monitored by addressable fire alarm monitor module, and shall report to the fire alarm system as a “supervisory” type device.
2. Carbon monoxide (CO) sensors shall have three CO exposure level settings for short, medium, and long duration periods of exposure to CO gas.
3. Carbon monoxide detectors shall be located in kitchen, boiler room, rooms with gas fired equipment including science prep rooms, science classrooms, laboratories, home economics (with gas), gas water heaters, gas furnaces, and gas fired AHUs or first room served by a gas fired AHU.
4. Carbon monoxide detectors shall be located in each modular classroom and shall be non-intelligent.

Audible, Visual, and Audible/Visual Notification Appliances (Base Bid):

1. Horns and horn/strobes shall be generally located to provide a minimum of 15dB above ambient sound levels throughout all building areas.
2. Horn/strobes shall be located in all mechanical rooms, and other high-noise areas.
3. Horn/strobes shall be located in all classroom areas.
4. Horns and strobes shall be located in gymnasiums.
5. All horns shall be set to the LOW volume setting and shall be placed to meet dB level requirements.
6. Horn/strobes shall be located in all common “public area” spaces, including corridors, classrooms, open office areas, and other areas where more than one-person occupancy would be expected.
7. Strobes shall be located in all restrooms except single water closets (toilet only) without a sink specifically in kindergarten and pre-school classrooms.

8. Strobes shall be located in copy rooms, work rooms, storage rooms greater than 400 square feet, and storage rooms where high occupant usage levels are anticipated under normal conditions.
9. Strobes shall be located in clinics and conference rooms.
10. Strobes shall not be installed in single occupant offices.
11. Ceiling mounted Horn/strobes are preferred over wall mounted in classrooms, restrooms, and offices. Ceiling mounted Horns, strobes, and Horn/strobes shall be centered in the space as much as possible, but shall not exceed 5 feet in any direction from the center, unless approved by the engineer or AHJ.
12. When ceiling mounting is not practical, horns, strobes, and horn/strobes shall be wall mounted with the bottom of the visual signal (strobe) lens at 80" above finished floor, or with the top of the visual signal (strobe) lens at 6" below the ceiling (for low ceiling areas), whichever is lower.
13. For specific limited applications, the horns, strobes, and horn/strobes may be installed with the top of the visual signal (strobe) lens at up to 96" above finished floor. Each location must be approved in writing by the engineer or AHJ.
14. Exterior weatherproof horn/strobes shall be provided at the fire department response point. The horn shall be silenceable and the notification appliance shall be mounted 10 feet above grade.
15. Provide wire guards for all locker room, gym and cafeteria horns, strobes and horn/strobes.
16. Horns, strobes and horn/strobes shall be red and labeled "FIRE"

Audible, Visual, and Audible/Visual Notification Appliances (Alternate 2):

1. Speakers and speaker/strobes shall be generally located to provide a minimum of 15dB above ambient sound levels throughout all building areas.
2. Speaker/strobes shall be located in all mechanical rooms, and other high-noise areas.
3. Speaker/strobes shall be located in all classroom areas.
4. Loudspeakers and strobes shall be located in gymnasiums.
5. All speakers shall be set to the volume setting recommended by manufacturer to meet intelligibility and dB level requirements.
6. Speaker/strobes shall be located in all common "public area" spaces, including corridors, classrooms, restrooms, open office areas, and other areas where more than one-person occupancy would be expected.
7. Strobes shall be located in all restrooms except single water closets (toilet only) without a sink specifically in kindergarten and pre-school classrooms.
8. Strobes shall be located in copy rooms, work rooms, storage rooms greater than 400 square feet, and storage rooms where high occupant usage levels are anticipated under normal conditions.
9. Strobes shall be located in clinics and conference rooms.
10. Strobes shall not be installed in single occupant offices.
11. Ceiling mounted speaker/strobes are preferred over wall mounted in classrooms, restrooms, and offices. Ceiling mounted speakers, strobes, and speaker/strobes shall be centered in the space as much as possible, but shall not exceed 5 feet in any direction from the center, unless approved by the engineer or AHJ.
12. When ceiling mounting is not practical, speakers, strobes, and speaker/strobes shall be wall mounted with the bottom of the visual signal (strobe) lens at 80" above finished floor, or with the top of the visual signal (strobe) lens at 6" below the ceiling (for low ceiling areas), whichever is lower.
13. For specific limited applications, the speakers, strobes, and speaker/strobes may be installed with the top of the visual signal (strobe) lens at up to 96" above finished floor. Each location must be approved in writing by the engineer or AHJ.
14. Exterior weatherproof horn/strobes shall be provided at the fire department response point. The horn shall be silenceable and the notification appliance shall be mounted 10 feet above grade.
15. Provide wire guards for all gym and cafeteria speakers, strobes and speaker/strobes.
16. Speakers, strobes and speaker/strobes shall be white and labeled "FIRE"
17. Speakers and speaker/strobes shall be installed in dedicated zones as required by Division 284650.

Remote Monitoring, Fire Alarm Control Panel and Remote Power Supply (Alternate 3):

1. A Bosch 465 communicator shall be provided for offsite monitoring. The fire alarm system shall report alarm, trouble, supervisory and waterflow to the monitoring company.

2. Provide a network drop at the FACP for a web interface allowing remote viewing of the FACP.
3. An electrical outlet is required and shall be provided by each FACP.
4. The electrical contractor shall run EM power to FACP and RPS from the facility EM Panel.

Labels for Devices:

1. All equipment shall be clearly labeled with the device address on the base of the detector or manual pull station with type black lettered on a clear background labels with a text size of at least 18 point.
   i. Smoke detectors and manual pull stations shall be labeled with the device address on the base of the detector or manual pull station.
   ii. All notification appliances shall be labeled with the notification circuit designation. The "End of Line" shall be clearly labeled.
   iii. Monitor and Relay modules shall be labeled with the device address and function. (For example: L1M-23 Waterflow; L1M-50 Mag Door Release; etc.)
   iv. Duct detectors shall be labeled with the device address on the base of the detector and the ceiling grid shall be labeled as duct detector, HVAC unit and device address. Remote test switch shall indicate HVAC Unit and device address.
2. All modules shall have the status LEDs visible without requiring the removal of a ceiling tile or cover plate.

Graphic Map:

1. Graphic Maps shall be securely mounted next to the fire alarm control panel. A graphic map is also required next to the remote annunciator (if provided). Graphic map location and colors shall be approved by PSD and TLH prior to mounting and installation.

END OF FIRE ALARM DESIGN CRITERIA

B. OFFSITE SIGNALING

1. Dialer: Provide digital alarm communicator transmitter (DACT) that shall transmit all control panel off normal condition, including Alarm, Water flow, Supervisory, or Trouble to the radio transmitter. The DACT shall utilize two (2) Cat6 voice lines to comply with NFPA 72 requirements, shall utilize Contact ID type point-by-point communication format. The DACT shall be Notifier Model UDACT or Owner approved equivalent transmitter (DACT). The Contractor shall provide all point-by-point programming to support transmission of all control panel off normal conditions, including Alarm, Supervisory, Water flow and Trouble.
2. Bosch Dialer Capture Ethernet module:
   a. Extend DACT phone line from MDF 66 block to Bosch module. Phone line shall return to 66 block for connection to a leased voice line.
   b. The Bosch shall utilize a Category 6 RJ45 data Ethernet connection port for interconnection to the District LAN/WAN network.
   c. Provide B10R-1640-120WI medium control panel enclosure which includes:
      i. B46 external annunciator
      ii. A keyed lock that matches the FACP
      iii. 1640-120WI Transformer
   d. Provide three (3) fire alarm monitor modules to supervise: B465 Loss of 120VAC Power
      i. B465 Loss of 120VAC Power
      ii. B465 Battery Fail
      iii. B465 System Trouble
3. Ethernet Communications: Provide Ethernet topology data communications module (LAN) that shall transmit all control panel off normal condition, including Alarm, Water flow, Supervisory, or Trouble via Email. The LAN module shall utilize a Category 6 RJ45 data Ethernet connection port for interconnection to the District LAN/WAN network. The LAN module shall support remote web browsing and email alert functions.

C. SUPPORT FOR INSTALLER AND OWNER PROVISIONS:

1. The fire alarm control panel shall provide a coded “self-test” test feature, capable of audible or silent testing. The “self-test” test feature shall signal alarms and troubles during test, and shall allow receipt of alarms and programmed operations for alarms from other areas not under “self-test”.
2. The fire alarm control panel shall provide internal system diagnostics and maintenance user interface controls to display and/or report the power, communications, and general status of specific panel components, detectors, and modules. The fire alarm control panel shall provide device loop controller diagnostics to identify common alarm, trouble, ground fault, and Class A fault conditions.
3. The fire alarm control panel shall allow the user to display/report the condition of the analog/addressable detectors, with analog sensitivity reading, and shall allow the user to report history for alarm, supervisory, monitor, trouble ad restore activity on the system, with time date stamp.
4. The fire alarm control panel shall allow the user to disable/enable devices, zones, actions, and sequences. The fire alarm control panel shall allow the user to activate/restore outputs, actions, and sequences. The fire alarm control panel shall allow the user to service the time and date of the system, and to change passwords for users. All these features shall be password protected.
5. The fire alarm system shall be programmed to Owner standards for specific general alarm functions, and other common operating functions, as defined by the Owner’s Fire Alarm Maintenance Group. Failure to follow Owner standards shall be considered cause to reprogram the system to Owner standards, at contractor’s expense. All panels will include a separate general alarm, NAC, HVAC\damper, Door Holder, Sprinkler and Elevator disable function. Fire Drill\Dialer disable function shall not be allowed.

2.3 FIRE ALARM SYSTEM SEQUENCE OF OPERATION

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

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

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

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

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

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

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

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

F. Drill Switch: Shall not be allowed.

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

H. Security lockout activation shall be monitored and shall release magnetic door holders.

2.4 ANNUNCIATORS

A. Remote Annunciators

1. Alpha Numeric Annunciators: Remote alpha numeric Annunciators shall be located throughout the facility, as indicated on the plans. The annunciator shall operate from system 24vDC, be battery backed up, and shall contain a supervised, backlit, liquid crystal display (LCD) with a minimum of 4 lines with 20 character per line. Each annunciator shall be capable of supporting custom messages similar to the main fire alarm control panel display. Provide key-accessible Lexan cover for Main Entry Annunciator location only.

2.5 GRAPHIC DISPLAY MAPS

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

B. Laminated portable maps shall be provided adjacent to the log book on a key ring with a grease pencil or dry erase fine point marker. Laminated maps shall include locations of power supplies,

remote test switches and fire/smoke dampers/fireflys. Laminated map size shall be approved by Owner.

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

D. All graphic maps shall include:

1. Building name and address including zip code (Black, Bold, ½” text)
2. Accurate north arrow based on orientation of each map.
3. Symbol legend identifying each device as shown on graphic map.
4. “You Are Here” arrow indicator (Red, Bold, ¼” text)
5. Room Designations (Black, 1/8” text)
6. Device addresses with preceding zeros i.e. L1D001 (Blue, 1/8” text)
7. Initiating Devices (Red)
8. Supervisory Devices (Orange)
9. Controlled HVAC units (Black, 1/8” text in hexagon include AHU, RTU or other)
10. Water Shutoff Location (Blue)
11. Gas Shutoff Location (Green)
12. Electrical Shutoff Location (Red)
13. Fire Hydrant Locations (Red)
14. Sprinkler zone map key plan
15. Roof Access Locations

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

2.6 INTELLIGENT ANALOG/ADDRESSABLE INITIATING DEVICES

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

B. Intelligent Detectors General:

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

C. Fire Detection Sensors

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

D. Smoke Detector Sensors

1. Photoelectric Smoke Detector: Provide intelligent analog-addressable photoelectric smoke detector. The photoelectric smoke detector shall utilize a light scattering type photoelectric smoke sensor to sense changes in air samples from its surroundings, and shall continually monitor any changes in sensitivity due to the environmental effects of dirt, smoke, temperature, aging and humidity. The photoelectric smoke detector shall be rated for ceiling or wall mount installation, and shall be rated for operation in constant air velocities from 4,000 ft/min. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five (5) sensitivity settings, ranging from 1.0% to 3.5% and shall be suitable for operation in the following environment:
    a. Temperature: 32 degrees F to 100 degrees F
    b. Humidity 93% RH, non-condensing
    c. Elevation: No limit
2. Projected Beam Smoke Detectors: Provide intelligent addressable reflector type projected beam type smoke detector, as indicated on the plans. The unit shall be capable of covering distances up to 300 feet, and shall feature automatic gain control, which shall compensate for gradual deterioration from dirt accumulation on lenses. The beam detectors shall be either ceiling mount or wall mount. Provide a key activated remote test switch/annunciator station mounted a minimum of 8ft above the finished floor (accessible from a 6’ ladder). Identify the remote test station with the associated device ID number it controls, and the associated beam detector unit identification.
3. Standard Detector Mounting Base with Trim Ring: Provide standard detector mounting base with trim ring suitable for mounting to a standard electrical box or trim ring. The standard detector base shall have the following minimum requirements:
    a. Removal of the respective smoke detector shall not affect communications with the remaining other detectors.
    b. Terminal connections shall be made on the room side of the base.

c. The base shall be capable of supporting one (1) remote alarm LED indicator, where shown on the drawings.

