

PROJECT MANUAL

FOR

HOLLINGWORTH ELEMENTARY SCHOOL
RESTROOM BUILDING AND SITE IMPROVEMENT

OWNER

ROWLAND UNIFIED SCHOOL DISTRICT
1830 SOUTH NOGALES STREET
ROWLAND HEIGHTS, CA 91748

ARCHITECT

PBK
8163 ROCHESTER AVENUE
RANCHO CUCAMONGA, CA 91730
(909) 987-0909

PROJECT W2105400AR
APRIL 2022


PROJECT MANUAL
FOR
HOLLINGWORTH ELEMENTARY SCHOOL
RESTROOM BUILDING AND SITE IMPROVEMENT

PROJECT W2105400AR

APRIL 2022

ROWLAND UNIFIED SCHOOL DISTRICT
1830 SOUTH NOGALES STREET
ROWLAND HEIGHTS, CA 91748

PBK
8163 ROCHESTER AVENUE
RANCHO CUCAMONGA, CA 91730
(909) 987-0909

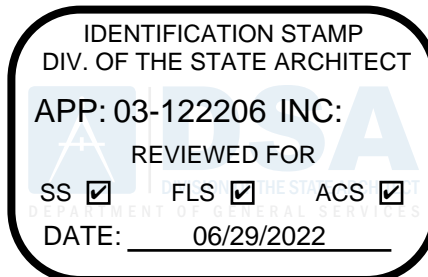


JAMES P. DiCAMILLO
ARCHITECT

C-15937

Stamp

PBK
8163 Rochester Avenue
Rancho Cucamonga, CA 91730
Phone: (909) 987-0909
Fax: (909) 980-9980



PROJECT MANUAL
FOR
HOLLINGWORTH ELEMENTARY SCHOOL
RESTROOM BUILDING AND SITE IMPROVEMENT

PROJECT W2105400AR

DSA APPLICATION NO. 03-122206

APRIL 2022

ROWLAND UNIFIED SCHOOL DISTRICT
1830 SOUTH NOGALES STREET
ROWLAND HEIGHTS, CA 91748

PBK
8163 ROCHESTER AVENUE
RANCHO CUCAMONGA, CA 91730
(909) 987-0909



RONALD DELA CRUZ
ELECTRICAL ENGINEER

Stamp

LEAF Engineers, Inc.
8163 Rochester Avenue
Rancho Cucamonga, CA 91730
P: (909) 987-0909

**TABLE OF CONTENTS
SPECIFICATIONS GROUP**

Hollingworth Elementary School
Restroom Building and Site Improvement

**SPECIFICATIONS GROUP
GENERAL REQUIREMENTS SUBGROUP**

DIVISION 01	GENERAL REQUIREMENTS	PAGES
01 11 00	Summary of Work	2
01 20 00	Price and Payment Procedures	4
01 25 13	Product Substitution Procedures	4
01 31 00	Project Management and Coordination	7
01 32 17	Construction Schedule - Bar Chart	8
01 33 00	Submittal Procedures	6
01 42 19	Reference Standards	3
01 43 00	Quality Assurance	3
01 45 29	Testing Laboratory Services	4
01 50 00	Temporary Facilities and Controls	6
01 61 00	Product Requirements	3
01 73 00	Execution Requirements	4
01 74 19	Construction Waste Management and Disposal	13
01 77 00	Closeout Procedures	5

**SPECIFICATION GROUP
FACILITY CONSTRUCTION SUBGROUP**

DIVISION 02 **EXISTING CONDITIONS**

NOT USED

DIVISION 03 **CONCRETE**

NOT USED

DIVISION 04 **MASONRY**

NOT USED

DIVISION 05 **METALS**

NOT USED

DIVISION 06 **WOOD, PLASTICS, AND COMPOSITES**

NOT USED

DIVISION 07 **THERMAL AND MOISTURE PROTECTION**

NOT USED

DIVISION 08 **OPENINGS**

NOT USED

DIVISION 09 FINISHES

NOT USED

DIVISION 10 SPECIALTIES

10 14 00 Signage 5

DIVISION 11 EQUIPMENT

NOT USED

DIVISION 12 FURNISHINGS

NOT USED

DIVISION 13 SPECIAL CONSTRUCTION

NOT USED

DIVISION 14 CONVEYING EQUIPMENT

NOT USED

DIVISION 15 TO 19 RESERVED

NOT USED

SPECIFICATIONS GROUP
FACILITY SERVICES SUBGROUP

DIVISION 20 RESERVED

NOT USED

DIVISION 21 FIRE SUPPRESSION

NOT USED

DIVISION 22 PLUMBING

NOT USED

DIVISION 23 HEATING, VENTILATING, AND AIR CONDITIONING

NOT USED

DIVISION 24 RESERVED

NOT USED

DIVISION 25 INTEGRATED AUTOMATION

NOT USED

DIVISION 26 ELECTRICAL

26 05 00	Common Work Results for Electrical	5
26 05 19	Low-Voltage Electrical Power Conductors and Cables	4
26 05 26	Grounding and Bonding for Electrical Systems	4
26 05 29	Hangers and Supports for Electrical Systems	5
26 05 33	Raceway and Boxes for Electrical Systems	9
26 05 53	Identification of Electrical Systems	3
26 20 00	Low-Voltage Electrical Distribution	10
26 27 26	Wiring Devices	3
26 43 13	Surge Protection Devices for Low-Voltage Electrical Power Circuits	5
26 50 00	Lighting	9

DIVISION 27 COMMUNICATIONS

27 10 00	Category 6A Structure Cabling System (SCS)	14
27 51 00	Intercom System	15

DIVISION 28 ELECTRONIC SAFETY AND SECURITY

28 31 00	Fire Detection and Alarm	16
----------	--------------------------	----

DIVISION 29 RESERVED

NOT USED

SPECIFICATIONS GROUP
SITE AND INFRASTRUCTURE SUBGROUP

DIVISION 30 RESERVED

NOT USED

DIVISION 31 EARTHWORK

31 20 00	Earth Moving	11
----------	--------------	----

DIVISION 32 EXTERIOR IMPROVEMENTS

32 12 16	Asphalt Paving	7
32 13 13	Concrete Paving	9

DIVISION 33 UTILITIES

33 10 00	Water Utilities	4
33 30 00	Sanitary Utilities	4
33 40 00	Storm Drainage Utilities	5

DIVISION 34 TRANSPORTATION

NOT USED

DIVISION 35 WATERWAY AND MARINE CONSTRUCTION

NOT USED

DIVISION 36 TO 39 RESERVED

NOT USED

SPECIFICATIONS GROUP
PROCESS EQUIPMENT SUBGROUP

DIVISION 40 PROCESS INTEGRATION

NOT USED

DIVISION 41 MATERIAL PROCESSING AND HANDLING EQUIPMENT

NOT USED

DIVISION 42 PROCESS HEATING, COOLING, AND DRYING EQUIPMENT

NOT USED

DIVISION 43 PROCESS GAS AND LIQUID HANDLING, PURIFICATION, AND STORAGE

NOT USED

DIVISION 44 POLLUTION CONTROL AND WASTE EQUIPMENT

NOT USED

DIVISION 45 INDUSTRY-SPECIFIC MANUFACTURING EQUIPMENT

NOT USED

DIVISION 46 INDUSTRY-SPECIFIC MANUFACTURING EQUIPMENT

NOT USED

DIVISION 47 INDUSTRY-SPECIFIC MANUFACTURING EQUIPMENT

NOT USED

DIVISION 48 ELECTRICAL POWER GENERATION

NOT USED

DIVISION 49 RESERVED

NOT USED

SECTION 01 11 00

SUMMARY OF WORK

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Work Included.
- B. Work under separate contracts.
- C. Work by Owner.
- D. Owner furnished products.
- E. Contractor use of site and premises.
- F. Work Sequence.
- G. Owner occupancy.
- H. Work restrictions.

1.2 WORK INCLUDED

- A. Work of this Contract comprises general construction of Modular Restroom Building and play structures located at 3003 East Hollingworth Street, West Covina, CA for Rowland Unified School District, Owner.
- B. Construct the work under a single lump sum contract.

1.3 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Concurrent Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

Separate contracts have been awarded to:

- 1. AMS: Provide and install one 24 x 40 modular building only. Foundation by General Contractor.
- 2. Miracle Playground: Provide and install play equipment for 5 - 12 years.
- 3. Kompen: Provide and install play equipment for 3 - 4 years old.

1.4 OWNER FURNISHED PRODUCTS

- A. Contractor's Responsibilities:
 - 1. Review Owner reviewed Shop Drawings, Product Data, and Samples.
 - 2. Receive and unload Products at site; inspect for completeness or damage, jointly with Owner.
 - 3. Handle, store, install and finish Products.
 - 4. Repair or replace items damaged after receipt.

1.5 CONTRACTOR USE OF SITE AND PREMISES

- A. Limit use of site and premises to allow:
 - 1. Owner occupancy.
 - 2. Use of site and premises by public.

1.6 OWNER OCCUPANCY

- A. Partial Owner Occupancy: Owner will occupy the entire site and premises during entire construction period, with the exception of areas under construction.
- B. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
- C. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
- D. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.
- E. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage.
- F. Perform the Work so as not to interfere with Owner's day-to-day operations.
- G. Maintain existing exits, unless otherwise indicated.
- H. Provide not less than 72 hours notice to Owner of activities that will affect Owner's operations.

1.7 WORK RESTRICTIONS

- A. On-Site Work Hours: Work shall be generally performed during normal business working hours, Monday through Friday, except as otherwise indicated or required to conform to construction schedule and labor codes.
 - 1. Weekend Hours: 8:00 a.m. - 4:00 p.m.
 - 2. Early Morning Hours: As directed later.
 - 3. Hours for Utility Shutdowns: As approved later.
 - 4. Hours for Noisy Operations: As directed later.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted to do so and then only after arranging to provide temporary utility services according to requirements indicated.
 - 1. Notify Architect not less than 5 days in advance of proposed utility interruptions. Do not proceed with utility interruptions without Architect's permission.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cash allowances.
- B. Schedule of Values.
- C. Application for Payment.
- D. Defect assessment.
- E. Non-payment for rejected work.
- F. Change procedures.

1.2 CASH ALLOWANCES

- A. Include in the contract sum all cash allowances stated herein.
- B. Items covered by cash allowances shall be supplied for such amounts and by such persons as the Owner may direct, but the Contractor shall not be required to employ persons or entities against which the Contractor makes reasonable objection.
- C. Costs Included in Cash Allowances: Cost of Product to Contractor or Subcontractor, less applicable trade discounts; delivery to site and applicable taxes.
- D. Costs Not Included in the Cash Allowance: Product handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage; labor for installation and finishing; and overhead profit and other expenses contemplated. These expenses shall be included in the contract sum and not in the allowance.
- E. Funds will be drawn from cash allowance amount only by written authorization of the Owner.
- F. At closeout of contract, funds remaining in cash allowance amount will be credited to Owner by change order.
- G. Whenever costs are more than cash allowance amount, the contract amount will be adjusted accordingly by change order.
- H. Contractor Responsibilities:
 - 1. Assist Architect in selection of products and suppliers.
 - 2. Obtain proposals from suppliers and offer recommendations.
 - 3. On notification of selection by Owner, execute agreement with designated supplier.
 - 4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery and product handling at site.
 - 5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for damage.

1.3 CONTINGENCY ALLOWANCE:

- A. Include in the contract sum and base bid all contingency allowances stated herein.
- B. Costs included in contingency allowance: Cost of work to Contractor or subcontractor, less applicable trade discounts; delivery to site and applicable taxes; product handling, including unloading, uncrating, and storage; protection of products from damage; labor for installation and finishing; reasonable overhead and profit and other expenses required by work.
- C. Funds will be drawn from contingency allowance amount only by written authorization of Owner.
- D. At closeout of Contract, funds remaining in contingency allowance amount will be credited to Owner by Change Order.
- E. Whenever costs are more than contingency allowance amount, the Contract amount will be adjusted accordingly by Change order.
- F. Contractor Responsibilities:
 - 1. Assist Architect in selection of products and suppliers.
 - 2. Obtain proposals from suppliers and offer recommendations.
 - 3. On notification of selection by Owner, execute agreement with designated supplier.
 - 4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery of product to site.
 - 5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for damage.
- G. Contingency Allowance: A stipulated sum of \$50,000.00

1.4 SCHEDULE OF VALUES

- A. Submit Schedule of Values for approval in duplicate within fourteen days after receipt of Notice to Proceed.
- B. Format: Submit typed schedule based upon the Table of Contents of this Project Manual. Identify each line item with number and title of the major specification Section.
- C. Include in each line item, the amount of Allowances specified in this Section.
- D. Include within each line item, a directly proportional amount of Contractor's overhead and profit.
- E. Revise schedule to list approved Change Orders, on continuation sheet, with each Application For Payment.

1.5 APPLICATIONS FOR PAYMENT

- A. Submit three copies of each application on AIA Form G702 - Application and Certificate for Payment and AIA Form G703 Continuation Sheet.
- B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
- C. Payment Application Times: The date for each progress payment is indicated in the General Conditions of the Contract.
- D. Payment Application Periods: The period of construction covered by each application for payment is the period indicated in the General Conditions of the Contract.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents. Architect will return incomplete applications without action.

- F. Waiver of Stop Notices: With each application for payment, submit waivers of stop notices from subcontractors for construction period covered by previous application.
- G. Final Payment: As specified in the General Conditions of the Contract and in Section 01 77 00 - Closeout Procedures.
- H. Refer to the General Conditions of the Contract for additional payment provisions.

1.6 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Architect, it is not practical to remove and replace the Work, the Architect will direct one of the following remedies:
 - 1. The defective Work may remain, but the listed schedule of value will be adjusted to a new value at the discretion of the Architect.
 - 2. The defective Work will be partially repaired to the instructions and satisfaction of the Architect and the listed schedule of value will be adjusted to reflect a new value at the discretion of the Architect.

1.7 NON-PAYMENT FOR REJECTED WORK

- A. Payment will not be made for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined to be unacceptable before or after placement.
 - 3. Products not completely unloaded from the transporting vehicle.
 - 4. Products placed beyond the lines and levels of the required work.
 - 5. Products remaining on hand after completion of the work.
 - 6. Loading, hauling and disposing of rejected products.

1.8 CHANGE PROCEDURES

- A. The Architect will advise of minor changes in the Work not involving an adjustment to Contract Sum/Price or Contract Time as authorized by General Conditions on AIA Form G710 Architect's Supplemental Instructions.
- B. The Architect may issue a Proposal Request which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications. Proposal Requests are for information only and are not to be considered instructions to stop the work or to execute the proposed change. Contractor will prepare and submit a detailed estimate within 14 days.
- C. The Contractor may propose a change by submitting a Change Order Request to the Architect, describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation.
- D. Stipulated Sum Change Order: Based on Proposal Request and Contractor's fixed price quotation or Contractor's Change Order Request as approved by Architect.
- E. Time and Material/Force Account Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in the General Conditions of the Contract.
- F. Maintain detailed records of work done on Time and Material/Force Account basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work as indicated in the General Conditions of the Contract.

- G. Construction Change Directive: Architect may issue a directive, signed by the Owner and Architect, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum or Contract Time. Promptly execute the change.
- H. Allowance Adjustment: Adjustment of allowance amounts shall be based upon a properly documented and detailed Change Order Request which substantiates distribution of allowance amounts and actual costs of work in place.
- I. Change Order Forms: AIA G701 Change Order.
- J. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the General Conditions of the Contract.
- K. All addenda (changes and/or revisions prior to award of contract) and construction changes (changes and revisions after award of contract) shall be approved by the Architect and the Division of the State Architect prior to start of construction covered by those changes and/or revisions in accordance with the requirements of Title 24 of the California Code of Regulations, Part 1, Section 4-338.
- L. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- M. Promptly revise progress schedules to reflect any changes in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change and resubmit.
- N. Promptly enter changes in Project Record Documents.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 25 13

PRODUCT SUBSTITUTION PROCEDURES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Product options.
- B. Substitution procedures.

1.2 DEFINITIONS

- A. Requests for changes in products, materials, or equipment required by Contract Documents proposed by the Contractor prior to and after award of the Contract are considered requests for substitutions. The following are not considered substitutions:
 - 1. Revisions to Contract Documents requested by the Owner or Architect.
 - 2. Specified options of products, materials, and equipment included in Contract Documents.

1.3 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers with Provision for Substitution: Products of manufacturers named and meeting specifications with substitution of products or manufacturer only when submitted under provisions of this section.
- C. Products Specified by Naming One or More Manufacturers without Provision for Substitution: No substitution allowed.

1.4 LIMITATIONS ON SUBSTITUTIONS SUBMITTED PRIOR TO THE RECEIPT OF BIDS

- A. The Bid shall be based upon the standards of quality established by those items of equipment and/or materials which are specifically identified in the Contract Documents.
- B. The opportunity to request a substitution is not for the convenience of the Bidder to request acceptance of equipment and/or materials which may be more familiar or have a lesser cost.
- C. Architect may consider requests for substitutions of specified equipment and/or materials only when requests are received by Architect prior to the date established for the receipt of bids as stipulated in Document 00 21 13 - Instructions to Bidders.
- D. Consideration by Architect of a substitution request will be made only if request is made in strict conformance with provisions of this section.
- E. Burden of proof of merit of requested substitution is the responsibility of the entity requesting the substitution.
- F. It is the sole responsibility of the entity requesting the substitution to establish proper content of submittal for requests for substitutions. Incomplete submittals will be rejected.
- G. Architect's decision on substitution requests are final and do not require documentation or justification.
- H. When substitution is not accepted, provide specified product.
- I. Substitute products shall not be included within the bid without written acceptance by Addendum.

1.5 LIMITATIONS ON SUBSTITUTIONS SUBMITTED AFTER THE AWARD OF THE CONTRACT

- A. The Contract is based upon the standards of quality established by those items of equipment and/or materials which are specifically identified in the Contract Documents.
- B. The opportunity to request a substitution is not for the convenience of the Contractor to request acceptance of equipment and/or materials which may be more familiar or have a lesser cost.
- C. Consideration by Architect of substitution requests received after the established date of the receipt of bids or contract award will only be made when one or more of the following conditions are met and documented:
 - 1. Specified item fails to comply with regulatory requirements.
 - 2. Specified item has been discontinued.
 - 3. Specified item, through no fault of the Contractor, is unavailable in the time frame required to meet project schedule.
 - 4. Specified item, through subsequent information disclosure, will not perform properly or fit in designated space.
 - 5. Manufacturer declares specified product to be unsuitable for use intended or refuses to warrant installation of product.
 - 6. Substitution would be, in the sole judgement of the Architect, a substantial benefit to the Owner in terms of cost, time, energy conservation, or other consideration of merit.
- D. Notwithstanding the provisions of Article 1.4 of this section and the above, the Architect may consider a substitution request after the date of the receipt of bids or contract award, if in the sole discretion of the Architect, there appears to be just cause for such a request. The acceptance of such a late request does not waive any other requirement as stated herein.
- E. Consideration by Architect of a substitution request will be made only if request is made in strict conformance with provisions of this section.
- F. Substitutions will not be considered when they are indicated or implied on shop drawings or product data submittals without separate written request as required by provisions of this section.
- G. Review of shop drawings does not constitute acceptance of substitutions indicated or implied on shop drawings.
- H. Substitutions will not be considered when requested or submitted directly by subcontractor or supplier.
- I. Substitutions will not be considered as a result of the failure to pursue the work promptly or coordinate activities properly.
- J. Burden of proof of merit of requested substitution is the responsibility of the Contractor.
- K. It is the sole responsibility of the Contractor to establish proper content of submittal for requests for substitutions. Incomplete submittals will be rejected.
- L. Owner shall receive full benefit of any cost reduction as a result of any request for substitution.
- M. Architect's decision on substitution requests is final and does not require documentation or justification.
- N. When substitution is not accepted, provide specified product.
- O. Substitute products shall not be ordered or installed without written acceptance.

1.6 REGULATORY REQUIREMENTS

- A. It shall be the responsibility of the entity requesting the substitution to obtain all regulatory approvals required for proposed substitutions.
- B. All regulatory approvals shall be obtained for proposed substitutions prior to submittal of substitution request to Architect.
- C. All costs incurred by the Owner in obtaining regulatory approvals for proposed substitutions to include the costs of the Architect and any authority having jurisdiction over the project shall be reimbursed to the Owner. Costs of these services shall be reimbursed regardless of final acceptance or rejection of substitution.
- D. Substitutions of materials or work procedures which affect the health, safety and welfare of the public shall have prior approval of the Division of the State Architect (DSA) field representative.

1.7 SUBSTITUTION REPRESENTATION

- A. In submitting a request for substitution, the entity requesting the substitution makes the representation that he or she:
 - 1. Has investigated the proposed substitution and has determined that it meets or exceeds the quality level of the specified product.
 - 2. Will provide the same warranty or guarantee for the substitution as for the specified product.
 - 3. Will coordinate installation and make changes to other work which may be required for the work to be completed with no additional cost to the Owner.
 - 4. Waives claims for additional cost or time extension which may subsequently become apparent.
 - 5. Will reimburse Owner for the cost of Architect's review or redesign services associated with substitution request.

1.8 SUBMITTAL PROCEDURE

- A. Submit each Substitution Request in conformance with the requirements of this section.
- B. Assemble complete Substitution Request into a single bookmarked Portable Document Format (PDF) file.
- C. Transmit electronic PDF files via Architect's Project Collaboration Site address or designated email address.
- D. Submit request with Architect's Substitution Request Form. Form may be obtained at the office of the Architect. Substitution requests received without request form will be returned unreviewed.
- E. Limit each request to one proposed substitution.
- F. Request to include sufficient data so that direct comparison of proposed substitution can be made.
- G. Provide complete documentation for each request. Documentation shall include the following information, as appropriate, as a minimum:
 - 1. Statement of cause for substitution request.
 - 2. Identify product by specification section and article number.
 - 3. Provide manufacturer's name, address, and phone number. List fabricators, suppliers, and installers as appropriate.
 - 4. List similar projects where proposed substitution has been used, dates of installation and names of Architect and Owner.

5. List availability of maintenance services and replacement materials.
 6. Documented or confirmation of regulatory approval.
 7. Product data, including drawings and descriptions of products.
 8. Fabrication and installation procedures.
 9. Samples of proposed substitutions.
 10. Itemized comparison of significant qualities of the proposed substitution with those of the product specified. Significant qualities may include size, weight, durability, performance requirements and visual effects.
 11. Coordination information, including a list of changes or modifications needed to other items of work that will become necessary to accommodate proposed substitution.
 12. Statement on the substitutions effect on the construction schedule.
 13. Cost information including a proposal of the net change, if any, in the Contract sum if the substitution is submitted after the receipt of bids or contract award.
 14. Certification that the substitution is equal to or better in every respect to that required by the Contract Documents and that substitution will perform adequately in the application intended.
 15. Waiver of right to additional payment or time that may subsequently become necessary because of failure of substitution to perform adequately.
- H. Inadequate warranty, vagueness of submittal, failure to meet specified requirements, or submittal of insufficient data will be cause for rejection of substitution request.

1.9 ARCHITECT'S REVIEW

- A. Within 14 days of receipt of request for substitution, the Architect will accept or reject proposed substitution.
- B. If a decision on a substitution cannot be made within the time allocated, the product specified shall be used.
- C. There shall be no claim for additional time for review of proposed substitutions.
- D. Final acceptance of a substitution submitted prior to the date established for the receipt of bids will be in the form of an Addendum.
- E. Final acceptance of a substitution submitted after the award of the contract will be in the form of a Change Order.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Coordination.
- B. Preconstruction conference.
- C. Progress meetings.
- D. Request for Information (RFIs).
- E. Preinstallation conferences.
- F. Closeout conference.
- G. Post construction dedication.

1.2 DEFINITIONS

- A. RFI - Request from Contractor seeking additional information, interpretation or clarification of the Contract Documents.

1.3 COORDINATION

- A. Coordinate scheduling, submittals, and Work of the various Sections of Specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Coordinate construction operations of the different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work.
- C. Prior to commencement of a particular type or kind of work examine relevant information, contract documents and subsequent data issued to the project.
- D. Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- E. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. In locations where several elements of mechanical and electrical work must be sequenced and positioned with precision in order to fit into available space, prepare coordination drawings showing the actual conditions required for the installation. Prepare coordination drawings prior to purchasing, fabricating or installing any of the elements required to be coordinated.
- H. Closing up of walls, partitions or furred spaces, backfilling and other covering up operations shall not proceed until all enclosed or covered work and inspections have been completed. Verify before proceeding.
- I. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion.

- J. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.
- K. Coordinate all utility company work in accordance with the General Conditions.
- L. Coordinate field engineering with the provisions of Section 01 73 00.

1.4 PRECONSTRUCTION CONFERENCE

- A. Architect will schedule a conference immediately after receipt of fully executed contract documents prior to project mobilization.
- B. Mandatory Attendance: Owner, Owner's Resident Inspector, Owner's Testing Laboratory Representative, Architect, Contractor, Contractor's Project Manager and Contractor's Job Superintendent.
- C. Optional Attendance: Architect's consultants, subcontractors and utility company representatives.
- D. Architect will preside at conference, record minutes and distribute copies.
- E. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Issue Notice to Proceed.
 - 3. Submission of executed bonds and insurance certificates.
 - 4. Distribution of Contract Documents.
 - 5. Federal and State labor law requirements applicable to Contract.
 - 6. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
 - 7. Designation of responsible personnel representing the parties.
 - 8. Procedures and processing of RFIs, field decisions, submittals, substitutions, applications for payments, proposal requests, Change Orders and Contract closeout procedures.
 - 9. Procedures for testing and inspection.
 - 10. Temporary facilities and controls.
 - 11. Procedures for moisture and mold control.
 - 12. Procedures for disruptions and shutdowns.
 - 13. Scheduling.
 - 14. Critical work sequence and long lead items.
 - 15. Work restrictions and working hours.
 - 16. Progress meetings.
 - 17. Use of site and premises.
 - 18. Storage.
 - 19. Authorities having jurisdiction over project.
 - 20. Owner occupancy requirements.

21. Construction waste management.
22. Preparation of Record Drawings.
23. Security.
24. Parking availability.
25. Progress cleaning.

1.5 PROGRESS MEETINGS

- A. Architect will schedule and administer meetings throughout progress of the Work at maximum twice a month intervals.
- B. Architect will make arrangements for meetings, prepare agenda, preside at meetings, record minutes (Field Reports), and distribute copies.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Owner's Inspector, and Architect, as appropriate to agenda topics for each meeting.
- D. Agenda:
 1. Review minutes of previous meetings. (Field Reports)
 2. Review of Work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems which impede planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Requests For Information (RFIs).
 7. Status of Proposal Requests (PRs).
 8. Status of Change Order Requests (CORs).
 9. Status of Change Orders (Cos).
 10. Status of corrective or deficient items.
 11. Review of off-site fabrication and delivery schedules.
 12. Maintenance of construction schedule.
 13. Corrective measures to regain projected schedules.
 14. Planned progress during succeeding work period.
 15. Coordination of projected progress.
 16. Maintenance of quality and work standards.
 17. Effect of proposed changes on progress schedule and coordination.
 18. Temporary facilities and controls.
 19. Progress cleaning.
 20. Other business relating to Work.

1.6 REQUEST FOR INFORMATION (RFI'S)

- A. Procedure: Immediately on discovery of the need for additional information, interpretation of the Contract Documents, and if not possible to request interpretation at Progress Meeting, prepare and submit an RFI in the form specified.
1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
 3. Each RFI shall address only one subject matter.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Date.
 2. Project name.
 3. Owner's name.
 4. Name of Contractor.
 5. Name of Architect.
 6. RFI number, numbered sequentially.
 7. Specification Section number and title and related paragraphs, as appropriate.
 8. Drawing number and detail references, as appropriate.
 9. Field dimensions and conditions, as appropriate.
 10. 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.
 11. Contractor's signature.
 12. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Hard-Copy RFIs: Identify each page of attachments with the RFI number and sequential page number.
- D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above. Attachments shall be electronic files in a format that will allow electronic editing by the Architect.
- E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow fifteen days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day. If the RFI is required to be forwarded to a consultant, subconsultant, or Owner for a response, the response time will be twenty five days.
1. The following RFIs will be returned without action:
 - (a) Requests for approval of submittals.
 - (b) Requests for approval of substitutions.
 - (c) Requests for information already indicated in the Contract Documents.

- (d) Requests for coordination information which is the responsibility of the Contractor.
 - (e) Requests for adjustments in the Contract Time or the Contract Sum.
 - (f) Requests for interpretation of Architect's actions on submittals and substitutions.
 - (g) Incomplete RFIs or RFIs with numerous errors.
- 2. Architect's action may include a request for additional information, in which case Architect's allowable time for response will start again.
 - 3. Architect's review of or response to RFIs shall not constitute an approval, direction, or procedure related to construction means, methods, techniques, sequences, or procedures of Contractor.
 - 4. Architect's review of or response to RFIs shall not constitute an approval, direction, or procedure related to the construction site safety precautions, procedures or methodology of Contractor.
 - 5. Architect'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 Order Request according to Division 01 Section 01 20 00 - Price and Payment Procedures.
 - (a) If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within five days of receipt of the RFI response.
 - (b) Under no circumstances is the Architect's review of or response to RFIs to be considered an authorization to depart from the Contract Documents or an authorization to perform extra work.
- F. On receipt of Architect's action immediately distribute the RFI response to affected parties.
 - G. Review response and notify Architect within three days if Contractor disagrees with response.

1.7 PREINSTALLATION CONFERENCES

- A. When required in individual specification Section, convene a preinstallation conference prior to commencing work of the Section. Refer to individual specification section for timing requirements of conference.
- B. Require attendance of parties directly affecting, or affected by, work of the specific Section.
- C. Notify Architect a minimum of seven days in advance of meeting date.
- D. Preinstallation conference to coincide with regularly scheduled progress meeting.
- E. Prepare agenda, preside at conference, record minutes, and distribute copies within two days after conference to participants.
- F. Agenda:
 - 1. Review of Contract Documents.
 - 2. Manufacturer's recommendations.
 - 3. Status of submittals.
 - 4. Related RFIs.
 - 5. Related Change Orders.
 - 6. Schedule of work activities.
 - 7. Deliveries of materials and equipment.
 - 8. Sequence of operation.

9. Acceptable substrates.
 10. Interface requirements.
 11. Possible conflicts.
 12. Access.
 13. Site utilization.
 14. Tests and inspections.
 15. Review of Mockups.
 16. Temporary facilities and controls.
 17. Quality and work standards.
 18. Weather limitations.
- G. Preinstallation Schedule:
1. Section 03 30 00 - Cast-in-Place Concrete
 2. Section 04 20 00 - Reinforced Unit Masonry System

1.8 PROJECT CLOSEOUT CONFERENCE

- A. Architect will schedule a project closeout conference, at a time convenient to Owner and Contractor, but no later than 90 days prior to the scheduled date of Substantial Completion.
- B. Mandatory Attendance: Owner, Owner's Resident Inspector, Owner's Testing Laboratory, Architect, and Contractor.
- C. Architect will preside at conference, record minutes, and distribute copies.
- D. Refer to Section 01 77 00 for additional closeout requirements.
- E. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 1. Submittal procedures for closeout documents.
 2. Preparation of Record Documents.
 3. Procedures required prior to review for Substantial Completion and for final review for acceptance.
 4. Procedures for completing and archiving web-based Project software site data files.
 5. Submittal of written warranties.
 6. Requirements for preparing operations and maintenance data.
 7. Requirements for delivery of material samples, attic stock, and spare parts.
 8. Requirements for demonstration and training.
 9. Preparation of Contractor's punch list.
 10. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 11. Coordination of separate contracts.

12. Owner's partial occupancy requirements.
13. Installation of Owner's furniture, fixtures, and equipment.
14. Responsibility for removing temporary facilities and controls.
15. DSA closeout and certification process.

1.9 POST CONSTRUCTION DEDICATION

- A. Attendance Required: Project superintendent, project manager, major subcontractors, Owner and Architect.
- B. Preparation prior to Dedication:
 1. Assist Owner in operation of mechanical systems.
 2. Verify operation and adjust controls for communication systems.
 3. Assist Owner in operation of lighting systems.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 32 17

CONSTRUCTION SCHEDULE - BAR CHART

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. References.
- B. Performance requirements.
- C. Qualifications.
- D. Quality Assurance.
- E. Project record documents.
- F. Submittals.
- G. Review and evaluation.
- H. Format.
- I. Cost and schedule reports.
- J. Early work schedule.
- K. Construction schedule.
- L. Short interval schedule.
- M. Requested time adjustment schedule.
- N. Recovery schedule.
- O. Updating schedules.
- P. Distribution.

1.2 REFERENCES

- A. Construction Planning and Scheduling Manual - A Manual for General Contractors and the Construction Industry, The Associated General Contractors of America (AGC).
- B. National Weather Service - Local Climatological Data.

1.3 PERFORMANCE REQUIREMENTS

- A. Ensure adequate scheduling during construction activities so work may be prosecuted in an orderly and expeditious manner within stipulated Contract Time.
- B. Ensure coordination of Contractor and subcontractors at all levels.
- C. Ensure coordination of submittals, fabrication, delivery, erection, installation, and testing of materials and equipment.
- D. Ensure on-time delivery of Owner furnished materials and equipment.
- E. Ensure coordination of jurisdictional reviews.
- F. Assist in preparation and evaluation of applications for payment.

- G. Assist in monitoring progress of work.
- H. Assist in evaluation of proposed changes to Contract Time.
- I. Assist in evaluation of proposed changes to Construction Schedule.
- J. Assist in detection of schedule delays and identification of corrective actions.

1.4 QUALIFICATIONS

- A. Scheduler: Personnel with 3 years minimum experience in scheduling construction work of a complexity and size comparable to this Project.
- B. Administrative Personnel: 3 years minimum experience in using and monitoring schedules on comparable projects.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with Construction Planning and Scheduling Manual published by the AGC.
- B. In the event of discrepancy between the AGC publication and this section, provisions of this section shall govern.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit record documents under provisions of Section 01 77 00.
- B. Submit one electronic file and three copies of final Record Construction Schedule which reflects actual construction of this Project.
- C. Record schedule shall be certified for compliance with actual way project was constructed.
- D. Receipt of Record Construction Schedule shall be a condition precedent to any retainage release or final payment.

1.7 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Within 7 days from the Notice of Award submit proposed Early Work Schedule and preliminary Cost Report defining activities for first 60 days of Work.
- C. Within 45 days from the Notice of Award submit proposed Construction Schedule and final Cost Report.
- D. Submit updated Construction Schedule at least 10 days prior to each Application for Payment.
- E. Submit Short Interval Schedule at each Construction Progress Meeting.
- F. Submit Time Adjustment Schedule within 10 days of commencement of a claimed delay.
- G. Submit Recovery Schedules as required by completion of work.
- H. Submit one electronic file and three copies of each schedule and cost report.

1.8 REVIEW AND EVALUATION

- A. Early Work Schedule shall be reviewed during Preconstruction Conference with Owner and Architect.
- B. Within 5 days of receipt of Owner and Architect's comments provide satisfactory revision to Early Work Schedule or adequate justification for activities in question.

- C. Acceptance by Owner of corrected Early Work Schedule shall be a condition precedent to making any progress payments for first 60 days of Contract.
- D. Cost loaded values of Early Work Schedule shall be a basis for determining progress payments during first 60 days of Contract.
- E. Participate in joint review of Construction Schedule and Reports with Owner and Architect.
- F. Within 7 days of receipt of Owner and Architect's comments provide satisfactory revision to Construction Schedule or adequate justification for activities in question.
- G. In the event that an activity or element of work is not detected by Owner or Architect review, such omission or error shall be corrected by next scheduled update and shall not affect Contract Time.
- H. Acceptance by Owner of corrected Construction Schedule shall be a condition precedent to making any progress payments after first 60 days of Contract.
- I. Cost-loaded values of Construction Schedule shall be basis for determining progress payments.
- J. Review and acceptance by Owner and Architect of Early Work Schedule or Construction Schedule does not constitute responsibility whatsoever for accuracy or feasibility of schedules nor does such acceptance expressly or impliedly warrant, acknowledge or admit reasonableness of activities, logic, duration, or cost loading stated or implied on schedules.

1.9 FORMAT

- A. Shall be fully developed horizontal bar-chart-type schedule prepared under concepts and methods outlined in AGC Construction Planning and Scheduling Manual.
- B. Provide separate bar for each activity or operation.
- C. Activity shall not have a duration longer than 14 days or a value over \$20,000.00 except non-construction activities for procurement and delivery.
- D. Prepare schedule on sheet of sufficient width to clearly show data.
- E. Provide continuous heavy vertical line identifying first day of week.
- F. Provide continuous subordinate vertical line identifying each day of week.
- G. Identify activities by number, description, and cost.
- H. Show each activity in proper sequence.
- I. Indicate graphically sequences necessary for related activities.
- J. Provide legend of symbols and abbreviations used.

1.10 COST AND SCHEDULE REPORTS

- A. Activity Analysis: Tabulate each activity and identify for each activity:
 - 1. Description.
 - 2. Interface with outside contractors or agencies.
 - 3. Duration.
 - 4. Start date.
 - 5. Finish date.

6. Actual start date.
7. Actual finish date.
8. Monetary value keyed to Schedule of Values.
9. Responsibility.
10. Percentage complete.
11. Variance positive or negative.

B. Cost Report: Tabulate each activity and identify for each activity:

1. Description.
2. Total cost.
3. Percentage complete.
4. Value prior to current period.
5. Value this period.
6. Value to date.

1.11 EARLY WORK SCHEDULE

- A. Shall establish scope of work to be performed during the first 60 days of Contract.
- B. Shall contain the following phases and activities:
 1. Procurement activities to include mobilization, shop drawings and sample submittals.
 2. Identification of key and long-lead elements and realistic delivery dates.
 3. Construction activities in units of whole days limited to 14 days for each activity except non-construction activities for procurement and delivery.
 4. Approximate cost and duration of each activity.
- C. Shall contain seasonal weather considerations. Seasonal rainfall shall be 10 year average for the month as evidenced by Local Climatological Data obtained from U.S. National Weather Service.
- D. Activities shall be incorporated into Construction Schedule.
- E. No application for payment will be evaluated or processed until Early Work Schedule has been submitted and reviewed.
- F. Shall be updated on a monthly basis while Construction Schedule is being developed.
- G. Failure to submit an adequate or accurate Early Work Schedule or failure to submit on established dates will be considered a substantial breach of Contract.

1.12 CONSTRUCTION SCHEDULE

- A. Shall include Early Work Schedule as first 60 days of Construction Schedule.
- B. Shall be a fully developed horizontal bar-chart-type schedule.
- C. Shall indicate a completion date for project that is no later than required completion date.

- D. Conform to mandatory dates specified in the contract documents.
- E. Should schedule indicate a completion date earlier than any required completion date, Owner or Architect shall not be liable for any costs should project be unable to be completed by such date.
- F. Seasonal weather shall be considered in planning and scheduling of all work. Seasonal rainfall shall be 10 year average for the month as evidenced by Local Climatological Data obtained from U.S. National Weather Service.
- G. Provide sub-schedules to define critical portions of entire schedule.
- H. Indicate procurement activities, delivery and installation of Owner furnished material and equipment.
- I. Level of detail shall correspond to complexity of work involved.
- J. As developed shall show sequence of activities required for complete performance of Work.
- K. Shall be logical and show a coordinated plan of Work.
- L. Show order of activities. Include specific dates of completion.
- M. Duration of activities shall be coordinated with subcontractors and suppliers and shall be best estimate of time required.
- N. Failure to include any activity shall not be an excuse for completing all work by required completion date.
- O. An activity shall meet the following criteria:
 - 1. Any portion or element of work, action, or reaction that is precisely described, readily identifiable, and is a function of a logical sequential process.
 - 2. Descriptions shall be clear and concise. Beginning and end shall be readily verifiable. Starts and finishes shall be scheduled by logical restraints.
 - 3. Responsibility shall be identified with a single performing entity.
 - 4. Additional codes shall identify building, floor, bid item and CSI classification.
 - 5. Assigned dollar value (cost-loading) of each activity shall cumulatively equal total contract amount. Mobilization, bond and insurance costs shall be separate. General requirement costs, overhead, profit, shall be prorated throughout all activities. Activity costs shall correlate with Schedule of Values.
- P. For major equipment and materials show a sequence of activities including:
 - 1. Preparation of shop drawings and sample submissions.
 - 2. Review of shop drawings and samples.
 - 3. Finish and color selection.
 - 4. Fabrication and delivery.
 - 5. Erection or installation.
 - 6. Testing.
- Q. Include a minimum of 15 days prior to completion date for punch lists and clean up. No other activities shall be scheduled during this period.