4. Relay Detector Mounting Base with Trim Ring: Provide relay detector mounting base with trim ring suitable for mounting to a standard electrical box or trim ring. The relay detector base shall have the following minimum requirements:
    a. Removal of the respective smoke detector shall not affect communications with the remaining other detectors.
    b. Terminal connections shall be made on the room side of the base.
    c. The form “C” dry relay contacts shall have a minimum contact rating of 1 Amp at 30vDC, and be listed for “pilot duty.”
    d. The operation of the relay shall be controlled from its respective detector and shall automatically de-energize when the detector is removed.
5. Isolator Detector Mounting Base with Trim Ring: Provide isolator detector mounting base with trim ring suitable for mounting to a standard electrical box or trim ring. Isolator devices shall only be used when the SLC leaves the building or enters a wet area. The isolator detector base shall have the following minimum requirements:
    a. Terminal connections shall be made on the room side of the base.
    b. The isolator base shall operate upon a short circuit condition on the device initiating loop circuit.
    c. Following a short circuit condition, each isolator/detector shall be capable of performing an internal self-test procedure to reestablish normal operations.
    d. Isolator device locations shall be shown on the graphic maps.
6. Duct Detector Housing: Provide smoke detector duct housing assemblies to facilitate mounting an intelligent analog/addressable photoelectric smoke detector, with a standard, relay, or isolator mounting base. Protect the measuring chamber from damage and insects, and provide an air exhaust tube and an air sampling inlet tube, which extends into the duct air stream, a minimum length of 75% of the duct width being covered. Provide air sampling inlet tube to cover duct widths up to ten (10) feet. The duct detector shall be suitable for use on ductwork with airflow velocities of 300ft^3/min to 4,000 ft^3/min.
    a. Provide key activated remote test station, as shown on the drawings.
    b. Provide duct detector housing with auxiliary relay for all HVAC unit locations, for transmission of the alarm signal to the HVAC unit DDC control panel.
    c. Provide duct detector housing with auxiliary relay for all smoke/fire damper locations.
    d. Provide MAGNEHELIC DIFFERENTIAL PRESSURE delta and date of install written on the duct above the detector housing with a BLACK SHARPIE PEN. Also document this value on the permanent Record of Completion.
7. Remote Duct\Beam Detector Test Station: Provide a remote duct detector test station to facilitate testing of intelligent duct smoke detectors programmed actions and sequences. The test station shall be key-operated, shall feature a red alarm LED, and shall mount to a standard electrical box or trim ring. When the key is in the “TEST” position, it shall not be possible to remove the key; the alarm LED shall light to indicate that the duct detector is in alarm, and all programmed functions shall occur. Upon system reset, the “TEST” condition shall clear and the system returns to normal. Mount remote test station in the nearest corridor location in the ceiling tile, or wall mounted at a minimum height of 8 ft from the finished floor (accessible from 6’ ladder). Identify the remote test station with the associated device ID number it controls and the associated HVAC until identification.
8. Provide keyed override switch with four (4) hour timer for gym and auditorium beam detectors. Location to be approved by Owner and Engineer prior to installation.
9. Remote test switches shall be located directly outside the gymnasium in the ceiling tile. If the area does not have a grid ceiling, the remote test station must be located below 8ft. above the finished floor.

E. Carbon Monoxide Detectors

1. Carbon monoxide (CO) detector shall be a system-connected System Sensor model number CO1224T or CO1224TR or approved equivalent listed to Underwriters Laboratories UL 2075 for Gas and Vapor Detectors and Sensors. The detector shall be equipped with a sounder and a trouble relay. The detector's base shall be able to mount to a single-gang electrical box or direct (surface) mount to the wall or ceiling. Wiring connections shall be made by means of SEMS screws. The detector shall provide dual-color LED indication that blinks to indicate normal standby, alarm, or end-of-life. When the sensor supervision is in a trouble condition, the detector shall send a trouble signal to the panel. When the detector gives a trouble or end-of-life signal, the detector shall be replaced. The detector shall provide a means to test CO gas entry into the CO sensing cell. The detector shall provide this with a test mode that accepts CO gas from a test agent and alarms immediately upon sensing CO entry. The detector shall perform in the detection of CO up to 12,000 feet above sea level and alarm within the time specified by ANSI/UL 2034 for CO concentrations of 70, 150 and 400 parts per million (ppm), as verified by a Nationally Recognized Test Laboratory

2.7 INTELLIGENT MODULES – GENERAL

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

1. Temperature: 32 degrees F to 100 degrees F
2. Humidity 93% RH, non-condensing
3. Elevation: No limit
4. Do not mount intelligent modules above finished ceilings. The intelligent monitor and control modules shall be mounted so that the LED is visible.
    a. Notifier mini-modules are not allowed.
5. Multi-input modules shall not be acceptable unless each input has a distinguishable color or pulse.

B. Fire Alarm Initiating Devices

1. Intelligent modules must be mounted at a height accessible from a 6' ladder from a finished floor.
2. Single Input Module:
    a. Provide intelligent addressable single input module, as applicable, The input module shall mount to a standard electrical box or trim ring, and shall provide one (1) supervised Class B circuit, capable of supporting the following circuit types:
        i. Normally Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
        ii. Normally Open Active Non-Latching (Monitors, Fans, Dampers, Doors, etc.)
        iii. Normally Open Active Latching (Supervisory, Tamper Switches)
3. Single Input Signal Module: Provide intelligent addressable single input signal module. The signal module shall mount to a standard electrical box or trim ring, and shall provide one (1) supervised Class B output circuit, capable of supporting the following circuit types:
    a. Audible Indicating Appliance Circuit, polarized, rated at 24vDC at 2 Amps.
    b. Visual Indicating Appliance Circuit, polarized, rated at 24vDC at 2 Amps.
    c. Supervised Control Circuit, polarized, rated at 24vDC at 2 Amps.
4. Control Relay Module: Provide intelligent addressable control relay module. The control module shall mount to a standard electrical box or trim ring, and shall provide one (1) Form "C" dry relay contact, rated at 2 Amps at 24vDC or 0.5 Amps at 120vDC; to control external appliances or equipment shutdown. The control relay module shall be rated for "pilot duty" and releasing systems.

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

2.8 FIRE ALARM INTEGRATED AUDIO/VISUAL EVACUATION SYSTEMS

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

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

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

D. Horns & Combination Horn/Strobes

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

E. Fire Alarm Pull Stations

1. Intelligent Manual Station: Provide intelligent addressable manual station. The manual station shall be semi-flush mounted, non-coded, dual action type, shall be red in color, and shall be individually addressable. The manual station shall require a key to reset the station, and shall mount a standard electrical box or trim ring.

2.9 ANCILLARY DEVICES

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

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

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

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

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

2.10 FIRE ALARM WIRE AND CABLE

A. Fire Alarm Power Branch Circuits: Building wire as specified.

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

PART 3 – EXECUTION

3.1 INSTALLATION

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

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

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

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

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

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

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

H. Install wiring with plenum rated cable. Cable routing shall be perpendicular to or parallel to structural building members, and shall utilize a metal bridle ring type support system attached to structural building members only. Mounting cable to other building systems (fire protection, electrical conduit, mechanical ductwork, etc.) or running cable in any fashion other than described, is strictly forbidden. For each device, neatly loop four feet of cable and support inside the nearest bridle ring.

I. Route cables such that a minimum separation of ½" is maintained between Class 1 wire and power-limited fire alarm circuits.

J. Provide separate relay (MR101C or approved equivalent) where 120VAC is required to release fire/smoke dampers, magnetic door holders, or similar. For Notifier devices, barrier CB500 may be installed in place of an additional relay.

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

K. Open cabling shall be installed in a neat and workmanship-like manner. Contractor shall reduce the quantity of ties in use. Ties shall be utilized only to avoid obstructions and to secure the service loop in the bridal ring (utilize electrical tape to manage service loop). Ties shall be red and plenum rated.

L. Provide panel breaker locks for all electrical circuits for fire alarm and detection control equipment panels. Fire alarm and detection circuit breaker locks shall be color coded red. Breaker Locks shall be Garvin Item # UBL1-RED.

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

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

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

P. Automatic Detector Installation: Conform to NFPA 72.

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

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

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

T. Provide and install UL listed surge suppressor on 120VAC within five feet of the fire alarm control panel to provide protection to the fire alarm control panel.

3.2 FIRE ALARM WIRE AND CABLE COLOR CODE

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

3.3 FIELD QUALITY CONTROL

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

B. Contractor shall utilize Bluebeam Session (provided by TLH Fire) to respond to rough wire and testing observation punch list items. Contractor shall attach pictures confirming completion (picture settings shall be set to high quality).

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

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

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

F. Provide three (3) original copies of the NFPA 72 Record of Completion Form. One for Owner, one for the Authority Having Jurisdiction (AHJ), and one for the facility's Fire Alarm System Logbook.

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

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

I. Facilities with voice evacuation systems: Intelligibility CIS scores shall be documented on the record drawings for each acoustically distinguishable space. Any acoustically distinguishable spaces below .8 CIS as measured per NFPA 72 shall be adjusted by the contractor.

J. Voltage drop readings for all notification circuits. (Run devices for 10 minutes on battery power prior to taking readings.)

3.4 MANUFACTURER'S FIELD SERVICES

A. Prepare and start systems.

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

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

3.5 DEMONSTRATION

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

3.6 TRAINING

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

1. On-Site Training: Provide a minimum of two (2) hours of onsite training of the facility's school staff and Maintenance personal in the basic operations and functionality of the fire alarm system panel, annunciator, and field devices. Review field panel locations, typical device locations, and 120vAC power locations (panels, breakers, and circuits). Demonstrate the various system responses to the field off-normal conditions. Simulate alarm conditions, supervisory conditions, trouble conditions, and ground fault conditions of the various field devices. Demonstrate how to reset various building systems (HVAC units, fire doors, etc.). Provide written instructions of basic system operating instructions behind clear Lexan framed glass, located adjacent to the fire alarm control panel. DO NOT EVER TRAIN SCHOOL STAFF ON HOW TO DISABLE ANY POINTS.

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

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

3.7 DEMOLITION

A. The contractor shall remove existing fire alarm components that are not part of the new fire alarm system AFTER permission from the SVVSD has been obtained. The contractor is responsible for safe disposal of all removed devices.

B. Cover plates shall be provided for back boxes of removed devices or as directed by the engineer. The cover plates shall be stainless steel finished edge cover plates and shall be approved by SVVSD and the architect prior to installation.
C. All existing fire alarm system wiring shall be removed. (Conduit may be reused if compliant with NEC.)
D. Ceiling tiles damaged by the contractor shall be replaced at the contractor's expense. Ceiling tiles required due to demolition of existing devices shall also be provided by the contractor and shall match the existing tiles. Submit ceiling tile replacements for approval by SVVSD.
E. The contractor shall submit in writing the dates of transfer of function from the existing fire alarm system to the new fire alarm system and the associated system down time. The contractor shall not proceed with the transfer without written consent from SVVSD and the local AHJ. The contractor will be responsible for providing a fire watch during system transfer if required by the AHJ.

END OF SECTION

INTENTIONALLY LEFT BLANK

SECTION 28 46 50 - FIRE ALARM VOICE EVACUATION SYSTEM (ALTERNATE 2)

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

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

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

1.2 SCOPE

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

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

1.3 APPLICABLE CODES AND STANDARDS

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

1. All equipment shall be listed and classified by Underwriters Laboratories, under the following standards:

a. Signaling Systems
b. UL 464 – Audible Signal Applications
c. UL 864 – Control Units for Fire Protective Signaling Systems
d. UL 1480 - Speakers for Fire Alarm and Signaling Systems, Including Accessories
e. UL 1971 - Standard for Signaling Devices for the Hearing Impaired
f. NFPA 72 - National Fire Alarm and Signaling Code

PART 2 – PRODUCTS

2.1 DESIGN CRITERIA

A. Acoustically Distinguishable Spaces and Fire Alarm System Interfaces shall be incorporated into the Plans submitted to Local AHJ’s.