1.13 SHORT INTERVAL SCHEDULE

- A. Shall be fully developed horizontal bar-chart-type schedule directly derived from Construction Schedule.
- B. Prepare schedule on sheet of sufficient width to clearly show data.
- C. Identify activities by same description as Construction Schedule.
- D. Show each activity in proper sequence.
- E. Indicate graphically sequences necessary for related activities.
- F. Indicate activities completed or in progress for previous 2 week period.
- G. Indicate activities scheduled for succeeding 2 week period.
- H. Further detail may be added if necessary to monitor schedule.

1.14 REQUESTED TIME ADJUSTMENT SCHEDULE

- A. Updated Construction Schedule shall not show a completion date later than the Contract Time, subject to any time extensions processed as part of a Change Order.
- B. If an extension of time is requested a separate schedule entitled "Requested Time Adjustment Schedule" shall be submitted to Owner and Architect.
- C. Indicate requested adjustments in Contract Time which are due to changes or delays in completion of work.
- D. Extension request shall include forecast of project completion date and actual achievement of any dates listed in Agreement.
- E. To the extent that any requests are pending at time of any Construction Schedule update, Time Adjustment Schedule shall also be updated.
- F. Schedule shall be a fully developed horizontal bar-chart-type schedule.
- G. Accompany schedule with formal written time extension request and detailed impact analysis justifying extension.
- H. Time impact analysis shall demonstrate time impact based upon date of delay, and status of construction at that time.
- I. Activity delays shall not automatically constitute an extension of Contract Time.
- J. Failure of subcontractors shall not be justification for an extension of time.
- K. Extensions will be granted only to extent that time adjustments extend Contract completion date.
- L. Owner shall not have an obligation to consider any time extension request unless requirements of Contract Documents, and specifically, but not limited to these requirements are complied with.
- M. Owner shall not be responsible or liable for any construction acceleration due to failure of Owner to grant time extensions under Contract Documents should requested adjustments in Contract Time not substantially comply with submission and justification requirements of Contract for time extension requests.
- N. In the event a Requested Time Adjustment Schedule and Time Impact Analysis are not submitted within 10 days after commencement of a delay it is mutually agreed that delay does not require a Contract time extension.

1.15 RECOVERY SCHEDULE

- A. When activities are behind Construction Schedule a supplementary Recovery Schedule shall be submitted.
- B. Form and detail shall be sufficient to explain and display how activities will be rescheduled to regain compliance with Construction Schedule.
- C. Maximum duration shall be one month and shall coincide with payment period.
- D. Ten days prior to expiration of Recovery Schedule verification to determine if activities have regained compliance with Construction Schedule will be made. Based upon this verification the following will occur:
 - 1. Supplemental Recovery Schedule will be submitted to address subsequent payment period.
 - 2. Construction Schedule will be resumed.

1.16 UPDATING SCHEDULES

- A. Review and update schedule at least 10 days prior to submitting an Application for Payment.
- B. Approved change orders which affect schedule shall be identified as separate new activities.
- C. Change orders of less than \$20,000.00 value or less than 3 days duration need not be shown unless completion date is affected.
- D. Maintain schedule to record actual prosecution and progress.
- E. No other revisions shall be made to schedule unless authorized by Owner.
- F. Provide narrative Progress Report at time of schedule update which details the following:
 - 1. Activities or portions of activities completed during previous reporting period.
 - 2. Actual start dates for activities currently in progress.
 - 3. List of major construction equipment used during reporting period and any equipment idle.
 - 4. Number of personnel by craft engaged on Work during reporting period.
 - 5. Progress analysis describing problem areas.
 - 6. Current and anticipated delay factors and their impact.
 - 7. Proposed corrective actions for Recovery Schedule.
 - 8. Proposed modifications, additions, deletions and changes in Construction Schedule.
- G. Schedule update will form basis upon which progress payments will be made.
- H. Owner will not be obligated to review or process Application for Payment until schedule and Progress Report have been submitted.

1.17 DISTRIBUTION

- A. Following joint review and acceptance of updated schedules distribute copies to Owner, Architect, and all other concerned parties.
- B. Instruct recipients to promptly report in writing any problem anticipated by projections shown in schedule.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Related submittals.
- B. Architect's digital data files.
- C. Proposed products list.
- D. Processing time.
- E. Submittal review.
- F. Submittal procedures - paper submittals.
- G. Shop drawings - paper submittals.
- H. Submittal procedures - electronic submittals.
- I. Shop drawings - electronic submittals.
- J. Product data.
- K. Samples.
- L. Manufacturers' instructions.
- M. Manufacturers' certificates.
- N. Submittal schedule.

1.2 RELATED SUBMITTALS

- A. Progress Payments: Section 01 20 00 - Price and Payment Procedures.
- B. Schedule of Values: Section 01 20 00 - Price and Payment Procedures.
- C. Substitutions: Section 01 25 13 – Product Substitution Procedures.
- D. Coordination Drawings: Section 01 31 00 - Project Management and Coordination.
- E. Construction Schedule: Section 01 32 17 - Construction Schedule - Bar Chart.
- F. Tests and Inspections: Section 01 45 29 – Testing Laboratory Services.
- G. Certified Final Property Survey: Section 01 73 00 – Execution Requirements.
- H. Waste Reduction Progress Reports: Section 01 74 19 - Construction Waste Management and Disposal.
- I. Closeout Procedures: Section 01 77 00 – Closeout Procedures.
- J. The General Conditions set forth additional requirements for submittals.

1.3 ARCHITECT'S DIGITAL DATA FILES

- A. Upon written request, and if asked nicely, the Architect's electronic CAD files will be provided for use in connection with preparation of shop drawings subject to the acceptance of the Architect's standard terms and conditions for electronic file transfer.

1.4 PROPOSED PRODUCTS LIST

- A. Within fourteen days after date of Notice to Proceed, submit complete list of major products proposed for use, with name of manufacturer, trade name, model number, and designated specification section of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.5 PROCESSING TIME

- A. Time period for review of submittals will commence upon receipt of submittal by Architect.
- B. Initial Review: Allow ten working days for each submittal.
- C. Resubmittal Review: Allow ten working days for each resubmittal.
- D. Sequential Review: Allow fifteen working days for initial and resubmittal review of each submittal where review is required by Architect's consultant's, Owner or other parties indicated.

1.6 SUBMITTAL REVIEW

- A. The Architect's review is only for general conformance with design concept and Contract requirements. Contractor is responsible for compliance with Contract Documents, dimensions, quantities, fit and coordination with other Work. Review does not authorize substitutions, exclusions and limitations to Contract requirements unless specifically requested by Contractor and acknowledged by Architect.
- B. Definitions for submittal review:
 - 1. Review Completed - Do Not Resubmit: The Work covered by the submittal has been reviewed by the Architect and may proceed provided it complies with the Contract Documents. Final acceptance will depend on that compliance.
 - 2. Revise as Noted - Do Not Resubmit: The Work covered by the submittal has been reviewed by the Architect and may proceed provided it complies both with Architect's notations and corrections on the submittal and the Contract Documents. Final acceptance will depend on that compliance.
 - 3. Revise as Noted - Resubmit for Record: The Work covered by the submittal has been reviewed by the Architect and the submittal is to be revised according to the Architect's notations and corrections and a new submittal is to be made. Do not proceed with the Work covered by the submittal. Once the revised submittal is received it will be reviewed again by the Architect and retained as the record submittal. Once reviewed, the Work may proceed provided it complies with the Contract Documents. Final acceptance will depend on that compliance.
 - 4. Not Acceptable - Make New Submittal: Do not proceed with the Work covered by the submittal. Prepare a new submittal that complies with the Contract Documents. Once the revised submittal is received it will be reviewed again by the Architect. Once reviewed, the Work may proceed provided it complies with the Contract Documents. Final acceptance will depend on that compliance.
 - 5. Comment Box / Line: This line is for the Architect to take other action as may be appropriate for the actual submittal made. Notations may include a request for additional items or a statement regarding the submittal. This area can also be used in conjunction with other boxes that have been marked.

1.7 SUBMITTAL PROCEDURES - PAPER SUBMITTALS

- A. Transmit each submittal in conformance with requirements of this section.
- B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphanumeric suffix.
- C. Identify Project and Architect's project number, Contractor, Subcontractor or supplier; pertinent Drawing and detail number(s), and specification Section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents. Submittals without Contractor's stamp and signature will be returned without review.
- E. Schedule submittals to expedite the Project, and deliver to Architect at 8163 Rochester Avenue, Rancho Cucamonga, CA 91730. Coordinate submission of related items.
- F. Make submittals in groups containing associated and related items to make sure that information is available for checking each item when it is received.
- G. Submittals for all items requiring color selection must be received before any will be selected.
- H. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
- I. Make submittals in advance of scheduled dates for installation to allow specified time for review, revisions, and resubmission prior to final review and subsequent placement of orders.
- J. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit proper processing.
- K. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- L. Provide space for Contractor and Architect review stamps.
- M. Revise and resubmit submittals as required, identify all changes made since previous submittal.
- N. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.
- O. Partial submittals will be considered non responsive and will be returned without review.
- P. Submittals not requested will not be recognized or processed. Submittals not requested will be returned without review.
- Q. Architect will not review submittals that contain material safety data sheets (MSDS) and will return them for resubmittal.
- R. Substitutions will not be considered when they are indicated or implied on submittals without separate written request as required by provisions of Section 01 25 13 - Product Substitution Procedures.

1.8 SUBMITTAL PROCEDURES - ELECTRONIC SUBMITTALS

- A. Transmit each electronic submittal in conformance with requirements of this section.
- B. Submittals for all items requiring color selections will not be accepted as an electronic submittal.
- C. Assemble complete submittal package into a single indexed Portable Document Format (PDF) file. File format licensed by Adobe Systems.

- D. Transmit electronic submittals as PDF files via Architect's Project Collaboration Site address or designated email address.
- E. Transmittal form for submittals shall be an electronic form acceptable to the Architect which identifies the Project, the Architect's project number, the Contractor, the Subcontractor or material supplier; pertinent Drawing and detail number(s), and specification Sections, as appropriate.
- F. Provide links enabling navigation to each item of submittal package.
- G. Name electronic submittal file with consistent project identifier composed of Architect's project number, Architect's alpha numeric file designation, and specification section number followed by sequential number. (e.g., 1930700-56-SUB - 064116-01.pdf)
- H. Resubmittals shall include an alphabetic suffix after initial point number. (e.g., 1930700-56-SUB – 064116-01-A.pdf)
- I. Resubmittals shall identify all changes made since previous submittal.
- J. Insert Contractor's review stamp to permanently record Contractor's action.
- K. Contractor's stamp shall be signed or initialed certifying that review, verification of Products required, field dimensions, adjacent work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- L. Submittals without Contractor's stamp and signature will be returned without review.
- M. Provide space for Architect's electronic review stamp.
- N. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
- O. Make submittals in advance of scheduled dates for installation to allow specified time for review, revisions, and resubmission prior to final review and subsequent placement of orders.
- P. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit proper processing.
- Q. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- R. Contractor shall reproduce and distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.
- S. Partial submittals will be considered non responsive and will be returned without review.
- T. Submittals not requested will not be recognized or processed. Submittals not requested will be returned without review.
- U. Architect will not review submittals that contain material data safety sheets (MSDS) and will return them for resubmittal.
- V. Substitutions will not be considered when they are indicated or implied on submittals without separate written request as required by provisions of Section 01 25 13 - Product Substitution Procedures.

1.9 SHOP DRAWINGS - ELECTRONIC SUBMITTALS

- A. Submit electronic copy of shop drawings in PDF format as specified in this section.
- B. Review comments will be indicated on reviewed document.
- C. After review, distribute in accordance with article on procedures stated above and provide copies for Record Documents described in Section 01 77 00 - Closeout Procedures.

- D. Do not reproduce Contract Documents or copy standard information and submit as shop drawings.
- E. Standard information prepared without specific reference to project requirements will not be considered a shop drawing.
- F. Do not use or allow others to use shop drawings which have been submitted and have been rejected.

1.10 PRODUCT DATA

- A. When specified in individual specification sections, submit copies of data for each product which Contractor requires.
- B. Electronic submittals for product data will comply with Article for electronic submittal procedures stated in this section.
- C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information unique to this Project.
- D. Manufacturer's standard product data or catalogs that do not indicate materials or products that are specific to project will be returned without review.
- E. After review, distribute in accordance with article on procedures stated above and provide copies for Record Documents described in Section 01 77 00 - Closeout Procedures.

1.11 SAMPLES

- A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- B. Include identification on each sample, with full Project information.
- C. Submit the number of samples which Contractor requires, plus two which will be retained by Architect.
- D. Reviewed samples which may be used in the Work are indicated in individual specification Sections.
- E. Submittals for all items requiring color selection must be received before any will be selected.
- F. If a variation in color, pattern, texture or other characteristic is inherent within the material or product submitted, sample shall approximate limits of variation.

1.12 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification Sections, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.
- B. Identify conflicts between manufacturer's instructions and Contract Documents.

1.13 MANUFACTURER'S CERTIFICATES

- A. When specified in individual specification Sections, submit manufacturer's certificate to Architect for review, in quantities specified for Product Data.
- B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect.

1.14 DEFERRED APPROVAL REQUIREMENTS

- A. Submit documents to Architect for review.

- B. Documents shall bear the stamp and signature of the Structural, Mechanical, or Electrical Engineer licensed in the State of California who is responsible for the work shown on the documents.
- C. Architect will forward submittal to project Structural, Mechanical, and Electrical Engineer.
- D. Review of project Architect, Structural, Mechanical, and Electrical Engineer is only for conformance with design concept shown on the documents.
- E. After review by Architect/Engineer, Architect will forward two copies of submittal to the Division of the State Architect for approval.
- F. Respond to review comments made by the Division of the State Architect and revise and resubmit submittal for final approval.
- G. Architect will forward two copies of final revised submittal to the Division of the State Architect for approval.
- H. The Division of the State Architect will return one copy of final submittal to the Architect.
- I. Architect will forward one copy of evidence of submittal approval by the Division of the State Architect for final distribution by the Contractor.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 42 19

REFERENCE STANDARDS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Definitions.
- B. Specification format and content.
- C. Industry standards.
- D. Codes and standards.
- E. Governing regulations/authorities.

1.2 DEFINITIONS

- A. General: Basic contract definitions are included in the General Conditions.
- B. Regulations: Includes laws, ordinances, statutes, 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.

1.3 SPECIFICATION FORMAT AND CONTENT

- A. Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 50-Division Master Format 2018 numbering system.
- B. The sections are placed in the Project Manual in numeric sequence; however, this sequence is not complete and the Table of Contents of the specifications must be consulted to determine the total listing of sections.
- C. The section title is not intended to limit the meaning or content of the section, nor to be fully descriptive of the requirements specified therein.
- D. The organization of the specifications shall not control the division of the work among subcontractors or establish the extent of work to be performed by any trade.
- E. Specifications use certain conventions regarding style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are:
 - 1. Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated, shall be interpolated as the sense requires. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable to maintain the context of the Contract Document indicated.
 - 2. Imperative and streamlined language is generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. Subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.
 - 3. The words "shall be" are implied wherever a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

- A. Except where Contract Documents include more stringent requirements, applicable construction industry standards shall apply as if bound into the Contract Documents to the extent referenced. Such standards are made part of Contract Documents by reference.
- B. Conform to reference standard by date of issue current on date for receiving bids except when a specific date is indicated.
- C. Where compliance with 2 or more standards is specified and where standards may establish different or conflicting requirements for quantities or quality levels, the more stringent, higher quality and greater quantity of work shall apply.
- D. The quantity or quality level shown or specified shall be the minimum provided or performed. Indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements.
- E. Each entity engaged in construction of the work is required to be familiar with industry standards applicable to its construction activity.
- F. Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed to perform a required activity, Contractor shall obtain copies directly from publication source.
- G. Trade associations names and titles of general standards are frequently abbreviated. Where such abbreviations are used in the Specifications or other Contract Documents, they shall mean the recognized trade association, standards-generating organization, authority having jurisdiction, or other entity applicable to the content of the text provision. Refer to the "Encyclopedia of Associations", published by Gale Research Co., available in most libraries.
- H. Refer to individual specification sections and related drawings for names and abbreviations of trade associations and standards applicable to specific portions of the work. In particular, refer to Division 23 for names and abbreviations applicable to mechanical work, and refer to Division 26 for names and abbreviations applicable to electrical work.
- I. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.5 CODES AND STANDARDS

- A. Latest edition of pertaining ordinances, laws, rules, codes, regulations, standards, and others of public agencies having jurisdiction of the work are intended wherever reference is made in either the singular or plural to Code or Building Code except as otherwise specified, including but not limited to latest edition of those in the following listing.
 - 1. 2019 California Building Standards Administrative Code (CBSAC), California Code of Regulations (CCR), Title 24, Part 1
 - 2. 2019 California Building Code (CBC) California Code of Regulations (CCR) Title 24, Part 2 (2018 International Building Code (IBC) with California amendments)
 - 3. 2019 California Electrical Code (CEC) California Code of Regulations (CCR) Title 24, Part 3 (2017 National Electric Code (NEC) with California amendments)
 - 4. 2019 California Mechanical Code (CMC) California Code of Regulations (CCR) Title 24, Part 4 (2018 Uniform Mechanical Code (UMC) with California amendments)
 - 5. 2019 California Plumbing Code (CPC) California Code of Regulations (CCR) Title 24, Part 5 (2018 Uniform Plumbing Code (UPC) with California amendments)
 - 6. 2019 California Energy Code, California Code of Regulations (CCR) Title 24, Part 6

7. 2019 California Historical Building Code (CHBC)
California Code of Regulations (CCR) Title 24,
Part 8
8. 2019 California Fire Code (CFC) California Code
of Regulations (CCR) Title 24, Part 9 (2018 International Fire Code (IFC) with
California Amendments)
9. 1990 State Fire Marshal Regulations California
Code of Regulations (CCR) Title 19 (As amended
to date)
10. 2019 California Existing Building Code (CEBC)
California Code of Regulations (CCR) Title 24,
Part 10 (2018) International Existing Building
Code (IEBC) with California
Amendments)
11. 2019 California Green Building Standards Code
(CALGreen) California Code of Regulations (CCR)
Title 24, Part 11.
12. 2019 State Referenced Standards Code (CRSC)
California Code of Regulations (CCR) Title 24,
Part 12
13. California Elevator Safety Code, California Code of
Regulations (CCR) Title 8. (As amended to date)
14. 2010 Americans with Disabilities Act (ADA)
Standards for Accessible Design. (ADAS)

1.6 GOVERNING REGULATIONS/AUTHORITIES

- A. Authorities having jurisdiction have been contacted where necessary to obtain information for preparation of Contract Documents. Contact authorities having jurisdiction directly for information having a bearing on the work.
- B. Comply with all federal, state and local laws, ordinances, rules and regulations indicated and which bear on the conduct of the work.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 43 00

QUALITY ASSURANCE

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Interpretation of requirements.
- B. Quality assurance and control of installation.
- C. Tolerances.
- D. Field samples.
- E. Mock-up.
- F. Manufacturers' field services and reports.

1.2 INTERPRETATION OF REQUIREMENTS

- A. 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.
- B. The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation shall comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits.
- C. Where codes or specified standards indicate higher standards, more stringent tolerances or more precise workmanship than levels shown or specified, comply with most stringent requirements.
- D. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

1.3 QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. **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.
- B. **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.
- C. **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.
- D. **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.
- E. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- F. Comply fully with manufacturers' instructions, including each step in sequence.
- G. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

- H. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.4 TOLERANCES

- A. Monitor tolerance control of installed products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturer's tolerances. Should manufacturer's tolerance conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.5 FIELD SAMPLES

- A. Install field samples at the site as required by individual specifications sections for review.
- B. Acceptable samples represent a quality level for the Work.
- C. Where field sample is specified in individual sections to be removed, clear area after field sample has been reviewed by Architect.

1.6 MOCK-UP

- A. Mock-up will be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Assemble and erect specified items, with specified attachment and anchorage devices, flashings, seals and finishes.
- C. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
- D. Where mock-up is specified in individual Sections to be removed, clear area after mock-up has been reviewed by Architect.

1.7 MANUFACTURERS' FIELD SERVICES AND REPORTS

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment and other field services as applicable, and to initiate instructions when necessary.
- B. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- C. Submit report in duplicate within 15 days of observation to Architect for review.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

3.1 GENERAL INSTALLATION

- A. Comply with requirements specified in Section 01 73 00.

3.2 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.3 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

SECTION 01 45 29

TESTING LABORATORY SERVICES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Selection and payment.
- B. Contractor submittals.
- C. Laboratory responsibilities.
- D. Laboratory reports.
- E. Limits on testing laboratory authority.
- F. Contractor responsibilities.
- G. Schedule of inspections and tests.
- H. Test and inspection form.

1.2 REFERENCES

- A. ASTM C140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
- B. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- C. ASTM E329 - Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.
- D. CBC - California Building Code, Title 24, Part 2 of the California Code of Regulations (CCR).
- E. DSA - Division of the State Architect, Office of Regulation Services, Structural Safety Section.
- F. IR - Interpretation of Regulation Documents, Division of the State Architect.

1.3 SELECTION AND PAYMENT

- A. Owner will employ and pay for services of an independent testing laboratory to perform specified inspection and testing as specified by Owner's testing laboratory.
- B. Owner will pay cost of testing and inspection except the following for which the Contractor shall reimburse the Owner through deductive change order:
 - 1. Any retesting and sampling required due to failure of original test.
 - 2. Any testing and inspection required to be performed that requires testing laboratory or agency to perform services outside the state of California.
 - 3. Concrete design mix.
 - 4. Additional testing expenses caused by failure of the Contractor to adhere to construction schedule or caused by failure of the Contractor to give proper advanced notice or caused by Contractor delay.
- C. Contractor shall employ and pay for services required to perform specified inspection and testing specified as Contractor responsibility.

- D. Employment of testing laboratory shall in no way relieve Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.4 QUALITY ASSURANCE

- A. Comply with requirements of ASTM E329 and ASTM D3740.
- B. Laboratory Staff: Maintain a full time registered engineer on staff to review services.
- C. Testing Equipment: Capable of performing tests required calibrated at reasonable intervals with devices acceptable to the National Bureau of Standards.
- D. All testing agency management, laboratory, and field supervisory personnel shall have at least five years experience in the inspection and testing of work and materials of construction.
- E. Testing laboratory shall maintain a current letter of acceptance issued by the Division of the State Architect (DSA) demonstrating that it has met the criteria established by the Division of the State Architect for performance of inspection work and testing of materials. Laboratory to furnish copy of acceptance letter upon request.

1.5 OWNER'S TESTING LABORATORY RESPONSIBILITIES

- A. Test samples of mixes submitted by Inspector.
- B. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
- C. Perform specified inspection, sampling, and testing of products in accordance with specified standards.
- D. Ascertain compliance of materials and mixes with requirements of Contract Documents.
- E. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
- F. Perform additional inspections and tests required by Architect.
- G. Attend preconstruction conferences and progress meetings when requested by Architect.

1.6 LABORATORY REPORTS

- A. After each inspection and test, promptly submit within no more than 14 days of the date of the inspection or test one copy of laboratory report to Architect, Engineer, Owner's Resident Inspector, Division of the State Architect] and to Contractor. Reports of test results of materials and inspections found not to be in compliance with the requirements of the Contract Documents shall be forwarded immediately to the Architect, Engineer, Owner's Resident Inspector, Division of the State Architect and the Contractor.
- B. Include:
 - 1. Date issued.
 - 2. Project title and number.
 - 3. Name of inspector.
 - 4. Date and time of sampling or inspection.
 - 5. Identification of product and Specifications section.
 - 6. Location in the Project.
 - 7. Type of inspection or test.
 - 8. Date of test.

9. Ambient conditions at time of test or sample-taking.
10. Results of tests and interpretation of test results.
11. Professional opinion as to whether tested work is in conformance with Contract Documents.
12. Recommendations on retesting.

C. Verification of Test Reports: Each testing agency shall submit to the Architect and the Division of the State Architect a verified report in duplicate covering all of the tests which were required to be made by that agency during the progress of the project. Such report shall be furnished each time that work on the project is suspended, covering the tests up to that time and at the completion of the project, covering all tests.

1.7 LIMITS ON TESTING LABORATORY AUTHORITY

- A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
- B. Laboratory may not approve or accept any portion of the Work.
- C. Laboratory may not assume any duties of Contractor.
- D. Laboratory has no authority to stop the Work.

1.8 CONTRACTOR RESPONSIBILITIES

- A. Submit proposed mix designs to Architect for review in accordance with Section 03 30 00.
- B. Cooperate with laboratory personnel, and provide access to the Work and to manufacturer's facilities.
- C. Notify Architect, Owner's Resident Inspector and testing laboratory 48 hours prior to expected time for operations requiring inspection and testing services.
 1. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to the Contractor's negligence.
 2. The Contractor shall notify the Owner's representative a sufficient time in advance of the manufacture of material to be supplied by him under the Contract Documents, which must by terms of the Contract be tested, in order that the Owner may arrange for the testing of same at the source of supply.
 3. Any material shipped by the Contractor from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said representative that such testing and inspection will not be required shall not be incorporated in the job.
- D. Employ and pay for services of Owner's testing laboratory to perform additional inspections, sampling and testing required when initial tests indicate work does not comply with contract documents.

1.9 SCHEDULE OF INSPECTIONS AND TESTS BY OWNER'S TESTING LABORATORY

- A. Perform tests and inspections for the following in conformance with the (CBC) California Building Code (International Building Code with State of California Amendments), Title 24, Part 2, of the California Code of Regulations (CCR).
 1. Structural Tests and Special Inspections: Refer to DSA-103.

1.10 SCHEDULE OF INSPECTIONS AND TESTS BY CONTRACTOR

- A. Contractor Responsibility:
 1. Statement of Responsibility - 1704.4. Refer to listed special inspections under Article 1.9.

- B. Plumbing:
 - 1. Testing as specified in Division 22 including, but not limited to: Sterilization, soil waste and vent, water piping, source of water, gas piping, downspouts and storm drains.
- D. Electrical
 - 1. Testing as specified in Division 26 including, but not limited to: Equipment testing, all electrical system operations, grounding system and checking insulation after cable is pulled.

1.11 INSPECTION BY THE OWNER

- A. An Inspector employed by the Owner in accordance with the requirements of the California Code of Regulations Title 24, Part 1 will be assigned to the work. His duties are specifically defined in Section 4-342 of Title 24, Part 1.
- B. The Owner and his representatives shall at all times have access for the purpose of inspection to all parts of the work and to the shops wherein the work is in preparation, and the Contractor shall at all times maintain proper facilities and provide safe access for such inspection.
- C. The work of construction in all stages of progress shall be subject to the personal continuous observation of the Inspector. He shall have free access to any or all parts of the work at any time. The Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner of the work and the character of the materials. Inspection of the work shall not relieve the Contractor from any obligation to fulfill this Contract. The presence of an Inspector shall in no way change, mitigate or alleviate the responsibility of the Contractor.
- D. The Inspector is not authorized to change, revoke, alter, enlarge or decrease in any way any requirement of the Contract Documents, drawings, specifications or subsequent change orders.
- E. Whenever there is insufficient evidence of compliance with any of the provisions of Title 24, Part 2 of the California Code of Regulations or evidence that any material or construction does not conform to the requirements of Title 24, Part 2 of the California Code of Regulations, the Division of the State Architect may require tests as proof of compliance. Test methods shall be as specified herein or by other recognized and accepted test methods determined by the Division of the State Architect. All tests shall be performed by a testing laboratory accepted by the Division of the State Architect.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

3.1 STRUCTURAL TEST AND INSPECTION FORM

- A. Form DSA 103 attached.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone service, communication service, water, and sanitary facilities.
- B. Temporary Controls: Barriers, enclosures and fencing. Water, erosion, pollution, noise and fire protection control.
- C. Construction Facilities: Access roads, parking, progress cleaning, project signage, and temporary buildings.

1.2 TEMPORARY ELECTRICITY

- A. Connect to existing power service at location as directed. Power consumption shall not disrupt Owner's need for continuous service. Owner will pay for cost of energy used. Exercise measures to conserve energy.
- B. Provide power outlets for construction operations, with branch wiring and distribution boxes. Provide flexible power cords as required.
- C. Provide main service disconnect and over current protection at convenient location.
- D. Comply with NECA, NEMA, and UL standards and regulations for temporary electric service.
- E. Permanent convenience receptacles may not be utilized during construction.

1.3 TEMPORARY LIGHTING

- A. Provide and maintain lighting for construction operations, observations, inspections, and traffic conditions.
- B. Provide and maintain lighting to exterior staging and storage areas after dark for security purposes.
- C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- D. Maintain lighting and provide routine repairs.
- E. Permanent building lighting may not be utilized during construction.

1.4 TEMPORARY HEATING/COOLING

- A. Provide and pay for devices as required to maintain specified thermal conditions for construction operations.
- B. Only electric or indirect fired combustion heaters shall be used. No direct fired space heaters will be allowed.
- C. Heaters will be equipped with controls to automatically turn off heater if airflow is interrupted or internal temperature exceeds design temperature.
- D. Do not use permanent equipment for temporary purposes.
- E. Maintain minimum ambient temperature of 50 degrees F and maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.
- F. Maintain temperature above dew point of enclosed space based upon relative humidity of enclosed area.

- G. Continuously monitor temperature of enclosed space(s) using an electronic monitoring device (s). Place devices in locations that will record average temperature of building(s). Provide print out to Architect upon request.

1.5 TEMPORARY VENTILATION

- A. Ventilate enclosed areas to assist cure of materials and to prevent accumulation of dust, fumes, vapors, or gases.
- B. Do not use permanent equipment for temporary ventilation purposes.
- C. Ventilate enclosed spaces to dissipate humidity. Maintain a maximum relative humidity level of less than 60 percent. Avoid pockets of high humidity.
- D. Continuously monitor humidity of enclosed space(s) using an electronic monitoring device(s). Place devices in locations that will record average humidity of building(s). Provide print out to Architect upon request.

1.6 TEMPORARY HUMIDITY CONTROL

- A. Provide temporary ventilation during construction activities to protect installed construction from adverse effects of high humidity and moisture.
- B. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- C. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- D. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- E. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record daily readings over a forty-eight hour period. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.

1.7 ELECTRONIC COMMUNICATION SERVICE

- A. Provide minimum DSL electronic communication service, including electronic mail, in primary field office.

1.8 TEMPORARY WATER SERVICE

- A. Provide, maintain and pay for suitable quality water service required for construction operations. Contractor may obtain water from existing fire hydrant if appropriate clearances are acquired and fees paid.
- B. Extend branch piping with outlets located so water is available by hoses with threaded connections.

1.9 TEMPORARY SANITARY FACILITIES

- A. Provide temporary chemical type toilet facilities and enclosures.
- B. Maintain temporary toilet facilities in a sanitary manner.
- C. Existing facilities shall not be used.
- D. Facilities shall comply with the accessibility requirements of the CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Section 11B-201.4.

1.10 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plant life and trees designated to remain and for soft and hardscape areas adjacent to work, replace damaged materials in kind.
- D. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

1.11 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks. Post fences and gates with no trespassing signs.

1.12 WATER CONTROL

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Provide water barriers as required to protect site from running water.

1.13 EROSION AND SEDIMENT CONTROL

- A. Conform to Best Management Practices for erosion and sediment control and non-storm water management as defined in Sections 3 and 4 of the Construction Activity Handbook published by the Storm Water Quality Association.
- B. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- C. Minimize amount of bare soil exposed at one time.
- D. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
- E. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

1.14 TEMPORARY FIRE PROTECTION

- A. Maintain temporary fire protection facilities of the types needed until permanent facilities are installed.
- B. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations".
- C. Fire safety during construction shall comply with CFC - California Fire Code (CCR) California Code of Regulations, Title 24, Part 9, Chapter 33.
- D. Store combustible materials in containers in fire-safe locations.
- E. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes.
- F. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

1.15 NOISE CONTROL

- A. Provide methods, means, and facilities to minimize noise produced by construction operations.

1.16 POLLUTION CONTROL

- A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.
- B. Conform to Best Management Practices for waste management and material controls as defined in Section 4 of the Construction Activity Handbook published by the Storm Water Quality Association.

1.17 EXTERIOR ENCLOSURES

- A. Provide temporary weather-tight closure of exterior openings to accommodate acceptable working conditions and protection for materials, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification Sections, and to prevent entry of unauthorized persons.
- B. Provide access doors with self-closing hardware and locks.

1.18 INTERIOR ENCLOSURES

- A. Provide temporary partitions and ceilings as required to separate work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas, and to prevent damage to existing materials and equipment.

1.19 SECURITY

- A. Provide security and facilities to protect Work and existing facilities and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program.

1.20 ACCESS ROADS

- A. Construct and maintain temporary roads accessing public thoroughfares to serve construction area. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow.
- B. Stabilize temporary vehicle transportation routes and construction entrances to prevent erosion and control dust immediately after grading in accordance with best management practice techniques defined in Section 3 of the Construction Activity Handbook published by the Storm Water Quality Association.
- C. Maintain stabilization techniques as work progresses.
- D. Provide and maintain access to fire hydrants, free of obstructions.
- E. Designated existing on-site roads may not be used for construction traffic.

1.21 PARKING

- A. Arrange for temporary gravel surface parking areas to accommodate construction personnel.
- B. Stabilize temporary surface parking areas immediately after grading to prevent erosion and control dust in accordance with Best Management practice techniques defined in Section 3 of the Construction Activity Handbook published by the storm Water Quality Association.
- C. Maintain stabilization techniques as work progresses.
- D. Do not allow vehicle parking on existing pavement.

1.22 TRAFFIC CONTROL

- A. Comply with requirements of authorities having jurisdiction.
- B. Obtain all permits, provide all materials and maintain controls as required of authorities having jurisdiction.

- C. Maintain access for fire-fighting equipment and access to hydrants.

1.23 PROGRESS CLEANING

- A. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- B. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- C. Provide walk-off mats at each building entry.

1.24 WASTE DISPOSAL

- A. Provide waste collection containers in sizes adequate to handle waste from construction operations.
- B. Maintain building areas free of waste materials, debris, and rubbish.
- C. Remove waste materials, debris, and rubbish from site periodically and legally dispose of off site.
- D. Maintain site area in a clean and orderly condition.

1.25 PROJECT IDENTIFICATION

- A. Provide 8 x 4 foot project sign of exterior grade plywood and wood frame construction, painted, with exhibit lettering by professional sign painter to Architect's design and colors.
- B. List title of Project, names of Owner, Architect and Contractor.
- C. Erect on site at location established by Architect.
- D. Sign to remain in place through construction period and shall be removed only after dedication of the project.
- E. Provide temporary directional signs for construction personnel and visitors.
- F. No other signs are allowed except those required by law.

1.26 FIELD OFFICES

- A. Office: Weather-tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture drawing rack and drawing display table.
- B. Maintain daily janitorial service for offices. Maintain approach to office free of mud and water.
- C. Provide space for Project meetings, with table and chairs to accommodate 8 persons.
- D. Provide separate private office, minimum of 120 sq. ft., similarly equipped and furnished, for use of Resident Inspector.
- E. When permanent facilities are enclosed with operable utilities, relocate offices into building, with written agreement of Owner, and remove temporary buildings.
- E. Permanent facilities shall not be used for field offices.
- F. Facilities shall comply with the accessibility requirements of the CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Section 11B-201.4.

1.27 STORAGE AREAS AND SHEDS

- A. Size to storage requirements for products of individual Sections. Allow for access and orderly provision for maintenance and for inspection of products.

1.28 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Maintain temporary equipment, facilities and controls until Substantial Completion or when use is no longer required.
- B. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to Substantial Completion review.
- C. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- D. Clean and repair damage caused by installation or use of temporary work.
- E. Materials and facilities that constitute temporary facilities are property of the Contractor.
- F. Restore existing facilities used during construction to original condition.
- G. Restore permanent facilities used during construction to specified condition.
- H. Replace construction that cannot be satisfactorily restored.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 61 00

PRODUCT REQUIREMENTS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Transportation and handling.
- C. Storage and protection.
- D. Damage and restoration.

1.2 PRODUCTS

- A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work.
- B. Products specified or recycled from other projects are not considered new products.
- C. Provide interchangeable components of the same manufacturer, for similar components.
- D. Provide products that comply with the Contract Documents, that are undamaged and are unused at the time of installation.
- E. Provide products complete with all accessories, trim, finish, safety guards and other devices and detail needed for a complete installation and for the intended use and effect.
- F. Where a specific manufacturer's product is specified as the basis of design, the designation shall establish the qualities relating to type, function, dimension, in-service performance, physical properties, appearance and other characteristics for comparable products of other named manufacturers.
- G. Where products are specified by name or by manufacturer provide the product or manufacturer specified. No substitutions will be permitted unless made under the provisions of Section 01 25 13.
- H. Where specifications only describe a product or assembly by listing exact characteristics required, provide a product or assembly that provides the characteristics.
- I. Where specifications only require compliance with performance requirements, provide products that comply with those requirements.
- J. Where the specifications only require compliance with an imposed code, standard or regulation, provide a product that complies with the standards, codes or regulations specified.
- K. Where specifications require review and acceptance of a sample, the Architect's decision will be final on whether a proposed product sample is acceptable or not.
- L. Provide materials and products specified in the full range of color, texture and pattern for selection by Architect. Range shall include standard stocked color/texture/pattern, as advertised in product data and brochures.

1.3 TRANSPORTATION AND HANDLING

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Schedule delivery to minimize long-term storage at site to prevent overcrowding of construction spaces.

- C. 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.
- D. Deliver products in manufacturer's original sealed container or packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
- E. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- F. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.4 STORAGE

- A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.
- B. Store sensitive products in weather-tight, climate controlled enclosures.
- C. Store products in a manner that will not damage or overload project structure.
- D. For exterior storage of fabricated products, place on sloped supports, above ground.
- E. Provide off-site storage when site does not permit on-site storage .
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
- G. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.
- J. Prevent the discharge of pollutants to storm water from storage of materials on-site using best management practice techniques defined in Chapter 4 of the Construction Activity Handbook published by the Storm Water Quality Task Force.

1.5 PROTECTION

- A. Protect installed Work and provide special protection where specified in individual specification Sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects.
- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Provide humidity and temperature control for installed products as recommended by materials manufacturer.
- G. Prohibit traffic from landscaped areas.

1.6 DAMAGE AND RESTORATIONS

- A. Damage to existing or new work whether accidental or not shall be restored or replaced as specified or directed by Architect.
- B. Restoration shall be equal to structural performance of original work.
- C. Finish shall match appearance of existing adjacent work.
- D. Work not properly restored or where not capable of being restored shall be removed and replaced.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 73 00

EXECUTION REQUIREMENTS

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General procedural requirements governing execution of the Work.
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.

1.2 SUBMITTALS

- A. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- B. Certified Surveys: Submit two copies signed by land surveyor.
- C. Final Property Survey: Submit 2 copies showing the Work performed and record survey data.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: Existence and location of site improvements and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify existence and location of construction affecting the Work.
- B. Existing Utilities: Existence and location of underground and other utilities indicated as existing are not guaranteed. Before beginning work, investigate and verify existence and location of underground utilities affecting the Work.
 - 1. Before construction, verify location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Written Report: Where conditions detrimental to performance of the Work are encountered, provide a written report listing 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 of 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, floors, and roofs 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. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. 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.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of need for clarification of Contract Documents, submit a Request For Information (RFI) to Architect. Include a detailed description of problem encountered, together with recommendations for resolution of the item discovered.

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 Architect promptly.
- B. General: Engage a land surveyor, registered in the state of California to lay out the Work using accepted surveying practices.
 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 3. Inform installers of lines and levels to which they must comply.
 4. Check the location, level and plumb, of every major element as the Work progresses.
 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Identification: Control datum for survey is that established by Owner provided survey.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

3.5 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 pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 - 4. Maintain maximum headroom clearance 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 produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. 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 Architect.
 - 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. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous construction waste.
 - 2. Recycling nonhazardous construction waste.
 - 3. Disposing of nonhazardous construction waste.

1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 PERFORMANCE GOALS

- A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 65 percent by weight of total waste generated by the Work.
- B. Salvage/Recycle Goals: Salvage and recycle as much nonhazardous construction waste as possible. Owner has established a minimum goal of 65 percent by weight of total waste generated by the Work for the following materials:
 - 1. Demolition Waste:
 - (a) Asphaltic concrete paving.
 - (b) Concrete.
 - (c) Structural and miscellaneous steel.
 - 2. Construction Waste:
 - (a) Site-clearing waste.
 - (b) Masonry and CMU.
 - (c) Lumber.
 - (d) Wood sheet materials.
 - (e) Wood trim.
 - (f) Metals.
 - (g) Roofing.
 - (h) Insulation.
 - (i) Carpet and pad.
 - (j) Gypsum board.
 - (k) Piping.
 - (l) Electrical conduit.
 - (m) Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - (1) Paper.
 - (2) Cardboard.
 - (3) Boxes.

- (4) Plastic sheet and film.
- (5) Polystyrene packaging.
- (6) Wood crates.
- (7) Plastic pails.

1.4 SUBMITTALS

- A. Submit waste management plan and progress reports under the provisions of Section 01 33 00.
- B. Waste Management Plan: Submit plan within 14 days of date established for the Notice of Award.
- C. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit reports. Include separate reports for construction waste. Include the following information:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons.
 - 4. Quantity of waste salvaged, both estimated and actual in tons.
 - 5. Quantity of waste recycled, both estimated and actual in tons.
 - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
 - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- D. Forms: Prepare waste reduction progress reports on forms included at end of Part 3.
- E. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- F. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- G. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- H. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- I. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- J. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section 01 31 00 - Project Management and Coordination. Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - 5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 - 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
 - 1. Total quantity of waste.
 - 2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
 - 3. Total cost of disposal (with no waste management).
 - 4. Revenue from salvaged materials.
 - 5. Revenue from recycled materials.
 - 6. Savings in hauling and tipping fees by donating materials.
 - 7. Savings in hauling and tipping fees that are avoided.
 - 8. Handling and transportation costs. Include cost of collection containers for each type of waste.
 - 9. Net additional cost or net savings from waste management plan.
- E. Forms: Prepare waste management plan on forms included at end of Part 3.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 - 1. Distribute waste management plan to everyone concerned within 3 days of submittal return.
 - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Comply with Division 01 Section 01 50 00 - Temporary Facilities and Controls, for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Receivers and Processors: Licensed entity normally engaged in the business of receiving, recycling, and processing waste materials with a minimum of 5 years of documented experience with the types of waste products to be processed under the provisions of this section.
- C. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall be shared equally by Owner and Contractor.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - 2. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 3. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 4. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 5. Store components off the ground and protect from the weather.
 - 6. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.3 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.
- C. Wood Materials:
 - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

- D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.
 - 1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.4 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
- B. Do not allow waste materials that are to be disposed of accumulate on-site. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- C. Burning: Do not burn waste materials.
- D. Disposal: Transport waste materials off Owner's property and legally dispose of them.

3.5 FORMS

- A. Waste Management Plan Forms Attached:
 - 1. Construction Waste Reduction Progress Report.
 - 2. Demolition Waste Reduction Progress Report.
 - 3. Construction Waste Identification.
 - 4. Demolition Waste Identification.
 - 5. Construction Waste Reduction Work Plan.
 - 6. Demolition Waste Reduction Work Plan.
 - 7. Cost/Revenue Analysis of Construction Waste Reduction Work Plan.
 - 8. Cost/Revenue Analysis of Demolition Waste Reduction Work Plan.

END OF SECTION

CONSTRUCTION WASTE REDUCTION PROGRESS REPORT

MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D/Ax100)
			ESTIMATED TONS	ACTUAL TONS (B)	ESTIMATED TONS	ACTUAL TONS (C)		
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

DEMOLITION WASTE REDUCTION PROGRESS REPORT

MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (D=B+C)	TOTAL QUANTITY OF WASTE RECOVERED % (D/Ax100)
			ESTIMATED TONS	ACTUAL TONS (B)	ESTIMATED TONS	ACTUAL TONS (C)		
Asphaltic Concrete Paving								
Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Sprinklers								
Mechanical Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panel boards								
Transformers								
Other:								

CONSTRUCTION WASTE IDENTIFICATION							
MATERIAL CATEGORY	GENERATION POINT	EST. QUANTITY OF MATERIALS RECEIVED (A)	EST. WASTE - % (B)	TOTAL EST. QUANTITY OF WASTE* (C=AxB)	EST. VOLUME CY	EST. WEIGHT TONS	REMARKS AND ASSUMPTIONS
Packaging: Cardboard							
Packaging: Boxes							
Packaging: Plastic Sheet or Film							
Packaging: Polystyrene							
Packaging: Pallets or Skids							
Packaging: Crates							
Packaging: Paint Cans							
Packaging: Plastic Pails							
Site-Clearing Waste							
Masonry or CMU							
Lumber: Cut-Offs							
Lumber: Warped Pieces							
Plywood or OSB (scraps)							
Wood Forms							
Wood Waste Chutes							
Wood Trim (cut-offs)							
Metals							
Insulation							
Roofing							
Joint Sealant Tubes							
Gypsum Board (scraps)							
Carpet and Pad (scraps)							
Piping							
Electrical Conduit							
Other:							

* Insert units of measure.

DEMOLITION WASTE IDENTIFICATION				
MATERIAL DESCRIPTION	EST. QUANTITY	EST. VOLUME CY	EST. WEIGHT TONS	REMARKS AND ASSUMPTIONS
Asphaltic Concrete Paving				
Concrete				
Brick				
CMU				
Lumber				
Plywood and OSB				
Wood Paneling				
Wood Trim				
Miscellaneous Metals				
Structural Steel				
Rough Hardware				
Insulation				
Roofing				
Doors and Frames				
Door Hardware				
Windows				
Glazing				
Acoustical Tile				
Carpet				
Carpet Pad				
Demountable Partitions				
Equipment				
Cabinets				
Plumbing Fixtures				
Piping				
Piping Supports and Hangers				
Valves				
Sprinklers				
Mechanical Equipment				
Electrical Conduit				
Copper Wiring				
Light Fixtures				
Lamps				
Lighting Ballasts				
Electrical Devices				
Switchgear and Panelboards				
Transformers				
Other:				

CONSTRUCTION WASTE REDUCTION WORK PLAN						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTATION PROCEDURES
			EST. AMOUNT SALVAGED TONS	EST. AMOUNT RECYCLED TONS	EST. AMOUNT DISPOSED TO LANDFILL TONS	
Packaging: Cardboard						
Packaging: Boxes						
Packaging: Plastic Sheet or Film						
Packaging: Polystyrene						
Packaging: Pallets or Skids						
Packaging: Crates						
Packaging: Paint Cans						
Packaging: Plastic Pails						
Site-Clearing Waste						
Masonry or CMU						
Lumber: Cut-Offs						
Lumber: Warped Pieces						
Plywood or OSB (scraps)						
Wood Forms						
Wood Waste Chutes						
Wood Trim (cut-offs)						
Metals						
Insulation						
Roofing						
Joint Sealant Tubes						
Gypsum Board (scraps)						
Carpet and Pad (scraps)						
Piping						
Electrical Conduit						
Other:						

DEMOLITION WASTE REDUCTION WORK PLAN						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS	DISPOSAL METHOD AND QUANTITY			HANDLING & TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS	EST. AMOUNT RECYCLED TONS	EST. AMOUNT DISPOSED TO LANDFILL TONS	
Asphaltic Concrete Paving						
Concrete						
Brick						
CMU						
Lumber						
Plywood and OSB						
Wood Paneling						
Wood Trim						
Miscellaneous Metals						
Structural Steel						
Rough Hardware						
Insulation						
Roofing						
Doors and Frames						
Door Hardware						
Windows						
Glazing						
Acoustical Tile						
Carpet						
Carpet Pad						
Demountable Partitions						
Equipment						
Cabinets						
Plumbing Fixtures						
Piping						
Supports and Hangers						
Valves						
Sprinklers						
Mechanical Equipment						
Electrical Conduit						
Copper Wiring						
Light Fixtures						
Lamps						
Lighting Ballasts						
Electrical Devices						
Switchgear and Panelboards						
Transformers						
Other:						

COST/REVENUE ANALYSIS OF CONSTRUCTION WASTE REDUCTION WORK PLAN

MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces or OSB								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

COST/REVENUE ANALYSIS OF DEMOLITION WASTE REDUCTION WORK PLAN

MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C= A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Asphaltic Concrete Paving Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Sprinklers								
Mech. Equipment								
Electrical Conduit								
Conner Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								
Other:								

SECTION 01 77 00

CLOSEOUT PROCEDURES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Closeout Procedures.
- B. Final Cleaning.
- C. Pest Control.
- D. Adjusting.
- E. Demonstration and Instructions.
- F. Project Record Documents.
- G. Operation and Maintenance Data.
- H. Warranties.
- I. Spare Parts and Maintenance Materials.

1.2 PROJECT CLOSEOUT CONFERENCE

- A. As specified under Section 01 31 00.

1.3 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect's review.
- B. Prepare and submit to Architect a list of items to be completed or corrected, the value of the items on the list, and reasons why the Work is not complete.
- C. Submit written request to Architect for review of Work.
- D. Submit warranties, bonds, service agreements, certifications, record documents, maintenance manuals, receipt of spare parts and similar closeout documents.
- E. Make final changeover of permanent locks and deliver keys to Owner.
- F. Terminate and remove temporary facilities from Project site.
- G. Advise Owner of change over in heat and other utilities.
- H. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- I. Submit affidavit of payment of debts and claims, AIA Document G706.
- J. Submit affidavit of release of liens, AIA Document G706A.
- K. Submit consent of contractors surety to final payment, AIA Document G707.
- L. Owner will occupy all portions of the building as specified in Section 01 11 00.

1.4 REGULATORY REQUIREMENTS

- A. Provide final verified reports required by Section 39151 and 81141 of the Education Code in the manner prescribed by Title 24, Part 1, Section 4-336 and 4-343 in compliance with DSA Procedure: Project Certification Process PR 13-02.

1.5 FINAL CLEANING

- A. Execute final cleaning prior to final review by Architect.
- B. Employ experienced professional cleaners for final cleaning.
- C. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces.
- D. Vacuum carpeted and soft surfaces. Shampoo if visible stains exist.
- E. Clean equipment and plumbing fixtures to a sanitary condition.
- F. Clean exposed surfaces of grilles, registers and diffusers.
- G. Replace filters of operating mechanical equipment.
- H. Clean debris from roofs, gutters, downspouts, and drainage systems.
- I. Clean site; sweep paved areas, rake clean landscaped surfaces.
- J. Remove waste and surplus materials, rubbish, and construction facilities from the site.
- K. Clean light fixtures and replace burned out lamps and bulbs.
- L. Replace defective and noisy ballasts and starters in fluorescent fixtures.
- M. Leave project clean and ready for occupancy by Owner.

1.6 PEST CONTROL

- A. Engage an experienced, licensed exterminator to make final inspection and rid Project of rodents, insects, and other pests. Submit final report to Architect.

1.7 ADJUSTING

- A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.8 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products, systems, and equipment to Owner's personnel two weeks prior to date of final review.
- B. For each demonstration submit list of participants in attendance.
- C. Provide two copies of video tape of each demonstration and instructions session.
- D. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- F. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at equipment location.

- G. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

1.9 PROJECT RECORD DOCUMENTS

- A. Maintain on site, one set of the following record documents; record actual revisions to the Work in contrasting color.
 - 1. Contract Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other Modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
- B. Store Record Documents separate from documents used for construction.
- C. Record information concurrent with construction progress.
- D. Specifications: Legibly mark and record at each Product Section in contrasting color ink, description of actual Products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Supplier and installer's name and contact information.
 - 3. Changes made by Addenda and Modifications.
- E. Contract Drawings and Shop Drawings: Legibly mark each item in contrasting color ink to record actual construction including:
 - 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 3. Field changes of dimension and detail.
 - 4. Details not on original Contract Drawings.
 - 5. Revisions to electrical circuitry and locations of electrical devices and equipment.
 - 6. Note change orders, alternate numbers, and similar information, where applicable.
 - 7. Identify each record drawing with the written designation of "RECORD DRAWING" located in prominent location.
- F. Record Digital Data Files: Immediately before inspection for Substantial Completion, review marked-up record prints with Architect and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
 - 1. Format: Annotated PDF electronic file with comment function enabled.
 - 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 - 3. Refer instances of uncertainty to Architect for resolution.

4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
 - (a) Refer to Section 01 33 00 "Submittal Procedures" for requirements related to use of Architect's digital data files.
 - (b) Architect will provide data file layer information. Record markups in separate layers.
- G. Final Property Survey: Under the provisions of Section 01 73 00.
- H. Submit documents to Architect at time of Substantial Completion.

1.10 OPERATION AND MAINTENANCE DATA

- A. Summary:
 1. Organize operation and maintenance data with directory.
 2. Provide operation and maintenance manuals for products, systems, subsystems, and equipment.
 3. Refer to Divisions 02 thru 49 for specific operation and maintenance manual requirements for the Work in those Divisions.
- B. Format: Annotated PDF electronic file with comment function enabled.
- C. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Engineers, Contractor, subcontractors, and major equipment suppliers and manufacturers.
- D. Part 2: Operation and maintenance instructions, arranged by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 1. Performance and design criteria.
 2. List of equipment.
 3. Parts list for each component.
 4. Start-up procedures.
 5. Shutdown instructions.
 6. Normal operating instructions.
 7. Wiring diagrams.
 8. Control diagrams.
 9. Maintenance instructions for equipment and systems.
 10. Maintenance instructions for finishes, including recommended cleaning methods and materials.
- E. Part 3: Project documents and certificates, including the following:
 1. Shop drawings and product data.
 2. Air and water balance reports.
 3. Certificates.
 4. Warranties.

1.11 WARRANTIES

- A. Commencement of warranties shall be date of Substantial Completion.
- B. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.
- C. Provide duplicate notarized copies in operation and maintenance manuals.
- D. Execute and assemble documents from subcontractors, suppliers, and manufacturers.
- E. Provide Table of Contents and assemble in binder with durable plastic cover.
- F. Submit prior to final Application for Payment.
- G. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of warranty on the work that incorporates the products.
- H. Manufacturer's disclaimer and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with Contractor.
- I. When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
- J. When work covered by warranty has failed and has been corrected, reinstate warranty by written endorsement. Reinstated warranty shall be equal to original warranty with equitable adjustment for depreciation.
- K. Upon determination that Work covered by warranty has failed, replace or repair Work to an acceptable condition complying with requirements of the Contract Documents.

1.12 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.
- B. Deliver to Project site and place in location as directed.
- C. Obtain signed receipt for delivery of materials and submit prior to request for final review by Architect.

2. PART 2 PRODUCTS

Not Used

3. PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 10 14 00

SIGNAGE

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Plastic/acrylic signs.
- B. Metal signs.
- C. Letters and numbers.
- D. Fire wall barrier identification signs.

1.2 REFERENCES

- A. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.
- B. 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design.

1.3 SUBMITTALS

- A. Submit shop drawings under provisions of Section 01 33 00.
- B. Submit shop drawings listing sign styles, lettering and locations, spacing and installation method.
- C. Submit samples under provisions of Section 01 33 00.
- D. Submit two samples illustrating full size sample sign, of type, style and color specified including method of attachment.
- E. Submit manufacturer's installation instructions under provisions of Section 01 33 00.
- F. Include installation templates.

1.4 REGULATORY REQUIREMENTS

- A. Conform to CBC - California Building Code, (CCR), Title 24, Part 2 and the 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design for accessibility requirements.
- B. DSA General Signage and Graphics Requirements: Raised characters shall comply with CBC Section 11B-703.2:
 - 1. Depth: It shall be 1/32 inch (0.8 mm) minimum above their background and shall be sans serif uppercase and be duplicated in Braille.
 - 2. Height: It shall be 5/8 inch (15.9 mm) minimum and 2 inches (51 mm) maximum based on the height of the uppercase letter "I". CBC Section 11B-703.2.5.
 - 3. Finish and contrast: Characters and their background shall have a non-glare finish. Character shall contrast with their background with either light characters on a dark background or dark characters on a light background. CBC Section 11B-703.5.1.
 - 4. Proportions: It shall be selected from fonts where the width of the uppercase letter "O" is 60 % minimum and 110 % maximum of the height of the uppercase letter "I". Stroke thickness of the uppercase letter "I" shall be 15 % maximum of the height of the character. CBC Sections 11B-703.2.4 and 11B-703.2.6.

5. Character Spacing: Spacing between individual raised characters shall comply with CBC Section 11B-703.2.7 and 11B-703.2.8
6. Format: Text shall be in a horizontal format. CBC Section 11B-703.2.9
7. Braille: It shall be contracted (Grade 2) and shall comply with CBC Sections 11B-703.3 and 11B-703.4. Braille dots shall have a domed or rounded shape and shall comply with CBC Table and Figure 11B-703.3.1.
8. Mounting height: Tactile characters on signs shall be located 48" minimum to the baseline of the lowest Braille cells and 60" maximum to the baseline of the highest line of raised characters above the finish floor or ground surface. CBC Section and Figure 11B-703.4.1
9. Mounting location: A tactile sign shall be located per CBC Section and Figure 11B -703.4.2 as follows:
 - (a) alongside a single door at the latch side.
 - (b) on the inactive leaf at double doors with one active leaf.
 - (c) to the right of the right hand door at double doors with two active leaves.
 - (d) on the nearest adjacent wall where there is no wall space at the latch side of a single door or at the right side of double doors with two active leaves.
 - (e) so that a clear floor space of 18" x18" minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.

Visual characters shall comply with CBC Section 11B-703.5 and shall be 40" minimum above finish floor or ground.

Pictograms shall comply with CBC Section 11B-703.6.

Symbols of accessibility shall comply with CBC Section 11B-703.7.

Variable message signs shall comply with CBC Section 11B-703.8.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and protect products to site under provisions of Section 01 61 00.
- B. Package signs, labeled in name groups.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not install adhesive mounted signs when ambient temperature is below 70 degrees F. Maintain this minimum during and after installation of signs.

2. PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acrylic Signs:
 1. Architectural Sign Identity, www.architecturalsignidentity.com.
 2. ASI - Sign Systems, www.asisignage.com.
 3. Best Manufacturing, www.bestsigns.com.
 4. Bravo Sign and Design, www.bravosign.com.
 5. CA Signs, www.casigns.com.

6. Mohawk Sign Systems, www.mohawksign.com.
7. Neiman and Company, www.neimanandco.com.
8. Signs and Lucite Products, Inc., www.adasignscalifornia.com
9. Signtec, www.signtec.com.
10. Southwell Company, www.southwellco.com.
11. Vomar Products, Inc., www.vomarproducts.com.
12. Substitutions: Under provisions of Section 01 25 13.

B. Letters and Numbers:

1. ARK Ramos, www.arkramos.com.
2. ASI - Sign Systems, www.signage.com.
3. Bravo Sign and Design, www.bravosign.com.
4. Gemini, www.gemini.signproducts.com
5. Matthews, www.matthewssigns.com.
6. Nelson-Harkins Ind., www.nelson-harkins.com.
7. Neiman and Company, www.neimanandco.com.
8. Southwell Company, www.southwellco.com.
9. Signs and Lucite Products, Inc., www.adasignscalifornia.com.
10. Signtec, www.signtec.com.
11. Vomar Products, Inc., www.vomarproducts.com.
12. Substitutions: Under provisions of Section 01 25 13.

C. Metal and Traffic Signs:

1. Four S Company, (877) 597-1288. No URL available.
2. Signs and Lucite Products, Inc., www.adasignscalifornia.com
3. Signtec, www.signtec.com.
4. Traffic Management Inc., www.trafficmanagement.com.
5. Substitutions: Under provisions of Section 01 25 13.

D. Fire Wall Barrier Identification Sign:

1. Fire Wall Signs, Inc., www.firewallsigns.com.
2. Fire Safety Signs, www.mysafetysign.com.
3. Substitutions: Under provisions of Section 01 25 13.

2.2 MANUFACTURED UNITS

- A. Room Control Signage: Mohawk Sign Systems, Series 200A, Format D Sand Carved Process, with 1/32 inch raised border and letters with integral California round top contracted Grade 2 braille dots with dot spacing in compliance with CBC Table 11B-703.3.1 raised a minimum of 1/ 40 inch. Material shall be 1/8 inch thick x 6 inch high MP plastic plate of length required with 1 inch high Century Gothic lettering; adhesive and mechanical mounting with copy centered on plate. Provide one sign for each door shown on the drawings. Allow for twelve letters and three numerals for each sign. Signage to be in compliance with the requirements of Article 703 of the 2010 ADA Standards for Accessible Design and CBC, California Building Code (CCR), Title 24, Part 2, Section 11B-703.
- B. Tactile Exit Signage: Mohawk Sign Systems, Series 200A, Format D Sand Carved Process, with 1/32 inch raised border and letters with integral California round top contracted Grade 2 braille dots with dot spacing in compliance with CBC Table 11B-703.3.1 raised a minimum of 1/ 40 inch. Material shall be 1/8 inch thick x 6 inch high MP plastic plate of length required with 1 inch high Century Gothic lettering; adhesive and mechanical mounting with copy centered on plate. Provide signs at locations shown on the drawings. Signage to be in compliance with the requirements of Article 703 of the 2010 ADA Standards for Accessible Design and CBC, California Building Code (CCR), Title 24, Part 2, Section 1011.4 and 11B-703.
- C. Pictorial Symbol Signage: Mohawk Sign Systems, Series 200A, Format D Sand Carved Process, with 1/32 inch raised border and letters with integral California round top contracted Grade 2 braille dots with dot spacing in compliance with CBC Table 11B-703.3.1 raised a minimum of 1/ 40 inch. Material shall be 1/8 inch thick MP plastic plate of size indicated with lettering and symbols as indicated; adhesive and mechanical mounting with copy centered on plate. Provide sign in locations shown on the drawings. Signage to be in compliance with the requirements of Article 703 of the 2010 ADA Standards for Accessible Design and CBC, California Building Code (CCR), Title 24, Part 2, Section 11B-703.
- D. Entrance and Restroom Signage:
 - 1. Restroom Doors: Acrylic plastic signs equivalent to that as detailed on the drawings; 12 inch circle and triangle with international symbol of accessibility in accordance with CBC, California Building Code, (CCR), Title 24, Part 2, Section 11B-216.8 and 11B-703.7.2.6.
 - 2. Building Entrance: Equivalent to 5 inch square, reflective plastic accessible sign in accordance with CBC, California Building Code (CCR), Title 24, Part 2, Section 11B-216.6 and 11B-703.7.2.1.
- E. Exterior Directional Signage: 0.080 inch thick aluminum sheet sign of size indicated. Paint with reflectorized paint. Graphics and text to be as indicated. Mount sign to wall with four countersunk vandal resistant screws or on free standing 2-inch diameter standard weight galvanized steel pipe post as indicated. Signs shall be in conformance with CBC, California Building Code (CCR), Title 24, Part 2, Section 11B-216.9.2 and 11B-703.5.
- F. Fire Wall Barrier Identification Sign: 11 x 15 inch adhesive backed vinyl sign with minimum 3 inch high letters identifying wall as a fire and or smoke barrier; listing hourly rating of fire wall; with specific language stating that all openings in wall are to be protected. Sign shall be in conformance with CBC, California Building Code (CCR), Title 24, Part 2, Section 703.7.
- G. Safe Dispersal Area Sign: 0.080 inch thick aluminum sheet sign in size indicated. Paint with reflectorized paint. Text to be as indicated. Mount and attach sign to adjacent fence fabric, post, or wall as indicated on drawings. Sign shall be in conformance with CBC, California Building Code (CCR), Title 24, Part 2, Section 1028.5.
- H. Traffic Signage:
 - 1. Van Parking Stall: 12 inch x 18 inch 0.080 inch thick aluminum accessible sign in accordance with CBC, California Building Code, (CCR), Title 24, Part 2, Section 11B-502.6 and 11B-703.7.2.1 with separate 12 inch wide x 4 inch high sign with "Van-Accessible" wording and additional language below symbol of accessibility that states "Minimum Fine \$250.00." Mount on 2 inch diameter standard weight galvanized steel pipe post.

2. Auto Parking Stall: 12 inch x 18 inch 0.080 inch thick aluminum accessible sign in accordance with CBC, California Building Code, (CCR), Title 24, Part 2, Section 11B-502.6 and 11B-703.7.2.1 with additional language below symbol of accessibility that states "Minimum Fine \$250.00." Mount on 2 inch diameter standard weight galvanized steel pipe post
 3. Drive Approach: 18 inch x 24 inch 0.080 inch thick aluminum tow-away sign with local address and police phone number in accordance with CBC, California Building Code, (CCR), Title 24, Part 2, Section 11B-502.8.1. Mount on 2 inch diameter standard weight galvanized steel pipe post.
 4. Passenger Loading Zone: 12 inch x 18 inch 0.080 inch thick aluminum sign as detailed on drawings. Mount on 2 inch diameter standard weight galvanized steel pipe post.
- I. Occupant Load Signage:
1. Provide maximum occupant load signs where indicated on drawings. Locate near main exit of space.
 2. Material: 1/8 inch thick x 6 inch high MP plastic plate of length required with 3/4 and 1/2 inch high Century Gothic lettering: adhesive and mechanical mounting with copy centered on plate.
 3. Signage to conform to the requirements of the CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Section 1004.3.
- J. Accessories: Provide all anchors, adhesives, and accessories for a complete installation.

3. PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Beginning of installation means installer accepts existing surfaces.

3.2 INSTALLATION - GENERAL

- A. Install in accordance with manufacturer's instructions.
- B. Install true, plumb, level and adequately secured to substrate.
- C. Clean and polish.

3.3 INSTALLATION - FIRE BARRIER

- A. Install fire wall barrier identification signs on fire walls in accessible concealed floor, floor-ceiling or attic space above accessible ceilings.
- B. Install at intervals not exceeding a 30' - 0" horizontal spacing.
- C. Install at maximum 15' - 0" from end of wall.

END OF SECTION

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Materials and equipment shall be furnished and installed in support of electrical work described in these plans and specifications including but not limited to, raceways, boxes, enclosures, feeders, branch circuiting, supports, terminal cabinets, sleeves, gutters, panels, transformers, switchgear, lighting fixtures, controls, relays, contactors, in order to complete and make fully functional the systems described.
 - 2. Complete fire alarm and annunciation system as shown and/or required by the (local jurisdiction having authority, California State Fire Marshal) including monitoring equipment and wiring for central station connection.
 - 3. Lighting systems, both interior and exterior as shown on the plans and as specified herein, including controls, occupancy sensors, lumen sensors, photocell controls, LED'S supports, fasteners, straps, and miscellaneous mounting hardware and support structures for such equipment.
 - 4. HVAC and plumbing electrical: Conduit, conductors and terminations for all line voltage power, line voltage controls and fusible and/or non-fusible safety disconnect switches for HVAC equipment, including but not limited to air conditioners, furnaces, fans, heat pumps, system pumps, condensing units. Provide protective equipment unless otherwise noted, etc. including protective devices.
 - 5. Power and Lighting Distribution: Furnish and install power and lighting distribution systems including but not limited to panels, feeders, transformers, branch circuits, devices, fixtures, disconnect switches, contactors, controls, etc. for a complete working system.
 - 6. Data systems infrastructure including all boxes, raceways, cable tray, wire basket tray, dedicated branch circuits, sleeves and penetrations, etc. as described and as shown in plans, risers, specifications and/or required for a complete and operating system.
 - 7. Allocation of time to adequately train the Owner on the use and operation of all systems installed within the facility or on the property.
- B. System Description:
 - 1. The electrical plans indicate the general layout and arrangement; the architectural drawings and field conditions shall determine exact locations. Field verify all conditions and modify as required to satisfy design requirements as well as code minimums. Maintain all required working clearances as described in CEC Article 110 as well as other applicable articles.
 - 2. Discrepancies shall be brought immediately to the attention of the Architect for clarification. The Architect shall approve any changes. Prior to rough-in, refer to architectural plans that shall take precedence over electrical plans with respect to locations.
- C. Related Work Under Other Sections:
 - 1. Mechanical Wiring: Control circuit wiring, energy management controls and interlocks for mechanical equipment shall be installed by Mechanical Contractor.

2. HVAC Control Raceway: Raceways, boxes, and control wiring for thermostats, temperature sensors and control components specified within the mechanical specifications, shall be furnished and installed as required, and installed in accordance with the minimum wiring methods allowed for branch circuit wiring in Division 26.
3. Smoke Fire Dampers: Coordination with Mechanical plans for exact locations and points of connection for power and fire alarm system connections (power and fire alarm connection shall be by Electrical Contractor).
4. Duct mounted smoke detectors: Coordination with Mechanical plans for exact locations and points of connection for power and fire alarm system connections (power and fire alarm connection shall be by Electrical Contractor).

1.3 SUBMITTALS AND SHOP DRAWINGS

- A. Before construction, submit in accordance with the General Conditions of this Specification.
- B. Manufacturers' specifications, catalog cuts and shop drawings as required to demonstrate compliance with the specifications. Identify specific intended use for each component where submittal may be ambiguous. Submit entire bound submittal at one time; partial submittals will not be accepted. At a minimum, submittals will be required for the following:
 1. Distribution equipment including transformers, distribution panels and breakers, motor controls, distribution and branch circuit panels, grounding, surge protection device, etc.
 2. Electrical equipment including disconnects, fuses, raceways, straps and racks, fittings, conductors, boxes, gutters, devices, plates, etc.
 3. Lighting equipment including fixtures, LED's, mounting accessories, color charts (where required), etc.
 4. Lighting control equipment including low voltage switching system, dimmer switchbank / accessories, occupancy sensing equipment, time clocks, contactors, photocells, lumen sensors, etc.
 5. Complete system component submittals for:
 - a. Voice Public Address System / Intercom / Clock.
 - b. Fire Alarm System.
 - c. Communication Systems including but not limited to; cable, fiber, terminations, cable management, cable tray, patch panels, equipment racks, cabinets, jacks, plates, cable labeling.
 6. Conduit including all fittings, etc.
 7. Wiring and cable, etc.
 8. Fire rating penetration materials, etc.
- C. The intent of these specifications is to establish a standard of quality for materials and equipment. Therefore, some items are identified by manufacturer or trade name designation. Substitutions shall be subject to the Architect's approval. Where the substitution will affect other trades, coordinate all changes with those trades concerned and pay any additional costs incurred by them as a result of this substitution. Approval of substitutions shall not relieve the Contractor from providing an operational system in accordance with all applicable codes and ordinances.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Storage of equipment for the job is the responsibility of the Electrical Contractor and shall be scheduled for delivery to the site, as the equipment is required. Damage to the equipment delivered to the site or in transport to the job shall be the responsibility of the Electrical Contractor.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Materials shall be new and bear the label of or be listed by a nationally recognized testing laboratory. The quality and suitability of all materials shall conform to the standards and practices of this trade.
- B. Supplied materials shall be of a current manufactured product line. Discontinued products are not acceptable. Where products are identified on the contract documents by part number, EC may supply the current product model or series which meets the specification and intended use of the specified component.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Professionalism and appearance of installations shall be in accordance with accepted practices of this trade. Installation methods shall conform to manufacturers' specifications and recommendations. The Contractor shall man the job with qualified journeymen and helpers in this trade for the duration of the job. It is the Contractor's responsibility to communicate with and keep the job superintendent apprised of changes or clarifications, etc.
- B. Employment of any person on any job in the capacity of an electrician is not permitted unless such person has qualified for and holds a valid Journeyman Electrician Pocket Card or General Journeyman Electrician Certificate issued by the State of California Division of Apprenticeship Standards except, Contractor may employ electrical helpers or apprentices on any job of electrical construction, new or existing, when the work of such helpers or apprentices is performed under the direct and constant personal supervision of a journeyman electrician holding a valid Pocket Card accepted by the State of California Division of Apprenticeship Standards:
 - 1. Each Pocket Card carrying journeyman electrician will be permitted to be responsible for the quality of workmanship for a maximum of one helper or apprentice during any same time period, provided the nature of work is such that good supervision can be maintained and the quality of workmanship is the best, as expected by Owner and implied by the latest edition of the National Electrical Code.
- C. Materials shall be installed in accordance with the manufacturers' specification and recommendations. They must conform to the approval AHJ adopted codes and standards, but not less than the 2019 CEC and all applicable codes and standards, including but not necessarily limited to California Code of Regulations Title 24, NFPA, National Electrical Manufacturers Association, ANSI, CBC, and any other adopted ordinances of applicable agencies having jurisdiction.
- D. Electrical Contractor shall lay work out in advance in order to avoid unnecessary cutting, chasing, and drilling of floors, walls, ceilings and other surfaces. Work of this nature shall be carefully done so as not to damage work already performed by other trades. Such alterations shall not depreciate the integrity of the structure. Approval for cuts or penetrations in structural members shall be by the Architect.
- E. Supporting Devices:
 - 1. Verify mounting height of all luminaires or items prior to installation when heights are not detailed.

2. Install vertical support members for equipment and luminaires, straight and parallel to building walls.
 3. Support conduits within 18" of outlets, boxes, panels, cabinets and deflections. Maximum distance between supports not to exceed spacing per CEC.
 4. Securely suspend all junction boxes, pull boxes or other conduit terminating housings located above suspended ceiling from the floor above or roof structure to prevent sagging and swaying.
 5. Provide seismic bracing per CBC requirements for this building location.
 6. Supporting Devices: Safety factor of 4 required for every fastening device or support for electrical equipment installed. Support to withstand four times weight of equipment it supports. Bracing to comply with seismic design category as per Structural Engineer.
- F. Coordinate work with other trades as required to eliminate any delays during construction. Coordinate changes with other prime contractors to avoid construction conflicts.
- G. Engineer's Field Observation: Site visits during construction for field observations and reports will be conducted by electrical engineer when directed by the Architect. A list of items that need to be addressed will be submitted to the Architect for forwarding to the Contractor.
- H. Drawings of Record: Provide a full and accurate set of field record drawings marked up in a neat and understandable manner submitted to the Owner Representative, Construction Manager, or Architect upon completion of the work and prior to issuance of a certificate of completion. The drawings shall dimension all electrical facilities including but not limited to underground conduit, vaults, boxes as well as conduit routing scaled to within 12" of actual field conditions and shall be kept up to date reflecting changes or deviations. Electrical facilities shall be accurately drawn on the plan to scale. Refer to the general conditions of these specifications for additional requirements. Record drawings shall be required to identify both horizontal and vertical dimensions to visible and fixed points such as concrete, asphalt, buildings, sidewalks, etc.
- I. Identification: Provide engraved laminated plastic nameplates for all switchboards, panelboards, fire alarm terminal cabinets, telephone and cable television backboards, main devices, control panels, time clocks, contactors and safety disconnect switches accurately identifying each device. Labels shall be attached to the equipment by means of screws or rivets. Self-adhering labels will not be acceptable. Refer to Section 26 05 53: Identification of Electrical Systems.
- J. Safety: The Electrical Contractor is responsible to maintain equipment in a safe and responsible manner. Keep dead front equipment in place while equipment is energized. Conduct construction operations in a safe manner for employees as well as other work persons or anyone visiting the job site. Provide barriers, trench plates, flags, tape, etc.
- K. Guarantees: Equipment and labor shall be guaranteed and warranted free of defects, unless otherwise stated to be more restrictive, for a period of one year from the date of final acceptance by the Owner. A written warranty shall be presented to the Architect at the time of completion prior to final acceptance. Equipment deemed to be damaged, broken or failed should be repaired or replaced at no additional cost to the Owner. Materials or system requiring longer than a one-year warranty as described herein shall be separately warranted in separate letters of guarantee stating the duration of warranty.

- L. Operating and Installation Manuals: Provide two copies each of manuals, operating and installation instructions for equipment indicated in submittal packages. Instruct the Owner's representative as to the operation and location of equipment necessary to allow them to operate the facility upon final acceptance. This instruction period shall be prearranged with the Owner's representative prior to occupancy of the facility and the weeks prior to training scheduled.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Provide a complete system of building wire and cable to all electrical loads.

1.3 SYSTEM DESCRIPTION

- A. Product Requirements: Provide products as follows:
 - 1. Provide stranded conductors for all wiring.
 - 2. Conductor not smaller than 12 AWG for power and lighting circuits.
 - 3. Conductor not smaller than 16 AWG for control circuits.
 - 4. 10 AWG conductors for 20 amperes, 120-volt branch circuits longer than 75 feet
 - 5. 10 AWG conductors for 20 amperes, 277-volt branch circuits longer than 200 feet.
 - 6. Copper.
- B. Wiring Methods: Provide the following wiring methods:
 - 1. Concealed Dry Interior Locations: Use only Type THHN/THWN insulation, in raceway.
- C. Branch Circuit Conductors: No branch circuit conductors are allowed in any slab or under slab on grade unless specifically indicated on drawings.

1.4 COORDINATION

- A. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.

PART 2 PRODUCTS

2.1 BUILDING WIRE

- A. Manufacturers:
 - 1. Southwire
 - 2. Or approved equal
- B. Product Description: Single conductor insulated wire.
- C. Conductor: Copper.
- D. Insulation: NFPA 70; Type THHN/THWN insulation for feeders and branch circuits.

2.2 TYPE AC CABLE

- A. Manufacturers:
 - 1. AFC

2. Southwire

- B. Product Description: A fabricated assembly of insulated conductors in a flexible metallic enclosure.
- C. Comply with NEC 320.
- D. Support, provide separate support to structure for all Type AC cable, spacing not exceeding three (3) feet and at each junction box.
- E. Provide an insulated green grounding conductor in all Type AC cable.
- F. Acceptable Use: Install, at Contractor's option, only for service to light fixtures above accessible ceilings, limit length to six (6) feet whips from accessible junction box to light fixtures.
- G. Provide insulated throat fittings at all terminations of Type AC cable.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify interior of building has been protected from weather.
- B. Verify mechanical work likely to damage wire and cable has been completed.
- C. Verify raceway installation is complete and supported.

3.2 EXISTING WORK

- A. Remove exposed abandoned wire and cable, including abandoned wire and cable above accessible ceiling finishes. Patch surfaces where removed cables pass through building finishes.
- B. Disconnect abandoned circuits and remove circuit wire and cable. Remove abandoned boxes when wire and cable servicing boxes is abandoned and removed. Install blank cover for abandoned boxes not removed.
- C. Provide access to existing wiring connections remaining active and requiring access. Modify installation or install access panel.
- D. Extend existing circuits using materials and methods compatible with existing electrical installations, or as specified.

3.3 INSTALLATION

- A. Route wire and cable to meet Project conditions.
- B. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- C. Identify and color code wire. Identify each conductor with its circuit number or other designation indicated.