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

C. Speakers shall be set for 25volt operation and adjusted or tapped as follows unless otherwise recommended by the vendor:

1. Hall speakers: 1 watt
2. Room speakers: 1 watt
3. Bathroom speakers: 1/4 watt
4. Gym speakers: 7.5 / 2 watts
5. Cafeteria speakers: 2 watts

2.2 FIRE ALARM SYSTEM SEQUENCE OF OPERATION

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

1. Automatic Voice Evacuation Sequence:
    a. The audio alarm signal shall consist of two cycles of the temporal code alarm tone followed by an automatic digital voice message. At the end of the voice message, the alarm tone shall resume. This sequence shall sound continuously until the "Alarm Silence" switch is activated.
    b. All audio operations shall be activated by the system software so that any required future changes can be facilitated by authorized personnel without any component rewiring or hardware additions.
    c. Each classroom projector shall mute upon activation of the fire alarm system speakers.

B. The voice evacuation system shall a minimum of 16 professionally pre-recorded messages and 8 custom recorded messages to be defined by Owner in a format similar to the following:

1. Fire Alarm (temporal code alert tone followed by evacuation message).
   Label Identification/Color – “FIRE ALARM”/Red
   Alert Tone – Two cycles of the temporal code 3 pattern, then the two times evacuation message, then two more cycles of the temporal code 3 pattern.
2. All Clear Verbal
   Label Identification/Color – “ALL CLEAR”/Green
   Alert Tone – 3 chimes.
   Message – “May I have your attention please. The emergency has now ended. An “All Clear” has been given. Please resume normal duties. Thank you for your cooperation.”
3. Temporal Code dBA test tone
   Label Identification/Color – “TEST TONE”/Green
   Alert Tone – Continuous Temporal Code

C. Voice Paging

1. The system shall be configured to allow voice paging. Upon activation of any speaker manual control switch, the alarm tone shall be sounded over all speakers in that group.
2. The control panel operator shall be able to make announcements via the push-to-talk paging microphone over the pre-selected speakers.
3. Facility for total building paging shall be accomplished by the means of an "All Call" switch.
4. Paging zones shall be categorized:
    a. Hallways, pod corridors (group areas), restrooms, mechanical and electrical rooms, teacher lounge, attached workrooms, administration area, offices common to hallway, and academic (classrooms, art, music, kindergarten classrooms, computer rooms, dining platform, innovation center, office common to classroom)
    b. Commons (Gym, Cafeteria, Auditorium, stage)
    c. Exterior

d. As directed on contract documents

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

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

2.3 FIRE ALARM INTEGRATED AUDIO/VISUAL EVACUATION SYSTEMS

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

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

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

D. SPEAKERS & COMBINATION SPEAKER/STROBES

1. Speaker/Speaker Strobes: Provide 25.0 Vrms white UL 1480 speaker approved for fire protective signaling systems., with a selectable low or high dBA output, capable of producing a sound rating of 97dBA, and shall have a selectable speaker taps for 1/4W, 1/2W, 1W and 2W. Both selectable features shall be capable of being changed. Speakers that cannot modify selectable settings shall not be acceptable. The speakers and speaker/strobes shall be provided with screw terminals for wiring interconnect, and shall mount to a deep electrical box or trim ring. Provide integral, 24vDC.Synchronized UL 1971 strobe unit with 15cd, 30cd, 60cd, 75cd, 95cd, 110cd, or 115cd flash outputs, as shown on the contract documents. The horn/strobes shall have their lens markings oriented for wall mounting or ceiling mounting. Provide weatherproof device and back box, where required. Locate horns and horn/strobes per NFPA 72 and ADA guidelines.
2. The supervised horn loudspeaker shall be a STH-15S/STH-15SR or approved equal. The horn shall be weather resistant and constructed of heavy gauge, treated aluminum. The horn shall be able to operate within any ambient temperature environment ranging from 66 degrees C (150°F) to -35 degrees C (-30°F). The horn shall be a double reentrant type with a 15 watt RMS audio power rated compression driver producing a UL rated 102 dB measured at 15 watts at 10 feet. The horn shall have an impedance selection via a 7 position switch of 5000, 2500, 1300, 666, 333, 89 & 45. Power taps shall be available at 2.0, 4.0, 7.5 & 15 watts for the 100 volt line, .9, 1.8, 3.8, 7.5 & 15 watts for the 70 volt line and .48, .94, 1.8, 7.5 & 15 watts for the 25 volt line. Each power tap shall have a 3dB incremental rating. The frequency response range shall be 400 - 14000 Hz. The horn shall have a dispersion of 70 degrees. The horn assembly shall be furnished with a mounting bracket that allows adjustment on either a vertical or horizontal plane with a single locking pin and include provisions for mounting, banding or strapping. Wiring terminals shall be fully enclosed and a vandal-resistant adapter cover shall provide connection protection for cable or conduit. The horn

shall be 7.875” W x 8.75” H x 9.313” D (200 x 222 x 237 mm). The horn shall be finished in gray (STH-15S) or red (STH-15SR) baked epoxy.
3. Speakers and Speaker strobes shall be white and labeled “FIRE”.
4. Exterior speakers shall be STH-15SR.

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

1. Amplifiers comply with UL 1711, "Amplifiers for Fire Protective Signaling Systems." Amplifiers shall provide an onboard local mode temporal coded horn tone as a default backup tone. Test switches on the amplifier shall be provided to test and observe amplifier backup switchover. Each amplifier shall communicate to the host panel amplifier and NAC circuit voltage and current levels for display on the user interface.
2. Dual alarm channels permit simultaneous transmission of different announcements to different zones automatically or by use of the central control microphone. All announcements are made over dedicated, supervised communication lines. All risers shall support Class B wiring for each audio channel.
3. Emergency voice communication audio controller module shall provide up to 32 minutes of message memory for digitally stored messages. Provide supervised connections for master microphone and up to 5 remote microphones.
4. Status annunciator indicating the status of the various voice alarm speaker zones and the status of fire fighter telephone two-way communication zones.

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

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

G. The system shall be interfaced with the building Security System

H. The system shall be interfaced with the building Access Control System.

PART 3 – EXECUTION

3.1 INSTALLATION

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

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

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

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

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

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

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

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

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

I. Interface with the school security system (magnetic door holder release).

J. Interface with the school access control system.

END OF SECTION

INTENTIONALLY LEFT BLANK

APPENDIX A: TLH FIRE TEST FORMS

TLH Observation Requirements- CONTACT TLH TO SCHEDULE OBSERVATIONS AT LEAST 2 WEEKS IN ADVANCE						
GC	EC	#	Checklist Items	GC	EC	Comments
		1	Megger testing shall be completed and documented to TLH prior to device termination.			
		2	Cables and wires should be checked for short circuits, ground faults, continuity and insulation prior to energizing.			
		3	Earplugs shall be provided and ready for all persons on site during testing			
		4	A NICET II certified. factory-trained tech must be on site during the preliminary test and TLH observation.			
		5	The fire alarm equipment supplier shall make a thorough inspection and test of the completed fire alarm system prior to final interconnection to the central station.			
		6	A printout or email must be provided showing that each device has been pretested prior to TLH observation. The pretest shall include:			
		7	• Operate each manual pull station			
		8	• Smoke each smoke detector (magnet testing is not accepted)			
		9	• Heat each heat detector (magnet testing is not accepted)			
		10	• Each sprinkler flow valve shall be closed and verified for proper supervisory alarm at the FACP			
		11	• Verify activation of all water flow switches and verify timing is 45 seconds			
		12	• Verify fire/smoke damper function and respective AHU shutdown and restart			
		13	• Record manometer readings for duct detectors and HVAC shutdown (write in sharpie on duct)			
		14	• Verify elevator recall, shunt trip, power supervision, etc.			
		15	• Verify interface with other systems (won doors, EM generator, VESDA, BDA, etc.)			
		16	• Open initiating device circuits and verify that the trouble signal actuates			
		17	• Open and short signaling line circuits and verify that the trouble signal actuates			
		18	• Open and short notification appliance circuits and verify that the trouble signal actuates			
		19	• Ground all circuits and verify response of trouble signals			
		20	• Check presence and audibility of tone at all alarm notification devices			
		21	• Verify strobes flash (synchronized)			
		22	• Voltage drop readings shall be completed and recorded for all notification circuits (120VAC disconnected, system on battery backup)			
		23	• Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.			
		24	• Load voltage tests for batteries			
		25	• Record intelligibility readings in each ADS on contractor redlines			
		26	• Record dBA readings in **every** room (alarm tone only) on contractor redlines			
		27	• Record EOL resistor readings on contactor redlines			
		28	TLH pre-test observation forms (attached) shall be completed and signed by both the installing contractor and the vendor tech. These forms must be submitted to TLH PRIOR to TLH observations.			
		29	A typed record of completion shall be provided and ready for signatures			
		30	The fire alarm equipment supplier must provide an accurate panel download to TLH at least 2 days prior to TLH observation via email. A hard copy shall also be provided for observations.			
		31	Verify monitoring company has all devices input with **DEVICE ADDRESS and LOCATION DESCRIPTION** and provide proof of data entry.			
		32	The manufacturer's manual should be on site to ensure proper testing procedures of system optional features			
		33	Graphic Maps shall be completed and ready for frame/mount			
		34	Frame and post (FACP operations and procedures)			

EC Signature: _____

GC Signature: _____

Project: Sample Test Forms

Electrical Contractor:
Contact:
Vendor:
Technician:

Applicable Codes:
Letters of Agreement:
Area of Facility (SF):

TLH FIRE
System Design I Code Compliance I System Testing
Cell: 303-517-1775 Email: tami@TLHFire.com

Date: 11/25/2019

	SIGN IN SHEET AND NOTIFICATION	
Yes	**Checklist Items**	**Account/Signature**
	Proof of factory certified training and NICET certification	
	Notification of Occupants, Fire Department and Monitoring Services	
	• Occupants notified via email at least 1 day prior to testing	
	• Occupants notified immediately prior to testing	
	• Monitoring Company	
	• Dispatch	
	• FIRE ALARM SYSTEM IS OFF LINE	
	• SECURITY SYSTEM IS OFF LINE	

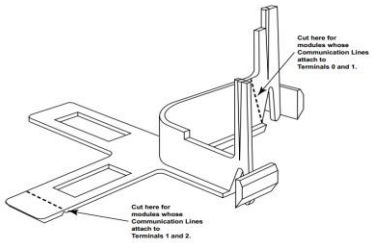
	PROCEDURE FOR FIRE ALARM TESTING	
Yes		**Comments**
	All Systems Normal	
	Verify fire department set and record drawings are onsite	
	Open all doors with magnetic hold open and confirm function and stability	
	Confirm Breaker Locks on all 120VAC circuits - drop 120VAC	
	Check all doors with magnetic hold open and confirm drop and latch	
	Disable alarm verification	
	Remove DACT line 1 (alternate to DACT line 2)	
	Test pull station	
	Verify signal silence - audible and visual	
	Verify resound (team can begin verification of audible/visual devices)	
	Initiate trouble condition	
	Initiate supervisory condition	
	Verify signals with monitoring company (Loss of AC, Loss PH1, Alarm (with correct device address), trouble, supervisory	
	Verify sequence of operations	
	Initiate Alarms and verify items on attached pages	

	Print Name	**Company**
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

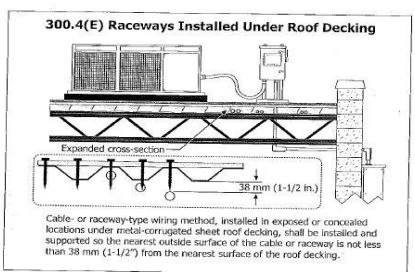
Rough Wire Observations			
Yes	**#**	**Checklist Items**	**Comments**
	1	Survivability	
	2	● Define Survivability Level (circle one) 0 1 2 3	
	3	● Verify FACP in 2H room	
	4	● Verify CI cable	
	5	● Verify CI cable installation in conduit	
	6	● Verify red pull boxes every 300 ft	
	7	● Verify red boxes in each smoke compartment	
	8	Verify wire	
	9	● Wire matches shop drawing wire legend submittal	
	10	● SLC (circle one) is 16 AWG or 18AWG	
	11	● Audible is 16 AWG (circle one) shield no shield	
	12	● If shielded - verify proper termination of shield (see wire diagram next sheet)	
	13	● Visual is 14 AWG	
	14	● Fire Alarm wire is Twisted	
	15	Underground wire	
	16	● (circle one) Aquashield or THHN	
	17	● Verify surge suppressor installed in correct orientation (protect building side)	
	18	● Ground wire is secured to (circle one) building steel grounding rod	
	19	Tracer colors	
	20	● Tracer matches shop drawing wire legend submittal	
	21	● SLC: (circle one) Preprinted SLC or Other_____	
	22	● IDC: (circle one) Brown or Other_____	
	23	● 24VDC: (circle one) Purple or Other_____	
	24	● Visual: (circle one) Green or Blue or Other_____	
	25	● Audible: (circle one) Blue or Purple or Other_____	
	26	● Misc. Fire Circuit: (circle one) Yellow or Other_____	
	27	● HVAC: (circle one) Green or Other_____	
	28	● Network audio: (circle one) Yellow or Other_____	
	29	Wiring style	
	30	● SLC: (circle one) Class B, Style 4, Class A, Style 6 or Class X, Style 7	
	31	● IDC: (circle one) Class B or Class A	
	32	● NAC: (circle one) Class B or Class A	
	33	Wire installation	
	34	● Power limited and non-power limited wiring is separated - separator installed or separate heavy duty relay	
	35	● Cable routing is perpendicular or parallel to structural building members	
	36	● Cable is supported every 4-6 feet (minimum) utilizing a metal bridle ring support system (bridle rings shall be attached to structural building members only)	
	37	● Cable is routed away from other building cabling and equipment	
	38	● Service loops are (18" 2ft 4ft (circle one))coiled in bridle rings (not tied to exterior of ring)	
	39	Back boxes and junction boxes	
	40	● Junction boxes (limit t-taps - WEGO)	
	41	● Edge protection with strain relief installed at all wire entry locations	