- D. Special Techniques - Wiring Connections:
1. Clean conductor surfaces before installing lugs and connectors.
 2. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
 - a. MDF/IDF room branch circuits: All branch circuits shall be dedicated and unspliced. Provide dedicated branch circuit 20 or 30 amperes, #10 and or #12 wire, unspliced from wiring device all the way back to the overcurrent device. Do not share ground with any other circuit.
 - b. Computer branch circuits: All branch circuits shall be dedicated. Provide dedicated branch circuit 20 amperes, #10 and or #12 wire from wiring devices all the way back to the overcurrent device. Do not share neutral with any other circuit.
 - c. Kitchen branch circuits: All branch circuits for 125-volt, single phase, 15 and 20 ampere receptacles shall be dedicated. Provide dedicated branch circuit 20 amperes, #10 and or #12 wire from wiring devices all the way back to the overcurrent device. Do not share neutral or ground with any other circuit.
 3. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
 4. Install split bolt connectors for copper conductor splices and taps, 6 AWG and larger.
 5. Install solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
 6. Install insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

3.4 WIRE COLOR

A. COLOR CODES FOR CONDUCTORS FOR BRANCH CIRCUITS AND FEEDERS:

<u>System/Phase</u>	Wire Sizes #10 and Smaller: Use Continuous Color Coded Insulation (Note 01)				Wire Sizes #6 and Smaller: Use Continuous Color Coded Insulation (Note 02)	
	A	B	C	N	G	IG
120/208	Black	Red	Blue	White	Green	Green/Yellow Stripe
120/240	Black	Orange	Blue	White w/color stripe (Note 03)	Green	Green/Yellow Stripe
277/480	Brown	Purple	Yellow	Gray	Green	Green/Yellow Stripe

1. Table Notes:
 - a. Wire size #8 and larger, black conductors with color marking tape at each termination and where accessible; colors as noted above.
 - b. Wire sizes #4 and larger, black conductor with green marking tape at each termination and where accessible.
 - c. Provide white (no stripe) insulation when 120/208V system is not present at this installation.
- B. Neutral Conductors: White. When two or more neutrals are located in one conduit, individually identify each with proper circuit number and provide color coding at each junction box containing more than one neutral.
- C. Branch Circuit Conductors: Install three or four wire home runs with each phase uniquely color coded.
- D. Feeder Circuit Conductors: Uniquely color code each phase.

- E. Ground Conductors:
 - 1. For 6 AWG and smaller: Green.
 - 2. For 4 AWG and larger: Identify with green tape at both ends and visible points including junction boxes.

3.5 GROUPING OF CIRCUITS

- A. Limit the number of current carrying conductors per conduit to 6. Neutrals serving computer receptacle branch circuits shall be counted as current carrying. Grounds shall not be counted.
- B. Grouping of different voltages is not allowed.
- C. Provide metal box sizes per NEC Table 314.16 (A).
- D. Provide conduit per NEC Annex C.
- E. Neutrals serving branch circuits shall not be shared. Provide dedicated neutral per circuit.

3.6 POWER LIMITED CIRCUIT INSTALLATION

- A. Provide a complete system of raceway and covered junction boxes for all power limited circuits installed exposes in finished spaces and spaces without a ceiling.
- B. Provide raceway for all power limited circuit wiring within wall cavities and above sheet rock, plaster and other "hard" (non-lay-in) ceiling types of construction.
- C. Labeling: Provide label on all junction boxes.
 - 1. Provide permanent labeling with indelible black marker, in neat, legible print indicating the system wiring name.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Grounding and bonding requirements of electrical installations for personnel safety and to provide a low impedance path for possible ground fault currents as described in CEC Article 250.
 - 2. "Grounding electrode system" refers to all electrodes required by CEC, as well as including made, supplementary, lightning protection system and telecommunications system grounding electrodes.
 - 3. The terms "connect" and "bond" are used interchangeably in this specification and have the same meaning.
- B. Related Sections:
 - 1. Section 26 05 00: Common Work Results for Electrical.
 - 2. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

- A. Equipment grounding conductors shall be UL 83 insulated stranded copper, except that sizes No. 10 AWG and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes No. 4 AWG and larger shall be permitted to be identified per CEC.
- B. Bonding conductors shall be ASTM B8 bare stranded copper, except that sizes No. 10 AWG and smaller shall be ASTM B1 solid bare copper wire.
- C. Conductor sizes shall not be less than what is shown on the drawings and not less than required by the CEC, whichever is greater.

2.2 SPLICES AND TERMINATION COMPONENTS

- A. Components shall meet or exceed UL 467 and be clearly marked with the manufacturer, catalog number, and permitted conductor size(s).

PART 3 EXECUTION

3.1 GENERAL

- A. Ground in accordance with the CEC, as shown on drawings, and as hereinafter specified.

- B. System Grounding:
 - 1. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformers.
 - 2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.
- C. Equipment Grounding: Metallic structures (including ductwork and building steel), enclosures, fire sprinklers, plumbing piping, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits shall be bonded and grounded.

3.2 INACCESSIBLE GROUNDING CONNECTIONS

- A. Make grounding connections which are buried or otherwise normally inaccessible (except connections for which periodic testing access is required) by exothermic weld.

3.3 SECONDARY EQUIPMENT AND CIRCUITS

- A. Main Bonding Jumper: Bond the secondary service neutral to the ground bus in the service equipment.
- B. Metallic Piping, Building Steel, and Supplemental Electrode(s):
 - 1. Provide a grounding electrode conductor sized per CEC between the service equipment ground bus and all metallic water and gas pipe systems, building steel, and supplemental or made electrodes. Jumper insulating joints in the metallic piping. All connections to electrodes shall be made with fittings that conform to UL 467.
 - 2. Provide a supplemental ground electrode and bond to the grounding electrode system.
- C. Service Disconnect: Provide a ground bar bolted to the enclosure with lugs for connecting the various grounding conductors.
- D. Switchgear, Switchboards, and Motor Control Centers:
 - 1. Connect the various feeder equipment grounding conductors to the ground bus in the enclosure with suitable pressure connectors.
 - 2. For service entrance equipment, connect the grounding electrode conductor to the ground bus.
 - 3. Connect metallic conduits, which terminate without mechanical connection to the housing, by grounding bushings and grounding conductor to the equipment ground bus.
 - 4. Triple Ground Rod: The ground system shall consist of three ground rods, arranged in an equilateral triangular pattern located at least five (5) feet outside of the housekeeping pad. Space 15 feet apart and drive into the earth to a point two (2) feet below finished grade to top of rods. Grounding electrode conductor shall form a continuous loop around rods, and conductor shall be properly bonded to each rod by a fusion weld similar to "Cadweld".
 - 5. Extend grounding electrode conductor from this ground rod(s) to the grounded service conductor (neutral) in the main switchboard at an accessible point on the ground bus per NEC 250-24.
 - 6. Install grounding electrode conductor of 3/0 Copper.
- E. Transformers:
 - 1. Exterior: Exterior transformers supplying interior service equipment shall have the neutral grounded at the transformer secondary. Provide a grounding electrode at the transformer.

2. Separately derived systems (transformers downstream from service equipment): Ground the secondary neutral at the transformer. Provide a grounding electrode conductor from bar at the service equipment.
- F. Conduit Systems:
1. Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor sized per CEC.
 2. Nonmetallic conduit systems shall contain an equipment grounding conductor, except that non-metallic feeder conduits which carry a grounded conductor from exterior transformers to interior or building-mounted service entrance equipment need not contain an equipment grounding conductor.
 3. Metal conduit containing only a grounding conductor, and which is provided for mechanical protection of the conductor, shall be bonded to that conductor at the entrance and exit from the conduit.
- G. Feeders and Branch Circuits: Install equipment grounding conductors with all feeders, power and lighting branch circuits.
- H. Boxes, Cabinets, Enclosures, and Panelboards:
1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes.
 2. Provide lugs in each box and enclosure for equipment grounding conductor termination.
 3. Provide ground bars in panelboards, bolted to the housing, with sufficient lugs to terminate the equipment grounding conductors.
- I. Motors and Starters: Provide lugs in motor terminal box and starter housing or motor control center compartment to terminate equipment grounding conductors.
- J. Receptacles shall not be grounded through their mounting screws. Ground with a jumper from the receptacle green ground terminal to the device box ground screw and the branch circuit equipment grounding conductor.
- K. Ground lighting fixtures to the equipment grounding conductor of the wiring system when the green ground is provided; otherwise, ground the fixtures through the conduit systems. Fixtures connected with flexible conduit shall have a green ground wire included with the power wires from the fixture through the flexible conduit to the first outlet box.
- L. Fixed electrical appliances and equipment shall be provided with a ground lug for termination of the equipment grounding conductor.

3.4 CONDUCTIVE PIPING

- A. Bond all conductive piping systems, interior and exterior, to the building to the grounding electrode system. Bonding connections shall be made as close as practical to the equipment ground bus.

3.5 TELECOMMUNICATIONS SYSTEM

- A. Bond telecommunications system grounding equipment to the electrical grounding electrode system.

3.6 GROUND RESISTANCE

- A. Grounding system resistance to ground shall not exceed 15 ohms. Make necessary modifications or additions to the grounding electrode system for compliance without additional cost to the Owner. Final tests shall assure that this requirement is met and test results shall be submitted to the Owner with final close out documents.
- B. Resistance of the grounding electrode system shall be measured using a four-terminal fall-of-potential method as defined in IEEE Standard 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.
- C. Below-grade connections shall be visually inspected by the IOR prior to backfilling. The Contractor shall notify the IOR 24 hours before the connections are ready for inspection.
- D. Furnish a copy of tests to Owner at completion of project.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 1. Conduit supports.
 2. Formed steel channel.
 3. Spring steel clips.
 4. Sleeves.
 5. Mechanical sleeve seals.
 6. Firestopping relating to electrical work.
 7. Firestopping accessories.
 8. Equipment bases and supports.

1.3 REFERENCES

- A. Underwriters Laboratories Inc.:
 1. UL 263 - Fire Tests of Building Construction and Materials.
 2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
 3. UL 1479 - Fire Tests of Through-Penetration Firestops.
 4. UL - Fire Resistance Directory.

1.4 DEFINITIONS

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.5 PERFORMANCE REQUIREMENTS

- A. Firestopping: Conform to Building Code and UL for fire resistance ratings and surface burning characteristics.

1.6 SUBMITTALS

- A. Product Data:
 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.

1.7 QUALITY ASSURANCE

- A. Perform Work in accordance with the Building Code.

PART 2 PRODUCTS

2.1 CONDUIT SUPPORTS

- A. Manufacturers:
 - 1. Allied Tube & Conduit Corp.
 - 2. Electroline Manufacturing Company
 - 3. O-Z Gedney Co.
 - 4. Appleton
- B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.
- C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
- D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.
- E. Conduit clamps: general purpose: One-hole malleable iron for surface mounted conduits.
- F. Cable Ties: High strength nylon temperature rated to 185 degrees F., self-locking.

2.2 FIRESTOPPING

- A. Manufacturers:
 - 1. Dow Corning Corp.
 - 2. Fire Trak Corp.
 - 3. Hilti Corp.
 - 4. International Protective Coating Corp.
 - 5. 3M fire Protection Products.
 - 6. Specified Technology, Inc.
- B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
 - 1. Silicone Firestopping Elastomeric Firestopping: Multiple component silicone elastomeric compound and compatible silicone sealant.
 - 2. Foam Firestopping Compounds: Multiple component foam compound.
 - 3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
 - 4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
 - 5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
 - 6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
 - 7. Firestop Pillows: Formed mineral fiber pillows.

2.3 FIRESTOPPING ACCESSORIES

- A. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

- B. General:
 1. Furnish UL Listed products.
 2. Select products with rating not less than rating of wall or floor being penetrated.
- C. Non-Rated Surfaces:
 1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.
 2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify openings are ready to receive sleeves.
- B. Verify openings are ready to receive firestopping.

3.2 INSTALLATION - HANGERS AND SUPPORTS

- A. Anchors and Fasteners:
 1. Concrete Structural Elements: Provide precast inserts, expansion anchors, powder actuated anchors or preset inserts as required.
 2. Steel Structural Elements: Provide beam clamps, spring steel clips, steel ramset fasteners or welded fasteners as required.
 3. Concrete Surfaces: Provide self-drilling anchors and expansion anchors as required.
 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts or hollow wall fasteners as required.
 5. Solid Masonry Walls: Provide expansion anchors or preset inserts as required.
 6. Sheet Metal: Provide sheet metal screws.
 7. Wood Elements: Provide wood screws.
- B. Inserts:
 1. Install inserts for placement in concrete forms.
 2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over four (4) inches.
 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.
- C. Install conduit and raceway support and spacing in accordance with NEC.
- D. Do not fasten supports to suspended ceiling support system, pipes, ducts, mechanical equipment, or conduit.
- E. Install multiple conduit runs on common hangers.
- F. Supports:
 1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
 2. Install surface mounted cabinets and panelboards with minimum of four anchors.

3. In wet and damp locations install steel channel supports to stand cabinets and panelboards one (1) inch off wall.
4. Support vertical conduit at every floor.

3.3 INSTALLATION - FIRESTOPPING

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.
- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating.
- D. Compress fibered material to maximum 40 percent of its uncompressed size.
- E. Place intumescent coating in sufficient coats to achieve rating required.
- F. Remove dam material after firestopping material has cured.
- G. Fire Rated Surface:
 1. Seal opening at all rated floors and walls as follows:
 - a. Install sleeve through opening and extending beyond minimum of one (1) inch on both sides of building element.
 - b. Size sleeve allowing minimum of one (1) inch void between sleeve and building element.
 - c. Pack void with backing material.
 - d. Seal ends of sleeve with UL Listed fire resistive silicone compound to meet fire rating of structure penetrated.
 2. Where cable tray, bus, or conduit, penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.
- H. Non-Rated Surfaces:
 1. Seal opening through non-fire rated floors and walls as follows:
 - a. Install sleeve through opening and extending beyond minimum of one (1) inch on both sides of building element.
 - b. Size sleeve allowing minimum of one (1) inch void between sleeve and building element.
 - c. Install type of firestopping material recommended by manufacturer.
 2. Install escutcheons where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
 3. Exterior wall openings below grade: Assemble rubber links of mechanical seal to size of conduit and tighten in place, in accordance with manufacturer's instructions.

3.4 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Provide mechanical sleeve seals.
- B. Interior conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.
- C. Set sleeves in position in forms. Provide reinforcing around sleeves.

- D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- E. Extend sleeves through floors and walls one (1) inch above finished floor level. Caulk sleeves.

END OF SECTION

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
1. Conduit and fittings.
 2. Outlet boxes.
 3. Weatherproof outlet boxes.
 4. Junction and pull boxes.
 5. Floor boxes.
 6. Cabinets, termination cabinets.
 7. Gutters.
- B. Related Work:
1. Installation of all wire, cable, conductor, boxes/gutters, pull ropes, fiber optic cable raceway, conduit, innerduct, cable sleeve and duct as described on the plans and/or as specified here-in. This scope shall include pathways to be installed underground onsite and offsite, underslab, above grade, both concealed and exposed, overhead concealed and exposed as appropriately applied. Raceways/boxes shall be installed in accordance with their intended and allowed uses and as specified here-in whichever is more restrictive. Size and capacity of all raceway/boxes shall be as specified here-in or as depicted on the drawings, but shall not be less than that required by code. Larger raceway sizes may be specified than code would permit. The specifications shall govern.
 2. Listed products for termination, coupling, extending, benching supports of raceways shall be used.
 3. Raceways/boxes described by this section shall include, but not be limited to, power for site utilities and lighting, site and building communications, controls, fire alarm, data system, power distribution, lighting, lighting controls, video, intercom, and other building low voltage/communications systems controls as may be required.
 4. Protection of and cleanliness of pathways and raceways must be assured during the construction process in order to eliminate the possibility of debris entering the conduit, duct, pathway resulting in decreased wire capacity and potential damage to installed conductors and cables.
 5. Pathways are shown in a diagrammatic way and are generally accurate as to routing, however, it is the Contractor's responsibility as a means and methods process to coordinate with all other trades that require space within a building. The Contractor shall obtain approval for installation of raceways routing through structural footings, retaining walls, columns, beams, purlins, grade beams, etc.
 6. It is the Contractor's responsibility to insure that all raceway and boxes systems penetrate fire assemblies and sound rated assemblies in an approved manner using the appropriate and listed products for the purpose.
 7. Minimum conduit size shall be 3/4" except if plan shows or code requires larger size. Exception: Use minimum 1" for underslab and below grade applications outside of building exterior walls.

8. All electrical systems shall be installed in an approved conduit system. This shall include but not be limited to all systems described in Section B.3 above.
9. All line voltage wiring above-grade within the building shall be installed in metallic conduit.
10. Empty or future conduits shall be properly plugged with plastic caps or inserts with a 3/8" polyethylene pull rope. Plastic or "duct" tape will not be acceptable.
11. All low voltage systems including data, voice, intercom, fire alarm, public address, etc. shall be in raceways separated from line voltage cabling. Voice / Data and Direct Digital Control (DDC) systems for HVAC cabling shall be routed as specified in Section 27 41 16 and 23 09 23 respectively, and as recommended by EIA/TIA standards. It shall be the contractor's responsibility to provide raceway down walls to outlet boxes and to provide sleeves across inaccessible ceiling spaces.
12. Underground conduits entering building shall have the open end of conduit within building above the elevation of the conduit outside the building such that water cannot enter building through conduit. If such a condition exists, a pull box outside of building footprint shall be installed in conduit route before conduit enters building whereby top of pull box is below finish floor of building and moisture may exit box before entering building.
13. No single conduit run of any type shall exceed 300 degrees of radius bend from termination box to termination box.
14. Separate Raceway System - Provide a separate raceway system for each of the following systems installed. Do not combine different systems into a raceway or cable tray system, unless otherwise noted or allowed. Mechanical controls and raceway shall be provided by others in separate raceway from the below systems:
 - a. Fire Alarm.
 - b. Line Voltage.
 - c. All other low voltage systems provided by electrical contractor.
15. Spare, Future Conduits: Conduits labeled conduit only, spare, or for future use, shall be provided with a pullrope, capped at each end, labeled as spare with destination marked, and turned over to the Owner in an unused state. Contractor shall not utilize these conduits for the installation of cabling or conductors as part of this scope of work. Contractor to verify and install at no additional cost to the Owner, additional conduits as required for the installation of the systems being installed.
16. Outlet System: Provide electrical boxes and fittings as required for a complete installation. Including but not limited to outlet boxes, junction boxes, pull boxes, bushings, locknuts, covers and all other necessary components.
17. Code Compliance: Comply with CEC as applicable to construction and installation of electrical boxes and fittings and size boxes according to CEC 312, 314 and 366 except as noted otherwise.
18. Outlets to be flush mounted: Maintain integrity of insulation and vapor barrier. Unless otherwise noted, flush mount all outlet boxes.
19. Provide putty pads of proper type around outlet boxes and/or as detailed on plan to meet sound transmission restrictions and fire ratings of walls.

1.3 SUBMITTALS

- A. Provide Product Data for the Following Equipment:
 1. Conduit and fittings.
 2. Outlet boxes.
 3. Weatherproof outlet boxes.
 4. Junction and pull boxes.
 5. Floor boxes.
 6. Cabinets, termination cabinets.
 7. Gutters.
 8. Putty pads.
 9. Raceways

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Conform to requirements of the CEC, latest adopted version with amendments by local AHJs.
 - 2. Furnish products listed by UL or other independent and nationally recognized testing firm.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Heavy wall Rigid Non-Metallic Conduit, shall be PVC schedule 40 manufactured in accordance with NEMA Standard TC-2, UL-651 and WC 1094A specifications.
- B. Extra heavy wall non-metallic conduit, shall be PVC schedule 80 manufactured in accordance with NEMA Standard TC-2, UL-651 and WC 1094A specifications.
- C. Galvanized Rigid Steel (GRS) conduit shall be hot dipped galvanized, zinc coated and shall comply with Underwriters Laboratories UL-6, ANSI Specification C-80.1 and Federal Specification WW-C-581E.
- D. Electrical Metallic Tubing (EMT) shall be zinc coated, with a protective coating applied to the inside surface and shall comply with Underwriter Laboratories UL-797 ANSI Specification C-80.3 and Federal Specification WW-C-563A.
- E. Electrical Non-Metallic Tubing (ENT), shall be listed to requirements of U.L. 1653, in accordance with CEC Article 362, and meet requirements of BI National Standard CAN/CSA- C22.2 No. 227.1-U.L. 1653. ENT shall be rated for 90 degrees C conductors and shall be recognized for use in 2-hour fire resistance non-load bearing and load bearing wall assemblies. ENT shall be recognized for through-penetration firestop systems as classified to meet U.L. and ICC building codes. ENT shall only be allowed for data cabling systems and will not be permitted for Fire Alarm or line-voltage systems.
- F. Flexible Metal Conduit (FMC) shall be continuous wound reduced wall galvanized steel produced to UL standards.
- G. Liquid tight flexible metal conduit shall have a thermoplastic cover over a galvanized steel core containing an integral copper ground in sizes to 1 1/4" and shall be in compliance with UL standards and CEC Article 350.
- H. Wire basket tray shall be 12" wide with 4" side rails minimum unless otherwise noted. It shall be U.L. listed and use listed connectors, elbows, tees, etc. and be cut and installed using listed equipment. Material shall be zinc electroplated steel.
- I. Cable runway tray shall be 12" wide with 4" side rails minimum unless otherwise noted. It shall be U.L. listed and use listed connectors, elbows, tees, etc. Material shall be hollow steel with gray painted finish.
- J. Manufacturers:
 - 1. Outlet Boxes: Bowers, Raco, Orbit, Steel City or equal.
 - 2. Weatherproof Outlet Boxes: Bell, Red Dot, Carlon or equal.
 - 3. Floor Boxes: Wiremold/Walker, Hubbell, Steel City, or equal.
 - 4. Junction and Pull Boxes: Circle AW, Hoffman, Wireguard or equal.
 - 5. Box Extension Adapter: Bell, Red Dot, Carlon or equal.

6. Conduit Fittings: O-Z Gedney, Thomas & Betts, Raco, Crouse Hinds, or equal.
7. Putty pads: 3M, Hilti, or equal.
8. Heavy wall rigid non-metallic conduit, Carlon, Certainteed, R&G Sloane or equal.
9. Extra heavy wall non-metallic conduit, Carlon, Certainteed, R&G Sloane or equal.
10. Galvanized Rigid Steel (GRS) conduit shall be hot dipped galvanized, zinc coated and shall comply with Underwriters Laboratories UL-6, ANSI Specification C-80.1 and Federal Specification WW-C-581E.
11. Electrical Metallic Tubing (EMT) shall be zinc coated, with a protective coating applied to the inside surface and shall comply with Underwriter Laboratories UL-797 ANSI Specification C-80.3 and Federal Specification WW-C-563A.
12. Electrical Non-Metallic Tubing (ENT), shall be listed to requirements of U.L. 1653, in accordance with CEC Article 362, and meet requirements of BI National Standard CAN/CSA-C22.2 No. 227.1-U.L. 1653. ENT shall be rated for 90 degrees C conductors and shall be recognized for use in 2-hour fire resistance non-load bearing and load bearing wall assemblies. ENT shall be recognized for through-penetration firestop systems as classified to meet U.L. and CBC building codes.
13. Flexible Metal Conduit (FMC), Alfex, American Flexible Conduit or equal.
14. Liquid tight flexible metal conduit, Anacanda (type UA), Electri-flex Liguatite or equal.
15. Floor Boxes, Single Gang, Walker/Wiremold 880 CS Series or approved equal.
16. Floor Boxes, Multiple Gang, Walker/Wiremold RFB Series or Walker Omnibox multi-service floor box with carpet plates, and/or water resistant device covers.
17. Masonry Boxes, outlets in concrete, Raco Series 690 or equal.
18. Wire basket tray, B-line, GS Metals, Cablofil, Chatsworth, FlexTray or equal.
19. Cable runway tray, B-line, CPI, Homaco, Chatsworth, FlexTray or equal.

2.2 OUTLET BOXES

- A. NEMA 1 gutter, junction and pull boxes shall be fabricated from code gage steel finished in grey enamel with screw cover fronts and concentric knockouts in all sides.
- B. NEMA 3R gutter, junction and pull boxes shall be fabricated from code gage galvanized steel with screw cover fronts and concentric knockouts in the bottom only. Any penetrations to the side, top or back shall be weatherproofed in an approved manner such as "MYERS" gasketed type hub or equal.
- C. Steel outlet boxes and plaster rings shall be galvanized rigid assemblies, either one piece pressed or factory welded construction containing the size and number of knockouts required. Steel outlet boxes shall be manufactured, sized and installed in accordance with CEC Article 314. Device Outlet: Installation of one or two devices at common location, minimum 4" square, minimum 1 1/2" deep. Single or 2 gang flush device plaster ring. Raco or equal.
- D. Luminaire Outlet: minimum 4" square with correct plaster ring depth, minimum 1 1/2" deep with 3/8" luminaire stud if required. Provide proper depth plaster ring on bracket outlets and on ceiling outlets.
- E. Construction: Provide galvanized steel interior outlet wiring boxes, of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices. Boxes shall be properly secured to the structure such that they are flush with the finish surface. Boxes shall be made structurally secure by means of the proper fastening devices.

- F. Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, plaster rings, luminaire studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations.

2.3 JUNCTION AND PULL BOXES

- A. Construction: Provide galvanized sheet steel junction and pull boxes, with screw-on covers; of the type shape and size, to suit each respective location and installation; with welded seams and equipped with steel nuts, bolts, screws and washers.
- B. Location:
 - 1. Install junction boxes above accessible ceilings for drops into walls for receptacle outlets from overhead.
 - 2. Install junction boxes and pull boxes as required to facilitate the installation of conductors and limiting the accumulated angular sum of bends between boxes, cabinets and appliances to 300 degrees.
 - 3. Locations: Junction boxes shall be located only where necessary and only in equipment rooms, closets, and accessible attic and underfloor spaces. A horizontal distance of 24" shall separate outlet boxes on opposite sides of occupancy separation walls, fire-rated walls or partitions.
 - 4. Labeling: Junction box covers shall be marked with indelible ink indicated the circuit numbers passing through the box.

2.4 CONDUIT FITTINGS

- A. Requirements: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and plastic conduit bushings of the type and size to suit each respective use and installation.
- B. Steel boxes may allow for field knock-out modifications, but shall in all other ways conform to code requirements.

2.5 FLOOR BOXES - SINGLE GANG

- A. Construction: Deep cast iron fully adjustable before and after concrete pour with all required components for complete activation. Verify required components for application of service fittings, covers, monuments, and the like, attached to floor boxes.
- B. Activations:
 - 1. Flush: Provide brass duplex or single signal cover, hinged with set screw lock. Carpet or tile finish ring.
 - 2. Monuments: Provide stainless steel monuments with power receptacle or data grommet as noted.
 - 3. Coordinate specific application of systems as noted on Drawings.

2.6 FLOOR BOXES - MULTIPLE GANG

- A. Construction: Deep cast iron, fully adjustable before and after pour. Equal to Walker/Wiremold RFB Series or Walker Omnibox multi-service floor box with carpet plates, and/or water resistant device covers. Verify color. Partition for different power or signal applications. Provide required power receptacle devices and signal grommets or receptacles as noted. Flange type shall be compatible with floor covering for either carpet or vinyl as required and shall be brass type not polycarbonate.

- B. Floor mounted boxes shall be water tight and cast iron when installed in grade level concrete slab floor, fully adjustable with interior and exterior leveling screws. Receptacle flange shall be brass with a duplex lift lid. Flange type shall be compatible with floor type. Before installation, coordinate exact location with Architect.

2.7 PUTTY PADS

- A. Intumescent moldable firestop putty designed to protect electrical outletboxes.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Conduit systems listed below are for use in installations where they are permitted to be used by CEC and/or other occupancy restrictions. The below installation methods do not intend to suggest that these materials be installed in conflict with any applicable code. Special attention to applications shall be made in building types such as wet location, hazardous locations, assembly occupancy and multi-story, but not limited to these. Requirements which are more restrictive than the CEC may be called for by the drawings and / or these specifications. These requirements must be adhered to. The Electrical Contractor shall be responsible to use the proper conduit system for the application. Exposed conduit is not allowed below ceilings or above slab of floor, without prior approval from Electrical Engineer. All conduits shall be concealed except in electrical and telecommunication rooms or where shown to be surface mounted. Exposed conduit (where allowed) shall be run square and plumb with building lines in an approved manner. Support roofmount conduits, where allowed, with minimum 12" wide approved rooftop supports (B-Line Durablok, or approved equal) unless otherwise detailed in roof requirements or as specified in roofing specification. Strap conduits to blocks with proper sized conduit straps. Spacing of support shall be a minimum as provided for in the CEC. All exposed conduit mounted below 8' above finished grade shall be strapped at a minimum of 5' spacing.
- B. Electrical Non-Metallic Tubing (ENT) shall be installed in accordance with its listed application. Only listed cement shall be used for connectors, coupling, fittings requiring cement. Unless otherwise noted, ENT systems shall be color coded: Blue for branch and/or feeder power wiring, yellow for communications systems, and red for fire alarm and emergency power systems. Use only approved and listed accessories:
 1. Electrical Nonmetallic Tubing (ENT) is designed to replace EMT, flexible metal conduit or other raceway or cable systems, for installation in accordance with Article 362 of the National Electrical Code, Section 12-1500 of the CEC, other applicable sections of the Code, and local codes.
 2. Any ENT used shall be listed to the requirements of UL Standard UL 1653 in accordance with Article 362 of the NEC and Section 12-1500 of the CEC.
 3. Any ENT used shall meet the requirements of BI National Standard CAN/CSA-C22.2 No. 227.1-UL1653 and shall be Listed/Certified in accordance to the Electrical Codes.
 4. Carlon's ENT shall be installed per the technical assessment prepared by fire cause analysis for use in 1hour and 2-hour rated construction.
 5. Penetration of fire rated walls, floors or ceilings shall use Classified Through-Penetration Firestop Systems described in the current Underwriters Laboratories Fire Resistance Directory.
 6. Fittings and outlet boxes shall be designed for use with ENT shall be listed. All fittings, boxes and accessories shall be from one manufacturer.
 7. Only Carlon ENT Blue cement recommended specifically for use with ENT and rigid nonmetallic fittings shall be used.

8. Unless indicated differently on drawings, ENT systems shall be color coded: BLUE for branch and feeder circuit wiring, YELLOW for communications, and RED for fire alarm and emergency systems, or colors can designate different voltages.
 9. ENT, fittings, and accessories shall be manufactured by Carlon.
 10. ENT shall not be used or allowed in any application where not allowed by CEC Article 362.
- C. Non-Metallic Rigid Conduit shall be used in concrete slabs, below concrete slabs on grade, or underground outside of a building slab or foundation. Maintain minimum depth requirements and cover with appropriate fill material. Conduit shall be heavy wall Schedule 40 or 80, rigid PVC only. Rigid utility P&C duct shall not be used in any application. Properly sized grounding conductors shall be installed per CEC article 250, in all non-metallic conduit branch circuit and feeder runs. PVC conduit shall be formed or field bent only with the use of properly approved bending tools such as to not decrease the internal bore of the conduit. All conduits shall be cut square and reamed of burrs. Approved and compatible glue shall be used on all PVC fittings to attain watertight joints.
- D. Galvanized Rigid Steel (GRS) conduit shall be used where exposed less than 8'-0" above finished grade to 18" below finished grade and where subject to physical damage. Conduits shall be cut square and reamed to remove burrs and sharp edges. Strap conduit below 8' above grade at 5' intervals. Unless otherwise noted, threadless setscrew and threadless weathertight fittings may be used in lieu of threaded fittings. All threaded ends entering a junction box of any type shall require one locknut on the inside and one on the outside of the enclosure and be provided with a plastic bushing or grounding bushing where necessary for proper grounding. Where exposed to moisture, a watertight hub or other approved method shall be required. All conduits shall be stubbed up straight and uniform into junction boxes, panels, cabinets, etc., and shall be (GRS) properly supported and strapped. All GRS conduit located below grade, shall be tape wrapped.
- E. Electrical Metallic Tubing (EMT) shall be used as allowed by code and as permitted by this specification. It shall not be in contact with soil or the concrete slab on the ground floor of any structure. Connectors and couplings shall be steel insulated set screw type where installed in indoor dry locations not subject to moisture. Where the potential for moisture is present, compression type weathertight fittings are required. One hole conduit straps are permitted from 1/2" to 1" and two hole conduit straps are required for size 1 1/4" and larger. EMT shall not be allowed in areas subject to severe physical damage. Install copper ground wire sized per CEC 250-122 in all EMT conduits.
- F. Flexible conduit may be used where concealed in building construction or above dropped ceilings, but shall meet the following criteria: No individual circuit path from distribution panel to last device shall exceed a cumulative length of 6' of flexible conduit from start to end. Flexible conduit shall not exceed a total directional change of 270 bending degrees in any one run between conduit terminations. Squeeze type or Jake type steel flex fittings of a grounding type are required. Flexible conduit must be supported in accordance with CEC. Where exposed to the weather, moisture, or spray down flexible conduit shall be of the liquidtight type. Fittings shall be manufactured for use with liquidtight flexible conduit. All motor connections shall be made with liquidtight flex. Flexible conduit may not be used where exposed except for last 2' of equipment connection and unless otherwise noted or approved. A copper ground wire sized per CEC 250-122 shall be installed in all flexible conduit runs. Flexible conduit may not be used exposed. Weatherproof liquid tight conduit shall not be used at roof level for equipment connections with lengths exceeding 24" nor shall it be used to circumvent a rigid conduit system in a horizontal direction. Connect recessed lighting fixtures to conduit runs with a maximum of 6' of flexible metal conduit extending from junction box to fixture.

- G. Underground conduits and transition to above grade/slab shall be as follows:
1. PVC elbows 2" and smaller are allowed, or if top of elbow is minimum 18" BFG or below top of slab, otherwise GRS elbows are required.
 2. GRS risers are required from elbow below grade to equipment (device, outlet, panel, cabinet, etc.) above grade.
 3. GRS elbows/risers to be PVC coated or 10 MIL tape wrapped (1/2" lapped) to 3" above finish grade or top of slab.
- H. Conduit Supports: Conduit runs may be supported by one-hole and two-hole straps or supports as manufactured by Unistrut, Minerallac, Caddy or equals. Supports may be fastened by means of anchors, shields, beam clamps, toggle bolts, or other approved methods appropriate for the application and size of conduit. Pipe nailers (J-hooks) may only be used for 1" conduit and smaller and only in wood frame construction. Conduit support methods are subject to review by the engineer and authority having jurisdiction for adequacy. Installations deemed inadequate shall be corrected by the contractor at no cost to the Owner.
- I. Bends and offsets shall be made with approved tools for the type of conduit being utilized. Bends shall be made without kinking or destroying the smooth bore of the conduit. Parallel conduits shall be run straight and true with bends uniform and symmetrical. Minimum radii shall be per CEC 344-24.
- J. Conduit Stub-outs below grade shall be capped with plastic cap, and identified by placing a pull box marked with correctly identified utility such as "Elec", "Tel", etc. Dimension for exact location on field record drawings. Provide lids for proper field application (i.e. traffic, incidental, pedestrian).
- K. Conduit Seals - Where below grade conduits enter structure through slab or retaining wall of building or basement, seal the inside of each conduit as follows:
1. Provide damming material around conductors 3" into conduit. Polywater or equal.
 2. Fill 3" of conduit with 3M #2123 sealing compound.
 3. Wrap conductors where they exit the conduit with 3M #2229 "Scotch Seal" mastic tape. Lap tape to approximate diameter of the raceway and wrap outside of conduit opening with (minimum) one turn.
 4. Use conduit sealing bushings type CSB (O-Z/Gedney) or equal.
 5. Empty conduits shall be sealed with standard non-hardening duct seal compound and then capped to prevent entrance of moisture and gases and to meet fire resistance requirements.
 6. Provide cable drip loop minimum 12" high.
- L. Marker tape: Place marker tape at 12" below finish grade along and above buried conduits. Label tape "CAUTION: ELECTRICAL LINES BELOW" or similar wording.
- M. Electrical and communications systems raceways routed underground shall not occupy the same trench as plumbing utilities such as sewer, water, storm drain, gas or other wet or dry gaseous utility system. A minimum of 12" of undisturbed earth is required. Where utilities must cross in closer proximity to each other due to physical constraints, 6" minimum crossing distances are allowed.
- N. Conduits, routed below footings, slabs, grade beams, columns, and other structural elements shall be installed in strict compliance with structural details and criteria shown on structural plans. Clearances below structural elements and sleeves through structural elements must be carefully planned to avoid conflict and must be approved by the structural engineer if conflict arises.

- O. All conduit or raceways passing through fire rated walls, floors, or ceilings shall be installed with a listed penetration method which protects the opening to the same rating as the assembly and is non hardening.
- P. Cable runway shall be used in equipment rooms where shown on the plans. Ladder tray installations shall conform to the requirements of CEC Article 318. The contractor shall provide all mounting hardware, connectors and bracing as required and as recommended by the manufacturer for a complete system installation.
- Q. Wire basket tray shall be used in all concealed spaces (above ceiling spaces, under buildings in access tunnels, below raised floors, etc.) unless otherwise noted. Wire basket tray installations shall conform to the requirements of CEC Article 318. The contractor shall provide all mounting hardware, connectors and bracing as required and as recommended by the manufacturer for a complete system installation. All cutting and bending of wire basket tray shall be per the manufacturer's recommendation using tools designed for that purpose. Cable loading shall not exceed the listing of the system and its support.
- R. Location: Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.
- S. Anchoring: Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry.
- T. Special Application: Provide weatherproof outlets for locations exposed to weather or moisture.
- U. Knockout Closures: Provide knockout closures to cap unused knockout holes where blanks have been removed.
- V. Mount outlet boxes, unless otherwise required by ADA, or noted on drawings, the following distances above the finished floor:
 - 1. Receptacles, Telephone, TV & Data outlets. (measured to bottom of outlet box): +15".
 - 2. Outlet above counter (measured to top of outlet box): +46".
 - 3. Control (light) Switches. (measured to top of outlet box): +48".
 - 4. Fire Alarm Manual Pull Stations, T-stats. (measured to top of outlet box): +48".
 - 5. Fire Alarm Visuals: the lower of +80" to bottom of lens, or 6" below ceiling.
 - 6. Other Outlets: As indicated in other sections of specifications or as detailed on drawings.
- W. Coordinate all electrical device locations with the architectural floor plan and interior and exterior elevations to prevent mounting devices within elements that they may conflict such as cabinetry, mirrors, planters, etc.
- X. Size outlet and junction boxes to minimum wire fill space requirements. Upsize box as required to allow ease of wire installation and device installation.
- Y. Outlet and junction boxes in fire rated walls shall be gauged and spaced so as not to exceed the maximum penetration allowed by the assembly without compromising the fire rating. If a conflict arises relative to a specific condition, the contractor shall follow the requirements of the fire authority and ask for guidance from the design team. At no time should a larger box be installed prior to resolution of conflict.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION OF ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Nameplates and warning signs where specified herein and as shown on contract documents including the following:
 - a. Nameplates and warning signs permanently installed on all electrical equipment and devices including, but not limited to, the following items:
 - 1) Enclosures for transformers, switchboards, motor control, panels, pullboxes, cabinets, motors, generators, transfer switches.
 - 2) Enclosures for all separately enclosed devices including, but not limited to, disconnect switches, circuit breakers, contactors, time switches, control stations and relays, fire alarm panels and lighting control panel.
 - 3) Wall switches not within sight of outlet controlled.
 - 4) Special systems such as, but not limited to, telephone, fire alarm, warning and signal systems. Identification shall be at each equipment rack, terminal cabinet, control panel, annunciator and pullbox.
 - 5) Devices mounted within and part of equipment including circuit breakers, switches, control devices, control transformers, relays, indication devices and instruments.
 - 2. Conductor and Cable Identification.
- B. Related Sections:
 - 1. Section 26 05 00: Common Work Results For Electrical.
 - 2. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.

PART 2 PRODUCTS

2.1 EQUIPMENT LABEL DESIGNATIONS

- A. Equipment labels indicating equipment designations both emergency and normal. Designation data per drawings or to be supplied with shop drawings approval.
- B. Panelboard labels showing panel designation, voltage, phase and source.
- C. Distribution panels, transformers, safety switches, transfer equipment, etc. Labels shall be per ANSI Z535.4 guidelines.

2.2 MATERIALS

- A. For Labels: Three layer laminated plastic or micarta with engraved white letters over black background.
- B. For Emergency Equipment: Use engraved white letters over red background.

- C. For Warning Signs: Minimum 18 gauge steel with red lettering on white porcelain enamel finish.
- D. Arc flash labels shall be provided as required by CEC Article 70E.
- E. Conductor tape number markers: TayMac MX4280 Series non-fading permanent adhesive.

2.3 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to the following:
 1. Panduit Corp.
 2. American Labelmark Co.
 3. Markal Corp.
 4. Calpico, Inc.
 5. Ideal Industries, Inc.

PART 3 EXECUTION

3.1 MOUNTING

- A. Equipment labels shall be mounted by self-tapping, threaded screws and bolts, or by rivets. Adhesive types are not acceptable unless specifically noted in this section.
- B. Conductor tape markers shall be consistently placed for ready conductor identification.

3.2 HEIGHTS ON LABELS

- A. Panelboards, Switchboards and Motor Control Centers and Special Systems Enclosures: 1/4" identify equipment designation; 1/8" identify voltage rating and source.
- B. Individual Circuit Breakers, Switches, and Motor Starters in Panelboards, Switchboards, and Motor Control Centers: 3/16" identify circuit and load served, including location of equipment.
- C. Enclosed Circuit Breakers, Enclosed Switches, and Motor Starters: 3/16" identify load served.
- D. Transformers: 3/16" identify equipment designation; 1/8" identify primary and secondary voltages, primary source and secondary load. Include location of primary source or secondary load if remote from transformer.

3.3 WARNING SIGNS

- A. Warning signs shall be permanently mounted with cadmium plated steel screws or nickel-plated brass bolts.
- B. Warning signs to read "DANGER - HIGH VOLTAGE", with letters 1 1/2" high, 3/16" stroke minimum.
- C. Provide warning sign on all doors or immediately next to door for equipment rooms, enclosures or closets containing equipment energized above 150 volts to ground as per CEC, and/or as directed by the Architect. For interior finish spaces and interior doors, signage shall be coordinated and approved with the Architect in advance of installation.

- D. Underground Warning Tape. Description: four (4) inch wide plastic tape, colored red with suitable warning legend describing buried electrical lines.

3.4 UNDERGROUND WARNING TAPE INSTALLATIONS:

- A. Install underground warning tape along length of each underground conduit, raceway, or cable six (6) to eight (8) inches below finished grade, directly above buried conduit, raceway, or cable. Where multiple lines installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.
- B. Install line marker for underground wiring, both direct buried and in raceway

3.5 PRINTED PANELBOARD DIRECTORY

1. Provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker for that panel, switchboard, or motor control center.
2. Panelboard directory shall include a legend indicating insulation color corresponding each phase and voltage in the building electrical system.
3. Copy in Owner's Manual.

3.6 ABOVE CEILING JUNCTION BOXES

- A. Labeling: Provide label on all above ceiling junction boxes.
 1. Provide permanent labeling with indelible black marker, in neat, legible print indicating the panelboard name, branch circuit number(s) and voltage of conductors within the junction box.

END OF SECTION

SECTION 26 20 00

LOW-VOLTAGE ELECTRICAL DISTRIBUTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Conditions of the Contract Documents and Division 1 - General Requirements as applicable, apply to this Section.

1.2 SUMMARY

- A. Provide all electrical distribution and motor control equipment and accessories required to distribute electrical power to all motors, outlets and systems requiring power.

1.3 QUALITY ASSURANCE

- A. New: Provide all new equipment.
- B. Single Manufacturer: All equipment of each type shall be the product of one manufacturer.
- C. UL: Equipment shall be UL listed. Service entrance equipment shall bear UL Service Entrance label.
- D. CEC: Equipment and installation shall comply with the California Electrical Code.
- E. Wet Locations: Equipment and enclosures installed outdoors and in wet locations shall be approved for the purpose.
- F. IEEE: Institute of Electrical and Electronics Engineers Standard 1015-1997 (Blue Book) Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.

1.4 LABELING

- A. Nameplates and labeling shall be provided in accordance with Section 26 05 53. All feeders shall be labeled at the feeder device.

1.5 FINISHES

- A. All equipment shall have a factory applied gray finish applied over a rust inhibiting treatment. Any items which have the finish marred shall be touched up or refinished to a new condition before final acceptance. This shall include, but shall not be limited to, sanding and properly removing rust or other contaminants and completely repainting equipment if damage is extensive. Overall acceptance is subject to approval of the Engineer.

1.6 SUBMITTALS

- A. Provide complete product data for each equipment type. Provide electric service studies when required.

- B. Submittal shall include written recommendation from manufacturer of settings for all electronic trip adjustment setting on all equipment furnished with adjustable trip settings. Contractor is responsible for adjusting all electronic trip settings per manufacturer recommendations.
- C. Electrical connections to all equipment furnished by any other division shall be coordinated with final approved equipment submittals from other divisions including but not limited to circuit breaker sizes, conduit sizes, wire sizes, fuse sizes, disconnect switch sizes and starter sizes that differ from those shown on the drawings prior to submitting Electrical Distribution Equipment submittal.

1.7 SHORT CIRCUIT CURRENT RATINGS

- A. General: All switchboards and panelboards shall be fully rated and marked with a maximum short circuit current rating. The equipment manufacturer shall have verified this rating with high-amperage testing. All short circuit current ratings are expressed as amperes RMS symmetrical at the applied voltage unless otherwise noted. All equipment shall withstand the specified level of fault current. All overcurrent devices shall interrupt the specified level of fault current.

1.8 ELECTRIC SERVICE STUDIES

- A. Standard: Submit studies in accordance with ANSI/IEEE Standard 242 Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.
- B. Submit one-line diagram for each electrical service. Key all equipment and components on diagram to items in the studies.
- C. Provide a short-circuit current analysis for each main switchboard. Short-circuit analysis shall calculate short-circuit levels at service transformer secondary, switchboard main breaker, each feeder breaker and all levels of downstream distribution equipment. Assume infinite source bus.
- D. Provide a time-current coordination study for each main switchboard. Coordination study shall compare the operating levels and times of the protective devices to the withstand levels and times that the equipment can sustain without damage or failure. Determine electronic trip unit settings necessary to achieve optimal selective coordination between 480 volt main service circuit breaker and first level of feeder distribution devices. Determine setting for all adjustments of trip units of all electronic circuit breakers that are linked by zone-selective-interlocking. Furnish time-current curves for the two (or more) levels of distribution protected with electronic trips, plus the first additional distribution level served from the switchboard feeder. Show a separate composite plot for each feeder breaker trip rating with the main breaker. Plot composite time-current curves on log-log background. Add a typical frame size of downstream molded-case circuit breaker to each switchboard feeder composite plot.
- E. Contractor shall make all adjustments to circuit breakers per electric service study and provide written documentation that all adjustments have been made.

1.9 OWNER'S INSTRUCTION

- A. Provide a four-hour period of instruction to the Owner's designated personnel upon completion of the main switchboards' installation. Review manufacturer's recommended switchboard maintenance. The Operations and Maintenance Manual shall be complete and on-site at the time of Owner instruction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Unless indicated otherwise, all equipment in this section shall be provided from a single manufacturer. The product designations listed are to establish a level of quality. Acceptable manufacturers are:
 - 1. Square D
 - 2. Siemens
 - 3. G.E.
 - 4. Cutler-Hammer

2.2 ENCLOSED SWITCHES

- A. General: Provide heavy duty enclosed switches similar to Square D Class 3100 Type HD.
- B. Switch Interior:
 - 1. All switches shall have switch blades which are visible when the switch is "OFF" and the cover is open.
 - 2. Lugs shall be front removable and UL Listed for 75 degrees Celsius conductors.
 - 3. All current carrying parts shall be plated to resist corrosion.
 - 4. Switches shall have removable arc suppressors to facilitate easy access to line side lugs.
 - 5. Switches shall have provisions for a field installable electrical interlock.
- C. Switch Mechanism:
 - 1. Switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started.
 - 2. The operating handle shall be an integral part of the box, not the cover.
 - 3. Provisions for padlocking the switch in the OFF position with at least three padlocks shall be provided.
 - 4. The handle position shall travel at least 90 degrees between OFF and ON positions to clearly distinguish and indicate handle position.
 - 5. All switches shall have a dual cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is ON and prevent turning the switch ON when the cover is open. The cover interlock mechanism shall have an externally operated override, but the override shall not permanently disable the interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.
- D. Switch Enclosures:
 - 1. Switch covers shall be attached with welded pin-type hinges.
 - 2. The enclosure shall be finished with gray baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated steel.
 - 3. The enclosure shall have ON and OFF markings stamped into the cover.
 - 4. The operating handle shall be provided with a dual colored, red/black position indication,
 - 5. All switches shall have provisions to accept up to three (3) 3/8-inch hasp padlocks to lock the operating handle in the OFF position.
 - 6. Tangential knockouts shall be provided to facilitate ease of conduit entry.

- E. Switch Ratings:
 - 1. Switches shall be horsepower rated for ac and/or dc as indicated on the plans.
 - 2. The UL Listed short circuit current rating of the switches shall be 200,000 rms symmetrical amperes when used with or protected by Class J fuses.
 - 3. Non-Fusible: 10,000 rms symmetrical amps.
- F. Fuse Clips: NEMA FU 1, Class J fuses.

2.3 SINGLE CIRCUIT BREAKERS WITH ENCLOSURES

- A. Product Description: Enclosed, molded-case circuit breaker conforming to NEMA AB 1, suitable for use as service entrance equipment where applied.
- B. Circuit Breakers: Molded case, quick make, quick break, trip free, common thermal magnetic trip.
- C. Ratings: Continuous current, poles as required, 480-volt system breaker shall interrupt short circuits up to 14,000 rms amps symmetrical; on 120/208 - 240 volt system, 10,000 amp rms symmetrical.
- D. Enclosure: NEMA AB 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R.
- E. Nameplate: Provide a nameplate showing load served.

2.4 FRACTIONAL HORSEPOWER MANUAL MOTOR CONTROLLER

- A. Square D - Class 2510 Type F.
 - 1. Description: NEMA ICS 2, ac general-purpose Class A manually operated, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light and toggle operator.
 - 2. Enclosures: ANSI / NEMA ICS 6, Type as indicated.

2.5 MAGNETIC MOTOR CONTROLLERS

- A. Square D - Class 8536 Type S.
 - 1. Description: NEMA ICS 2, ac general-purpose Class A magnetic controller for induction motors rated in horsepower.
 - 2. Coil Operating Voltage: Provide as required to interface with controls system, including control power transformer.
 - 3. Coil: Be of encapsulated type.
 - 4. Poles: as indicated.
 - 5. Size: as indicated.
 - 6. Contacts: Totally enclosed, double-break, silver-cadmium-oxide power contacts. Contact inspection and replacement shall be possible without disturbing line or load wiring.
 - 7. Wiring: Straight-through wiring with all terminals clearly marked.
 - 8. Overload Relay: NEMA ICS.
 - a. Solid State: Trip current rating will be established by selection of overload relay and shall be adjustable (3 to 1 current range). The overload shall be self-powered. Provide phase loss, phase unbalance protection, permanent tamper guard, Trip Class 10 or 20 and a mechanical test function.

- b. Outputs: Units shall be designed for addition of either a normally open or normally closed auxiliary contact and shall be field convertible. Provide one (1) set of N.O. and N.C. contacts in each starter.
 - c. Reset: Unit shall include both manual reset and remote reset using an external module.
 - d. Select overload current setting based on the motor nameplate data of the actual motor to be protected. All standard NEMA sizes may be used for the overload relay, including Size 00.
9. Enclosure: ANSI / NEMA ICS 6, Type 1, 3R or 4X.
 10. Control Power Transformers: 120 volt secondary. VA minimum, in each motor starter. Provide fused primary and secondary.
 11. Provide red LED running pilot light and H-O-A switch.

2.6 FUSES (600 VOLTS AND BELOW)

- A. Manufacturers:
 1. Bussmann.
 2. Little Fuse
 3. Ferraz Shawmut
- B. Dimensions and Performance: NEMA FU 1, Class as specified or as indicated on Drawings.
- C. Voltage: Rating suitable for circuit phase-to-phase voltage.
- D. Class J (Time Delay) Fuses
 1. Dimensions and Performance: NEMA FU 1.
 2. Voltage: Rating suitable for circuit phase-to-phase voltage.
 3. Dual-element, time delay ten (10) seconds (minimum) at 500 percent rated current.
- E. Spares: Spare fuses shall be provided in the amount of ten (10) percent of each type and size installed. Replacement for fuses and limiters blown during construction shall not count as spares.

2.7 DISTRIBUTION PANELBOARDS

- A. Manufacturers: Square D I-Line, Class 2110.
- B. Product Description: NEMA PB 1, circuit breaker type panelboard.
- C. Panelboard Bus: copper current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.
- D. Continuous current rating shall be sufficient to protect wiring and equipment served.
 1. Panels 400A and smaller, 35,000 amperes rms symmetrical.
 2. Panels greater than 400A: 65,000 amperes rms symmetrical.
- E. Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Furnish circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
- F. Main Circuit Breaker:
 1. When distribution panel has main circuit breaker, provide molded case circuit breaker with electronic trip unit. Current sensing to be true-rms.
 2. Main breaker shall have minimum interrupting rating of 65,000 amperes rms symmetrical at applied voltage.

3. Electronic trip shall be Square D micrologic with adjustable long-time, short-time and instantaneous pick-up set points.
- G. Cabinet Front: Safety dead front type. Conform to NEMA 1; NEMA 3R if located outdoors. All panelboards located in kitchen areas shall be flush mount with NEMA 4X Stainless Steel enclosures.

2.8 BRANCH CIRCUIT PANELBOARDS

- A. Manufacturers: Square D Type NQ for 208/120V, type NF for 480/277V.
- B. Product Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.
- C. Panelboard Bus: Copper current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard;
- D. For non-linear load applications subject to harmonics furnish 173 percent rated, plated copper, solid neutral.
- E. Minimum Integrated Short Circuit Rating: 14,000 amperes rms symmetrical for 208-240/120 volt panelboards; 22,000 amperes rms symmetrical for 480 volt panelboards.
- F. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.
- G. Enclosure: NEMA PB 1, Type 1 or Type 3R. All panelboards located in kitchen areas shall be flush mount with NEMA 4X Stainless Steel enclosures.
- H. Cabinet Front: Safety dead front type with concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike. Finish in manufacturer's standard gray enamel.
- I. Provide ground-fault circuit breaker for each heat trace branch circuit.
- J. Panelboards indicated to have thru-feed lugs shall be furnished with thru-feed lugs in all sections of panelboard.

2.9 MAIN SWITCHBOARDS:

- A. General: Provide universal building-type switchboards fabricated in accordance with NEMA Standard PB-2, UL Standard 891, and bearing a UL Service Entrance Label. Switchboard characteristics are 280/120 volts, 3 phase, 4 wire. Main connection and unit-mounted branch connections shall be from the rear. Group mounted branch connections shall be from the front or the rear. The entire switchboard assembly shall be similar to Square D Type QED-2. Provide with NEMA-3R weather enclosure.

- B. Structure:
1. The switchboard shall be freestanding and have front and rear alignment. Provide rear access to main device(s) and all unit-mount branch devices (2000A and less can be front access only). Provide front or rear access to group-mounted devices. Formed up steel channels bolted together to form a rigid structure to which formed up fronts, side sheets, and rear covers are bolted. Galvanized 1-1/2" x 3" mounting channels on bottom, rear, left, and right sides to close all openings at the bottom. Arrange for easy addition of future cubicles at end. Provide pull box, fabricated with unit at factory, on top of switchboard if required for proper entrances and exits of feeders.
 2. When "SPACE" is indicated on one-line diagram, provide full bussing extension to serve that space and all overcurrent device mounting hardware for the given frame size.
- C. Installation: Freestanding, level and bolted to a four (4) inch concrete pad.
- D. Instrumentation:
1. General: Monitor the incoming line with a meter per power company standards.
 2. Wiring Lugs: Provide ring lugs for all wiring terminations of potential transformers (PTs), current transformers (CTs) and current sensors. Fork lugs are not acceptable. Ring lugs are intended to minimize the chance of leads pulling apart and creating an open circuit. (Zero current reading).
- E. Phase, Neutral and Ground Bussing: Silver plated 98% conductivity copper sized to comply with NEMA Temperature Rise Standard. In addition, copper bus shall be sized on the basis of a maximum temperature rise of 65 degree C. The vertical bussing per cubicle shall be sized not less than the sum of all devices, including spare spaces, to be served from that cubicle. **The vertical bus shall be a minimum of 2000 amperes and shall be full height.** Bus supports, connections, and joints shall be bolted with SAE Grade 5 medium carbon steel bolts employing Belleville washers. Provide complete bussing, mounting provisions for circuit protective devices and space screw cover wherever the drawings indicate space only. Arrange and drill bussing for **future full capacity extension**. Provide a full length ground bus, with minimum ampacity of 1/3 phase bus ampacity. Provide full-size neutral rated at 100 percent of phase bus.
- F. Terminations: Provide proper incoming line lugs to accommodate cable shown on plans.
- G. Short Circuit Ratings:
1. Switchboard assembly of protective devices, together with the bussing and bracing, shall be fully-rated to withstand and interrupt short circuits on a system capable of delivering up to 65,000 amps RMS symmetrical at nominal system voltage.
- H. Protective Devices:
1. Switchboard Main Breaker:
 - a. Stationary mounted, manually operated, 100 percent rated molded case circuit breakers with electronic tripping system and stored energy closing mechanisms. The electronic tripping system shall be similar to Square D Micrologic Full Function Trip unit. Main breakers shall be as noted on drawings.
 - b. The breaker shall be UL Listed for continuous duty at 100% of the current rating.
 - c. Minimum interrupting rating of 65,000 amperes rms symmetrical at 208Y/120 Volts.
 - d. Local trip indicators: overload, short circuit and ground fault.
 - e. Electronic sensing systems shall be true-RMS sensing and not susceptible to adverse harmonic current effects.
 - f. Adjustments:
 - 1) The electronic trip unit shall have LSIG Trip functions.

2. Feeder Devices:
 - a. Breakers 700 Amps and Larger:
 - 1) Branch feeder breakers 700 amp and larger shall be molded case circuit breakers rated 100% with electronic trip units, similar to Square D [RJ (1600-2500A 65kaic 100%)], [PJ (700-1200A 65kaic 100%)].
 - 2) Interrupting rating shall be at least 65,000 amperes rms symmetrical at 208Y/120 Volts.
 - 3) The electronic trip unit shall have LSI trip functions.
 - 4) The breaker shall be UL Listed for continuous duty at 100% of the current rating.
 - b. Breakers 600 amps and smaller shall be type L (600A and 400A frame), J (250A frame), and H (150A frame) molded circuit breakers, AIC rating to match main breaker.
 - c. The breaker shall be UL Listed for continuous duty at 100% of the current rating.

- I. Transient Voltage Surge Suppressor (TVSS):
 1. General: Provide a Square D Class 1310 240kA surge current rated mounted in the switchboard mounted above the main circuit breaker compartment.

- J. Lightning and Overvoltage Surge Arrester:
 1. General: Provide a Square D SDSA3650 lightning and overvoltage surge arrester inside the switchboard housing, connected between the service entrance bussing and the ground bus.
 2. Description: Device shall be a heavy duty, three-phase, zinc metal oxide varistor (MOV), secondary class arrester rated for 650 volts and U.L. listed in Category (OWHX) of the Electrical Construction Materials Directory (Green Book). Device shall comply with ANSI/IEEE C62.11-1987 Standard for Metal Oxide Surge Arresters for AC Power Circuits.
 3. Installation shall comply with NEC Article 280. Provide fusing if required by installation instructions from arrester manufacturer.

- K. Identification:
 1. General: Identify each device and meter with a nameplate showing load served. Refer to Article on LABELING in Section 26 05 00.
 2. Master Nameplate: Provide a master nameplate on face of boards similar to following, with correct data shown:

Main Switchboard _____ 'MSB'
 208/120 Volts, 3 Phase, 4 Wire, 60 Hertz
 Main Bus: 1600 amps. braced for 65K RMS sym. amps.
 Date Installed:

- L. Submittal: Include at least the following:
 1. Manufacturer and Model Numbers
 2. Dimensions
 3. Cable Termination Provisions
 4. Current Ratings
 5. Voltage Ratings
 6. Short Circuit Ratings
 7. Protective Device Ratings
 8. Electronic metering system
 9. Surge Arrester
 10. Unit Elevation
 11. Bussing Schematic, Sizes and Statement of Conductor and Plating Materials
 12. Original Manufacturer Brochure and Specifications

13. Coordination drawing using dimensions of actual switchboard submitted. Show board footprint, proper clearances, and other equipment in same room.
- M. Testing: Test all devices and systems to assure proper operation.

PART 3 EXECUTION

3.1 MOUNTING:

- A. General: All equipment shall be securely fastened in place.
- B. Locations: In all cases mounting locations shall comply with the requirements of the California Electrical Code. This shall include providing suitable working clearances.
- C. Concrete Pads:
1. Provide concrete in accordance with the Division of the Specifications for that product.
 2. Indoor concrete pads shall consist of a four (4) inch pad with beveled edges extending two (2) inches beyond the perimeter of supported equipment. Switchboards shall be installed on a pad. Refer to the drawings and the specifications for each piece of equipment to determine what other equipment shall be mounted on a pad.
 3. All equipment, ground mounted outdoors, shall be mounted on a pad. Outdoor pads shall be minimum of one foot thick reinforced with #4 rebar one (1) foot on center each way. Size outdoor pads with at least four (4) feet working clearance in front of equipment and one (1) foot on all sides. Provide anchor bolts for pad-mounted equipment. Refer to Detail on drawings.
- D. Wall Mounted Equipment: Wall mounted equipment shall be suitably positioned on the wall. Equipment mounted on exterior basement wall shall have Unistrut channels between the wall and the equipment to prevent condensation problems. Where wall mounted equipment is specified, but a convenient wall not available, a suitable Unistrut mounting stanchion anchored in concrete shall be provided. In lieu of this stanchion, small devices may be mounted on to the equipment served if approved by the equipment manufacturer.
- E. Motor rated disconnects: Install disconnects in a vertical orientation with off in the down position.

3.2 DELIVERY, STORAGE AND HANDLING:

- A. General:
1. Store all types of electrical power distribution equipment in a clean, heated building affording appropriate physical protection. Control access to prevent unauthorized tampering with the equipment. However, equipment may be stored in other inside or outside environments under approved conditions.
 2. Inspect equipment when received at Project site for shipping damage. Report as required by freight carrier to recover repair or replacement costs from the freight carrier in the event damage was sustained.
 3. Covers are required unless indoor, ventilated storage conditions exist. Canvas tarpaulins or the equivalent are preferred over other coverings because they provide better humidity control and enclosure scuff protection. Where exposed to moisture, covers shall be waterproof.
 4. The manufacturer's shipping skids shall be left on the equipment to provide structural support until the equipment is set in final resting place.
 5. Refer to Section 26 05 00 for additional requirements. Contractor shall furnish new equipment to replace any equipment that is exposed to weather or subjected to other deleterious effects of construction.

- B. Approved Conditions for Equipment Storage:
1. General: Where storage conditions specified above are not available, indoor or outdoor storage shall comply with the following.
 2. Switchboards, and Other General Distribution and Utilization Equipment:
 - a. Store metal-enclosed equipment in the upright position. Provide good ventilation of the shelter and protection from dirt, moisture and physical damage.
 - b. Space heaters furnished with the equipment shall be connected to a continuous source of power of the proper rating. Where space heaters are supplied from auxiliary power transformers, care shall be taken that low-voltage heater circuits are properly isolated before power source connection to prevent inadvertent energizing of the auxiliary transformer and associated high-voltage primary wiring.
 - c. Ambient conditions may allow condensation inside waterproof covers. If condensation is occurring, temporary heaters or lamp banks shall be provided of sufficient wattage to prevent condensation.
 - d. Contractor shall ensure that equipment stored in shipping cases receives adequate ventilation to avoid mildew and prevent condensation.

3.3 GROUND FAULT PROTECTION OF EQUIPMENT:

- A. General: Provide for system performance testing as required by the California Electrical Code. Provide each ground fault relay, sensing device or ground fault protection system with instructions and a test form. The form shall be retained by those in charge of the building's electrical installation and be available to the authority having jurisdiction. The instruction content shall be as required by UL.

3.4 LABELING:

- A. Nametag: Provide a nametag for each piece of distribution equipment; see Section 26 05 53, Electrical Identification.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
 - 1. Wiring devices.
- B. Related Sections:
 - 1. Section 26 05 00: Common Work Results for Electrical.
 - 2. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.
 - 3. Section 26 05 26: Grounding and Bonding for Electrical Systems.
 - 4. Section 26 05 33: Raceway and Boxes for Electrical Systems.

PART 2 PRODUCTS

2.1 RECEPTACLES

- A. General - All receptacles shall be listed by Underwriters Laboratories, Inc.:
 - 1. Mounting straps shall be plated steel, with break-off plaster ears and shall include a self-grounding feature (this feature does not substitute for a grounding conductor terminated on grounding strap of device). Terminal screws shall be brass, brass plated or a copper alloy metal.
 - 2. Receptacles shall be of a screw terminal type, "pressure type quick wire" terminations are not allowed.
- B. Duplex receptacles shall be premium specification grade single phase, 20 ampere, 120 volts, 2-pole, 3-wire, and conform to the NEMA 5-20R configuration in NEMA WD 6. The duplex type shall have bussing break-off feature for two-circuit operation. The ungrounded pole of each receptacle shall be provided with a separate terminal:
 - 1. Wiring device color shall be standard white. Contractor to verify device color with Architect prior to procurement.
 - 2. Ground Fault Interrupter Duplex Receptacles - Shall be an integral unit suitable for mounting in a standard outlet box:
 - a. Ground fault interrupter shall be commercial grade and consist of a differential current transformer, solid state sensing circuitry and a circuit interrupter switch. It shall be rated for operation on a 60 Hz, 120 volt, 20-ampere branch circuit. Device shall meet CEC requirements. Device shall have a minimum nominal tripping time of 1/30th of a second. Devices shall meet UL 943.
- C. Receptacles; 20, 30 and 50 ampere, 250 volts: Shall be complete and match with appropriate cord grip plug. Devices shall meet UL 231.

- D. Weatherproof Receptacles: Shall consist of a listed weather resistant duplex receptacle, mounted in box with a gasketed, while in use weatherproof, cast metal cover plate and cap receptacle opening. The cap shall be permanently attached to the cover plate by a spring-hinged flap. Approved manufacturers: Intermatic WP10 Series, Thomas & Betts/Red Dot 2CK Series, or engineer approved equal.
- E. Approved receptacles are Hubbell HBL5352 Series, and Hubbell GF20, GFCI Series.

2.2 SWITCHES

- A. Toggle switches shall be totally enclosed tumbler type with bodies of phenolic compound. Toggle handles color to match receptacle device color unless otherwise specified. Approved toggle switch is Hubbell SB120:
 - 1. Shall be single unit toggle, butt contact, quiet AC type, heavy-duty general-purpose use with an integral self-grounding mounting strap with break-off plaster ears and be of a screw terminal type.
 - 2. Shall be color coded for current rating, listed by Underwriters Laboratories, Inc., and meet the requirements of NEMA WD 1, Heavy-Duty and UL 20.
 - 3. Ratings:
 - a. 120 volt circuits: 20 amperes at 120-277 volts AC.
 - b. 277 volt circuits: 20 amperes at 277 volts AC.
 - 4. The switches shall be mounted on the strike plate side of doors.
 - 5. Incorporate barriers between switches with multi-gang outlet boxes where required by the CEC.
 - 6. All toggle switches shall be of the same manufacturer.
 - 7. Key lockable switches shall be Hubbell HBL122 Series.

2.3 WALL PLATES

- A. Wall plates for switches and receptacles shall be type 302 stainless steel.
- B. Standard NEMA design, so that products of different manufacturers will be interchangeable. Dimensions for openings in wall plates shall be accordance with NEMA WD1.
- C. For receptacles or switches ganged together, wall plates shall be a single ganged plate.
- D. Wall plates for data, telephone or other communication outlets shall be as specified in the associated specification.
- E. Surface mounted boxes, NEMA1, shall be industrial grade raised galvanized steel covers. In shop areas, all receptacles shall be dust proof and or waterproof where applicable.
- F. Waterproof device covers shall be cast iron, 4-corner screw type, for FS and FD type mounting. Device covers shall be zinc galvanized finish. Weatherproof covers shall be lockable.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with the CEC, NECA "Standard of Installation", and as shown as on the drawings.
- B. Ground terminal of each receptacle shall be bonded to the outlet box with an approved green bonding jumper, and also be connected to the green equipment grounding conductor.

- C. General: Devices shall be of the type specified herein. All devices shall be installed with “pigtailed” leads from the outlet box. No device shall be used in the “feed through” application. Screw terminals shall be used to connect all devices to the circuit and shall be grounded by means of a ground wire where grounding terminals are provided in the device.
- D. Installation: Devices and plates shall be installed in a “plumb” condition and must be flush with the finish surface of the wall where boxes are recessed.
- E. Mounting heights: All control and convenience devices shall comply with California Code of Regulations Title 24 and ADA with respect to accessibility requirements. Mounting heights indicated on plans shall have precedence.
- F. Install switches with the off position down.
- G. Clean debris from outlet boxes.
- H. Provide extension rings as required to bring outlet boxes flush with finished surface or casework.
- I. Test each receptacle device for proper polarity.

END OF SECTION

SECTION 26 43 13

SURGE PROTECTION DEVICES FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. (Section 16400) – Surge Protection Devices (“SPD”), individually mounted and switchboard mounted. Switchboards: Surge Protection Device integrated in switchboards.

1.3 REFERENCES

- A. IEEE C62.41.1, IEEE Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits,
- B. IEEE C62.41.2, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits,
- C. IEEE C62.45, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits.
- D. National Electrical Code: Article 285
- E. UL 1283 - Electromagnetic Interference Filters
- F. UL 1449, Third Edition, effective September 29, 2009 – Surge Protection Devices

1.4 SUBMITTALS

- A. Product Data: Submit capacity, dimensions, weights, details, and wiring configuration.
- B. Submittals shall include UL 1449 3rd Edition Listing documentation verifiable by visiting www.UL.com, clicking “Certifications” link, searching using UL Category Code: VZCA and VZCA2:
 - 1. Short Circuit Current Rating (SCCR)
 - 2. Voltage Protection Ratings (VPRs) for all modes
 - 3. Maximum Continuous Operating Voltage rating (MCOV)
 - 4. I-nominal rating (I-n)
 - 5. SPD shall be UL listed and labeled as Type 1 or Type 4 intended for Type 1 or Type 2 applications.
- C. Upon request, an unencapsulated but complete SPD formally known as TVSS shall be presented for visual inspection.
- D. Minimum of ten (10) year warranty Manufacturer's Installation Instructions: Submit installation instructions and connection requirements.

1.5 QUALITY ASSURANCE

- A. List individual units under UL 1449 (Third Addition) and UL 1283.
- B. Single manufacturer: All equipment of each type shall be the product of one manufacturer.
- C. SPD shall comply with NEC Article 285 and shall be permanently marked with the short-circuit current rating of the device.
- D. Manufacturer Qualifications: Engage a firm with at least 5 years' experience in manufacturing transient voltage surge suppressors.
- E. Manufacturer shall be ISO 9001 or 9002 certified.
- F. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of ten (10) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- G. The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept equipment on site in factory packaging. Inspect for damage.
- B. Protect equipment from damage by providing temporary covers until construction is complete in adjacent space.
- C. Handle and store equipment in accordance with manufacturer's Installation and Maintenance Manuals. One (1) copy of this document to be provided with the equipment at time of shipment.

PART 2 PRODUCTS

1.1 SURGE PROTECTION DEVICES (SPD)

- A. Manufacturers:
 - 1. Current Technology
 - 2. Liebert
 - 3. Siemens
 - 4. Square D
 - 5. GE
- B. Product Description: Surge protection devices for protection of AC electrical circuits.
- C. Unit Operating Voltage: As indicated on Drawings.
- D. Construction:
 - 1. Finish: Factory finish of baked enamel.
 - 2. Balanced Suppression Platform: Equally distribute surge current to Metal Oxide Varistor (MOV) components to ensure equal stressing and maximum performance. Furnish surge suppression platform with equal impedance paths to each matched MOV.
 - 3. Internal Connections: Hardwired with connections using low impedance conductors and compression fittings.

4. Safety and Diagnostic Monitoring: Equipped with standard overcurrent protection:
 - a. Continuous monitoring of fusing system.
 - b. Monitor individual MOV's (including neutral to ground). Capable of identifying open circuit failures not monitored by conventional fusing systems.
 - c. Monitor for overheating in each mode due to thermal runaway.
 - d. Furnish green and red solid state indicator light on each phase. Absence of green light and presence of red light indicates which phases have been damaged. Fault detection activates flashing trouble light. Units not capable of detecting open circuit damage, thermal conditions, and over current will not be accepted.
5. Labeling: Permanently affix UL 1449 (Third Addition) suppression voltage ratings and CSA to unit.

E. Types:

1. Switchboards; locate as integral part of switchboard, coordinate mounting with switchboard manufacturer.
2. Panelboards; locate as stand-alone. Component in housing adjacent to protected panelboard.

F. Protection Modes: For Wye configured system, furnish device with directly connected suppression elements between line-neutral (L-N), line-ground (L-G), and neutral-ground (N-G). For Delta configured system, furnish device with suppression elements between line to line (L-L) and line to ground (L-G).

G. Switchboards:

1. The SPD shall be UL 1449 labeled as Type 1 or as Type 4 intended for Type 1 or Type 2 applications.
2. SPD shall meet or exceed the following criteria:
 - a. Maximum 7-Mode surge current capability shall be 300kA per phase.
 - b. UL 1449 - Third Edition Revision, *effective September 29, 2009*, Voltage Protection Ratings shall not exceed the following:

VOLTAGE	L-N	L-G	N-G	L-L	MCOV
208Y/120	800V	800V	800V	1200V	150V
480Y/277	1200V	1200V	1200V	2000V	320V

3. UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

System Voltage	Allowable System Voltage Fluctuation (%)	MCOV
208Y/120	25%	150V
480Y/347	15%	320V

4. SPD shall incorporate a UL 1283 listed EMI/RFI filter with minimum attenuation of -50dB at 100 kHz.
5. Suppression components shall be heavy duty 'large block' MOVs, each exceeding 30mm diameter.
6. SPD shall include a serviceable, replaceable module.
7. SPD shall be equipped with the following diagnostics:
 - a. Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED.
 - b. Audible alarm with on/off silence function and diagnostic test function (excluding branch).
 - c. Form C dry contacts one normally open (NO) and one normally closed (NC) for remote status monitoring.
 - d. Surge Counter

No other test equipment shall be required for SPD monitoring or testing before or after installation.

8. SPD shall have a response time no greater than 1/2 nanosecond.
9. SPD shall have a 10 year warranty.

H. Distribution and Lighting Panelboards:

1. Listing requirements: SPD shall bear the UL Mark and shall be Listed to most recent editions of UL 1449 and UL 1283. "Manufactured in accordance with" is not equivalent to UL listing and does not meet the intent of this specification.
2. Listing requirements: SPD and performance parameters shall be posted at www.UL.com under Category Code: VZCA. Products or parameters without posting at UL.com shall not be approved. (To access UL Category Code click on Certifications in the left menu bar of UL's home page. Type "VZCA" into the Category Code search box and click Search.)
3. SPD shall be UL 1449 labeled with 200kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD, per NEC 285.6.
4. SPD shall be UL 1449 labeled as Type 1 intended for use without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal overtemperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.
5. SPD shall be UL 1449 labeled with 20kA I-nominal (I-n) (verifiable at UL.com) for compliance to UL 96A Lightning Protection Master Label and NFPA 780.
6. Standard 7 Mode Protection paths: SPD shall provide surge current paths for all modes of protection: L-N, L-G, L-L, and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems
7. If a dedicated breaker for the SPD is not provided in the switchboard, the service entrance SPD shall include an integral UL Recognized disconnect switch. A dedicated breaker shall serve as a means of disconnect for distribution SPD's.
8. SPD shall meet or exceed the following criteria:
9. Minimum surge current capability (single pulse rated) per phase shall be:
 - a. Distribution applications:
 - 1) Siemens Model TPS3 09 with Maximum surge current capability of 100kA per phase.
10. UL 1449 Listed Voltage Protection Ratings (VPRs) shall not exceed the following:

VOLTAGE	L-N	L-G	N-G
208Y/120V	700V	700V	700V
480Y/277V	1500V	1500V	1500V

UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

System Voltage	Allowable System Voltage Fluctuation (%)	MCOV
208Y/120	25%	150V
480Y/277V	20%	320V

11. SPD shall include a serviceable, replaceable module (excluding Distribution).
(NOTE #11: Delete or adjust as appropriate.)
12. Service Entrance SPD shall have UL 1283 EMI/RFI filtering with minimum attenuation of -50dB at 100kHz.
13. SPD shall have a warranty for a period of ten (10) years, incorporating unlimited replacements of suppressor parts if they are destroyed by transients during the warranty period.
14. SPDs shall be equipped with the following diagnostics:
 - a. Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED.

- b. Audible alarm with on/off silence function and diagnostic test function (excluding branch).
 - c. Form C dry contacts one normally open (NO) and one normally closed (NC) for remote status monitoring.
 - d. Surge Counter
- No other test equipment shall be required for SPD monitoring or testing before or after

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify mounting area is ready for equipment.
- B. Verify circuit rough-ins are at correct location.

3.2 INSTALLATION

- A. Install in accordance with IEEE 1100.
- B. Install service entrance suppressors in switchboard.
- C. Install suppressors for panelboards adjacent to panel.
- D. Install surge counter in face of switchboard.
- E. Include surge counter for stand-alone SPD.
- F. Install with maximum conductor length of 24 inches. Install suppressor with internal fusing.
- G. Provide 30 amp, 3 pole circuit breakers in panelboards to feed SPD.

END OF SECTION

SECTION 26 50 00

LIGHTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes interior luminaires, lamps, ballasts, and accessories. Provide all luminaires complete with all new lamps, completely wired, controlled, and securely attached to supports.

1.3 SUBMITTALS

- A. Product Data: Submit dimensions, ratings, and performance data.
- B. Photometric data for each luminaire, lamp and ballast. Include indications of all options and accessories as well as finish color.
- C. Specification Review: A complete item by item, line by line specification review.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Provide luminaires listed by U.L.
 - 2. Luminaires installed in outdoor areas unprotected from weather to be U.L. Listed for wet locations.
 - 3. Insulated ceilings: Luminaires installed into insulated ceilings shall be U.L. Listed Type IC.
- B. Certification: Certify that fixtures submittal have trim compatible with ceilings being installed.
- C. Concrete for outdoor lighting poles foundations shall be provided per Section 03 30 00 - Concrete.

1.5 EXTRA MATERIALS

- A. Provide extra materials for Owners use. All parts shall be packaged in suitable carton.
- B. Provide ten (10) percent spare lamps of each lamp type. Deliver to Owner in original packaging.

PART 2 PRODUCTS

2.1 LUMINAIRES

- A. Acceptable Manufacture: Provide per Fixture Schedule on drawings.
 - 1. Engineer approved substitute: Contractor may submit luminaires from other manufacturers. Contractor shall provide a full set of submittals per paragraph 1.2 of this specification section for Engineer and Architects approval. Contractor must have approved submittals stamped and dated from the Engineer and Architect minimum 10 days prior to bid.
- B. Product Description: Complete luminaire assemblies, with features, options, and accessories as scheduled.
- C. All luminaires shall be new and of specification grade.
- D. Manufacturer nomenclature in fixture schedule or otherwise described on the Drawings is given only to show the general fixture series. Contractor shall provide fixture with all required accessories and mounting frame type.
- E. Wire guard at fixtures in mechanical, electrical, and high abuse areas.