Rough Wire Observations			
Yes	**#**	**Checklist Items**	**Comments**
	42	● Boxes have support wire and wire is red	
	43	● Caddy bars are installed for ceiling mounted appliances	
	44	● Exposed knock outs are covered with a surface skirt in public areas	
	45	Conduit installation	
	46	● Conduit is not mounted in flute of deck	
	47	● Conduit and flex are red	
	48	● Edge protection provided and installed	
	49	● Conduit Sleeves are secured to wall (mini)	
	50	Device locations	
	51	● Locations match shop drawings (or noted on contractor redlines)	
	52	● Pull stations mounted 48" AFF	
	53	● Smoke detectors at least 3' from diffusers	
	54	● Heat detectors at least 3' from diffusers and heat sources	
	55	Record drawings kept on site and up to date	

120VAC separator from 24VDC:



CONDUITS, JUNCTION BOXES AND DEVICE BACK BOXES SHALL HAVE APPROPRIATE PLENUM RATED PLASTIC EDGE PROTECTION WIRE INSULATING BUSHING WHERE OPEN CABLE ROUTING OCCURS. DO NOT USE ROMEX TYPE CONNECTORS.



300.4(E), FPN, and Exception

Cables and Raceways Installed Under Roof Decking
NEC, p. 132

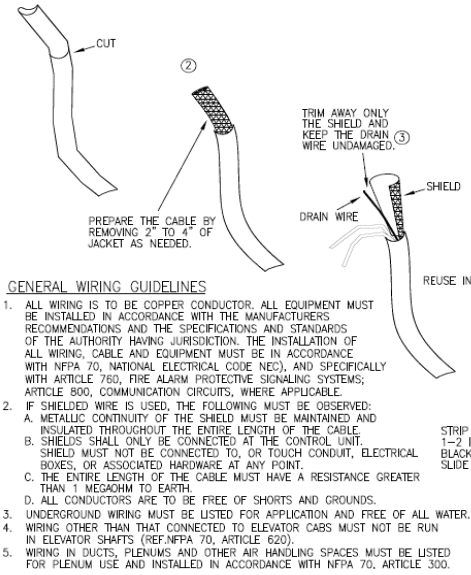
Proposal 3-31
Log 3310
ROP, p. 280

Comment 3-10
Log 2040
ROC, p. 157

118. GROMET & STRAIN RELIEF BUSHING
NOT TO SCALE

① USE ONLY UL LISTED FIRE ALARM SHIELDED TWISTED-PAIR CABLE (STP)

SHIELDING DETAIL

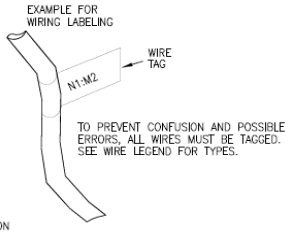


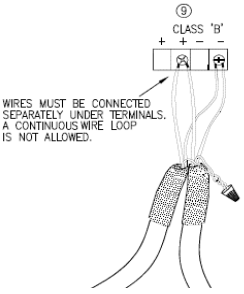
GENERAL WIRING GUIDELINES

1. ALL WIRING IS TO BE COPPER CONDUCTOR. ALL EQUIPMENT MUST BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS AND THE SPECIFICATIONS AND STANDARDS OF THE AUTHORITY HAVING JURISDICTION. THE INSTALLATION OF ALL WIRING, CABLE AND EQUIPMENT MUST BE IN ACCORDANCE WITH NFPA 70, NATIONAL ELECTRICAL CODE(NEC), AND SPECIFICALLY WITH ARTICLE 760, FIRE ALARM PROTECTIVE SIGNALING SYSTEMS; ARTICLE 800, COMMUNICATION CIRCUITS, WHERE APPLICABLE.
2. IF SHIELDED WIRE IS USED, THE FOLLOWING MUST BE OBSERVED:
   A. METALLIC CONTINUITY OF THE SHIELD MUST BE MAINTAINED AND INSULATED THROUGHOUT THE ENTIRE LENGTH OF THE CABLE.
   B. SHIELDS SHALL ONLY BE CONNECTED AT THE CONTROL UNIT. SHIELD MUST NOT BE CONNECTED TO, OR TOUCH CONDUIT, ELECTRICAL BOXES, OR ASSOCIATED HARDWARE AT ANY POINT.
   C. THE ENTIRE LENGTH OF THE CABLE MUST HAVE A RESISTANCE GREATER THAN 1 MEGAOHM TO EARTH.
   D. ALL CONDUCTORS ARE TO BE FREE OF SHORTS AND GROUNDS.
3. UNDERGROUND WIRING MUST BE LISTED FOR APPLICATION AND FREE OF ALL WATER.
4. WIRING OTHER THAN THAT CONNECTED TO ELEVATOR CABS MUST NOT BE RUN IN ELEVATOR SHAFTS (REF.NFPA 70, ARTICLE 620).
5. WIRING IN DUCTS, PLENUMS AND OTHER AIR HANDLING SPACES MUST BE LISTED FOR PLENUM USE AND INSTALLED IN ACCORDANCE WITH NFPA 70, ARTICLE 300.

WIRING TECHNIQUES FOR SHIELDED CABLE:

- SHIELDS AND DRAINS MUST NEVER TOUCH GROUND.
- MOST GROUNDS ARE DUE TO SHIELDING ISSUES.
- MOST SHORTS ARE SHIELD TO CONDUCTOR.
- BY CREATING A PROPER PROCEDURE FOR WIRE HANDLING WITH ADDRESSABLE CIRCUITS MOST GROUNDS AND SHORTS CAN BE ELIMINATED.
- ALL UNSHIELDED WIRE MUST BE ENTIRELY IN GROUND CONDUIT.
- CONDUIT SYSTEM MUST HAVE A GOOD REFERENCE TO EARTH GROUND
- PIGTAILS MAY BE NOT BE USED IN FIRE ALARM APPLICATION.





Project: Sample Test Forms

cal Contractor:
Contact:
Vendor:
Technician:

olicable Codes:
of Agreement:
of Facility (SF):

TLH FIRE
System Engineering I Code Compliance I System Testing
Cell: 303-517-1775 Email: tami@TLHFire.com www.TLHFire.com

Date: 11/25/2019

TLH Fire Alarm Punch List

See itemized details on following pages

		PUNCH LIST ITEMS	GC Sign Off	EC Sign Off
1	❍	Provide signed and completed record of completion - provide copies to TLH and Owner		
2	❍	Provide Log Book with fire alarm sequence of operations, pre-testing results, smoke detector sensitivity report, basic operating instructions, decibel levels for each room, and intelligibility scores; install acrylic folder that holds		
3	❍	Send PDF and MS Excel of panel download to TLH		
4	❍	Send PDF of graphic map to TLH. Graphic Map addresses and device labels shall include device address with preceding zeros. (i.e. L1D-001)		
5	❍	Provide framed and securely mounted graphic map. Indicate Gas, Water and Electric Shutoff on Graphic Map		
6	❍	Provide CD or USB drive including record drawings, O&Ms, PDF of panel program, panel program in native format and coffee stained record drawings in record drawing cabinet.		
7	❍	Provide smoke detector sensitivity report		
8	❍	Provide dBA readings (every room)		
9	❍	Provide EOL readings		
10	❍	Provide manometer readings on record drawings and written in sharpie on duct work (inches of H2O)		
11	❍	Complete demolition of existing fire alarm system		
12	❍	Provide Contractor Redlines (pdf format)		
13	❍	Contractor shall initial observation reports and return to TLH		
14	❍	Confirm function of paging interface (supplement or shunt)		
15	❍	Verify HVAC shutdown for each applicable unit		
16	❍	Provide and install keys in Knox box (coordinate with owner)		
17	❍	Owner to complete Owner Testing Affidavit Form		
18	❍	Clean inside and outside of FACP and RPS's		
19	❍	Connect grounding cable in remote power supplies, label NAC circuit terminations and provide typed panel identification label on RPS and FACP. Provide label for both electrical panel and remote power supply designation		
20	❍	Provide accurate labels for field devices. Update record drawings and redlines with accurate device addresses, end of line terminations, and other field changes. Contractor shall verify field labels.		
21	❍	Contractor shall incorporate redlines and punch list items on record drawings and submit record drawings for review and approval		
22	❍	AES Comments:		
23		❍ External antenna is mounted at least 18 inches above the roof line.		
24		❍ External antenna is at least 10 inches away from any parapet, wall, or obstruction.		
25		❍ External antenna should have 360 degree visibility.		
26		❍ All antennas must be plumb when mounted.		

Project: Sample Test Forms

cal Contractor:
Contact:
Vendor:
Technician:

olicable Codes:
of Agreement:
of Facility (SF):

TLH FIRE

System Engineering I Code Compliance I System Testing

Cell: 303-517-1775 Email: tami@TLHFire.com www.TLHFire.com

Date: 11/25/2019

TLH Fire Alarm Punch List

27		❍	External antennas must have a lightning protector installed (preferably as close to the antenna as possible).		
28		❍	RG-58 cabling is no longer than twenty-five feet (25').		
29		❍	RG-8 cabling is no longer seventy-five feet (75').		
30		❍	LMR-400 (LMR-600 preferred) cabling is no longer than one-hundred twenty-five feet (125').		
31		❍	Service Length: A little extra coax is reasonable and desirable to allow for servicing the devices attached. Typically no more than an additional 12 inches or so should be necessary. This is needed to allow movement of the cable to enable such things as connectors to be disconnected and antenna to be installed and removed for service.		
32		❍	No Tight Bends: Coaxial cable does not tolerate being bent in a tight radius. Much as a solid pipe, the structure of the coax can kink if bent too much. As the cable is bent, the center conductor has the tendency to be pushed or driven toward the shield on the outside and away on the inside. Coax derives some of its characteristics from the distance between the center conductor and its shield. Tight bends can negatively affect those characteristics. Tight bending can permanently alter the coax such that it can never be corrected. 6 inch radius is the minimum recommended for the AES supplied RG-8 Coax.		
33	❍	Contractor shall complete comments itemized on punch list reports. GC and EC shall initial by each issue verifying completion			

The intent of this document is to aid the installing contractor. Contractor is responsible for compliance with contract documents and specifications. Quality Control and due diligence is the responsibility of the contractor.

Actions taken by TLH Fire with respect to the observations are only for general conformance with the design concepts of the project based upon the contract documents. In all respects, TLH Fire is subject to the terms and conditions of its contract with its Client. Notations, "corrections," comments, or omissions do not modify the obligations of the contractor of its subcontractors from those set forth in the Contract Documents. Contractor shall field verify, confirm and correlate all dimensions, wire requirements, etc. before construction or installation of any component or assembly begins. Unless otherwise specifically noted on the submittal, all fabrication, installation and construction means, methods, techniques, sequences, schedules and procedures remain solely the responsibility of the contractor. Contractor remains solely responsible for job site safety and all safety precautions and procedures. Notwithstanding anything else to the contrary, TLH Fire by observing the installation does not assume professional responsibility for any design or work product (including but not limited to its technical accuracy or professional competency) provided by contractor or owner on a "design build" or "performance specification" basis. TLH Fire provides no warranties, express or implied.

Fire Alarm Control Panel (FACP)			
Yes	**#**	**Checklist Items**	**Comments**
	1	Verify Time and Date on FACP	
	2	Correct receipt of alarm, supervisory, and trouble signals	Circuit:_____
	3	Operation of evacuation signals and auxiliary functions	
	4	Circuit supervision including detection of open circuits and ground faults	_____ Volts
	5	Lamps and LEDs are illuminated	
	6	Standby and alarm current demand is acceptable	
	7	Primary power is connected	
	8	● 120 VAC dedicated circuit is connected	NEC 760.41 (a) (b)
	9	● 120 VAC dedicated circuit is indicated on FACP with typewritten brady label	
	10	● Emergency generator is connected	Required for voice IFC 2702.2.4
	11	● Dedicated circuit breakers are labeled, marked red and locked	
	12	● Electrical Panel Circuit Labels are typed	
	13	● Earth ground is connected to building steel, cold water, grounding rod	
	14	● After removing primary power, does power transfer to battery backup	
	15	● After removing power, does FACP indicate trouble condition	no delay permitted O Confirmed
	16	● 120VAC separation from 24VDC	
	17	● Surge Suppressor is provided (indicate location in notes)	
	18	Secondary power is connected	
	19	● Battery backup is connected	
	20	● Battery backup has required capacity and amp-hour rating	
	21	● Trouble condition occurs on loss of battery backup	
	22	● Battery backup had fully re-charged after testing (allow sufficient time)	
	23	FACP Additional	
	24	● No delay on AC loss	
	25	● No Trouble Reminder	
	26	● Horns and Strobes on Signal Silence	
	27	● Disable zones are provided: 99 H/S+DH, 98 HVAC, 97 Elev, 96 CO Audible CO; Z210 H/S+DH +CO Audible + Elev [NFS2-3030]	Sprinkler Outside H/S not included
	28	● Electrical Outlet under FACP metal cover plate/wiremold backbox	
	29	● Log book is provided	
	30	● As-built document cabinet	Location:
	31	● Provide typewritten label on cover of cabinet indicating 120VAC circuit	
	32	● Provide typewritten label on cover of cabinet indicating cabinet identification	
	33	● Provide typewritten (shrinkwrap) labels for each circuit	
	34	● Graphic Map is framed and securely mounted	
	35	● Smoke detector located within 5' of FACP	

Batteries			
Yes	**#**	**Checklist Items**	**Comments**
	36	Corrosion or leakage or tightness of connections.	
	37	Has a load voltage test been performed (Measure terminal voltage while supplying the maximum load required by its application)	
Date Batteries:			
Battery Size:			

Monitoring Company:

Account Number:

Fire Alarm Control Panel (FACP)
DACR:
DACT 1:
DACT 2:
Location of As-Built drawings:
Location of system operations and maintenance manuals:

FACT - Alternate Method for FACP Monitoring (IP DACT etc.)			
Yes	**#**	**Checklist Items**	**Comments**
	1	Type of DACT: (circle one) Conversion performance MVFN non-facilities based	Magic Jack/Vonage - Not Acceptable
	2	(Circle two if POTS is one) POTS Cell Intranet Internet Radio XMTR	Two POTS lines not acceptable
	3	Integrity between FACT and XMTR is monitored (immediate)	
	4	Integrity from XMTR to FACP is monitored (immediate)	
	5	Integrity from XMTR to DACR is monitored (200sec max)	
	6	Shared security dialer is provided	
	7	● UL listed for fire alarm and allowed by AHJ	
	8	● Properly supervised	
	9	● Dialer is connected to required capacity and amp-hour battery backup	
	10	Two separate means of signal transmission are provided	
	11	FACT is connected to earth ground	
	12	DACT is connected to earth ground	
	13	DACT is monitored for trouble conditions	
	14	FACT is monitored for battery fail	
	15	FACT is monitored for network fail	
	16	FACT is monitored for AC power fail	
	17	During testing, FACT works properly	
	18	● FACT seizes line	
	19	● FACT transmits signals off-site using primary line	
	20	● FACT transmits signals off-site using secondary line	
	21	● FACT indicates a trouble signal upon loss of primary line	
	22	● FACT indicates a trouble signal upon loss of secondary line	
	23	FACT transmits signals to off-site monitoring station	
	24	● FACT transmits general alarm, supervisory, and trouble conditions	
	25	● FACT transmits specific alarm, supervisory, and trouble conditions	
	26	● Alarm signals were received within 90 seconds of actuation	
	27	● Supervisory signals were received within 90 seconds of actuation	
	28	● Trouble signals were received within 200 seconds of actuation	
	29	● Signals were received in order of testing	
	30	Verify monitoring company has all devices input with **DEVICE ADDRESS and LOCATION DESCRIPTION** and provide proof of data entry.	

Monitoring Company: _____

Account Number: _____

DACR: _____

DACT 1: _____

DACT 2: _____

Location of As-Built drawings: _____

Location of system operations and maintenance manuals: _____

Graphic Work Stations, Point Light Annunciators and LCD Annunciators (ANN)			
Yes	**#**	**Checklist Items**	**Comments**
	1	Annunciator:	
	2	● Typewritten annunciator labels are in place (if applicable)	
	3	● Verify correct operation of selector buttons/switches	
	4	● A keyed reset switch function or locked cabinet	
	5	Graphic Annunciator:	
	6	● Verify approved annunciator graphic is utilized	
	7	● Verify proper LED activation	
	8	● Verify lamp test	
	9	Graphic Workstation:	
	10	● Home Screen shows site and navigation to building areas (provide elevation view if necessary)	
	11	● Verify home screen navigation	
	12	● Verify each screen has readable text	
	13	● Verify each screen navigates to a smoke compartment (auto navigate to be approved by AHJ)	
	14	● Verify proper navigation of each initiating device	

Amplifier (EVAC 1)-Room			
Yes	**#**	**Checklist Items**	**Comments**
	1	Primary power is connected	
	2	● 120 VAC dedicated circuit is connected	
	3	● Emergency generator is connected	
	4	● Dedicated circuit breakers are labeled, marked red and locked	
	5	● Earth ground is connected to building steel, cold water, grounding rod	
	6	● After removing primary power, does power transfer to battery backup	
	7	● After removing primary power does FACP indicate trouble condition	
	8	● All alarm appliances are tested under maximum load (i.e. includes all alarm appliances requiring simultaneous operation)	
	9	● 120 VAC separation from 24 VDC	
	10	● Surge Suppressor is provided (indicate location in notes)	
	11	Secondary power is connected	
	12	Battery backup is connected	
	13	Battery backup has required capacity and amp-hour rating	
	14	Complete system testing using only secondary power	
	15	Battery backup has fully re-charged (allow sufficient time)	
	16	Provide typewritten label on cover of cabinet indicating 120VAC circuit	
	17	Provide typewritten label on cover of cabinet indicating cabinet identification	
	18	Provide typewritten (shrinkwrap) labels for each circuit	
	19	Smoke detector located within 5' (>15' AFF) or 21' (< 15' AFF) (circle one)	
	20	Ambient conditions are acceptable (not Custodial or above ceiling)	
Batteries			
Yes	**#**	**Checklist Items**	**Comments**
	21	Corrosion or leakage or tightness of connections.	
	22	Has a discharge test been performed with battery charger disconnected, load test batteries following the manufacturer's recommendations	
	23	Has a load voltage test been performed (Measure terminal voltage while supplying the maximum load required by its application)	
	24	Has a primary battery load voltage test been performed	
Date Batteries			
Battery Size			

Auxiliary Power Supplies (RPS1)-Room			
Yes	**#**	**Checklist Items**	**Comments**
	1	Primary power is connected	
	2	● 120 VAC dedicated circuit is connected	
	3	● Emergency generator is connected	
	4	● Dedicated circuit breakers are labeled, marked red and locked	
	5	● Earth ground is connected to building steel, cold water, grounding rod	
	6	● After removing primary power, does power transfer to battery backup	
	7	● After removing primary power does FACP indicate trouble condition	
	8	● All alarm appliances are tested under maximum load (i.e. includes all alarm appliances requiring simultaneous operation)	
	9	● 120 VAC separation from 24 VDC	
	10	● Surge Suppressor is provided (indicate location in notes)	
	11	Secondary power is connected	
	12	Battery backup is connected	
	13	Battery backup has required capacity and amp-hour rating	
	14	Trouble condition occurs on loss of 120VAC power (Notifier - verify dip switch 4 is set to "ON" for 2 hr delay)	_____ hr delay
	15	Complete system testing using only secondary power	
	16	Battery backup has fully re-charged (allow sufficient time)	
	17	Trouble monitoring and activation modules are installed	
	18	If APS's share AIM, confirm all APS's are supervised	
	19	Smoke detector located within 5' (>15' AFF) or 21' (< 15' AFF) (circle one)	
	20	Provide typewritten label on cover of cabinet indicating 120VAC circuit	
	21	Provide typewritten label on cover of cabinet indicating cabinet identification	
	22	Provide typewritten (shrinkwrap) labels for each circuit	
	23	Ambient conditions are acceptable (not Custodial or above ceiling)	
Batteries			
Yes	**#**	**Checklist Items**	**Comments**
	24	Corrosion or leakage or tightness of connections.	
	25	Has a discharge test been performed with battery charger disconnected, load test batteries following the manufacturer's recommendations	
	26	Has a load voltage test been performed (Measure terminal voltage while supplying the maximum load required by its application)	
	27	Has a primary battery load voltage test been performed	
Date Batteries			
Battery Size			

Detector Testing (SMOKE)				
Yes	**#**	**Checklist Items**		**Comments**
	1	Smoke detectors are provided (NFPA 72 2013 14.4.5.3.4)		
	2	●	Smoke detectors are installed in correct location - 21 ft from corner, 40ft max in hall	
	3	●	Smoke detectors are at least 3ft from diffuser	
	4	●	Room names and numbers on shop drawings match signage at the facility	
	5	●	Activation of smoke detectors indicates an alarm condition at FACP/FSA	
	6	●	Activation of smoke detectors activates notification appliances	
	7	●	Activation of smoke detector accurately reports to the monitoring company	
	8	●	Test method (Note: Magnet testing is not acceptable)- canned aerosol smoke	
	9	●	Smoke detectors with control output functions have been verified that the control capability shall remain operable even if all devices are in alarm state	
	10	●	Smoke detector sensitivity report produced by technician	
	11	Heat detectors are provided		
	12	●	Heat detectors are installed in the correct location	
	13	●	Activation of heat detectors indicates an alarm condition at FACP/FSA	
	14	●	Activation of heat detectors activated notification appliances	
	15	●	Test method (Note: Magnet testing is not acceptable)- heat source	
	16	Duct detectors are provided		
	17	●	Duct detectors are installed in the correct location (supply/return)	
	18	●	Sampling tubes are installed in the correct orientation	
	19	●	Activation of duct detectors indicates an (alarm/supervisory) condition at FACP/FSA	
	20	●	Activation of duct detectors does not activate notification appliances	Supervisory ONLY
	20		Check Test methods utilized (Note: Remote test station method not permitted as only method)	
	20		Remote Test Switch	
	20		Smoke in HVAC duct work	
	20		Canned aerosol smoke housing	
	20		Differential pressure measurements on sampling tubes	Required
	20		Magnet testing (if acceptable)	
	21	●	HVAC system has been restarted after testing	
	22	●	Duct detectors removed from supply air are patched with pooky	
	23	●	Modules are located above/in/below (circle) ceiling grid and grid labeled	
	24	Beam detectors are provided		
	25	●	Beam detectors are installed in the correct location	
	26	●	Activation of beam detectors indicates an alarm condition at FACP/FSA	
	27	●	Activation of beam detectors activates notification appliances	
	27		Check Test methods utilized (Note: Remote test station method not permitted as only method)	
	27		Remote Test Switch	
	27		Optical filter	
	27		Canned aerosol smoke	
	28	●	Trouble condition occurs when beam path is fully blocked	
	29	Alarm verification on the system is		Enabled/Disabled (circle)
	30	Carbon Monoxide detectors are provided		
	31	●	Carbon Monoxide detectors are installed in the correct location	
	32	●	Activation of CO detector indicates an alarm/sprvsry (circle) at FACP/FSA	
	33	●	Activation of CO detector sounds local temporal 4	
	34	●	Activation of CO detector sounds local temporal 4 (Supervisory)	
	35	●	Activation of CO detector sounds global temporal 4 (Alarm - voice)	
	36	●	Loss of power indicates trouble condition at FACP/FSA	
	37	All equipment shall be clearly labeled with typewritten text (Brady Label) at a font size of at least 18 point.		
	38	●	Smoke/heat detectors shall be labeled with the device address on the base of the detector.	
	39	●	Duct detectors shall be labeled with the device address on the housing of the detector.	
	40	●	Remote test switches shall be labeled with the device address and HVAC unit/Beam location.	