2.2 FLUORESCENT LUMINAIRES

- A. Provide fluorescent fixtures complete with lamp ballast.
 - 1. Housing shall be fabricated with 22 gage steel, minimum. Housing shall have complete coverage of white paint, 85 percent minimum reflectivity applied by light or powder process, then baked until cured.
- B. Fluorescent fixture lenses where required, shall be light-stable 100 percent virgin acrylic, translucent conforming to minimum standards of IES-NEMP-SPI. Lens shall be pattern 12 prismatic unless noted otherwise. Thickness of material shall be nominal 0.125 inches. The lens shall be formed with a minimum of eight (8) ounces of acrylic per square foot.
- C. Parabolic fixtures shall have both ballast housing reflector covers installed including fixtures requiring only a single ballast. Static Luminaires: All luminaires shall be static type with no-air-handling functions. Punchouts closed with dampers or AIA-Pattern control blades are unacceptable.
- D. Reflectors for compact fluorescent lamps (CFL):
 - 1. All reflectors of each type to be from single manufacturer.
 - 2. CFL reflectors shall have low iridescence.
 - 3. Reflector Color: Semi-specular natural aluminum.

2.3 LED LUMINAIRES

- A. Quality Assurance:
 - 1. DOE Lighting Facts certified.
- B. LED Specifications:
 - 1. Lumen maintenance of the LEDs has been tested in accordance with IESNA LM-80-08 reporting methodology.
 - 2. CRI:>82 minimum (general); >90 healthcare and retail.
 - 3. SDCM: <2.5 in linear pendants and linear recessed; <3.5 in discrete recessed.
 - 4. R9: .0 (general office/school environments); >50 in healthcare and retail environments.

- 5. Outdoor luminaires to be rated at a minimum of 40⁰ C.
- C. Lumen Maintenance:
 - 1. Minimum L70 at 50K hours based on TM-21 Addendum A Lifetime report at an ambient temperature of 25⁰ C, outdoors at an ambient temperature of 40⁰ C.
- D. Thermal Testing:
 - 1. ISTM testing in accordance to UL 1598-2008.
- E. Driver:
 - 1. 0-10V enabled.
 - 2. Output Class 2 rated.
 - 3. Dimming range: 5-100%.
 - 4. Constant current.
 - 5. THD @ max load: <20%.
 - 6. Power factor: >0.95
 - 7. Environment protection rating: UL Damp and dry.
 - 8. Approbations: certified to UL8750, UL1310, UL935, CSA-C22.2 No. 250.13-12, CSA 22.2 No. 223.
 - 9. ROHS Compliant
- F. Fixture photometry:
 - 1. Conducted by a NVLAP accredited testing lab with IESNA LM 79-08.
 - 2. System flux measured in delivered lumens.
- G. Warranty:
 - 1. Provide 5 year total system warranty.

2.4 COMPACT FLUORESCENT LAMP BALLAST

- A. Manufacturers:
 - 1. CFL ballast shall be furnished by luminaire manufacturer.
 - 2. Manufacturers:
 - a. Advance Transformer
 - b. ESI
 - c. Lightolier
 - d. Motorola
 - e. Magnetek
 - 3. All CFL ballast shall be solid state electronic type.
- B. Efficiency: All ballast shall comply with Public Law 100-357; "National Appliance Energy Conservation Amendments of 1988". Ballast shall be marked with symbol "E-inside-a-circle".
- C. Standard: UL Listed, 60 hertz line frequency.
- D. CFL Starting Circuit:
 - 1. CFL lamps 4 pin modified rapid start.
- E. Ballast factor of 0.95 minimum.
- F. Class P thermal protector
- G. Ballast shall have Class A sound rating.

- H. Minimum starting temperature indoors: 50 degrees Fahrenheit.
- I. Total harmonic distortion of 10 percent or less.
- J. Power Factor of 90 percent minimum.
- K. Lamp Shutdown Protection: Ballast shall detect lamp fault and disconnect lamp from circuit per NEMA recommendations for CFL lamp shutoff circuits.
- L. Warranty: Five (5) years.
- M. Voltage: Branch circuit voltage connection shall be readily adjustable dual voltage (120/277) ballasts

2.5 SOLID STATE ELECTRONIC BALLAST

- A. Manufacturers:
 - 1. Advance Transformer Standard Series.
 - 2. Universal Lighting Technologies, Inc.
 - 3. Howard Industries Precision, Inc.
 - 4. Osram Sylvania / Motorola Gold Edition
 - 5. SLI Lighting
- B. Product Description: High Frequency Solid State Electronic Program Start ballast suitable for lamps specified, with voltage to match luminaire voltage.
- C. Lamp Compatibility:
 - 1. Ballast shall be two or three lamp type as required by Luminaire quantity.
 - 2. Ballast shall not reduce the rated life published by the lamp manufacturer.
- D. Voltage: Branch circuit voltage connection shall be readily adjustable dual voltage (120/277) ballasts.
- E. Inrush Current: Submit ballast manufacturer published data for inrush current for each type of electronic ballast required.
- F. Standards:
 - 1. Power Factor: 0.95 minimum for 20 percent THD models and 0.99 for 10 percent THD models.
 - 2. Total harmonic distortion, 20 percent or less.
 - 3. Ballast Warranty: Ballast shall have five (5) year written warranty from date of manufacturer against mechanical or electrical defects under normal conditions of use.
 - 4. CBM Label: Provide fluorescent ballast comply with Certified Ballast Manufacturers Association (CBM) Standards and carry the CBM Mark on the label.
 - 5. Frequency: 60 hertz line frequency.
 - 6. ANSI Ballast Factor: Minimum ballast factor of 0.85.
 - 7. UL Listed and Class P.
 - 8. When located outdoors provide suitable for starting lamps at 0 Degrees F.

2.6 HIGH INTENSITY DISCHARGE (HID) BALLASTS

- A. All recessed HID fixtures shall be thermally protected at the fixture. Remote ballast shall have thermal protection and line fusing.
- B. All HID ballast shall be High Power Factor type constant wattage.

- C. Ballast Circuit: Shall be magnetic-regulator or auto regulator.
- D. Product Description: ANSI C82.4, metal halide lamp ballast, suitable for lamp specified, with voltage to match luminaire voltage.

2.7 FLUORESCENT LAMPS

- A. T8 Fluorescent:
 - 1. Lamp Color: Provide NEMA color designated RE 741 lamps. Lamp color temperature shall be 4100 Kelvin with CRI of 75 minimum. Lamp shall have rare earth triphosphor coating.
 - 2. Watts: All lamps shall be reduced wattage energy saving. Provide four (4) foot lamps rated at 32 watts.
 - 3. Reduced Mercury: Four (4) foot T8 lamps shall be reduced mercury type. Lamps shall be Philips Alto Series, Osram Sylvania ECO Series or GE reduced mercury with green caps.

2.8 EMERGENCY BATTERY PACKS

- A. Provide Emergi-Lite FPSIU series, or Engineer approved substitute, battery pack for fluorescent fixtures designated to have emergency battery back-up.
- B. Fixture shall include lighted push button test switch installed in visible, accessible location adjacent to fixture.
- C. Provide unswitched alternating current power source per manufacturer's instructions.
- D. Provide connection to local switch where indicated on drawings, connect such that fixture can be controlled on/off from local switch without discharge of battery.
- E. For fixtures designated to have emergency battery pack and be on a contactor controlled circuit, provide unswitched alternating current source ahead of contactor and wiring as required to allow automatic on/off control from the contactor without discharge of battery and local on/off switching where indicated.
- F. Battery pack shall provide 1100 lumen output for 90 minutes per 2' x 4' light fixture.
- G. Provide integral battery pack for all exit signs where emergency generator power is not available. Battery pack shall provide minimum of 90 minutes output.

2.9 EMERGENCY LIGHTING AUTOMATIC TRANSFER SWITCHES

- A. Provide automatic transfer switch on all lighting fixtures shown to be on emergency.

2.10 HID LAMPS

- A. All lamps shall be clear unless indicated on the Drawings as phosphor-coated or required to be phosphor-coated by fixture manufacturer for proper photometric performance.
- B. Protect HID Lighting fixtures on the side of the ballast with fuse holder. Size and type of fuse shall be per ballast manufacturer.

2.11 DOWNLIGHT FIXTURES

- A. Provide recessed light fixtures with trim rings compatible with the ceiling material where fixture is to be installed.

2.12 COMPACT FLUORESCENT LAMPS (CFL)

- A. Provide Lamp with NEMA color RE 835. Lamp color temperature of 3500 Kelvin. Lamp color rendering index shall be 82 minimum.
- B. CFL shape shall be triple tube, installed vertical, unless luminaire schedule on drawings states otherwise. Provide Phillips PL-T Series Amalgam CFL or Engineer approved substitute.

2.13 ACCEPTABLE LAMP MANUFACTURERS

- A. Manufacturers:
 - 1. General Electric
 - 2. Osram Sylvania
 - 3. Venture Lighting
 - 4. North American Phillips
- B. Products shall be produced by manufacturers shown or as scheduled from each type of lighting fixture.
- C. Furnish all lamps of each type from the same manufacturer.

2.14 EXIT SIGNS

- A. Exit signs shall meet visibility requirements and be listed per UL 924 "Emergency Lighting and Power Equipment" and shall also meet Federal, State and Local Codes.
- B. Chevron Directional Indicator: Provide Chevron per NFPA 101 Section 5-10.4.1.2.
- C. Product Description:
 - 1. LED Exit Sign:
 - a. Provide exit sign with Light Emitting Diodes (LED) illuminance source. Cover LED with diffuser.
- D. Housing: Diecast aluminum with stencil face and matte white paint finish.
- E. Input Voltage: 120/277 volt, dual input voltage.
- F. EPA Energy Star Label.
- G. Wire Guards: Install wire guard on all exit signs installed in gyms, lockers rooms, and athletic wing.

2.15 OUTDOOR LUMINAIRE POLE ASSEMBLIES

- A. Outdoor Pole assemblies shall consist of a pole base, pole, luminaire or group and lighting circuit wiring.
- B. Diesel Standard: 2000 (IBC) International Building Code. Section 1609 requires wind forces on structure to be determined by the provisions of ASCE 7.

- C. Minimum Wind Speed: 120 miles per hour.
- D. Metal poles shall comply with NEC 410-15(b).
- E. Pole Material: Steel.
- F. Pole Shape: Round tapered.
- G. Pole finish shall match luminaires along mounting arms and bolt covers. Provide polyester powder coat finish on pole and luminaire, 3 mil thick.
- H. Pole accessories to include handhole and cover, full matching anchor bolt cover, anchor bolt kit, template, washers and leveling nuts.

PART 3 EXECUTION

3.1 EXISTING WORK

- A. Disconnect and remove abandoned luminaires, lamps, poles and accessories.
- B. Extend existing luminaire installation using materials and methods compatible with existing installation, or as specified.
- C. Clean and repair existing luminaires to remain or to be reinstalled.

3.2 INSTALLATION

- A. General: All luminaires shall have proper supports.
- B. Install suspended luminaires using pendants supported from swivel hangers.
- C. Locate recessed ceiling luminaires as indicated on Drawings.
- D. Install surface mounted ceiling luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- E. Chain Hung: Unless otherwise indicated all fluorescent fixtures in Mechanical, Electrical and Elevator Equipment Rooms shall be chain hung. Verify exact mounting height with Architect before installing fixtures. Provide pendant hangers when equipment room has fire-resistive ceiling.
- F. Suspended Ceilings:
 1. Provide means of support for luminaires per NEC 410-36. T-bar clips shall be installed on the luminaire and shall be field secured to the inverted ceiling tees so that the luminaire is securely fastened to the ceiling system framing members.
 2. Ceiling tiles shall not bear the weight of luminaires. Surface mount luminaires, recessed downlights, light track, exit signs, etc. shall be supported by proper frames or other attachment to main ceiling system grid or building structure above ceiling.
 3. Luminaires shall be centered in ceiling tile.
 4. Luminaire shall have flange or trim ring for closure of ceiling cutout or opening.

5. Fire-rated Ceiling Assembly: For Luminaires to be flush-mounted into a fire-rated ceiling or surface mounted to a fire-rated ceiling, install with independent, secure support. Raceway, cable assemblies, boxes and fittings located above a fire-rated floor/ceiling or roof ceiling assembly shall not be secured to, or supported by, the ceiling assembly including the ceiling support wires. Provide an independent means of secure support. Independent support wires shall be distinguishable by color, tagging, or other effective means from those that are part of the fire-rated design.
- G. Verify weights and recommended mounting methods of all luminaires with manufacturers. Furnish and install supports. Luminaires weighing more than 30 pounds shall be supported independently of the outlet box.

3.3 LOCATIONS

- A. Luminaires shown on the Electrical Drawings represent general arrangements only. Refer to Architectural Drawings and to Architect on jobsite for more exact locations. Coordinate location with all other trades before installation. Coordinate all light fixtures in Mechanical Rooms with the final installed piping and ductwork layouts. Adjust fixture mounting height and location if required so that light output is not obstructed by piping and ductwork.

3.4 FIRE INTEGRITY OF CEILING PENETRATIONS

- A. Where ceiling is part of a fire-rated assembly, maintain integrity of that assembly with methods given in Section Electrical Hangers and Supports. Obtain ceiling system UL Fire Resistance Directory Design Number from Architectural Drawings.

3.5 AIMING AND ADJUSTMENT

- A. General: All adjustable lighting units shall be aimed, focused, and locked by the Contractor under the supervision of the Architect/Owner. All aiming and adjusting shall be carried out after the entire installation is complete.

3.6 LAMPS

- A. Clean all lamps after installation.

3.7 CLEANING

- A. Lenses: Clean lenses of all luminaires after space is finished and prior to project acceptance.
- B. Louvers: Remove plastic bag from parabolic louver luminaires after space is finished and prior to project acceptance. Do not remove bags until luminaires have been cleared by the air-balance subcontractor.

3.8 OUTDOOR LUMINAIRE POLES

- A. Pole Base: Do not grout space between pole base plate and top of concrete pole foundation. Leave open to allow water to drain and for pole to breathe. If grout is recommended by pole manufacture in space between pole base plate and top of concrete pole foundation, provide grout with drain hole through grouting.
- B. Pole Delivery: Unwrap pole upon delivery to job site, unless otherwise instructed by pole manufacturer. Wrapped poles exposed to weather that show wrapper striping or other deterioration of finish shall be replaced at Contractor expense. Replacement shall be new pole or pole refinished at pole factory.

- C. Installation:
1. Poles shall be erected only with luminaire(s) or equivalent damping device, unless otherwise instructed by pole or luminaire manufacturer. Poles installed without luminaires are subject to increased modes of vibration.
 2. Do not level pole with shims; leveling nuts above and below pole baseplate provide flexible adjustment and long-term holding of pole position.
 3. Provide anchor bolts and pole manufacturer's bolt template prior to concrete formwork for pole bases.
 4. Minimum wire size for circuit tap inside pole shall be AWG #12.
 5. Install pole base cover. Cover shall rest on top of concrete pole foundation and completely conceal air space under pole base plate.
- D. Fusing:
1. Install fuse holder and fuses as noted in pole base detail on Drawings.
 2. All ballast-controlled luminaires shall be protected by Busmann Fuses FNQ with Holders HEB (1-pole) or (2-pole) HEX. Fuse(s) and holder shall be mounted inside pole at handhole. Size of fuse to be recommended by the luminaire manufacturer.

3.9 RFI

- A. Provide flexible braided metal electrical bonding strap from grounded housing to door frame of all fluorescent parabolic fixtures in designated rooms. Bonding strap shall be braided conductor designed for field installation to either long door side.

END OF SECTION

SECTION 27 10 00

CATEGORY 6A STRUCTURE CABLING SYSTEM (SCS)

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 RELATED WORK

- A. All Division 26 as it relates to this scope of work.

1.3 DESCRIPTION

- A. Summary of Work:
 - 1. Provide a complete and tested Structured Cabling System (SCS) for the interconnections of the Local Area Network (LAN). The SCS shall include fully terminated unshielded twisted pair cables, fiber optic cabling, raceways, conduit, back boxes, copper/fiber optic termination components, station mounting hardware, fiber optic enclosures, patch panels, copper/fiber optic patch cables, relay racks/cabinets, and other incidental and miscellaneous premises wiring system hardware as required for a complete, tested, and usable system that is in compliance with the latest NEC, ANSI/EIA/TIA, BICSI, and Authorities Having Jurisdiction codes and standards. The installation shall comply with all applicable requirements, design guidelines, and standards in effect at the job site and as indicated in the Drawings and Specifications.
 - 2. If there are any discrepancies between the drawings and specification or among themselves, the contractor shall request clarification prior to providing pricing for the scope of work. If a request is not issued and a response not provided via a posted addendum, the contractor shall provide pricing for the most costly scenario and obtain clarification during the course of the project.

1.4 QUALITY ASSURANCE

- A. Acceptable manufacturers:
 - 1. The equipment/products described herein, and furnished per these specifications shall be the product of one manufacturer. All references to model numbers and other detailed descriptive data is intended to establish standards of design performance, and quality, as required
 - 2. The approved manufacturers shall provide a complete CATEGORY 6A solution with a 40 year performance warranty (nCompass).
 - 3. Acceptable product connectivity shall be manufactured by Ortronics and the acceptable cable shall be manufactured by PANDUIT or approved equal. Only the manufacturers listed in this paragraph will be accepted.
- B. Installer Qualifications:
 - 1. The Data Cable System Installer shall be licensed and shall meet all applicable regulations of the State of California and Department of Labor insofar as they apply to this type of system. The proposer shall be a firm normally employed in the low voltage and data cabling industry and shall provide a reference list of ten (10) large-scale projects and contact names confirming successful CATEGORY 6A premises wiring system installations.

2. The SCS Installer shall be a Panduit, local area, integrator of the manufacturer's product and must be able to provide the manufacturer's maximum available warranty on the entire SCS. The contractor's certification must have been obtained and held within 75 miles of the project's location.
 3. The installing contractor must have a full-time employed RCDD (Registered Communications Distribution Designer) on staff. Current RCDD certification shall be provided in the product submittals.
 4. All individuals installing the SCS must be employees of the certified installer and at least 30% of the installing staff shall have undergone a training class given by the manufacturer. Current certification indicating the successful completion of the training course shall be available upon request at the project and submitted in the contractor's product submittals.
 5. The proposing contractor and the installing contractor must be the same company. No subcontractor to the proposing SCS contractor will be allowed for any portion of the SCS scope of work.
- C. Pre-Construction Meeting:
1. The successful Contractor shall attend a mandatory pre-construction meeting with the project's consultant and individuals deemed necessary by the Owner's representative prior to the start of the work. No SCS work shall begin prior to this meeting.
- D. Acceptance:
1. The Owner's representative reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds.
- E. Warranty:
1. The selected system installer shall be a certified installing contractor of product and hold current certification. Contractor shall be shall provide a 40 year end to - end performance warranty on all products installed. The proposer shall provide current certification documentation. The performance warranty shall be issued by the manufacturer and shall warrant that ALL Enhanced CATEGORY 6A cable links have been tested bi-directionally (end to end) using a Level 2 or better tester, per TSB-67, and that all test results conform to the most current TIA/EIA-568-A and/or TSB-67 Link values.
 2. The warranty will also cover multimode fiber optic cabling. Performance testing shall be conducted in accordance with ANSI/EIA/TIA-526-14 Standard, method B.
 3. The warranty will stipulate that all products used in this installation meet the prescribed mechanical and transmission specifications for such products as described in ISO/IEC 11801, ANSI/TIA/EIA-568-A, or EN 50173. Quality and workmanship evaluation shall be solely by the Owner/Designer and designated representatives.

1.5 REGULATORY REQUIREMENTS

- A. Standards: All work shall be performed in accordance with the latest revisions of the following standards and codes:
1. Latest Local Codes and Amendments
 2. 2008 National Electrical Code
- B. Other References:
1. TIA/EIA-568-B Commercial Building Telecommunications Wiring Standard
 2. EIA/TIA-569 Commercial Building Standard for Telecommunication Pathways and Spaces.
 3. TIA/EIA-606 The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

4. TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.
5. EIA/TIA 455-A Standard Test Procedure for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices and Other Fiber Optic Components.
6. TIA/EIA TSB 67 Transmission Performance Specification for Field Testing of Unshielded Twisted-Pair Cabling Systems.
7. TIA/EIA TSB 72 Centralized Optical Fiber Cabling Guidelines
8. ISO/IEC 11801 Generic Cabling Standard
9. EN 50173 Generic Cabling Standards for Customer Premises
10. ANSI/EIA/TIA 526-14 Optical Power Loss Measurements of Installed Multimode Fiber Cable Plan.

C. Governing Codes and Conflicts: If the requirements of these specifications or the Project Drawings exceed those of the governing codes and regulations, then the requirements of these specifications and the Drawings shall govern. However, nothing in the Drawings or Specifications shall be construed to permit work not conforming to all governing codes, regulations, and manufacturer installation requirements.

1.6 ABBREVIATIONS

A. The following abbreviations are used in this document: DC Direct Current IDF Intermediate Distribution Frame MDF Main Distribution Frame PBX Private Branch Exchange UTP Unshielded Twisted Pair

1.7 SUBMITTALS

- A. Project Initiation:
1. Within fourteen (14) days of Notice to Proceed, the data network system installer shall furnish the following in a single consolidated submittal:
 - a. Permits: The Contractor shall obtain all required permits and provide copies to the Owner/Architect/Engineer.
 - b. Product Literature: Complete manufacturer's product literature for all cable, patch panels, cross-connect blocks, cable supports, cable labels, outlet devices, and other products to be used in the installation. In addition, whenever substitutions for recommended products are made, samples (when requested by the Owner/Designer) and the manufacturer's supporting documentation demonstrating compatibility with other related products shall be included. The submittal shall have some type of distinguishing marker or pointer to indicated what specific product is to be provided
 - c. Construction Schedule: A time-scaled Construction Schedule, using PERT/CPM, indicating general project deadlines and specific dates relating to the installation of the cable distribution system.
 - d. Testing: Proposed Contractor CATEGORY 6A UTP cable test result forms, fiber optic cable test result forms and a list of instrumentation to be used for systems testing.
 - e. Specification Compliance: A letter shall be provided stating, by section and subsection, that the SCS installer complies with the ENTIRE specification section. If the installer intends to deviate from any portion of the specifications, a detailed explanation of reason in which the installer would like to deviate shall be provided in addition to the specification compliance letter. NO DEVIATIONS SHALL BE ACCEPTABLE UNTIL THEY HAVE BEEN ACCEPTED BY OWNER.

- f. Certifications: The contractor shall submit all of the following certifications and the certifications must contain dates which are valid from the date of proposal and not expire any sooner than 12 months after substantial completion of the project.
 - 1) BICSI RCDD Certification: This certification must be held by an on-staff, full-time employee of the SCS installer. The holder must be staffed out of the office that is located within 75 miles of the project.
 2. Panduit Certification: This certification has been obtained by the SCS installer's office that is located within 75 miles of the project and shall be a company certification, not an individual certification.
 3. Panduit Certification: This certification must be held by at least 30% of the, on-site, staff and be made available at the site if requested by the owner, architect, and/or project's technology consultant.
 4. Fiber Optic Technician Certification: This certification must be held by the on-staff/on-site individual that is supervising the fiber optic installation and performing the fiber optic terminations and testing.

- B. Shop Drawings:
 1. Submit the following items, for Owner review and approval, within twenty-eight (28) days of notice to proceed:
 - a. Proposed circuit routing and circuit grouping plan prepared by a BICSI certified RCDD (Registered Communications Distribution Designer). The RCDD certification must be current. Identifiable, separate routing shall be shown for both the station cabling and the MDF-to-IDF tie cabling.
 - b. In addition to the cable routing, the submitted drawings shall indicate the following, even if the following is expected to be provided by the project's electrical or general contractor:
 - 1) Location of wall penetrations (all penetrations shall be sleeved and contain protective bushings at both ends)
 - 2) Location of sleeved wall pass-thru
 - 3) Size of sleeve at each location installed
 - 4) Quantity of cable passing through each sleeve
 - 5) Location of drops in each room (quantity or labeling of drops are not required in the submittal plans. Labeling shall be provided in the closeout plans and quantities shall be as per the contract documents, addendums, and issued changes. Each drop shall be labeled for the type of outlet that it is)
 - 6) Conduit routing, size, quantity, and stub-up locations for all floor mounted outlets.
 - c. Drawing Compliance: A letter shall be provided stating that the SCS installer complies with the ENTIRE project drawing, including all general, keyed, and notes to contractor. If the installer intends to deviate from any portion of the specifications, a detailed explanation of reason in which the installer would like to deviate shall be provided in addition to the specification compliance letter. **NO DEVIATIONS SHALL BE ACCEPTABLE UNTIL THEY HAVE BEEN ACCEPTED BY THE OWNER.**

- C. Close-out Procedures:
 1. Two (2) copies of the following documents shall be delivered to the building owner's representative at the time of system acceptance. The close out submittals shall include:
 - a. Inspection and Test Reports: During the course of the Project, the Contractor shall maintain an adequate inspection system to ensure that the materials supplied and the work performed, conform to contract requirements. The Contractor shall provide written documentation that indicates that materials acceptance testing was conducted as specified.

The Contractor shall also provide documentation, which indicates that all cable termination testing was completed and that all irregularities were corrected prior to job completion.

- b. Provide complete test reports for all cabling and devices that comprise system as outlined in this document.
- c. Include the Name, address and telephone of the authorized factory representative with a 24-hour emergency service number.
- d. The manual shall also include Manufacturer's data sheets and installation manuals/instructions for all equipment installed, a list of recommended spare parts.
- e. Generic or typical owner's instruction and operation manual shall not be acceptable to fulfill this requirement.
- f. An up-to-date record ("as-built") set of approved shop drawing prints that have been revised to show each and every change made to the structure cabling system from the original approved shop drawings. Drawings shall consist of a scaled plan of each building showing the placement of each individual item of the technical cabling system equipment as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway.
- g. As-built Drawings shall include cable pathways, camera locations with correct labeling and MDF/IDF locations. The as-built drawings shall be prepared using AutoCad 2013 or later. Provide the Owner with electronic versions of the as-builts on thumb drive media.
- h. All drawings must reflect point to point wiring, device address and programmed characteristics as verified in the presence of the engineer and/or the end user unless device addressing is electronically generated, and automatically graphically self-documented by the system.
- i. A copy of the manufacturer's warranty on the installed system.
- j. Any keys to cabinets and/or equipment and special maintenance tools required to repair, maintain, or service the system.
- k. Operating and Maintenance Instructions for all devices within the system. These instructions shall reflect any changes made during the course of construction, and shall be provided to the Owner, for their use, in a three-ring binder labeled with the project name and description. (4 copies)
- l. Upon completion of the work and at a time designated by the Architect or owner, provide formal training sessions for the Owner's operating personnel to include location, operation, and maintenance of all included systems and equipment. Minimum amount of training time shall be at least 4 hours.
- m. One (1) 30" x 42" laminated floor plan sheets illustrating technology drops and cable designation. Contractor shall provide one complete floor plan sheet for each telecommunications room (MDF or IDF)

PART 2 - PRODUCTS

2.1 GENERAL

- A. Installation: The cabling shall be installed per requirements of the manufacturer and the Project Documents utilizing materials meeting all applicable TIA/EIA standards. The Contractor is responsible for providing all incidental and/or miscellaneous hardware not explicitly specified below as required for a complete and operational system.
- B. Materials: Materials shall be as listed or shall be approved equivalent products of other manufacturers meeting the intent and quality level of the TIA/EIA specifications. All approved equivalent products will be published by addendum ten days prior to proposal for Architect/Engineer to review.

- C. Testing: All installed cabling shall be tested 100% good after installation by the Contractor. All final test results shall be delivered to owner at completion of project. Refer to closeout requirements listed under section 1.5.
- D. Ratings: All products shall be new and brought to the job site in the original manufacturer's packaging. Electrical components (including innerduct) shall bear the Underwriter's Laboratories label. All communications cable shall bear flammability testing ratings as follows: CM Communications Cable CMP Plenum Rated Communications Cable CMR Riser-Rated Communications Cable
- E. Initial Cable Inspection: The Contractor shall inspect all cable prior to installation to verify that it is identified properly on the reel identification label, that it is of the proper gauge, containing the correct number of pairs, etc. Note any buckling of the jacket that would indicate possible problems. Damaged cable or any other components failing to meet specifications shall not be used in the installation.
- F. Cable Lubricants: Lubricants specifically designed for installing communications cable may be used to reduce pulling tension as necessary when pulling cable into conduit.
 - 1. Approved Products
 - a. Twisted-pair cable: Dyna-Blue American Polywater
- G. Fire Wall Penetrations: Any penetration through firewalls (including those in sleeves) will be resealed with an Underwriter Laboratories (UL) approved sealant.
 - 1. Approved Products
 - a. Wiremold Flamestopper - #FS4R-RED
 - b. Precut 4" conduit - #FSPCC4758

2.2 CABLE ROUTING/PATHWAY

- A. Cable Tray: Metal cable tray shall be provided to affix to the top of all floor mount racks. Cable tray shall be used to brace racks to walls and to route cable from walls to racks in communication closets.
 - 1. Approved Products:
 - a. Ladder Rack Straight Sections: Ortronics #OR-TRT10 (black). Provide vertically down wall and horizontally to rack.
 - b. Ladder rack Curved Section: Ortronics #OR-TRTC1-12B (black), Provide for each transition from vertical wall run to horizontal run.
 - c. Ladder Rack 90° Horizontal E-Bend Section: Ortronics #OR-TRTHR-12B (black). Provide as required.
 - d. Rack to Runway Mounting Plate: Ortronics #OR-JP06-12B (black). Provide one each per rack.
 - e. Wall Angle Support Kit: Ortronics #OR-P129240HB (black). Provide as required per ladder tray and wall junction.
 - f. End Cap Kit: Ortronics OR-2-E1-25C-A (black). Provide as required per exposed end of ladder tray
 - g. Junction Splice Kit: Ortronics #OR-P820147H (black). Provide as required per junction.
 - h. Ladder Rack Elevation Kit, Ortronics #OR-REK-2-3
 - i. And all applicable installation accessories.
- B. Cable Support System: All low voltage cabling shall be installed and supported using a Caddy Cable Cat or Arlington Loop cable support system at 48" intervals unless installed in conduit. Do not exceed manufacture recommendation for the quantity of cables supported in an individual support.
- C. All cable bundles shall be grouped together using plenum rated Velcro for the entire run above and below the ceilings.

- D. Innerduct shall be bright orange and shall be labeled fiber optic cables from fiber patch panel to conduit or plenum entrances. Innerduct installed in plenum rated ceilings shall be plenum rated.
 - 1. Approved products
 - a. Carlon
 - b. Dura-line

2.3 STATION WIRING

- A. Wire: The data and voice wire provided for all outlets shall be (CATEGORY 6AA) unshielded twisted pair, four-pair, 24 AWG solid copper conductor, meeting the intent and quality level of the TIA/EIA-568-B Commercial Building Wiring Standard. Refer to floor plan and data outlet legend for number of active data ports to specified faceplates.
 - 1. Approved Products: For all voice and data connections:
 - a. Plenum-Rated PANDUIT (blue color for all voice/data drops on entire project)
 - 1) Panduit Model #PUR6XCO4xUG
- A. Testing: The CATEGORY 6AA four-pair UTP cable must be UL Performance Level tested. Each 1000 foot spool must be individually tested with test results affixed to the spool. ALL CABLE MUST BE PROVIDED ON NEW 1000 FOOT SPOOLS. NO SHORTS WILL BE ALLOWED.
- C. Rating: Cable installed in conduit shall be non-plenum rated. Cable not installed in conduit shall be plenum rated if installed in plenum ceiling space, non plenum rated otherwise.
- D. All cable shall be routed to the center of the room in which it is serving and then route to the outlet location that it is intended for.
- E. Provide 10' service loop at all headend locations properly supported above ceiling. Provide 3' service loop at each workstation outlet properly supported above ceiling. All workstation service loops shall be made in figure eight configurations, no exceptions.

2.4 STATION HARDWARE

- A. Flush Mount Jacks: Flush mount jacks shall be high quality CATEGORY 6AA RJ45 modular jacks with circuit board construction and IDC style or 110-style wire, T568B terminations. Jacks shall meet EIA/TIA TSB40 recommendations for CATEGORY 6A connecting hardware.
 - 1. Approved Products – Data, Wireless, Security and Analog Jacks:
 - i. Data (Blue) – Panduit# CJX6x88TGBU
 - ii. Wireless (Orange) – Panduit# CJ6x88TGGR
 - iii. Security (Green) - Panduit #CJ6x88TGYL
 - iv. Phone – (White) Panduit #CJ6x88TGIW
 - v. Speaker/Clock (RED) – Panduit #CJ6x88TGRD
 - 2. All blank inserts shall be gray.
 - 3. Provide 10% overlap of all colors of TracJack Modules for future expansion of additional network drops
- B. Faceplates: Faceplates shall be a 4-port, flush mounted,
 - 1. 4-Port Single Gang, Product Code OR-40300456 for stainless
 - 2. Provide distinguished signage on each door of the IDF and MDF communication rooms stating, "Authorized Personnel Only"

3. Provide within the MDF yellow caution striping three feet out from around the perimeter of the row of network and CCTV cabinets.
 4. Provide wall mounted handset faceplates where applicable for wall mounted phone. Refer to floor plan for locations. Part #OR-40300637
 5. Provide Mounting Straps (where applicable)
- C. Workstation Patch Cables: Cabling Contractor shall provide district with (1) – 15' CATEGORY 6A patch cable for each data drop on entire project. Each cable will be factory terminated with RJ45 connections on each end with appropriate pin-out assignments per project configuration.
- Approved Products:
1. CAT 6A stranded copper Patch Cords. Patch cable colors to be coordinated with jack color of each system type.
 2. Provide 15' lengths for all drops on the entire project.
 3. All patch cables shall be factory terminated. NO EXCEPTIONS.
 4. Ortronics Product No. OR-MC615-yy (yy = color)
- D. Network *Cabinet* Patch Cables: Cabling Contractor shall provide owner with CATEGORY 6A patch cable for each data drop on entire project. These cables will provide connectivity from the front of the network patch panels to the network equipment provided by owner upon move-in. The patch cables are to be terminated properly with RJ-45 connections on each end with the proper pin-out assignments per project configuration.
- E. Cabling Contractor shall provide an extra 50 of each color and length for future expansion purposes.
- Approved Products:
1. CAT 6A stranded copper Patch Cords. Patch cable colors to be coordinated with jack color of each system type.
 2. Provide 75% in 5' lengths and 25% in 7' lengths
 3. All patch cables shall be factory terminated. NO EXCEPTIONS.
 4. Ortronics Product No. OR-MC6xx-yy (xx = length, yy = color)

2.5 FIBER OPTIC PRODUCTS

- A. Fiber Optic Cable shall be UL listed type OFCP (Optical Fiber Conductive Plenum) or OFNP (Optical Fiber Non-Conductive Plenum):
- B. Singlemode:
1. Single-mode fibers, each with a color-coded PVC tight buffer shall have a maximum attenuation of 1.0 dB/km at 1310 nm and 1.0 dB/km at 1550 nm.
 2. Intra-building Single-mode
 - a. Tight-Buffered, Interlocking Armored Cable, Plenum, 6-F (OS2)
 - b. Panduit FSLR912
- C. Fiber Optic Connectors:
1. Optical Fiber Connectors shall be LC type connectors
 - a. Single-Mode – Panduit LC Connectors Product #FLCSSCBUY
- D. Fiber Optic Enclosures
1. The fiber optic enclosures used shall provide termination panels for LC type connectors and be of sufficient size and capacity to terminate 110% of the fiber count of the inside of outside fiber optic cables. Patch panels must be 19" rack mountable. Provide all termination accessories, fiber patch cords, enclosures and test for a complete fiber optic distribution system.
 2. Approved Products (for MDF/IDF locations):

3. Provide a 1RU fiber optic enclosure as designated on the project drawings:
 - a. Panduit Model No. FRME1U
4. Provide LC Fiber Adapter Panels – Panduit Model No. FAP6WBUDLCZMultimode:
5. Provide three (3) fiber patch cords, at each end of each fiber installed for the connection of the owner provided network equipment.
6. 10' Multimode 50/125um SC-to-LC – Corning #570502C5120010F
7. Provide new panels for IDF locations as well as new panels required at all MDF locations.

2.6 WIRELESS

- A. For the proper functioning and protection of the wireless infrastructure in designated areas of the campus building the contractor shall use the following:
 1. *Use the Oberon 1011-00 for the mounting of access points in the fine arts area of the building as needed.*
 2. *Use the Oberon 1013-00 for the mounting of access points and associated patch antennas in high-density areas (cafeteria, lgi's, etc) of the campus as needed.*
 3. *Use the Oberon 1016-00 for the mounting of access points in the athletics (eg. Gyms, etc.) Area of the campus as needed.*
- B. All wireless access points located in high volume spaces shall be located on the wall and at a maximum of 12' A.F.F.
- C. Gymnasium will use hardened 1542D's wireless access points -no protective housing needed
- D. Exterior Bus Canopy to receive Wireless Access Points Coverage – Need prior approval of model

PART 3 - EXECUTION

3.1 GENERAL

- A. Fire Wall Penetrations
The contractor shall avoid penetration of fire-rated walls and floors wherever possible. Where penetrations are necessary, they shall be made using the combination of Pre-Cut Conduit #FSPCC-4758 and Wiremold Flamestopper FS4R-RED fittings. Contractor shall also seal all floor, ceiling and wall penetrations in fire or smoke barriers and in the wiring closet.
- B. Allowable Cable Bend Radius And Pull Tension
In general, communications cable cannot tolerate sharp bends or excessive pull tension during installation. Refer to the cable manufacturers allowable bend radius and pull tension data for the maximum allowable limits.
- C. Cable Lubricants
After installation, exposed cable and other surfaces must be cleaned free of lubricant residue.
- D. Pull Strings Provide pull strings in all new conduits, including all conduits with cable installed as part of this contract. Pull test is not to exceed 200 pounds. Data and video cables can be pulled together with pull strings.
- E. Conduit Fill Conduit fill shall not exceed 40%.

- F. Damage
1. The Contractor shall replace or rework cables showing evidence of improper handling including stretches, kinks, short radius bends, over-tightened bindings, loosely twisted and over-twisted pairs at terminals and cable sheath removed too far (over 1-1/2 inches).
 2. The Contractor shall replace any damaged ceiling tiles that are broken during cable installation.
- G. Clean Up
1. All clean up activity related to work performed will be the responsibility of the Contractor and must be completed daily before leaving the facility.
- H. No retainage shall be released until *Conroe ISD* has received all Operations and Maintenance manuals and as-built drawings and first O&M walk.

3.2 DOCUMENTATION

- A. Labels The Contractor will label all outlets using permanent/legible typed or machine engraved labels approved by the Owner (no handwritten labels permitted). Label patch panels in the wiring closet to match those on the corresponding data outlets. The font shall be at least one-eighth inch (1/8") in height, block. All labels shall correspond to as-builts and to final test reports.
1. The following nomenclature should be used when labeling data/voice jacks:
 - a. All cables being served by MDF closet shall begin with 'MDF' all IDF served cables shall begin with 'IDF#' (# designated IDF closet number).
 - b. Next identification letter shall refer to patch panel that is serving outlet (A,B,C...)
 - c. Next identification shall note what # data port on patch panel (1 thru 48).
 - d. Example:
Outlet from 23rd port of the third patch panel from top of rack located at IDF-2
IDF 2 - C23
Outlet from the 5th port of the second patch panel from the top of rack located at MDF MDF - B5
- B. Floor Plan
1. A floor plan clearly labeled with all outlet jack numbers shall be included in the as-built plans.
- C. Cables: All cables shall be labeled at both ends. This includes but not limited to horizontal voice and data cabling, copper backbone tie cables, and fiber optic cables.
- D. Fiber Optics: Fiber optic strands shall be labeled at both ends on the fiber distribution panel.
- E. Equipment racks: Equipment racks shall bear at least one indicating label indicated MDF or IDF. If rack is installed in IDF, label shall include IDF #.
- F. Access Points: Label ceiling grid with digital label according to location installed.