Symptoms of carbon monoxide poisoning: Carbon monoxide bonds to the hemoglobin in the blood and reduces the amount of oxygen being circulated in the body. The following symptoms are examples taken from NFPA 720. They represent approximate values for healthy adults:

Concentration (ppm CO)	Symptoms
200	Mild headache after 2-3 hours of exposure
400	Headache and nausea after 1-2 hours of exposure
800	headache, nausea, and dizziness after 45 minutes of exposure; collapse and unconsciousness after 2 hours of exposure

Alarm thresholds are as follows:

Parts Per Million	Detector response time, min.
30 ± 3ppm	No alarm within 30 days
70 ± 5ppm	60-240
150 ± 5ppm	10-50
400 ± 10ppm	4-15

For smooth testing procedure:

Personnel Required:
2 x FA contractors
1 x Programmer

Required items:
1 x label maker for device labels
1 x smoke pole with extra smoke
1 x heat pole/hair dryer

Procedure:

1. Confirm smoke detectors are installed in correct location - 21 ft from corner, 40ft max in hall
2. Confirm smoke detectors are at least 3ft from diffuser
3. Confirm room names and numbers on shop drawings match signage at the facility
4. Smoke detector - do not over smoke and fan after smoking so detector clears
5. Activation of smoke detectors indicates an alarm condition at FACP/FSA
6. Activation of smoke detectors activates notification appliances
7. Verify accurate voice message in applicable smoke compartment(s)
8. Verify accurate device number and location is annunciated on panel
9. Smoke detectors with control output functions have been verified that the control capability shall remain operable even if all devices are in alarm state
10. Verify appropriate dampers actuate in accordance with damper matrix
11. Activation of smoke detector accurately reports to the monitoring company
12. Smoke detector sensitivity report produced by technician

Shortcuts:

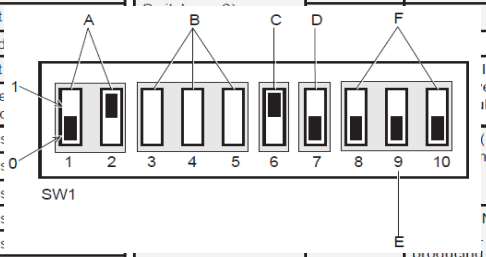
crt		Contractor to resolve and test
diff		Relocate smoke detector at least 3’ from air diffusers
ds		Contractor shall correct device seating and ceiling cut to provide flush device mounting with hidden ceiling tile cut
gl		Provide typed label on grid for modules located above ceiling
ma/c		Provide typed label with module address and function/ Provide module cover and typed label with device address and with function
ph		Label each concealed device location with device type, device ID address and circuit function at the adjacent ceiling tile grid T-bar. Use plastic laminate with engraved ¼-inch lettering. Laminate shall be of red on white core construction (white lettering on red background).
rsc		Remove shipping cover from detector
rts		Provide typed label including HVAC unit information and device address

Fire Smoke Dampers			
Yes	**#**	**Checklist Items**	**Comments**
	1	Provide accurate damper control matrix	
	2	Provide accurate, complete FA floorplans showing FSD locations and numbering	
	3	Verify fire/smoke damper location	
	4	● FSD is identified with 1" white text on red background near damper	
	5	● FSD is labeled on ceiling grid	
	6	Verify fire/smoke damper accessibility	
	7	● Ductwork is equipped with a 12" x 12" access panel or breakaway ductwork	
	8	● No other trades impede access to panels	
	9	Verify damper penetration is sealed	
	10	● Bolted angle iron on one side OR sealing tape on both sides	refer to datasheet
	11	Verify fire/smoke damper operation	
	12	● Fire/smoke dampers are open before test begins	
	13	● FSD closes according to damper control matrix	
	14	● HVAC units identified on the matrix shut down	
	15	● 60 second delay before HVAC restart	
	16	Verify 120 volt circuits	
	17	Fire alarm interface	
	18	● Fire alarm modules and relays shall be clearly labeled with typewritten text (Brady Label) at a font size of at least 18 point.	
	19	● Monitor and relay modules shall be labeled with the device address and function. (For example:L1M-50 Damper Control)	
	20	● Modules are located above/in/below (circle) ceiling grid and grid labeled	
	21	Verify duct detector setup	
	22	● Verify sampling tube is mounted perpendicular to the flow.	
	23	● Verify sampling tube holes are oriented against the direction of air flow.	
	24	● Verify duct detector is sealed in the ductwork.	

OSID			
Yes	**#**	**Checklist Items**	**Comments**
	1	OSID detectors are provided	
	2	● Emitters are installed in correct location	
	3	● Imagers are installed in correct location	
	4	● Activation of detector indicates an alarm condition at FACP/FAAN	
	5	● Activation of detector activates notification appliances	
	6	● Detectors with control output functions have been verified that the control capability shall remain operable even if all devices are in alarm state	
	6	Check Test method utilized	
	6	Smoke	
	6	Optical filter covering Imager	
	6	Optical filter covering each emitter	
	7	● Trouble condition occurs when beam path is fully blocked	
	8	Imager settings	
	9	● Fire alarm threshold is set to medium	switch 1 = 0, switch 2 = 1
	10	● Number of emitters matches emitters in use	switches 3, 4, & 5 (binary from left to right)
	11	● Alarm is latching	switch 6 = 1
	12	● Dust Rejection is disabled	switch 7 = 0
	13	● Enhanced mode is disabled	switch 9 = 0
	14	● Unused dip switches are set to 0	switch 8 = 0, switch 10 = 0
	15	All equipment shall be clearly labeled with typewritten text (Brady Label) at a font size of at least 18 point.	
	16	● OSID detectors shall be labeled with the device address on the imager	
	17	● OSID detectors shall be labeled with the device address on each emitter	
	18	● OSID shall be monitored for alarm and trouble. Modules shall be labeled with the device address and function.	

Configure System via the DIP Switches on the Termination Card of the Imager:

A. Fire Alarm Thresholds (Switch Pair A, Switch no. 1 & 2)	00	Not Configured (Trouble / Fault signaled)	**C.** Alarm Latching (Switch C,	0	Non-Latching
	10	Low (Highest			
	01	Medium (Med			
	11	High (Lowest			Increased tolerance ents resulting in lts signaled)
B. Number of Emitters (Switch Group B, Switch no. 3, 4 & 5)	000	Not Configure Fault signaled			
	100	1 Emitter pres			(EN54-12 Approved enabled) for UL 268 units, set to 0
	010	2 Emitter pres			
	110	3 Emitter pres			
	001	4 Emitter pres			Not EN54-12 . Object intrusion
	101	5 Emitter pres			producing 6dB attenuation gives a Fault instead of Alarm)
	011	6 Emitter present			
	111	7 Emitter present	**F.** Not Used(Switch no. 8 & 10)	0	Unused DIP switches should be set to 0



Standard settings:

VESDA			
Yes	**#**	**Checklist Items**	**Comments**
	1	VESDA detection is provided	
	2	● Vesda commissioning forms provided	
	3	● Vesda Make and Model - (VLS Model zone for each pipe run labeled)	
	4	● Vesda detector label installed (22pt font)	
	5	● Correct date and time	
	6	● Access Codes are properly programmed	Operator____ Level 1____ Level 2____ Level 3____
	7	● VESDA detector is installed in accordance with construction documents	Wet locations require sloped piping & drip loop
	8	● Piping is installed in accordance with construction documents	
	9	● 120VAC separation from 24VDC	
	10	● Plenum rated PVC	
	11	● Paint to match existing prior to drilling sampling holes	permitted by AHJ - water based paint
	12	● Tubing vacuumed after drilling	
	13	● Exhaust port provided and properly installed	
	14	● Filter is (Check one) ☐Clean ☐Contaminated (_____% dust)	New filter required if contaminated
	15	● Verify filter installation date	
	16	● Smoke thresholds (% Obscuration) match shop drawing submittal	Action_____ Alert_____ Fire 1_____ Fire 2_____
	17	● Aspirator speed matches shop drawing submittal	
	18	● Fault Status Confirmed (Cannot be completed if solvent cement is installed)	System_____ Zone_____ Urgent_____ Power_____ Network_____ Airflow_____ Filter_____
	19	● Verify use of appropriate solvent cement	
	20	● Button Lockout	
	21	Smoke Test	Enabled/Disabled
	22	Reset	Enabled/Disabled
	23	Isolate	Enabled/Disabled
	24	AutoLearn Smoke	Enabled/Disabled
	25	AutoLearn Flow	Enabled/Disabled
	26	Relays Connected	Yes/No
	27	GPI Connected	Yes/No
	28	GPI Function	Enabled/Disabled
	29	● Piping and sampling holes are appropriately labeled (see pictures below)	
	30	At changes in direction or branches of piping	
	31	Each side of penetrations of walls, floors, or other barriers	
	32	At intervals that provide visibility with the space, but no greater than 20'	
	33	● Verify hole diameters	
	34	● Verify end cap	Hole Diameter_____ No Hole_____
	35	● Manometer readings performed and recorded for each sampling port	
	36	● Drip loops provided (List areas where temperature differentials are located)	
	37	● Accessible test port(s)	
	38	● Performance-based Smoke Testing	
	39	Check Test methods utilized (Note: It is recommended that two separate test methods are conducted - allow environment to return to normal conditions before starting second test)	
	40	Smoke Pellet Test	

VESDA			
	41	Polyurethane Mat Test	
	42	Canned Smoke	
	43	Wire Burn	
	44	Air sampling detector indicates an alarm condition at FACP/FAA	
	45	Activation of air sampling detector activates notification appliances	

Miniature sampling point label – These are round labels with a hole in the center to fit around the miniature sampling points.

Sampling point decal – This decal is wrapped around a pipe on the samplinghole. The decal has a hole in the centre. The hole in the decal must be aligned to the sampling hole drilled into the pipe.

Pipe label – This label identifies the pipe as being a smoke detector pipe and warns against tampering with it.

Manual Pull Station Testing (PS & WF)			
Yes	**#**	**Checklist Items**	**Comments**
	1	Manual pull stations are provided	
	2	Manual pull stations are installed in the correct location	
	3	Activation of manual pull stations indicates an alarm condition at FACP/FAAN	
	4	Activation of manual pull stations activates notification appliances	
	5	Activation of sounder cover is enabled / disabled / NA (circle one)	
	6	All equipment shall be clearly labeled with typewritten text at a font size of at least 18 point.	
	7	● Manual pull stations shall be labeled with the device address on the base of the pull station.	
Sprinkler System Testing			
Yes	**#**	**Checklist Items**	**Comments**
	8	Waterflow switches are provided	
	9	● Monitor module is provided for each waterflow switch (or group of waterflow switches, not to exceed five)	
	10	● Activation of waterflow switch sends signal to FACP within 90 seconds	Time = _____
	11	● Activation of a waterflow switch indicates an alarm condition at the FACP/FAAN	
	12	● Test method: Flowing water	
	13	Tamper switches are provided	
	14	Monitor module is provided for tamper switches (not to exceed twenty)	
	15	● Modules are located above/in/below (circle) ceiling grid and grid labeled	
	16	● Modules are placed at least 6ft from sprinkler equipment or placed in watertight back boxes	
	17	Activation of all control valves indicates a supervisory condition at the FACP/FAAN	
	18	Test method (Note: shorting terminals are not acceptable)-closing of control valves	
	19	All equipment shall be clearly labeled with typewritten text (Brady Label) at a font size of at least 18 point.	
	20	● Monitor and relay modules shall be labeled with the device address and function. (For example: L1M-23 Waterflow - Area Served)	

Special Hazard Equipment (SUPPRESSION AND PRE-ACTION)			
Attention: If not conducting a full discharge test, confirm that the releasing solenoid is in test mode or disconnected			
Yes	**#**	**Checklist Items**	**Comments**
	1	Abort switches are provided	
	2	● Abort switches operate correctly	
	3	● Verify correct sequence and operation	
	4	Cross zone detection circuit is provided	
	5	● Occurrence of correct sequence with operation of first zone	
	6	● Occurrence of correct sequence with operation of first and second zone	
	7	Release solenoid circuit is provided	
	8	● Verify correct operation of solenoid	
	9	Verify solenoid does not activate during manual valve opening of fire release device (inspector test)	
	10	Verify supervision of all circuits by creating an open circuit	
	11	Verify fire/smoke damper operation	
	12	● Fire/smoke dampers close upon first alarm	
	13	● Air handling units serving the area shut down	
	14	Verify Signage is installed	
	15	● Protected Room	
	16	● Horn/strobe indicates imminent suppression release	
	17	● Strobe indicates suppression agent has released	
	18	Obtain Puff test results	
	19	Obtain Fan test results	
	20	Attention: Confirm that the releasing solenoid has been placed back in service.	
	21	All equipment shall be clearly labeled with typewritten text (Brady Label) at a font size of at least 18 point.	
	22	● Monitor and relay modules shall be labeled with the device address and function. (For example: L1M-23 Waterflow, L1M-50 NAC 1 Horn Control, etc.)	