3.3 EQUIPMENT RACK CONFIGURATION

- A. Equipment Racks
 - 1. Equipment racks shall be assembled and mounted in locations shown on the Drawings and as detailed. Each rack shall be securely mounted to the floor and braced to the wall with cable tray in accordance with the manufacturer's instructions and recommendations. Racks shall be mounted such that the side rails are plumb with vertical cable management panels. Racks to be located such that future expansion can occur without relocating existing racks. Racks shall be grounded in accordance with NEC requirements.
- B. Wire Management Components
 - 1. Horizontal cable management panels shall be installed directly above and below each patch panel, also 2 per each 48 port patch panel should be left at site to accommodate the switch gear when they are installed. Vertical cable management panels shall be installed on each side of the rack. In instances where more than one rack is installed in a single location, vertical cable management shall be installed between the racks and on either side.
- C. Cable Placement
 - 1. Cable installation in the Wiring Closet must conform to the Project Drawings. All cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance location. Avoid crossing area horizontally just above or below any riser conduit. Lay and dress cables to allow other cables to enter the conduit/riser without difficulty at a later time by maintaining a working distance from these openings.
- D. Cable Routing
 - 1. Cable shall be routed as close as possible to the ceiling, floor or corners to ensure that adequate wall or backboard space is available for current and future equipment. All cable runs within the Wiring Closet shall be horizontal or vertical within the constraints of minimum cable bending radii. Minimum bend radius shall be observed. Cables shall not be tie-wrapped to electrical conduit or other equipment.
- E. Installation
 - 1. All incoming cables shall be routed on the cable tray and neatly dressed down to the patch panels.
- F. Hardware
 - 1. Provide rack and jack panel hardware as required for all data station wiring.

3.4 STATION WIRING INSTALLATION

- A. General
 - 1. Cabling between wiring closet and workstation locations shall be made as individual home runs. No intermediate punch down blocks or splices may be installed or utilized between the wiring closet and the communications outlet at the workstation location.
 - 2. All cable must be handled with care during installation so as not to change performance specifications. Factory twists of each individual pair must be maintained up to the connection points at both ends of the cable. There shall never be more than one and one-half inches of unsheathed enhanced CATEGORY 6A UTP cable at either the wiring closet or the workstation termination locations.
- B. Exposed Cable
 - 1. All cabling shall be installed inside walls or ceiling spaces whenever possible. Exposed cables and/or cables routing through mechanical rooms, electrical rooms, or restrooms shall be installed inside conduits, unless noted otherwise on the project drawings.

2. Additional exposed cable runs will require Owner approval, and will only be allowed when no other options exist.
 3. All cable routing through conduits and sleeves shall maintain a 40% maximum conduit fill ratio.
- C. Placement
1. All cabling and associated hardware shall be placed so as to make efficient use of available space. All cabling and associated hardware shall be placed so as not to impair the Owner's efficient use of their full capacity.
- D. Cable Routes
1. All cabling placed in ceiling areas must be in conduit, cable tray or a Caddy Cable Cat or Arlington Loop cable support. Cable supports shall be permanently anchored to building structure or substrates. Provide attachment hardware and anchors designed for the structure to which attached and that are suitably sized to carry the weight of the cables to be supported. Do not route cable through webbing of structural steel. Cabling must be supported in dedicated supports intended to support cabling as described in this section. Contractor shall adhere to the manufacturer's suggested fill ratio for each size cable support installed.
 2. Attaching cable to pipes or other mechanical items is not permitted. Communications cable shall be rerouted so as to provide a minimum of 18 inches spacing from light fixtures, sources of heat, power feeder conduits and EMI sources. Cabling shall not be attached to ceiling. Grid support wires. Cable runs shall be routed down the corridors; parallel or perpendicular to building structure. Multiple cables to be bundled together at and between each cable support installed.
 3. Contractor shall be responsible for coordinating with other trades on the project so that the installed cable pathway does not interfere with the installation of other systems to insure that mechanical ducts, pipes, conduits, or any other above ceiling systems are not putting unnecessary stress on any portion of the install SCS.

3.5 STATION HARDWARE

- A. Flush Mount Jacks
1. Flush mount jacks shall be mounted in a faceplate with back box.
- B. Placement
1. Where possible, the communications outlet shall be located so that its centerline is 18 inches above floor level or 12 inches above permanent bench surfaces. Outlets shall not be mounted on temporary, movable, or removable surfaces, doors, or access hatches.
 2. Outlets shall be installed within 3'-0" of power outlets
- C. RJ-45 Jack Pin Assignments
1. Pin connections for data station cable outlets and patch panels shall match EIA/TIA 568 modular jack wiring recommendation T568B.
 2. Pin connections at data jack panels shall match pin connections at outlets (straight through wiring)
- D. Faceplate Icons: Contractor shall install faceplate icons.

3.6 CABLE TESTING REQUIREMENTS

- A. Notification: The Owner and Engineer shall be notified one week prior to any testing so that the testing may be witnessed.
- B. Inspection: Before requesting a final inspection, the Contractor shall perform a series of end-to-end installation performance tests. The Contractor shall submit for approval a proposal describing the test procedures, test result forms and timetable for all copper and fiber optic cabling.
- C. Procedures: Trained personnel shall perform all testing. Acceptance of the test procedures discussed below is predicated on the Contractor's use of the recommended products and adherence to the inspection requirements and practices set forth. Acceptance of the completed installation will be evaluated in the context of each of these factors.
- D. Errors: When errors are found, the source of each shall be determined, corrected and the cable retested. All defective components shall be replaced and retested. Re-test results must be provided on Owner approved forms and witnessed by Owner.
- E. Twisted Pair Cable Testing:
 - 1. At a minimum, the Contractor shall test all station drop cable pairs from Data Closet termination patch panels to outlet device RJ45 jacks. CATEGORY 6A products shall be tested for compliance to ANSI/TIA/EIA 568A and ISO/IES 11801 for a CATEGORY 6A rated installation. Test equipment used shall meet TIA/EIA TSB-67, Level II accuracy. Further, the contractor shall have a copy of TSB-67 in their possession and be familiar with its contents.
 - 2. Each wire/pair shall be tested at both ends for the following:
 - a. Wire map (pin to pin connectivity)
 - b. Length (in feet)
 - c. Attenuation
 - d. Near end cross talk (NEXT)
 - e. Power Sum
 - 3. Test equipment shall provide an electronic and printed record of these tests.
 - 4. Test results for each CATEGORY 6A four-pair UTP cable must be submitted with identification to match labels on all patch panel ports and RJ45 jacks and must match as-builts associated with that cable.
- F. Fiber Optic Cable Testing
 - 1. Testing device for fiber optic cables shall be a high quality OTDR (Optical Time-Domain Reflectometer) equipped with a printer. The printed data shall show, in addition to any summary information, the complete test trace and all relevant scale settings. The OTDR must have the capability to take measurements from bare fiber strands as well as SC connector terminations.
 - 2. All fiber optic cable shall be tested on the reel before installation to insure that it meets the specifications outlined herein.
 - 3. After installation the Contractor shall test each fiber strand in accordance the EIA 455-171 Method D procedures (bi-directional testing) at both 850nm and 1300nm for multimode or 1310nm and 1550nm for singlemode. A form shall be completed for each cable showing data recorded for each strand including length, total segment (end-to-end) loss (dB) and connector losses (dB) at each end. In addition, the printed data strip for each strand shall be attached to the form. Patch cables shall also be tested.

4. Acceptable fiber optic connector loss shall not exceed .75dB per mated pair. The Contractor is responsible for obtaining minimum loss in fiber connections and polishing per manufacturer specifications.
5. Singlemode:
 - a. Singlemode fibers shall have a maximum attenuation of 1.0 dB/km at 1310 nm and 1.0 dB/km at 1550 nm.
6. Multimode:
 - a. 50/125um micron multimode fibers shall have a maximum attenuation of 3.5 dB/km at 850 nm and 1.5 dB/km at 1300 nm. Minimum bandwidth shall be 2000 MHz/km at 850 nm and 500 MHz/km at 1300 nm.
7. OTDR shots shall be provided for each strand of fiber optics completely installed and terminated.

3.7 INSPECTION

- A. Conformance to the installation practices covered above are to be verified when completed. In some cases, the Owner/Designer may inspect before acceptance.
 1. Written Test Report:
 - a. Complete test results, including actual values associated with tests.
 - b. Show all certifications for telecommunications wiring systems.
 - c. Include cable maps showing each cable route and keyed to cable labels. Provide owner with complete floor plans identifying outlet location and cable routing drawing in AutoCad format. Provide electronic copy of drawings to owner in AutoCad version 2004 or greater.
 - d. Documentation of outlet, cable and rack labeling system.
- B. After performing all tests, tabulate results and bind together in format acceptable to Owner. Installer shall provide written certification in the test report that telecommunications cable is properly installed and test results certify system to all specified standards.

END OF SECTION

SECTION 27 51 00

INTERCOM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The drawings and general provisions of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. This section includes a fully operational IP platform for a district-wide internal and school Critical Communications Solution, incorporating school safety notifications and general communications including but not limited to the following:
 - 1. The platform shall provide complete internal communications and employ state of the art IP Technology including the minimum functions listed.
 - a. Two-way internal intercommunications between staff locations and classrooms.
 - b. Scheduled bell events.
 - c. Emergency announcements that will override any pre-programmed audio, assuring that all Emergency/Lockdown etc., are heard at each and every speaker location.
 - d. Capability of prerecording emergency announcements that can be activated by a Soft Key on an administrative console, panic button, dial string, or web browser.
 - e. Atomic Time Synchronization with Class Change Tones utilizing multiple, programmable schedules for each zone.
 - f. District-wide, Emergency, Group, All School and Zone live voice paging.
 - g. District-wide, Emergency, Group, All School and Zone paging for pre-recorded audio – tones, music and voice.
 - h. Web-based user interface.
 - 2. The system shall support a minimum of 1000 level priorities which shall be user-definable, allowing each end point to place a minimum of 5 different priority calls at the same time.
 - 3. Any authorized administrator shall be able to call from outside the school into any classroom, zone, or entire school directly via the School District supplied SIP enabled Telephone Network. This shall allow remote monitoring, call-in annunciation, and two-way conversation from outside the facility as well as paging into the system. (Compliance with NEMA Standard SB-40 for emergency communications in K-12 Schools).
 - 4. Authorized system users shall be able to create a minimum of 100 automated sequences with voice instructions, tones, emails, program distribution, and relay activations and replay them.
 - 5. Automated message strings shall be manually initiated from a single-button access on the console, on a SIP connected telephone, a panic button, from the web-based user interface or via interface with third party systems.
 - 6. Paging and two-way intercom features shall be accessible from any system console or SIP connected telephone for each campus.
 - 7. The platform shall synchronize its system time to the network timeserver or a web-based time server.
 - 8. Each single campus installation shall be locally survivable for intercom, paging, bells, and emergencies such as lockdown, even when the district connection is unavailable.

9. This specification establishes a minimum level of quality, features, and performance for individual components as well as the integrated system.
10. Systems that do not comply with the feature-sets highlighted in this Specification will not be considered.

B. Scope of work includes connecting analog speakers to new IP based system using new gateways.

1.3 DEFINITION OF TERMS

A. Installer(s): Shall refer to the person, persons, or company who or which actually contracts to perform the work specified herein.

1.4 SUBMITTALS

A. Product data for each component.

B. Shop Drawings: Prior to proceeding with the work: Provide detailed equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, location of each field connection, and a complete schedule of all equipment and materials with associated manufacturer's cuts sheets which are to be used.

- a. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Identify terminals to facilitate installation, operation, and maintenance. Include a single-line diagram showing cabling interconnection of components and levels throughout system and impedances.
- b. Artwork drawings and lists indicating proposed nameplate nomenclature and arrangements for control panels and plug panels prior to fabrication reflecting equipment used.
- c. Each drawing shall have a descriptive title and all sub-parts of each drawing shall be labeled. All drawings shall have the name and locations of the project, Systems Contractor's name in the title block.
- d. Details and descriptions of any other aspect of the system, which must differ from the contract documents due to field conditions or equipment, furnished.

C. FCC Approval: The system shall be approved for direct interconnection to the telephone utility under Part 68 of FCC rules and regulations. Systems, which are not FCC approved or utilize an intermediary device for connection, will not be considered. Provide the FCC registration number of the system being proposed as part of the submittal process.

D. Product Certificates: Signed by manufacturers certifying that products furnished comply with specified requirements.

E. Installer Certificates: Signed by manufacturers certifying that Installers comply with specified requirements.

F. Manufacturer Certificates: Signed by manufacturers certifying that they comply with specified requirements.

G. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Include record of final matching transformer-tap settings, and signal ground-resistance measurement certified by Installer.

- H. Maintenance Data: For equipment to be included in maintenance manuals specified in Division 1.
 - a. Record of Owners equipment-programming option decisions.
 - b. All instructions necessary for proper operation and manufacturer's instructions.
 - c. "Proof of Performance" information.
 - d. Manufacturer's maintenance information.
 - e. Copies of non-proprietary computer programs and system set up disks documenting all programmable features of the installed system.
- I. Record Drawings: Prior to final acceptance, provide three (3) complete sets of drawings indicating all cable numbers and construction details in accordance with the actual system installation. Revise all shop drawings to represent actual installation conditions. These Record Drawings will be used during "Final Acceptance Testing".
- J. System Training: Submit the following information describing the training programs and system trainers as outlined in paragraph 1.6 of this specification and in accordance with Division 1 specifications.
 - a. Include with the submittal a preliminary staff development training program in outline form for review and approval by the owner's representative.
 - b. Include with the submittal a current copy of the trainer's certification from the manufacturer that certifies and identifies the trainer(s) who are eligible to provide training and support for the project.
 - c. Include with the submittal a current copy of trainer's needs assessment form which will be reviewed with the owner's designated representative for the system's preliminary system programming and configuration.
 - d. Include with the submittal copies of all documentation used to identify for the owner those participants attending and completing the training programs.
- K. A copy of the manufacturer's standard statement of warranty proving all equipment provided for the school communications network is covered with the required **five-year** warranty shall be included with the project submittal. This statement of warranty shall be provided on the manufacturer's stationary.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced Installer who is an authorized representative of equipment manufacturer for both installation and maintenance of equipment required for this Section. Provide the following within thirty (30) days after notification to proceed:
 - 1. Provide a list of installations that the Installer has specifically installed for verification by the Owner. Random installations from other vendors and/or Installers shall not be accepted. The Installer, not its employees, must meet these qualifications.
 - 2. The Installer shall be bondable.
 - 3. The Installer shall demonstrate to the satisfaction of the Owner or his representative that he has:
 - a. Adequate plant and equipment to pursue the work properly and expeditiously.
 - b. Adequate staff and technical experience to implement the work.
 - c. Suitable financial status to meet the obligations of the work.
 - d. Technically capable and factory trained service personnel at a local service facility to provide routine and emergency service for all products used in this project.

- B. Any Contractor, who intends to bid on this work and does not meet the requirements of the "Quality Assurance" paragraph(s), shall employ the services of an "Installer" who does meet the requirements and who shall provide the equipment, make all connections and continuously supervise the installation. A subcontractor so employed as the "Installer" must be acceptable to the Architect/Engineer. The "Installer" shall be identified within thirty (30) days of notification to proceed for acceptance by the Architect/Engineer.
 - C. Because the life expectancy of this type of communications structure normally exceeds 10 years, the owner expects continuity from the service provider. If the installing/servicing company has not been an authorized provider of the manufacturers product for it least (7) years, the following is required:
 - 1. A list of (2) systems manufacturers of which they currently are authorized service providers where the relationship exceeds (7) years.
 - 2. A letter from the manufacturer outlining the details of changes in service providers over the last (7) years and what actions they will take to ensure continuity of service to the customer.
 - D. Each major component of equipment shall have the manufacturers name, address and model number on a plate securely affixed in a conspicuous place. NEMA code ratings, UL Label, or other data that is die-stamped into the surface of the equipment shall be easily visible.
 - E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
 - F. Comply with NFPA 70
 - G. Comply with NEMA Standard SB-40 for Emergency Communications in K-12 schools.
 - H. Comply with UL 60950.
- 1.6 IN-SERVICE TRAINING
- A. The contractor shall provide and implement a complete and comprehensive staff training program for all administrators, facility staff members, and teachers. This mandatory training program will provide school staff a complete understanding of how to utilize and properly operate all functions.
 - B. The training program shall be implemented by a staff member/trainer employed by the contractor. The trainer must be factory certified to provide training on their product.
 - C. All staff development training is to be coordinated through the owner's designated representative. As training sessions are completed, the trainer will provide the school's administrative staff and school district's staff a document listing all of the staff and faculty members who attended, received, and completed the training program.
- 1.7 WARRANTY
- A. Provide a **manufacturer's five-year warranty** of the school communications network equipment against defects in material and workmanship. This warranty will cover all electronic system components. Additional warranties cover clocks, speakers, and call in switches. If any defects are found within the warranty period, the defective equipment shall be replaced at no cost (equipment only); a one year warranty shall be provided for labor.

- B. A copy of the manufacturer's standard statement of warranty proving all equipment provided for the school communications network is covered with the required five-year warranty shall be included with the project submittal. This statement of warranty shall be provided on the manufacturer's stationary. The standard five-year warranty is an important element in establishing a standard in quality. Manufacturers who circumvent the five-year warranty by offering special "extended warranties" that are not part of their normal published warranty will not be accepted.
 - C. Contractor shall respond, excluding weekends and holidays, within 24 hours to any warranty service calls. If equipment cannot be repaired within 24 hours of service visit, the contractor shall provide "loaner" equipment to the facility at no charge.
 - D. Make available a service contract offering continuing factory authorized service of the system after the initial warranty period.
- 1.8 MANUFACTURERS
- A. Manufacturers: Subject to compliance with requirements, provide the following system:
 - 1. Telecenter manufactured by Rauland
 - a. Authorized Rauland Distributor contact:
Name: Firetron Inc
Contact: Richard Phillips
Phone: 281-499-1500
Email: rphillips@firetron.com

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

- A. The New Campus Communications System will connect to the Existing District Server for District Wide announcements and all Management Functions. Server Currently Runs the Rauland Telecenter Campus Enterprise Software.
- B. The platform shall utilize state of the art IP Technology for Call-in Notification, School Safety Paging and Evacuation tones, Atomic Time Synchronization, Class Change Tones utilizing multiple, programmable schedules for each zone, Two-way hands-free Internal Communications and Paging, and Program Distribution. The system shall be easy to learn and operate. All standard programming shall be web-based and user friendly to allow the system administrator the ability to easily program system features.
- C. Provide complete and satisfactorily operating district/school communications and district/school safety as described herein, using materials and equipment of types, sizes, ratings, and performances as indicated. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.
- D. The platform shall be a single electronic system consisting of a minimum of 10 audio channels for each campus, (classroom) IP Speaker Modules and call switches, IP Zone Modules connecting corridor speakers, inside and outside horns, IP Administrative Consoles, SIP enabled PBX integration and district-wide integration for paging, emergency notifications, calendar scheduling and configuration.

- E. Each Classroom shall be provided with a Speaker Module interface and a minimum of 5 different call switches, each with their own annunciation path and priority.
- F. Call-ins may automatically annunciate (display of priority and location) to administrative consoles, SIP enabled phones, and outside phones.
- G. Call-ins shall be programmed to automatically change priority and annunciation route based on age of call-in and original priority.
- H. Call-ins may have priority (and annunciation route) changed by user action from a console or SIP enabled phone.
- I. Call-in annunciation route shall include playing pre-recorded audio over speakers, sending a pre-configured email, and activating relays.
- J. The platform shall lend itself to expansion by simple addition of hardware modules.
- K. The platform shall connect directly to an existing, standard protocol WAN/LAN network, without the need for a separate server at each school location. Configuration, including bell schedules, calendars, and emergency sequences can be remotely created, changed, stored and downloaded to the system by an authorized user from a web-based user interface.
- L. The platform shall provide the ability to initiate school safety paging announcements, evacuation tones and take cover tones from any telephone or connected web browser within the facility or outside the facility to any other location within the facility or district.
- M. The platform shall provide the ability to selectively communicate or monitor individual classrooms in emergency situations from any telephone within the facility or outside the facility to any other location within the facility; all communication within the classroom shall be hands-free and will not require any interaction by the classroom user.
- N. The platform shall provide classroom users the ability to confirm that they have safely secured their classrooms during an emergency with a single button press. The front office administrator will receive confirmation that the classroom is safely secured via an administrative console and web-based user interface. The front office administrator can view classrooms that are not safely secured via the administrative console. The front office administrator can view classrooms that are not safely secured via the web-based user interface. The front office administrator shall be able to initiate two-way communication, without a pre-announcement tone, to the classroom during an emergency via the administrative console. Web-based user interface will still identify that a school is in an emergency, even if all classrooms are safely secured. Individual classroom check-in and school emergency status shall be viewed from the web-based user interface, both on-site and remotely.
- O. IP Addressable and POE powered Speaker Modules for individual rooms shall be system programmable and may be assigned any two, three, four, five or six digit number as well as name and description. Any extension may be reassigned at any time.
- P. IP-enabled two-way voice communication shall be available from any provided telephone or administrative console through any speaker in a campus. This shall allow hands-free communication to any classroom or any individual loudspeaker unit. A programmable pre-announce tone shall sound immediately before the intercom path is opened and a supervisory tone shall continue to sound at regular intervals when speaker monitoring is

active, complying fully with all privacy legislation. Pre announce tone and supervisory tones shall be disabled during designated emergencies automatically.

- Q. The platform shall allow users to configure multiple schedules per school, with a minimum of 500 unique events per schedule, and automatic Daylight Savings time correction. Schedules can be programmed to occur once, daily, weekly, monthly, or in any combination of the preceding recurrences. Each school may have a minimum of 20 unique bell schedules, with a minimum of 5 active schedules on any given day for each campus. User shall be able to select from 25 standard included tones as well additional user created and uploaded audio files for class change signaling and messaging. In addition, scheduled events shall include relay actions, email notifications, and paging exclusions as system configuration changes. The platform shall allow control of the bell schedules via the district WAN/LAN without the need for a separate server at each school location. Bell schedules can be remotely created, changed, stored and assigned to calendar days for the local school by an authorized user from a web-based user interface.
- R. The platform shall be able to integrate with an existing PA system or operate as a fully independent IP solution. The platform shall be able to function in combination of said configurations, and allow for seamless communication within a school or district-wide, regardless of the type of configuration used. The platform shall be scalable, with the ability to easily add, install, and configure additional equipment to a system.
- S. The platform allows for customization of preprogrammed sequences, used for emergencies, events, and everyday communications. Preprogrammed sequences can be activated from the push of a relay button, soft key of an administrative console, a dial string of a SIP phone, or a web browser configured to the district network. Sequences can be initiated automatically as part of a schedule or on the fly. Preprogrammed sequences can be customized to utilize any combination of audio tones, emails, relays, tone exclusions, swings, delays, duples, SIP phone notifications, and program distribution. Audio tones can include customized audio files and voice messages, recorded in any language. Uploaded audio tones and messages can be preprogrammed to announce repeatedly or individually, as part of a scheduled sequence or on the fly. Each school in a district can have its own customized sequences, and can be activated individually, in groups, or district-wide.

2.2 EQUIPMENT AND MATERIAL

A. Server Software

1. Provides district-wide paging, bell event scheduling, emergency notification and configuration for entire district.
2. Ability to configure system and initiate system features, per school and district-wide via web-based user interface.
3. The software has the ability to sync system time to the Atomic Clock Signal or to the school's or district's network time server.
4. The software will provide a web browser to deliver district-wide emergency paging, pre-recorded messages and tones from any authorized computer in the facility or the district. The software must be capable of automatically notifying district personnel via the WAN/LAN of an alarm condition.
5. The software can automatically broadcast emergency instructions via associated system hardware throughout an entire district when an alarm (e.g. lockdown, lockout, security, fire) is initiated via the web-based user interface. The emergency instructions are preprogrammed and require no user intervention. Bell tones are able to be halted during an emergency. The system provides redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm or security systems.

6. The software allows for user-uploaded pre-recorded messages and tones. Software supports the upload of MP3 and WAV file types. User-uploaded pre-recorded messages and tones can be part of emergencies, sequences, and bell schedules.
7. The software can be installed in cloud, virtual or physical server environments.
8. The web-based user interface supports secure HTTP browsing.
9. The software supports encryption to ensure secure access.
10. The system shall monitor itself if devices go offline and system actions are not received. Specified users shall receive email notifications when devices go offline. The software shall be able to keep a log and report on system activity within a school or all schools district-wide for a minimum of one year. These reports can be exported to excel spreadsheets.
11. The software will support a minimum of 20 bell schedules per school, with 5 schedules assignable to a specific school day. Bell schedules can be programmed to announce tones, activate relays, send emails, activate program distribution, and notify SIP phones.
12. The system allows programmable end points to be automatically included or excluded for live paging, bell tones, or prerecorded audio, depending on the time or day or day of the week. These inclusions/exclusions can be applied manually or automatically depending on their schedule.
13. The software can automatically send an email, as part of a programmed sequence of events, to district administrators alerting them of an emergency within the district.
14. The software provides the ability to view schools that are in an emergency status, using any web browser on the district's network. The software shall identify the name of the school in an emergency as well the type of emergency that school is in.
15. The software provides the ability to view individual classrooms that are not checked-in during an emergency, using any web browser on the district's network. The software shall identify the name, extension, and description of the classroom that is not checked-in during the emergency.
16. The system has a minimum of 5 customizable emergencies, one of them being an All-Clear – with the ability to return the system from an emergency to normal status. Each emergency shall have a minimum of 500 unique events.
17. As a district-wide communications solution, the system shall be able to provide simultaneous communications to all schools or groups of schools within a district. The system shall allow a user to initiate district-wide communications to individual schools, all schools or groups of schools, from a web-based user interface. The system shall allow a user to initiate prerecorded audio, live paging, or programmed sequences to individual schools, all schools or groups of schools, from the web-based user interface. Programmed sequences shall be customizable per school, and the system shall be able to activate them simultaneously to individual schools, all schools or groups of schools, from the web-based user interface.
18. The communications software must allow upgrade from an individual school system to multiple schools, or an entire school district, using the same web-based user interface. The communications software from an individual school system must be identical in typical user operation to the multiple schools or entire school district communications system software.

B. Campus Controller

1. Provides call routing for paging and intercom for a single facility.
2. System shall connect to the district provided Telephone Network via a SIP connection.

3. Support a flexible numbering plan allowing two, three, four, five, or six digit extensions.
4. SIP interface to a district provided Telephone Network shall be capable of allowing connected phones to display classroom call-ins, answer internal intercom call-ins, make pages and change priorities of call-ins in progress.
5. Direct dialing, two-way amplified voice intercom between any provided telephone or admin console and speaker without the use of a press-to-talk or talk-listen switch.
6. Ability to upgrade priority level from individual call switch.
7. The ability to answer intercom call-ins registered at administrative consoles and pre-selected telephones.
8. The ability to automatically escalate incoming call-ins to an alternate telephone or group of telephones if they remain unanswered for a predetermined amount of time.
9. The ability to manually upgrade an intercom call-in to an alternate telephone or group of telephones.
10. The ability for classrooms to "check-in" via push button when they have successfully secured their location during emergency.
11. Administrative console shall display locations that have not checked in to confirm their secured location and provide hands-free audio monitoring and communication to unsecured locations.
12. The controller shall not need direct connection to any classroom via home run or distributed wiring. It shall communicate solely through the IP network.
13. Single button access from any console on the system to distribute emergency announcements within the facility to all or select locations equipped with speakers. Emergency announcements originating from any assigned administrative console shall have priority over all regular system functions.
14. Ability for administrative consoles and connected phones to selectively monitor audio at any two way speaker during an emergency.
15. Stores a minimum of 48 hours' worth of Bell Event Schedules, all emergency notification sequences as well as facility wide configuration.
16. System has the ability to sync system time to the Atomic Clock Signal or to the school's or districts network time server.
17. System's SIP Interface shall provide:
 - a. Audio paging access from any telephone to any single intercom speaker, zone (group) of intercom/paging speakers, or all speakers/paging horns throughout the entire facility.
 - b. Ability to answer a call-in directed to that SIP extension.
 - c. Ability to upgrade a call-in directed to that SIP extension.
 - d. Single button access from any telephone on the system to initiate alarm signals within the facility to all or select locations equipped with speakers. A minimum of 25 separate distinct alarm signals shall be provided. Alarm signals originating from any assigned administrative telephone shall have priority over all regular system functions.
 - e. Ability to initiate a school-wide emergency including lockdown and evacuate sequences.
 - f. SIP device shall display call-in information from call in switch. Information will include a minimum of Classroom Name, Number, and Priority Level.
18. The system will have the ability to utilize a web browser and a USB microphone connected to the PC to deliver district-wide live emergency paging, pre-recorded messages and tones from any authorized computer in the facility or the district. The system must be capable of automatically notifying district personnel via the WAN of an alarm condition.

19. The system can automatically broadcast emergency instructions throughout an entire campus when an alarm (e.g. lockdown, lockout, security, fire) is tripped or manually activated. The emergency instructions are preprogrammed and require no user intervention. Bell tones are able to be halted during an emergency. The system provides redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm or security systems.

C. IP Addressable Modules:

1. System shall provide multiple IP Addressable Modules for intercom, paging and relay activation.
 - a. All Modules are POE 802.3af compliant
 - b. All Modules support DHCP.
 - c. All Modules connect to network with a single RJ45 connector
2. IP Addressable Speaker Module
 - a. Shall interface to school's data network, a classroom speaker, and multiple call switches.
 - b. A minimum of 5 levels of call-in can be placed from an IP Speaker Module. The call-ins are routed to administrative consoles and select SIP connected telephones and can only be cleared from the system once answered. If a call-in is not answered within a preprogrammed time the call-in may reroute to other telephones, consoles, and speakers.
 - c. An option for Privacy call in switches is supported. When the Privacy switch is activated it prevents administrative or classroom telephones from monitoring the specific classroom/location intercom speaker.
 - d. The ability to belong to one or more of a minimum of 100 independent zones for zone paging, program/music distribution zones and class change tone zones; this assignment is a programmable function, changeable by time of day. Each IP Speaker Module's location shall be programmed in software to belong to any combination of software zones. IP Speaker Modules shall be designed to mount near ceiling and wall speakers and in the plenum space.
 - e. Intercom and paging volume adjustable from Software interface.
3. IP Addressable Zone Paging Module
 - a. Zone Paging Module shall connect multiple speakers for district all page, all page, zone paging, bells, audio events and, emergency notification.
 - b. Zone Paging Modules shall be rack and wall mountable.
 - c. Zone Paging Modules shall be able to belong to one or more of 100 independent zones for live paging, bells, pre-recorded audio and emergency notification.
4. IP Addressable Aux I/O Module
 - a. Aux I/O Module shall have two input contacts and two output contacts.
 - b. Input and output contacts are individually addressable.
 - c. Aux I/O Module shall be wall and rack mountable.
 - d. User can program relays to be activated manually, through an event/bell schedule, or during emergency notification.
 - e. Aux I/O Module can perform school lockdown from a single press of a panic button.
5. IP Addressable Program Line Input Module
 - a. Program Line Input Module shall provide line level audio program distribution into system.
 - b. Program Line Input Module shall have a 3.5mm cable jack.
 - c. Program Line Input Module shall be configured via web-based user interface.
 - d. User can configure program distribution to be activated manually or automatically through an event/bell schedule.

- e. Program Line Input Module will have a system priority level such that emergency communications override program distribution.
- D. IP Addressable Analog Gateway
- 1. IP Addressable Gateway provides integration with existing analog wiring infrastructure – consisting of shielded two-pair classroom field wiring. The Gateway provides the ability to reuse speaker wiring, speakers, and punch blocks to integrate analog infrastructure with IP platform.
 - 2. Each Gateway will have 5 watts of power per port and 25 watts total per device.
 - 3. Supports 24 classrooms that utilize 25 Volt speakers and all current Telecenter call switches for front office notification.
 - 4. Supports minimum of 5 call switch priorities per classroom, capable of lockdown check-in functionality, while reusing existing shielded two-pair classroom field wiring.
 - 5. Classroom intercom volume adjustable from Software interface.
 - 6. Classroom paging volume adjustable from Software interface.
 - 7. Configured to the school network and can be used in conjunction with IP Addressable Modules.
- E. IP Addressable Administrative Console
- 1. A full color screen with 64 soft keys, 3 line select, volume control, push to talk, speakerphone mode and left/right and up/down scrolling.
 - 2. Audio paging access from any Console to any single intercom speaker, zone (group) of intercom/paging speakers, or all speakers/paging horns throughout the entire school.
 - 3. Programmable soft key access from any console on the system to initiate alarm signals within the school to all or select locations equipped with speakers. A minimum of 25 separate distinct alarm signals shall be provided. Alarm signals originating from any assigned administrative console shall have priority over all regular system functions.
 - 4. Programmable soft key access from any console to automatically broadcast page emergency instructions throughout an entire school when an alarm (e.g. lockdown, lockout, security, fire) is tripped or manually activated. The emergency instructions are preprogrammed and require no user intervention. The system provides redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm or security systems.
 - 5. Ability to perform intercom to any single IP Addressable Speaker Module.
 - 6. Ability to display 3 call-ins at a time on the screen while other call-ins are annunciating and the ability to scroll to view all call-ins.
 - 7. Ability to upgrade a call-in via soft key.
 - 8. Programmable soft key access from any console for activating relays, campus wide.
 - 9. Ability to maintain, along with controller and other IP Modules system functions, including intercom, bells and paging for the local campus in the event of district-wide connection loss.
 - 10. Classrooms that have not 'checked-in' during an emergency are listed on the Administrative Console's screen.
 - 11. The time duration of an emergency is shown on the screen of the administrative console. The check-in timer is shown on the screen of the administrative console.
- F. Audio Paging/Program Amplifiers – Ashly NE 8250
- 1. Power amplifier(s) shall be provided to provide a minimum of 2 watts of power to all paging speakers, and 15 watts of power to all paging horns.

2. The maximum load on the paging/program amplifiers shall be 80% of the rated maximum output of the amplifiers.
- G. Normal/Emergency Call Switch – Rauland Dual Level Call In Switch
1. Normal/Emergency Call Switches indicated on the drawings shall provide the following functions and features:
 - a. One (1) “Normal” call switch that shall activate a distinctive “NORMAL” level call from single button activation. The button shall be clearly marked “NORMAL” and will route the call-in to any one or more Administrative Consoles and/or Marquee Displays for quick and easy response from an Administrative Console.
 - b. One (1) “Emergency” call switch that shall activate a distinctive “EMERGENCY” level call from single button activation. The button shall be red in color and shall be clearly marked “EMERGENCY” and will route the call-in to any one or more Administrative Consoles and/or Displays for quick and easy response from an Administrative Consoles.
- H. Emergency/Check-In Call Switch – Rauland Check-In Call In Switch
1. Emergency/Check-In Call Switched indicated on the drawings shall provide the following functions and features:
 - a. One (1) “Emergency” call switch that shall activate a distinctive “EMERGENCY” level call from single button activation. The button shall be red in color and shall be clearly marked “EMERGENCY” and will route the call-in to any one or more Administrative Consoles and/or Displays for quick and easy response from an Administrative Consoles.
 - b. One (1) “CHECK-IN” call switch that shall activate a distinctive “CHECK-IN” level call from single button activation. The button shall be blue in color and shall be clearly marked “CHECK-IN” and will route the call-in to any one or more Administrative Consoles. This button will be used for emergency check-ins during school emergencies, notifying the front office of the classroom occupants’ safety during an emergency.
- I. Equipment Racks
1. All equipment racks shall provide 44 spaces (77”) minimum for mounted system equipment.
 2. All equipment racks shall be multi-rack format (“gangable”) style, bolted together, and open cavity.
 3. All equipment racks will be provided with lockable rear doors.
 4. Equipment rack(s) shall be located in climate-controlled areas/rooms as shown on drawings.
 5. All head-end, distribution, and source equipment, including data and power, shall be located in racks configured as approved by the Engineer.
 6. Rack mounted equipment shall be accessible from front and rear.
 7. All unused rack spaces will be covered with appropriate blank/vent panels.
- J. Interior Ceiling Speakers
1. Provide Ceiling Speaker Assembly consisting of 8 Ohm, 8” speaker mounted in a 2 foot by 2 foot, or 2 foot by 1 foot, lay-in baffle, with an integrated back box that covers the full area of the baffle.
 2. The speaker shall be connected by inserting an 8-pin RJ45 terminated CAT 5e or Cat 6 cable.
 3. The speaker shall include provisions to allow attachment of a safety cable if required.

- K. Wall Mounted Horns
1. Provide double re-entrant type horn loudspeakers with integral driver. The horn loudspeaker shall be impervious to weather and vandalism. Horn shall be constructed of heavy-duty ABS plastic. Horn loudspeaker drivers shall be rated at 15 watts with a frequency response of 480 Hz to 14 KHz. Sensitivity shall be 106 dB 1 watt, 1 meter. Transformer assembly shall be dual voltage multi-tap type suitable for 25 or 70-volt installations. Dispersion pattern shall be 180 degrees conical. The horn loudspeaker shall be constructed of treated heavy gauge aluminum, with all exposed parts potted and a sealed driver. Wiring terminal shall be fully enclosed. The speaker flange and mounting surface shall have a cork-rubber gasket. The horn loudspeakers finish shall be gray baked on enamel.
 2. The recessed back box shall be of heavy gauge cold-rolled steel, spot welded for stability with a rust-retardant gray primer finish. Acoustically treat the interior to eliminate mechanical resonance. The back box shall be 10-3/4"x10-3/4"x6" deep.
 3. The baffle shall be vandal proof, the faceplate constructed of 14-gauge carbon steel with a minimum tensile strength of 55,000 PSI. A lattice grid sub-plate shall deny access to the horn but be acoustically transparent for sound projection. Provide tamper proof, stainless steel mounting hardware. The baffle shall have a mar/scratch baked epoxy rust inhibitive finish.
- L. Uninterruptible Power Supplies (UPS)
1. UPS equipment provided for this system will include Power Conditioning to smooth current and voltage fluctuations.
 2. UPS equipment will be sized in accordance with the system manufacturer's recommendations.
 3. Provide an individual UPS for EACH SYSTEM CONTROLLER (Gateway) furnished with the system.
 4. Provide additional UPS(s) for protection of all other equipment furnished with the system and housed in the equipment racks.
 5. All UPS equipment shall be rack mounted.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with the Installer present, for compliance with requirements and other conditions affecting the performance of the School Communications and School Safety Network.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.
- B. Furnish and install all material, devices, components, and equipment for a complete operational system.
- C. Impedance and Level Matching: Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

- D. Control Circuit Wiring: Install control circuits in accordance with NFPA 70 and as indicated. Provide number of conductors as recommended by system manufacturer to provide control functions indicated or specified.
- E. All housings are to be located as indicated.
- F. The contractor shall provide necessary transient protection on the AC power feed, all copper station lines leaving or entering the building, and all central office trunks. All protection shall be as recommended by the equipment supplier and referenced to earth ground.
- G. Wiring within Enclosures: Provide adequate length of conductors. Bundle, lace, and train the conductors to terminal points with no excess. Provide and use lacing bars.
- H. Provide physical isolation from speaker-microphone, telephone, line-level wiring, and power wiring. Run in separate raceways, or where exposed or in same enclosure, provide 12 inch minimum separation between conductors to speaker-microphones, telephone wiring and adjacent parallel power. Provide physical separation as recommended by equipment manufacturer for other system conductors.
- I. Identification of Conductors and Cables: Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams. All intercom data cabling to be white in color.
- J. Weatherproofing: Provide weatherproof enclosures for items to be mounted outdoors or exposed to weather.