Elevator Functions (ELEV)			
Yes	**#**	**Checklist Items**	**Comments**
	1	Elevator recall is provided	
	2	● Smoke detectors located in lobbies activate primary recall function	
	3	● Smoke detectors located in lobbies activate secondary recall function	
	4	● Smoke detectors located in equipment rooms activate recall function	
	5	● Smoke detectors located at the top of shafts activate recall function	
	6	● Smoke detectors located at the top of shaft are supervisory	
	7	Elevator shunt trip is provided	
	8	● Heat detectors located in hoistway activate shunt trip	
	9	● Heat detectors located in equipment rooms activate shunt trip	
	10	● Verify heat detector shunt trip after FACP reset after recall and confirm alarm state is maintained (Elevator Code Requirement)	
	11	● Verify heat detectors are located within 2' of each sprinkler head in machine rooms and top of shaft	
	12	● Elevator shunt trip power is monitored and loss of power activates supervisory condition	
	13	Warning light flashes when machine room or shaft smoke activates	
	14	Elevator hoistway venting is provided	
	15	● Elevator hoistway venting is connected to fire alarm system	
	16	● Elevator hoistway venting is activated upon top of shaft smoke detector	
	17	● Elevator hoistway top of shaft smoke detector latches in supervisory	
	18	Verify proper operation of elevator on emergency generator	
	19	Verify keyed override	
	20	Verify Phase II operation	
	21	All equipment shall be clearly labeled with typewritten text (Brady Label) at a font size of at least 18 point.	
	22	● Monitor and relay modules shall be labeled with the device address and function. (For example: L1M-23 Primary Recall, L1M-24 Alternate Recall, etc.)	

Occupant Notification Appliance Testing (NAC)			
Yes	**#**	**Checklist Items**	**Comments**
	1	Notification appliances are provided	
	2	Notification appliances are installed in the correct location	
	3	Exterior notification appliances are installed in the correct location	
	4	• Exterior notification appliance is activated on waterflow alarm	
	5	Ceiling mounted notification appliances are attached to the backbox and supported by the ceiling grid, not the ceiling tile	
	6	Notification appliances are properly synchronized	
	7	Audible notification appliances were measured at the minimum dBA level (60 dBA 70 dBA ____dBA) throughout the building	
	8	Verify audible information is (circle appropriate) intelligible temporal code	
	9	Verify alarm signal deactivation (i.e. audible/visual signal silence)	
	10	All equipment shall be clearly labeled with typewritten text (Brady Label) at a font size of at least 18 point.	
	11	• All notification appliances shall be labeled with the notification appliance circuit designation. The "end of line" shall be clearly labeled.	

18.4.1.2* The total sound pressure level produced by combining the ambient sound pressure level with all audible notification appliances operating shall not exceed 110 dBA at the minimum hearing distance.

18.4.1.4 Audible notification appliances for alert and evacuation signal tones shall meet the requirements of 18.4.3(Public Mode Audible Requirements), 18.4.4 (Private Mode Audible Requirements), 18.4.5 (Sleeping Area Requirements), or 18.4.6 (Narrow Band Tone Signaling for Exceeding Masked Thresholds), as applicable.

18.4.3.1* To ensure that audible public mode signals are clearly heard, unless otherwise permitted by 18.4.3.2through 18.4.3.5, they shall have a sound level at least 15 dB above the average ambient sound level or 5 dB above the maximum sound level having a duration of at least 60 seconds, whichever is greater, measured 5 ft (1.5 m) above the floor in the area required to be served by the system using the A-weighted scale (dBA).

18.4.3.2 Where approved by the authority having jurisdiction or other governing codes or standards, the requirements for audible signaling shall be permitted to be reduced or eliminated when visible signaling is provided in accordance with Section 18.5.

18.4.3.3 Audible alarm notification appliances installed in elevator cars shall be permitted to use the audibility criteria for private mode appliances detailed in 18.4.4.1.

18.4.3.4 If approved by the authority having jurisdiction, audible alarm notification appliances installed in restrooms shall be permitted to use the audibility criteria for private mode appliances detailed in 18.4.4.1.

18.4.4.1* To ensure that audible private mode signals are clearly heard, they shall have a sound level at least 10 dB above the average ambient sound level or 5 dB above the maximum sound level having a duration of at least 60 seconds, whichever is greater, measured 5 ft (1.5 m) above the floor in the area required to be served by the system using the A-weighted scale (dBA).

Table A.18.4.3 Average Ambient Sound Level According to Location

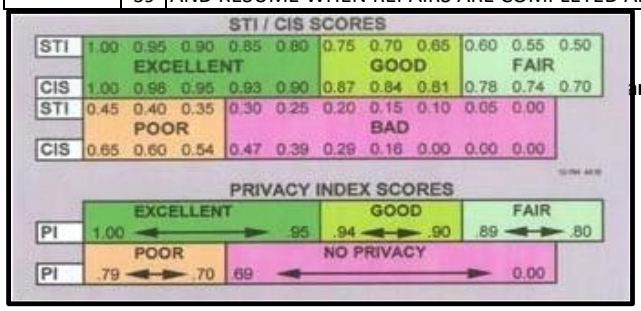
Location	Average Ambient Sound Level (dBA)
Business occupancies	55
Educational occupancies	45
Industrial occupancies	80
Institutional occupancies	50

Occupant Notification Appliance Testing (NAC)

Mercantile occupancies	40
Mechanical rooms	85
Piers and water-surrounded structures	40
Places of assembly	55
Residential occupancies	35
Storage occupancies	30
Thoroughfares, high-density urban	70
Thoroughfares, medium-density urban	55
Thoroughfares, rural and suburban	40
Tower occupancies	35
Underground structures and windowless buildings	40
Vehicles and vessels	50

Emergency Communications Equipment (VOICE)			
Yes	**#**	**Checklist Items**	**Comments**
	1	Amplifiers/tone generators are provided	
	2	Verify correct switching and operation of backup equipment	Confirm function of paging interface (supplement or shunt)
	3	Verify messages other than fire alarm can be manually activated	1)lights locks out of sight 2)arm 3)security alarm
	4	Verify all messages are clear of feedback/noise	
	5	Paging zones by a) level b) academic c) commons d) exterior	
	6	Floor above/floor below activation confirmed	
	7	Phone jacks are properly installed	
	8	Verify initiation of communications path through jack	
Preliminary Voice Test			
Yes	**#**	**Checklist Items**	**Comments**
	9	Perform and record the CIS test results for each speaker regardless of location	
	10	Perform and record the DBA test result for each speaker regardless of location	
	11	Record only the alert tone DBA (maximum reading with ANSI type II sound meter)	
	12	Perform and record the wire resistance for each circuit. Perform the resistance test in accordance to manufacture procedures	
	13	Perform and record the performance test as describe in NFPA 72	
	14	Notification Appliance Circuit (NAC) performance test, NFPA 72, class B style Y	
	15	Speaker circuits shall meet the Notification Appliance Circuit performance criteria, class B style Y	
Audible Notification Appliance Network			
Yes	**#**	**Checklist Items**	**Comments**
	16	Verify speakers are suitable for the intended climate	
	17	Verify speakers are located throughout the building interior	
	18	Verify interior speakers are rated 2 watts or less power output for most occupied areas	
	19	Verify speakers are rated 8 watts or less power output for large/noisy areas or the exterior	
	20	If applicable, verify the MNS interfaces with the building public address system	
	21	**NOTE**: The following two tests require total silence and complete facility accessibility	
	22	Verify the Common Intelligibility Scale (CIS) are equal to or greater than 0.80 in normally occupied areas. Perform the CIS test in accordance to test equipment manufacturer specifications	
	23	Occupancy requirement, verify audible output between 70 and 105 DBA. NOTE: Adjustment of the DBA level may be required after the facility is occupied.	
	24	All equipment shall be clearly labeled with typewritten text at a font size of at least 18 point.	
	25	● All notification appliances shall be labeled with the notification appliance circuit designation. The “end of line” shall be clearly	
	26	● Monitor and relay modules shall be labeled with the device address and function. (For example: L1M-23 Sound System Override, etc.)	
Performance Test			
Yes	**#**	**Checklist Items**	**Comments**
	27	Confirm the performance test was performed by the installing contractor and have a copy of their test report	
	28	**Performance of Notification Appliance Circuit(s) NAC, Class B, Style Y**	

	28	Single Open	
	29	● Result: Trouble and Alarm capability	
	30	● Verify Central Station received a Trouble signal	
	31	● Verify Central Station received a Fire Alarm signal	
	32	Single Ground	
	33	● Result: Trouble and Alarm capability	
	34	● Verify Central Station received a Trouble signal	
	35	● Verify Central Station received a Fire Alarm signal	
	36	W to W short	
	37	● Result: Trouble	
	38	● Verify Central Station received a Trouble signal	
	39	NOTE; THE TEST SHALL BE PERFORMED ON EACH CIRCUIT. IF CIRCUITS ARE INCOMPLETE, INOPERATIVE, OR IMPROPER PERFORMANCE, THE TEST WILL STOP AND RESUME WHEN REPAIRS ARE COMPLETED AND VERIFIED	



an .65 average of .70

Preliminary Horn Test (HORN)			
Yes	**#**	**Checklist Items**	**Comments**
	1	Perform and record the dBA test result for each horn regardless of location	
	2	Perform and record the wire resistance for each circuit. Perform the resistance test in accordance to manufacture procedures	
	3	Perform and record the performance test as describe in NFPA 72	
	4	Notification Appliance Circuit (NAC) performance test, NFPA 72, class B style Y	
	5	Occupancy requirement, verify audible output between 70 and 105 DBA. NOTE: Adjustment of the DBA level may be required after the facility is occupied	
	6	All equipment shall be clearly labeled with typewritten text (Brady Label) at a font size of at least 18 point.	
	7	• All notification appliances shall be labeled with the notification appliance circuit designation. The “end of line” shall be clearly labeled.	
	8	• Monitor and relay modules shall be labeled with the device address and function. (For example: L1M-23 RPS Trouble, L1M-50 NAC 1 Horn Control, etc.)	

Visual Notification Appliance Network (VISUAL)			
Yes	**#**	**Checklist Items**	**Comments**
	1	Verify all conduit runs are properly documented on as-built drawings	
	2	Verify appliances are correctly displayed on as-built drawings	
	3	Verify appliances are physically labeled and located in accordance with as-built drawings	
	4	Remove covers on pull and junction boxes (at least 10%) to verify internal wiring per as-built documents	
	5	Verify the number (amount) of notification appliances are documented on as-built drawings & battery calculation sheets	
	6	Verify Notification Appliances are labeled ALERT FIRE	
	7	All equipment shall be clearly labeled with typewritten text at a font size of at least 18 point.	
	8	● All notification appliances shall be labeled with the notification appliance circuit designation. The “end of line” shall be clearly labeled.	
	9	● Monitor and relay modules shall be labeled with the device address and function. (For example: L1M-23 RPS Trouble, L1M-50 NAC 1 Visual Control, etc.)	
Performance Test			
Yes	**#**	**Checklist Items**	**Comments**
	10	Confirm the performance test and voltage drop readings were performed by the installing contractor and have a copy of their test report	Record the lowest reading using a voltmeter while strobes are flashing and power supply is on battery backup
	11	**Performance of Notification Appliance Circuit(s) NAC, Class B, Style Y**	
	12	Single Open	
	13	● Result: Trouble and Alarm capability	
	14	● Verify Central Station received a Trouble signal	
	15	● Verify Central Station received a Fire Alarm signal	
	16	Single Ground	
	17	● Result: Trouble and Alarm capability	
	18	● Verify Central Station received a Trouble signal	
	19	● Verify Central Station received a Fire Alarm signal	
	20	W to W short	
	21	● Result: Trouble	
	22	● Verify Central Station received a Trouble signal	
		NOTE; THE TEST SHALL BE PERFORMED ON EACH CIRCUIT. IF CIRCUITS ARE INCOMPLETE, INOPERATIVE, OR IMPROPER PERFORMANCE, THE TEST WILL STOP AND RESUME WHEN REPAIRS ARE COMPLETED AND VERIFIED	

Rescue Assistance			
Yes	**#**	**Checklist Items**	**Comments**
	1	Mounting and Cover	
	2	● Base Station 60" to center	
	3	● Tactile Signage 60" to center	
	3	Illuminated when exit sign illumination is required	
	4	● Call Box 48" to center	
	5	● Instructional Signage 48" to center	
	6	Dedicated Power Supply	
	7	Survivability Level 1, 2, or 3	
	8	Call box on each level (not on 1st level)	

Miscellaneous			
Yes	**#**	**Checklist Items**	**Comments**
	1	**Transient Suppressors direction** inspected per the manufacturer's instructions	
	2	Verify 120 volt circuits	
Magnetic Doors and Won Doors			
	3	Validate operation of door hold-open devices	
	4	● Verify structural support	
	5	Validate operation of WON doors	
	6	● Control/relay module is located within 3 feet of control equipment	
	7	● Manual Release	
	8	● Kick Plate	
	9	● Seal	
	10	All equipment shall be clearly labeled with typewritten text at a font size of at least 18 point.	
	11	● Relay modules shall be labeled with the device address and function. (For example: L1M-23 Door Control)	
	12	● Modules are located above/in/below (circle) ceiling grid and grid labeled	
	13	120V dedicated circuits shall be equipped with red breaker locks.	
	14	Supervise power if battery backup is not provided.	
Coiling Doors			
	15	● Verify release of coiling doors upon LOCAL smoke detection	
	16	All equipment shall be clearly labeled with typewritten text (Brady Label) at a font size of at least 18 point.	
	17	● Relay modules shall be labeled with the device address and function. (For example: L1M-23 Door Control)	
	18	● Modules are located above/in/below (circle) ceiling grid and grid labeled	
Connection to Background Sound System (MISC)			
	19	Background sound system shuts down upon an alarm condition	
	20	Control/Relay module is located within 3 feet of control equipment	
	21	Background sound system automatically resets upon clearing an alarm condition	
	22	All equipment shall be clearly labeled with typewritten text (Brady Label) at a font size of at least 18 point.	
	23	● Relay modules shall be labeled with the device address and function. (For example: L1M-23 Gym Sound System Shutdown)	
	24	● Modules are located above/in/below (circle) ceiling grid and grid labeled	
Fire Alarm System Interface with BDA System			
	25	● NFPA dictates that 99% coverage is required in areas of "vital importance," which are designated by your local fire department. In other areas, 90% coverage is required.	
	26	● Minimum Signal Strength: According to both the NFPA and IFC, a minimum signal strength of -95 dBm is required for adequate coverage.	
	27	● Antenna Isolation: The NFPA dictates that antenna isolation must be 15 dB higher than the gain of the amplifier.	
	28	● NEMA-4 compliant enclosure	
	29	● Battery backup (24 hours) or connection to EM Circuit	
	30	● Fire Ratings: Cables connecting public safety electronic equipment must meet a two-hour fire rating. This also applies to the room that contains the equipment.	
Monitor Modules have been provided and installed for:			

Miscellaneous			
Yes	**#**	**Checklist Items**	**Comments**
	31	● loss of radio signal (BDA Trouble)	
	32	● BDA antenna	
	33	● BDA battery charger(s) failure	
	34	● 120 VAC Fail	
	35	● Low Battery	
	36	Activation of any module shall cause a supervisory condition at the FACP	
	37	All equipment shall be clearly labeled with typewritten text (Brady Label) at a font size of at least 18 point.	
	38	● Monitor modules shall be labeled with the device address and function. (For example: L1M-23 Antenna Failure)	
	39	● Modules are located above/in/below (circle) ceiling grid and grid labeled	
Fire Alarm System Interface with Emergency Generator			
	40	Monitor Modules have been provided and installed for:	
	41	● Auto	
	42	● Controller Trouble	
	43	● Switch Transfer	
	44	● Running	
	45	Activation of any module shall cause a supervisory condition at the FACP	
	46	Location of Emergency Generator	
	47	Location of Fuel Storage	
	48	● Type of Fuel	
	49	All equipment shall be clearly labeled with typewritten text (Brady Label) at a font size of at least 18 point.	
	50	● Monitor modules shall be labeled with the device address and function. (For example: L1M-23 Generator Running)	
	51	● Modules are located above/in/below (circle) ceiling grid and grid labeled	
Mass Notification			
	52	For the Public Fire alarm reporting power supply a change in current exceeded 10% (if so, investigate immediately)	
	53	Fire extinguishing system switch is mechanically or electrically operated and receipt of signal has been verified	
	54	Test LOC priorities (see additional checklist)	
	55	Test ring-back feature of FA versus Mass notification system	
	56	Verify 10 minute mass notification timeout	
Connection to Auditorium Lighting (MISC)			
	57	Auditorium lights turn on upon activation of an alarm condition	
	58	All equipment shall be clearly labeled with typewritten text (Brady Label) at a font size of at least 18 point.	
	59	● Relay modules shall be labeled with the device address and function. (For example: L1M-23 Turn On Auditorium Lighting)	
	60	● Modules are located above/in/below (circle) ceiling grid and grid labeled	
Security Panic Button			
	61	Verify security button releases magnetic door hold open devices	**TAKE SECURITY OFF LINE OR SWAT!!**
	62	Verify security button sends security signal through security panel	
	63	All equipment shall be clearly labeled with typewritten text (Brady Label) at a font size of at least 18 point.	

Miscellaneous			
Yes	**#**	**Checklist Items**	**Comments**
	64	● Monitor and relay modules shall be labeled with the device address and function. (For example: L1M-23 Door Release)	
	65	● Modules are located above/in/below (circle) ceiling grid and grid labeled	
Fire Alarm System Interface with Security			
	66	Relay Modules have been provided and installed to notify security system of alarm	
	67	All equipment shall be clearly labeled with typewritten text (Brady Label) at a font size of at least 18 point.	
	68	● Relay modules shall be labeled with the device address and function. (For example: L1M-23 Send Signal to Security)	Lock down Lock out
	69	● Modules are located above/in/below (circle) ceiling grid and grid labeled	
Emergency Communications Equipment			
	70	Amplifier/Tone Generators: Verify correct switching and operation of backup equipment	
	71	Call-In Signal Silence: Operate/function and verify receipt of correct visual and audible signals at control unit	
	72	Off-hook indicator (ring down): Install phone set or remove phone from hook and verify receipt of signal at control unit.	
	73	Phone Jacks: Visually inspect phone jack and initiate communications path through jack.	
	74	Phone Set: Activate each phone set and verify correct operation	
	75	System Performance: Operate the system with a minimum of any five handsets simultaneously. Verify voice quality and clarity	

O & M Manual				
Yes	**#**			**Comments**
	1	Project name is correct		
	2	Signed letters of warranty		
	3	●	Electrical contractor	
	4	●	Vendor	
	5	●	Warranty for relevant construction (FA, PA, Exit signs, Security, etc.)	
	6	Bookmarks		
	7	●	Fire alarm sections bookmarked	
	8	●	Bookmarks titled with description of section	
	9	Datasheets		
	10	●	Fire alarm components	
	11	●	Fire alarm wire	
	12	Operation and installation manual		
	13	●	FACP	
	14	●	DACT	
	15	●	RPS	
	16	●	SLC devices	
	17	●	NAC devices	

	Installation Drawings of Record - As-Built drawings, at a minimum shall include the following information (AS-BUILT)	Contractor Sign Off	FA Vendor Sign Off	Comments
INSTALLING CONTRACTOR	Provide scans of contractor redlines			
	● Verify EOL and dBA readings noted			
	● Verify Manometer readings recorded for each duct detector			
	● Verify module locations (below grid, in grid, or above grid) are indicated for each module			
	● Verify all adds/deletions are recorded			
	● Confirm NAC and SLC capacity does not exceed 80%			
	● Identify 120VAC circuits for:			
	❍ FACP			
	❍ Remote Power Supplies			
	❍ Dampers			
	❍ Door Holders			
	● Show all wire runs (NAC, SLC, IDC, Sychronization Circuit etc.)			
	❍ Identify locations utilizing conduit and identify cable run within each conduit			
	❍ Identify locations utilizing underground or overhead wire			
	● Identify surge suppressor locations			
	● Show interface methods			
	❍ Public Address (RDL/Atlas/Other)			
	❍ Paging (RDL/Atlas/Other)			
	❍ Others			
FIRE ALARM SYSTEM VENDOR	Provide panel download and control by event			
	● Verify panel download device address, type and location incorporated in record drawings			
	● Verify panel download matches UDACT information			
	● Verify panel download device address, type and location incorporated in graphic map			
	● Verify panel download device address, type and location incorporated on record drawing custom address list			
	● Verify control by event matches approved sequence of operations			
	● Verify custom address for duct detector includes HVAC unit and module location			
	Provide CAD files (utilizing etransmit command) and PDFs			
	● Verify each item completed by installing contractor (above) is incorporated into record drawings			
	● Verify general appearance and legibility			
	● Verify drawings are a minimum of 1/8” scale and match shop drawing submittal/contract document layout			
	● Verify remodels during Construction Process have been incorporated			
	● Verify TLH shop drawing review comments have been incorporated			
	● Verify punch list comments have been resolved and incorporated in record drawings			
	● Verify FACP and RPS panel diagrams accurately depict installation			
	● Provide Point to Point (riser) diagram with all associated labeling and markings			
	● Provide accurate device counts and calculations			
	Provide calculations in Excel format			
	Provide sequence of operations in Excel format			
	Review previous team emails (Check email flags)			
	Compare drawings with TLH observation reports			

	Installation Drawings of Record - As-Built drawings, at a minimum shall include the following information (AS-BUILT)	Contractor Sign Off	FA Vendor Sign Off	Comments
FIRE ALARM SYSTEM VENDOR	Graphic Maps			
	• Verify general appearance and legibility			
	• Building name and address, including zip code (black, bold, 1/2" text)			
	• Accurate north arrow			
	• Legend includes all symbols used			
	• "You are here" arrow (red, bold, 1/4" text)			
	• Simplified room designations (black, 1/8" text)			
	• Room designations for areas with devices			
	• Art rooms with kiln rooms identified			
	• Device addresses (blue, 1/8" text)			
	• Initiating devices (red)			
	• Supervisory devices (orange)			
FIRE ALARM SYSTEM VENDOR	• Water shutoff location (blue)			
	• Gas shutoff location (green)			
	• Electrical shutoff location (red)			
	• Fire hydrant locations (red)			
	• Remote power supply locations			
	• Remote test switch locations			
	• Legible key plan indicating building sprinkler zones			
	• Room designations match as-built documents			
	• Remodels are incorporated			
	• Device addresses match record drawings/panel download			
FIRE ALARM SYSTEM VENDOR	• Incorporate area designation key plan			
	• Graphic map is provided for FACP and each FSA and LOC with proper orientation			
	• Provide PDF of 11x17 maps for approval prior to producing hard copies and laminating			
	• Compare to panel download			
	Graphic Screens			
	• Room designations match as-built documents			
	• Remodels are incorporated			
	• Device addresses match as-built documents			
	• Disable lists have been coordinated and approved by owner			
	• Screen navigation is clear and easy to control			
	• Home screen incorporates a site plan			
	• An elevation screen is included for ease of navigation			

Project Closeout/Record Documents			
Yes	**#**	**Checklist Items**	**Comments**
	1	Punchlist items resolved by contractor	
	2	New graphic map installed	
	3	Terminology and formats (mapnet, custom addressing, etc) must be consistent throughout	
	4	Record of Completion	
	5	Log Book (red binder) in acrylic folder with tabs for maintenance, events, record of completion	
	6	Provide a flash drive or CD in the FACP with the panel program restoration file	
	7	Redlined Contractor drawings (PDF)	
	8	Provide spare parts as required in Contract Documents	
	9	Provide six keys for each component/panel.	
	10	Return all Master Keys to owner - list keys/badges returned in "Comments"	
	11	Provide Manometer Readings	
	12	Provide dBA readings	
	13	Provide End-of-Line voltage drop readings on loss of 120V AC	
	14	Provide scans of signed off permit (PDF)	
Format standards and required elements			
	15	AutoCAD 2018 (or higher version) files using etransmit command	
	16	"As-constructed" or "As-Built" on each drawing page and on each project manual cover page	
	17	As-Built date shall be included and the same on each drawing page and on each project manual cover page	
	18	ACAD Convention: use paperspace for the titleblock and model space for the project elements	
	19	Microsoft Excel file with calculations, custom address list etc.	
	20	Fire Alarm Graphic Maps must be included in the submittal package; both electronic and hard copies.	
	21	Fire Alarm system information and data sheets must be included in the submittal package; both electronic and hard copies.	
Hard Copies			
	22	As-built Drawings	
	23	● 2 full size white bond prints of each drawing	
	24	● 1 B-size print of each drawing	
	25	● 11x17 portable maps are laminated and provided to owner (4 sets)	
	26	Project O & M Manual:	
	27	● Letter of Warranty	
	28	● One paper copy of the project manual in a 3-ring binder	
Electronic Copies			
	29	CAD Files and PDFS - 1 CD or thumb drive containing the following:	
	30	● All FA CAD files - CTB's (pen schedules), special fonts, JPEGS, logos, etc.	
	31	● All FA PDF files	
	32	O&M and Panel Programming - 1 CD or thumb drive containing the following:	
	33	● All O&M PDF files (the native electronic document must be converted into PDF; do not scan the document into PDF. PDF must have bookmarks for major sections and subsections. PDF document must be one single electronic document)	
	34	● Panel Program (in its native format) for reprogramming in event of FACP failure.	
	35	● Panel Program (MS Excel or Word format), calculations, device lists or similar files shown in drawings