3.3 GROUNDING

- A. Provide equipment grounding connections for Integrated Electronic Communications Network systems as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.
- B. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.
- C. Provide all necessary transient protection on the AC power feed and on all copper station lines leaving or entering the building. Note in system drawings, the type and location of these protection devices as well as all wiring information.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide services of a duly factory authorized service representative for this project location to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.
- B. Inspection: Make observations to verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Provide a list of final tap settings of paging speaker line matching transformers.
- C. Testing: Rectify deficiencies indicated by tests and completely re-test work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

3.5 FINAL ACCEPTANCE TESTING

- A. The Final Acceptance Testing shall be provided to the Owner or the Owners designated representative only. Final acceptance testing to any other trade or service provider for the project will not comply with the requirements of this section.
- B. The contractor will provide a Final Acceptance Test record document signed by both the contractor and the Owner or designated Owner's Representative establishing the "In Warranty" date. The warranty period will not commence until the Final Acceptance Test is completed.
- C. Be prepared to verify the performance of any portion of the installation by demonstration, listening and viewing test, and instrumented measurements. Make additional adjustments within the scope of work and which are deemed necessary by the Owner because of the acceptance test.

3.6 COMMISSIONING

- A. The contractor shall train the Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of the system. This training will be in accordance with the training as outlined in Section 1.6 of these specifications. In addition to the Training Materials provided, the contractor will also furnish Operators Manuals and Users Guides at the time of this training.
- B. Schedule training with Owner through the owners representative, with at least seven days advance notice.

3.7 OCCUPANCY ADJUSTMENTS

- A. The contractor shall provide Occupancy Adjustments in accordance with Section 1.6 of these specifications. A response scenario amenable to both the owner and the contractor will be established and followed for the first year of service.

3.8 CLEANING AND PROTECTION

- A. Prior to final acceptance, the contractor shall vacuum and clean all system components and protect them from damage and deterioration. All blank spaces in equipment cabinets will be covered with blank panels. Top and side panels, and all cabinet doors will be installed. All general areas within and around all equipment rack/cabinets in the facility will be swept, vacuumed, and cleaned up. No cabinets will be left unlocked and all cabinet keys will be turned over to the owner or designated owner's representative.

END OF SECTION

SECTION 28 31 00
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section Includes:
1. Provide a complete, fully addressable, power limited, fire detection and voice evacuation system for this project. The system shall be connected, tested, verified by AHJ to be acceptable and left in first class operating condition. All equipment herein specified shall be engineer-approved and California State Fire Marshal (CSFM) listed. The entire installation shall conform to the National Fire Protection Association (NFPA) Standard 72, 2016 90A & CEC Article 760 and authorities having jurisdiction as applicable. The system specified and depicted on the plan is a complete and approved system. The entire fire alarm system has been submitted and approved by the Division of the State Architect as a complete submittal. Any routing of the system wiring that is significantly different than shown on the approved drawings shall have the approval of the engineer and must be obtained prior to construction.
 2. Provide all work and material as shown and / or required to provide a fully functional and adequate system as described hereon and as required by the California State Fire Marshal.
 3. Supervision: The fire alarm system shall monitor the integrity of all alarm initiating and indicating appliance circuits and provide local and remote status of all connected systems. The system shall be provided with automatically charged standby batteries to maintain system operation for 24 HRS in the normal supervisory mode and 15 minutes of alarm. Batteries shall be supervised for connection to the system and low voltage threshold. The automatic battery charger shall be capable of charging fully discharged system batteries to 100% in 8 hours.
 4. The system wiring and installation shall be as stated in drawings and as required by the manufacturer. All wiring shall be color coded, tagged and verified to assure that it is free from shorts and grounds and shall be rated for the appropriate environmental conditions such as well locations.
 5. Testing: The completed system shall be tested in accordance with NFPA Standard 72 7.6.6 and 7.8.2.
 6. All Fire Alarm wiring shown in drawings shall be installed in conduit.
 7. System Operation shall include:
 - a. Separate zone signaling and device status indication for all initiating devices.
 - b. Audible to sound the California uniform fire alarm signal in temporal mode. Devices shall be at least 15dBA above average ambient sound level, but not less than 75dBA at 10' or more than 120dBA.
 - c. Visual devices shall not exceed 2 flashes per second and shall not be slower than 1 flash per second. Visual devices shall be synchronized when 3 or more devices are within the same field of view.
 - d. Supervision of all circuits to indicate any abnormal wiring condition.
 - e. N.O./N.C. integral relays for external device interface or as indicated on drawings.
 - f. Central station connection capable of indicating (3) distinct separate signals as being tamper, trouble and alarm with point reporting capabilities.

8. All work shall be completed as shown on the plans and or as specified within this specification and shall include the following (but is not limited to):
 - a. Life safety fire alarm detection and signaling system.
 - b. Furnishing and installation of equipment and devices.
 - c. Conductors, connections and interconnections where specified and all in conduit system.
 - d. Conduit, wire and connections for control of heating and ventilation motors, smoke dampers and smoke exhaust.
 - e. Testing, cleaning and adjusting of completed work.
 - f. Wiring diagrams, as-built drawings and three (3) sets of equipment operations and maintenance instructions for Owner.
 - g. Complete maintenance for two years.
 - h. Proposal for subsequent maintenance contract.
 - i. All work and material for complete and operable systems as indicated or specified.
 - j. Permits, inspections and fees.
 - k. Identification and instruction to Owner Representative. Training shall consist of a minimum of two (2) 6-hour sessions.
9. Coordination with Section 26 05 33: Raceway and Boxes for Electrical Systems.
10. Furnishing of special back boxes where required for installation of fire alarm devices.
11. All conductors to be installed in conduit pursuant to Specification Section 26 05 33: Raceway and Boxes for Electrical Systems.
12. Qualifications: Contractor shall receive written approval and verified test results which shall be submitted to the owner for system from manufacturers recognized representative prior to completion and acceptance.
13. All initiating devices shall be separately addressed for individual identification at control panel.
14. As-Built Drawings: A complete set of reproducible "as-built" drawings showing installed wiring, color coding, wire tag notations exact locations of all installed equipment, specific interconnections between all equipment and internal wiring of the equipment shall be delivered to the owner upon completion of the system.
15. Maintenance Instructions: Three (3) submittals of maintenance instructions shall be provided and shall be complete, easy to read, understandable and shall provide the following information:
 - a. Instructions for replacing any components of the system, including internal parts.
 - b. Instructions for periodic cleaning and adjustments of equipment with a schedule of these functions.
 - c. A complete list of all equipment and components with information as to the address and telephone number of both the manufacturer and local supplier of each item.
 - d. User operating instructions shall be prominently displayed on a separate sheet located next to the control unit in accordance with UL Standard 864. The contractor shall warrant all equipment and wiring free from inherent mechanical and electrical defects for two years from the date of final acceptance.
16. The FACP shall integrate with the to prevent bells from activating during a fire alarm.
17. The FACP shall meet the requirements of UL ANSI 864 Ninth Edition. Systems listed to UL ANSI 864 Eighth Edition or earlier revisions are not acceptable. Per DSA IRA-1 chapter of approval for temporary school use of DSA approved relocatable buildings, Approval of fire alarm and/or fire sprinkler systems for temporary use buildings shall be in accordance with the Chapter 9, CCR, Title 24, Part 2.
 - a. Fire Alarm: Section 3.4.4.4 For buildings sited less than three years and used for educational purposes (instruction), provide an approved manual fire alarm system consisting of manual pull-stations, visual notification appliances and audible device(s) (with a minimum rating of 95 dBA at 10 feet). Buildings more than 25 feet apart are to be provided with additional audible devices to ensure the fire alarm signal can be heard within adjacent buildings.

- b. Communications: Section 3.4.4.5 Buildings more than 25 feet from other buildings, including other temporary buildings, with a stand-alone fire alarm system must be provided with approved “two-way communication” with the main administration offices consisting of an intercom system, permanently mounted telephone or “walkie-talkie” devices or other similar systems. Buildings that are less than 25 feet from existing permanent buildings on the site shall be interconnected with the campus fire alarm system.

B. Substitutions

1. Substitution of system components or manufacturer will require the contractor to separately obtain approval with DSA at Contractor’s expense and shall meet all requirements of the system as designed and pre-approved.
2. All proposed substitutions shall be listed with the California State Fire Marshal.

1.3 SUBMITTALS

A. Comply with applicable provisions of Section 26 05 00: Common Work Results for Electrical.

B. General:

1. Two (2) copies of all submittals shall be submitted to the Architect/Engineer for review and approval.
2. All references to manufacturers model numbers and other pertinent information herein is intended to establish minimum standards of performance, function, and quality.
3. For equipment other than that specified, the contractor shall provide proof that the proposed substitute equipment equals or exceeds the form, feature, function, performance, and quality of the specified equipment.

C. Product Data:

1. A complete list of all supplied equipment including model numbers with catalog data sheets on each component.
2. Data sheets show California State Fire Marshal Listing, U.L. listing, equipment ratings, dimensions and finishes.
3. Highlight actual devices to be used and their amp draw in stand-by and alarm modes.

D. Shop Drawings:

1. Provide schematic layout, floor plan, drawings indicating location of all components and equipment, required size and location of conduit and outlets and type and quantity of system conductors. Include voltage drop calculations and battery calculations based on actual number of devices to be installed.
2. Include riser and wiring diagrams for overall system and components including control panels, annunciators, power supplies, initiating circuits, notification appliances, control devices and FATC. Address numbers shall be noted on all appliances.
3. Include physical and electrical characteristics of equipment to indicate conformance with the Specifications.
4. Describe system characteristics and function as well as device wiring diagrams.
5. Voltage drop and battery calculations for each control panel and power supply and initiating circuits at 24 hour stand-by and 15 mins alarm.
6. System operational matrix.

E. Operating and Maintenance Instruction Manual:

1. Manual shall include the following tailored to this specific project:
 - a. Operational description.
 - b. Coded cabling plan.
 - c. Two wire circuit diagrams.
 - d. Wiring destination schedule.

- e. Schematic component diagrams and PC board layouts.
- f. Maintenance and alignment procedures.
- g. Voltage drop and battery calculations.

F. Other documentation

1. In addition to the shop drawings, the following information shall also be included with the submittal.

- a. Manufacturer's technical data sheets for each piece of equipment that will be installed.
- b. Standby battery calculations for the FACP and any remote power supply or other panels that include their own standby batteries.
- c. Voltage drop calculations showing the worst-case end of line voltage for all notification appliance circuits
- d. Detailed description of the overall operation of the system or a sequence of operation matrix.
- e. Proof of factory training and certification of the supervising technician assigned to the project.
- f. Proof of factory training and certification of a service technician employed by the installation company that can be onsite to troubleshoot and repair any service-related problems with the system, within 4 hours of being notified of the problem.

1.4 PERFORMANCE REQUIREMENTS

- A. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
- B. Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.
- C. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.
- D. On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
- E. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.
- F. NAC circuits and control equipment shall be arranged such that loss of any one (1) NAC circuit will not cause the loss of any other NAC circuit in the system.
- G. Two-way emergency telephone communication circuits shall be supervised for open and short circuit conditions.
- H. The secondary power source of the fire alarm control panel shall be capable of providing at least 24 hours of backup power with the ability to power the system for an additional 15 minutes in an alarm condition, at the end of the 24-hour backup period.

I. Basic System Operation

1. When an off normal condition occurs (Alarm, Supervisory, or Trouble) the respective LED on the FACP shall illuminate.
2. A piezo sounder shall activate at the FACP during any off normal condition until the SILENCE button is pressed by an authorized user.
3. A Red LED shall illuminate when an alarm or pre-alarm condition exists.
4. An Amber (yellow) LED shall illuminate when a Supervisory or Trouble condition exists.
5. A backlit 4-line 40-character LCD screen shall display all messages that refer to an off-normal condition.
6. An Alarm condition shall have priority over all other signals.
7. The FACP shall include an event buffer that maintains the last 4,000 system events including a date and time stamp for each.
8. In response to a fire alarm condition, the systems notification appliances and relay-controlled output circuits that are associated through programming with the device initiating the alarm, shall automatically activate. Additionally, the system shall notify an approved central station via dial-up, IP, or cellular means as deemed acceptable by the local Authority Having Jurisdiction (AHJ).

1.5 QUALITY ASSURANCE

- A. Loads of Equipment and Components
 - a. Follow IEEE Standard where applicable.
 - b. Provide fuse protection for equipment and spare fuses.
 - c. Design systems for operation at 120 volts, normal or emergency power as indicated, 60 Hz nominal input.
 - d. Operating voltage dissipated by resistors shall not exceed 25% of ratings.
 - e. Operating voltage of capacitors shall not exceed 80% of rated voltage.
 - f. Operating loads and voltages on transistors and solid-state devices shall not exceed manufacturer's recommendation for normal full load operation.
 - g. Use electronic components of types and rating commonly available from stock of established commercial distribution.
- B. Regulatory Requirements
 1. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.
 - a. 2019 California administrative code (cac), part 1, title 24 ccr *
 - b. 2019 California building code (cbc), part 2, title 24 ccr (2018 international building code, vol. 1 & 2, and 2019 California amendments)
 - c. 2019 California electrical code (cec), part 3, title 24 ccr (2017 national electrical code and 2019 California amendments)
 - d. 2019 California mechanical code (cmc), part 4, title 24 ccr (2018 iapmo uniform mechanical code and 2019 California amendments)
 - e. 2019 California plumbing code (cpc), part 5, title 24 ccr (2018 iapmo uniform plumbing code and 2019 California amendments)

- f. 2019 California energy code (cec), part 6, title 24 ccr
- g. 2019 California fire code (cfc), part 9, title 24 ccr (2018 international fire code and 2019 California amendments)
- h. 2019 California existing building code (cebc), part 10, title 24 ccr (2018 international existing building code and 2019 California amendments)
- i. 2019 California green building standards code (Cal green), part 11, title 24 ccr
- j. 2019 California referenced standards code, part 12, title 24 ccr
- k. title 19 ccr, public safety, state fire marshal regulations

Partial list of applicable standards are following:

- a. NFPA 72 national fire alarm and signaling code (ca amended): 2016 edition
- b. NFPA 2001 standard on clean agent fire extinguishing systems for protection of commercial cooking equipment; 2005 edition (r2010)
- c. UL 464 audible signaling devices for fire alarm and signaling systems, including accessories; 2003 edition
- d. UL 521 standard for heat detectors for fire protective signaling systems; 1999 edition
- e. UL 1971 standard for signaling devices for the hearing impaired; 2002 edition (2010) California building code, chapter 35, for state of California amendments to the nfpa standards.
- f. California fire code, chapter 33 for fire safety during construction and demolition.

For a complete list of applicable nfpa standards refer to 2019 CBC (sfm) chapter 35 and California fire code chapter 80.

- 2. All requirements of the Authority Having Jurisdiction (AHJ).

The FACP and associated field devices system shall comply with the following Underwriters Laboratories Inc. (UL) USA listing standards as applicable.

- 1. No. 38 Manually Actuated Signaling Boxes
- 2. No. 50 Cabinets and Boxes
- 3. No. 864 Control Units for Fire Protective Signaling Systems
- 4. No. 268 Smoke Detectors for Fire Protective Signaling Systems
- 5. No. 268A Smoke Detectors for Duct Applications
- 6. No. 346 Waterflow Indicators for Fire Protective Signaling Systems
- 7. No. 464 Audible Signaling Appliances
- 8. No. 521 Heat Detectors for Fire Protective Signaling Systems
- 9. No. 1638 Private Mode Emergency and General Utility Signaling
- 10. No. 1971 Visual Notification Appliances

1.6 WARRANTY

- A. For a period of two years from date of final acceptance, the system shall be under full guarantee for materials and labor at no cost to the Owner. The system shall be under a service contract with a technician authorized by the manufacturer. Replacement parts and

labor shall be readily available during normal business hours while the service contract is in effect. A complete system inspection and test shall be performed at five months and again at eleven months after final acceptance. Tests shall include all smoke detector sensitivity settings.

- B. Conform to applicable provisions of the General Requirements.
- C. Service technicians and replacement components for the system shall be available locally from a service representative of the manufacturer who is able to provide evidence of technical training and authorization by the manufacturer.
- D. All component failures shall be remedied to the satisfaction of the Owner.
- E. A continuing service contract shall be offered at time of bid to commence at the expiration of warranty included with the system.

1.7 ACCEPTABLE MANUFACTURER

- A. All fire alarm system devices and equipment shall be manufactured with the one indicated on the drawing or approved equivalent. no other manufacturers will be accepted.
- B. All equipment, materials, accessories, devices, etc. covered by the specifications and/or noted on the contract drawings shall be new and unused and be UL listed for their intended use.
- C. All equipment provided shall be available for purchase from at least two authorized distributors within the service area.

1.8 MAINTENANCE:

Maintenance and testing shall be on a semi-annual basis or as required by the AHJ. A preventative maintenance schedule shall be provided by the contractor describing the protocol for preventative maintenance. The schedule shall include:

Systematic testing and complete inspection of the entire fire alarm system including control panels, field devices, and wiring terminations including smoke sensors, heat sensors, manual pull stations, sprinkler system switches, remote panels, power supplies, and terminal boxes, and all other fire alarm accessories, in accordance with NFPA 72. Cleaning and adjusting of these devices shall be conducted at this time.

An inspection and test of system power supplies, batteries, circuit breakers, and fuses as well as a load test of the batteries shall be conducted in accordance with NFPA 72.

Placing the system into an alarm condition and checking each notification device for proper operation.

Removing devices from the FACP SLC circuit to ensure a trouble condition occurs.

Input and output mapping shall be tested to ensure proper sequence of operation.

Signal transmission shall be tested to the Monitoring Station.

A report showing the calibrated sensitivity of each of the systems smoke detectors shall be generated from the fire alarm control panel and verified to ensure all smoke detectors are within UL tolerance.

Following each periodic maintenance and test, the owner shall be provided with a detailed report of the test results including any deficiencies found.

PART 2 PRODUCT

2.1 MANUFACTURERS

- A. Fire Alarm Control Panel (FACP): Notifier
- B. Fire Alarm Power Supply: Notifier
- C. Area Smoke Detectors and Heat Detectors: Notifier
- D. Strobes, Combination Speaker/strobe and Weatherproof Speaker: System Sensor

2.2 MATERIALS

- A. Main FACP or network node shall contain a microprocessor based Central Processing Unit (CPU) and power supply in an economical space saving single board design. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system-controlled devices.
- B. System Devices and components shall be provided as specified on the fire alarm equipment legend and as shown on associated electrical drawing.

2.3 COMPONENTS

NEW FIRE ALARM CONTROL PANEL (FACP)

- A. FACP shall be as indicated model on the drawing or approved equivalent.

2.1 System description

A. The fire alarm system as outlined on the drawings, shall be a fire life safety system as manufactured by the panel indicated on the drawing. It shall be complete with all necessary hardware, software and memory specifically tailored for this project.

B. All equipment needed for a complete operable system, (whether specifically indicated or not) shall be included in this section. It shall be the installing contractor's responsibility for a complete and operable system upon completion of this project.

2.2 Automatic alarm operations

A. The fire alarm system operation subsequent to the alarm initiation via pull station, smoke detector, heat detector, sprinkler flow switch, etc., shall be as follows:

1. All audible alarm indicating devices shall sound the temporal signal code in synchronization with each other, until silenced at the control panel or at the remote annunciator.

2. All visual alarm indicating devices shall flash per NFPA requirements in synchronization with each other, until reset at the control panel or at the remote annunciator.

3. Alarm audible devices and alarm visual devices shall operate on the same circuit
4. The alarm signals shall be inhibited from being silenced for a period of at least 1 minute after commencing operation. this rate is to be field programmable for actual AHJ requirements.
5. Display type and location of alarm per point on the main control panel lcd display.
6. Display type and location of alarm per point on remote lcd annunciator.
7. List on printer the time, date, type, and user defined message for each event printed.
8. Graphically display on the fireworks station, school diagram showing whole school, with graphic scrolling thru system prompts, down to point of alarm activation.
9. Subsequent alarms are to report to the main control panel and fireworks, shall indicate to the operator that a subsequent alarm is present, and also indicate the number of subsequent alarms.
10. Shut down all associated air handlers in alarm zone.

2.3 Automatic supervisory operation

- A. All data, initiating, indicating and supervisory lines shall be constantly monitored for integrity. indicate opens, shorts, grounds, at main control panel and remote annunciator.

2.4 operation

A. During the normal state, the normal led (green) shall flash. the first line of the lcd shall display the time in (hh: mm: ss) as well as the number of active points (ap) and the number of disabled points (dp) in the system.

B. When the control panel goes into alarm condition, the normal led (green) extinguishes and the alarm led (red) shall light, the buzzer pulsates, and the lcd indicates the time, the number of messages waiting, the type of alarm, the point id number of devices, and the time that the alarm occurred. the second line is dedicated to the user specified message.

C. To silence the panel buzzer, the operator shall press the local silence button and the buzzer will silence.

D. To silence the audible devices, the operator shall press the alarm silence button. a new alarm shall cause the audibles to resound.

E. During the trouble condition, the amber trouble led shall light, the normal led shall go out, and the buzzer shall pulsate. the display shall indicate the point id number of the device, the time the event occurred and up to a 40-character custom user description.

F. During the monitor or supervisory condition, the appropriate led shall light, the normal led shall go out, and the buzzer shall pulsate. the display shall indicate the point id number of the device, the time the event occurred and up to a 40-character custom user description.

B. Fire Alarm Amplifier:

1. The intelligent fire alarm amplifier shall be as indicated model on the drawing or approved equivalent. The intelligent 50 or 70-watt amplifier is used to amplify the audio message for distribution throughout the facility. Since it is designed as a self-

- contained distributed amplifier it can be conveniently located near the area of protection to reduce wiring demands.
2. Each amplifier can produce 50 or 70 -watts of audio power. Up to four amplifiers can be used on the voice evacuation system. The amplifier has its own power supply with battery backup and four speaker circuits which can be expanded to eight speaker circuits. The amplifier is fully supervised by the main panel for trouble conditions.
- C. Fire Alarm Power Module:
1. The intelligent fire alarm power module shall be as indicated model on the drawing or approved equivalent. It delivers 6 amps of notification appliance circuit power and built-in synchronization. Its switch mode power supply design is up to 50% more efficient than competitive linear mode power supplies.
 2. The power supply is a 6-amp notification power expander that provides its own AC power connection, battery charging circuit, and backup battery for use with the same manufacturer series fire alarm control panels (FACPs). The power supply is the cost-effective solution for powering notification appliances required by the Americans with Disabilities Act (ADA). It has built-in ANSI cadence pattern. The output circuits can be programmed as notification appliance circuits, or as auxiliary power (configurable for constant, resettable, or door holder power).
- D. Intelligent Photoelectric Smoke Detector
1. The intelligent photoelectric smoke detector shall be as indicated model on the drawing or approved equivalent and shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
- E. Intelligent Thermal Detectors
1. The intelligent thermal detectors be as indicated model on the drawing or approved equivalent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. A high heat thermal detector rated at 190 degrees Fahrenheit shall also be available. The thermal detectors shall connect via two wires to the fire alarm control panel signaling line circuit.
- F. Ceiling Mounted Strobe
1. The notification appliances shall be as indicated model or approved equivalent model as Visual Strobe appliances for ceiling-mount applications with a low-profile design or approved equals. The Strobes shall be listed for UL Standard 1971 (Emergency Devices for the Hearing-Impaired) for Indoor Fire Protection Service.
 2. The Series shall be Restriction of Hazardous Substances (RoHS) compliant and contain no mercury or other hazardous substances.
 3. All Series shall meet the requirements of FCC Part 15 and ICES-003.
 4. All inputs shall be compatible with standard reverse polarity supervision of circuit wiring by a Fire Alarm Control Panel (FACP) with the ability to operate from 16 to 33 VDC.
 5. The Strobe appliances shall produce a flash rate of one (1) flash per second over the Regulated Voltage Range and shall incorporate a Light Emitting Diode (LED) as the light source with a rugged Lexan® lens. The appliances shall be of low current design. The LED strobe flash duration shall be 20 ms. Where multi-candela appliances are specified, the strobe intensity shall have 4 field selectable settings at 15, 30, 75, 95 candela for ceiling-mount applications. The selector switch for selecting the candela shall be tamper resistant. Appliances with candela settings shall show the candela selection in a visible location at all times when installed.

6. The Strobe mounting options shall include Ceiling backboxes, 4" square, 1 1/2 or 2 1/8" deep and 4" Octagonal, 1 1/2" or 2 1/8" deep. Two wire appliance wiring shall be capable of directly connecting to the mounting base. Removal of an appliance shall result in a supervision fault condition by the Fire Alarm Control Panel (FACP).
 7. All notification appliances shall be backwards compatible.
 8. The ceiling models shall have a low-profile measuring.
 9. When synchronization is required, the appliance shall be compatible with Sync Modules, PS Power Supplies, or other manufacturer's panels with built-in manufacturer Patented Sync Protocol. The strobes shall not drift out of synchronization at any time during operation. If the sync protocol fails to operate, the strobe shall revert to a non-synchronized flash-rate and still maintain (1) flash per second over its Regulated Voltage Range. The appliance shall also be designed so that the audible signal may be silenced while maintaining strobe activation when used with patented sync protocol.
- G. Combination Speaker Strobes
1. The Speaker Strobes are designed for high efficiency sound output for indoor applications. The product line features intelligible communications with crisp, clear voice messages and tone signaling, ideal for mass notification and voice evacuation.
 2. Providing a sleek aesthetic appearance, the wall and ceiling appliances feature dual voltage (25/70 VRMS) capability and field-selectable taps from 1/8 to 2 watts. For faster and easier installation, the low-profile design incorporates a speaker mounting plate, and each model has a built-in level adjustment feature and Snap-On cover with no visible mounting screws.
 3. For visible signaling to meet the hearing impaired, the E Speaker Strobe models incorporate the low current draw of the Strobes.
 4. Ceiling mount models are available in multi-candela ceiling strobe with field selectable intensities of 15/30/75/95/110/115cd or the high intensity strobe with field selectable 135/150/177/185cd.
 5. The strobe portion of all Speaker Strobes may be synchronized when used in conjunction with the Sync Modules, Power Supplies or other manufacturers panels incorporating the manufacturer Patented Sync Protocol. Synchronized strobes offer an easy way to comply with ADA recommendations concerning photosensitive epilepsy.
 6. Speaker Strobes are UL Listed for indoor use under Standard 1971 (Signaling Devices for the Hearing-Impaired) and Standard 1480 (Speaker Appliances). All inputs employ IN/OUT wiring terminals for fast installation using #12 to #18 AWG wiring.
 7. The speakers shall be UL Listed under UL 1480 for Fire Protective Service and speakers equipped with strobes shall be listed under UL 1971 for Emergency Devices for the Hearing-Impaired. In addition, the strobes shall be certified to meet the requirements of FCC Part 15, Class A.
 8. All models shall have listed sound output of up to 87 dB at 10 feet and a listed frequency response of 400 to 4000 Hz. The speaker shall also incorporate a sealed back construction.
 9. The speaker and speaker strobe appliances shall be designed for indoor flush mounting. The speaker and speaker strobe shall incorporate a speaker mounting plate with a snap-on grille cover with no visible screws for a level, aesthetic finish and shall mount to standard electrical hardware. The finish of the Speakers and Speaker Strobes shall be red. All speaker and speaker strobe appliances shall be backward compatible.
 10. When synchronization is required, the strobe portion of the appliance shall be compatible with sync modules or the Power Supplies with built-in Patented Sync Protocol. The strobes shall not drift out of synchronization at any time during operation. If the sync module or Power Supply fails to operate, (i.e., contacts remain closed), the strobe shall revert to a non-synchronized flash rate.

- H. Weatherproof Speaker
 - 1. Weatherproof notification appliances shall be UL listed for outdoor use. The appliances shall be available for optional wall mounting or ceiling mounting to weatherproof backboxes using either exposed conduit, concealed conduit, or semi-flush mounting to a recessed electrical box in walls or ceilings using indicated manufacturer mounting accessories.
 - 2. Wall-mount outdoor speakers can be used indoors or outdoors in wet or dry applications, and can provide reliable operation from -40°F to 151°F . These speakers provide a broad frequency response range, low harmonic distortion and maintain a high sound pressure level at all tap settings to provide accurate and intelligible broadcast of evacuation messages.
 - 3. Field-selectable settings, including candela, speaker voltage and power settings, and automatic selection of 12- or 24-volt operation enable installers to easily adapt devices to meet requirements.
 - 4. Weatherproof audibles shall be System sensor models or approved equals. The speaker devices shall be able to produce a continuous output or a temporal code-3 output that can be synchronized.
 - 5. Speaker shall be listed to Underwriters Laboratories Standard S4048 for outdoor fire protective signaling systems. Speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature from -40°F to 150.8°F . Speaker shall have power taps and wattage settings that are selected by rotary switches. The speaker must be installed with its weatherproof back box in order to remain outdoor approved per UL listing S4048. The speaker shall be suitable for use in air handling spaces and wet environments.

- I. Battery
 - 1. The battery shall have sufficient capacity to power the fire alarm system for no less than twenty-four hours plus 15 minutes of alarm upon a normal AC power failure.
 - 2. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.
 - 3. If necessary, to meet standby requirements, external battery and charger systems may be used.

PART 3 EXECUTION

3.1 COORDINATION

- A. Refer to the electrical and mechanical drawings and specifications to determine quantities and location of devices and required scope of work and coordinate work with mechanical and electrical installers. Provide function described under mechanical section Sequence of Control, for fire and/or emergency conditions. Submit proposed interconnection to elevator supplier. Submit conduit and pathing requirements to electrical installer. For self-contained door release, coordinate with door supplier.

3.2 GENERAL

- A. Comply with all applicable paragraphs in Section 26 05 00: Common Work Results for Electrical, apply as though repeated herein
- B. Install system(s) in accordance with manufacturer's instructions.
- C. Include services of certified technicians to supervise installation, provide adjustments, provide final connections, system testing and system training to Owner Representative

3.3 INSTALLATION

The complete system shall be installed by one (1) contractor and the installing contractor must be a certified dealer of the specified system. No subcontractors, to the awarded proposing contractor, will be allowed to install any portion of this system Including, but not limited to:

1. Wiring
 2. Field device installation
 3. System programming
 4. FACP installation
 5. Remote power supply installation
- A. The installing contractor shall install the network fire alarm system in as instructed by the manufacturer's instructions.
 - B. Installation shall be in accordance with the CEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
 - C. All conduit, junction boxes, conduit supports, and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
 - D. All fire detection and alarm system devices, control panels shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
 - E. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.
 - F. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as 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. The control panel enclosure shall feature a quick removal chassis to facilitate rapid replacement of the FACP electronics.

3.4 GROUNDING

- A. All equipment to be grounded by means of green ground wire to "U" contact of duplex receptacles and bonded to ground provided under 26 05 26: Grounding and Bonding of Electrical Systems.

3.5 INSPECTION

- A. Systems to meet all the requirements of the CSFM and IOR and AHJ and shall be approved thereby before installation and prior to final acceptance.
- B. Closeouts:
 1. It is the intent of these specifications and of the architect/engineer that a continued program of system maintenance be continued by the owner in compliance with NFPA Standard 72H. It is mandatory that the installing contractor provide such services and make available these services to the owner upon completion of the project.

2. As part of the closeout documents, fire alarm contractor will provide owner with AutoCAD as built drawings indicating locations of devices, routing of wiring, and panel information. All room numbers indicated on final close out documents and all panel settings shall be listed by actual building room numbers and not by room number indicated on construction documents. CAD files shall be AutoCAD 2004 or later. Provide the owner with one Mylar plot of each drawing and two blue line prints of each drawing. Provide the owner with electronic versions of the as-built CD's.
 3. Locate next to building FACP and other fire alarm panels.
 4. A building graphic shall be provided mounted in aluminum-extruded frame with plexi-glass front. Graphic shall locate all fire alarm devices, power supplies, and FACP.
 5. State FML-005 certificate shall also be framed and mounted near the fire alarm panel. Fire alarm panel shall have white FM required installation sticker attached to it.
- C. Graphic shall include actual room numbers posted as part of the building graphics package, include as part of substantial completion requirement

3.6 LOCATION

- A. Before installation, verify exact location of control equipment and outlets. The Owner reserves the right to relocate system components within a radius of 10' at no increase in cost before rough-in work is started for the respective component.

3.7 WIRING

- A. All fire alarm wiring shall be new.
- B. Furnish all conductors, equipment, terminal strips, etc., and labor to install a complete and operable system. All cable conductors shall be color coded and numbered for identification at all terminals. Green shall be for grounding conductor only. Use red insulation and or red jacketing on all fire alarm cable.
- C. All wiring shall be in accordance with NFPA 72, the California Electrical Code, Local Codes, and article 760 of NFPA Standard 70. All wiring sizes shall conform to recommendations of the equipment manufacturer, and as indicated on the engineered shop drawings.
- D. All wire shall be U.L. Listed FPL for limited energy (300V) and fire alarm applications and shall be installed in conduit. Limited energy FPLP or MPP wire may be run open in return air ceiling plenums provided such wire is U.L. Listed for such applications and is of the low smoke producing fluorocarbon type and complies with CEC Article 760 if so, approved by the local authority having jurisdiction.
- E. No A.C. wiring or any other wiring shall be run in the same conduit as fire alarm wiring.
- F. Wiring used for the multiplex communication circuit (SLC) shall be twisted and support a minimum wiring distance of 10,000 feet when sized at 12 AWG. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit. Shielded wire shall not be required.
- G. The fire alarm control panel shall be capable of T-tapping NFPA Style 4 (Class B) Signaling Line Circuits (SLCs). Systems which do not allow or have restrictions in, for example, the number of T-taps, length of T-taps etc., is not acceptable.

- H. Contractor shall provide a service loop located above each device installed on the entire project. The service loop shall be a minimum of 5'.
- I. Contractor shall provide a service loop located above each type of panel installed. The service loop shall be a minimum of 10', but shall have enough length to allow for the panel to be relocated to any wall within the room that panel is located in.
- J. All service loops shall be installed in the accessible ceiling that is nearest to each device and panel. No service loops shall be installed in open spaces or non-accessible spaces

3.8 TERMINAL BOXES, JUNCTION BOXES AND CABINETS:

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

3.9 CONDUIT / RACEWAY:

- A. All wire shall be installed in an approved conduit/raceway system (except where permitted by NEC and the local authority having jurisdiction). Maximum conduit "fill" shall not exceed 40% per CEC.
- B. Conduit and raceway system shall be installed as specified under the general electrical section of the specifications, and per CEC, local, and state requirements.
- C. Minimum conduit size shall be 3/4" (19.1 mm). Install conduit per engineered shop drawings.
- D. Systems utilizing open wiring techniques with low smoke plenum cable shall provide conduit in all inaccessible locations, inside concealed walls, all mechanical/electrical rooms, or other areas where wiring might be exposed or subject to damage.
- E. All vertical wiring and all main trunk/riser wiring shall be installed in a complete raceway/conduit system. All riser boxes shall be adequately sized for the number of conductors traversing the respective box as well as the number of terminations required.
- F. 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 CEC Article 760-29.
- G. 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.
- H. 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.
- I. All wiring associated with smoke control system shall be installed in conduit per current adopted codes regardless of voltages or ratings.

3.10 TESTING

- A. After all equipment specified herein for each system has been installed and is in operating condition, conduct performance tests to determine if the installation and components comply with these specifications. Furnish competent personnel, all test material and approved test

instruments and conduct the tests under supervision of factory personnel, in the presence of the Engineer, the building and fire inspecting agencies:

1. The contractor's job foreman, in the presence of a representative of the manufacturer, a representative of the owner, and the fire department shall operate every installed device to verify proper operation and correct annunciation at the control panel.
2. At least on half of all tests shall be performed on battery standby power.
3. Where application of heat would destroy any detector, it may be manually activated.
4. The signaling line circuits and notification appliance circuits shall be opened in at least two (2) locations to verify the presence of supervision.
5. When the testing has been completed to the satisfaction of the contractor representative IOR, representatives of the manufacturer and owner, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to the owner and the authority having jurisdiction.
6. The contractor shall leave the fire alarm system in proper working order, and, without additional expense to the owner, shall replace any defective materials or equipment provided by him under this contract within two years from the date of final acceptance by the awarding authority.
7. The local responding fire department must be notified prior to the final test in accordance with local requirements and when requested, participate in system testing and evaluation.

3.11 WALK TEST

- A. Notify Owner, Architect and Engineer when system is 100 percent operational. Schedule walk-through of the entire facility and verify that each initiating and each indicating device is operating properly.
- B. Provide report at conclusion of walk through certifying all fire alarm devices are working.
- C. Walk test shall include a representative from owner maintenance department.
- D. Walk test to show in a printed report all AHU shutdown, strobes/horns, heat and smoke detectors. Report shall list all devices by approximate location to rooms, and device number.

3.12 SOFTWARE

- A. Installer shall provide a backup copy of the installed program database (on CD) upon completion of the project. They shall also provide the current version of system software, for the panel provided, on CD.

3.13 REPORT

- A. Prepare written report of final test results, signed by witnessing parties. Submit to the Engineer in triplicate for final approval.

END OF SECTION

SECTION 31 20 00

EARTH MOVING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Top soil excavation.
- B. Site rough grading.
- C. Building excavation, backfill and compaction.
- D. Excavation for pavements and site structures.
- E. Consolidation and compaction.
- F. Fill for overexcavation.
- G. Utility trenches, backfill and compaction.
- H. Subgrade preparation of pavement areas.
- I. Finish grading.
- J. Erosion and sedimentation control measures.

1.2 REFERENCES

- A. CBC - California Building Code, Title 24, Part 2, Chapter 18A and Appendix J.
- B. Los Angeles County Code.
- C. City of West Covina Dust Control Ordinance.
- D. Storm Water Quality Association - Stormwater Best Management Practice Handbook (BMP Handbook) Construction Edition.
- E. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- F. ASTM D448 - Sizes of Aggregate for Roadway and Bridge Construction.
- G. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- H. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop.
- I. ASTM D2922 – Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods. (Shallow Depth).
- J. ASTM D2937 – Test Method for Density of Soil in Place by the Drive-Cylinder Method.
- K. ASTM D3017 – Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

- A. Submit samples under provisions of Section 01 33 00.
- B. Submit 10 lb. sample of each type of fill to testing laboratory in air-tight containers.

- C. Submit name of imported materials source. Provide materials from same source throughout the work. Change of source requires Architect's approval.
- D. Submit test reports under provisions of Section 01 45 29.

1.4 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01 77 00.
- B. Accurately record location of utilities remaining, rerouted utilities, new utilities by horizontal dimensions, elevations or inverts, and slope gradients.

1.5 QUALITY ASSURANCE

- A. Comply with California Building Code (CBC), Title 24, Part 2, Chapter 18A and Appendix J.
- B. Comply with Los Angeles County Code.
- C. Comply with City of West Covina Dust Control Ordinance.
- D. Perform best management practice dust control techniques for given site conditions as defined in Section 3 of the Storm Water Best Management Practice Handbook, (BMP Handbook) Construction Edition.

1.6 FIELD CONDITIONS

- A. Verify that survey benchmark and intended elevations for the work areas are as indicated.
- B. Notify Architect of unexpected subsurface conditions and discontinue work in area affected until notified to resume work.
- C. Perform site assessment to identify any contaminated soils which may occur on site.

1.7 PROTECTION

- A. Protect trees, shrubs, lawns, and other features remaining as portion of final landscaping.
- B. Protect bench marks, fences, roads, sidewalks, paving, and curbs.
- C. Underpin adjacent structures, including utilities and pipe chases, which may be damaged by excavation work.
- D. Protect above or below grade utilities which are to remain.
- E. Barricade open excavations and post warning lights. Operate lights from dusk to dawn.
- F. Protect facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- G. Repair or replace all damage.

2. PART 2 PRODUCTS

2.1 SOIL MATERIALS

- A. Existing Subsoil: Excavated and re-used material, graded free of lumps and rocks larger than 3 inches in any dimension.
- B. Imported Subsoil: Non-expansive predominantly granular soils such as a silty sand, free of lumps and rocks larger than 3 inches in any dimension, and debris. Expansion index less than 20, and no more than 50 percent of the material shall pass a No. 200 sieve. Material shall contain sufficient fines (binder) to result in a stable subgrade.

- C. Existing Topsoil: Excavated and re-used material, graded free of roots, rocks larger than one inch, subsoil, debris and large weeds.
- D. Imported Topsoil: Friable loam, free of subsoil, roots, grass, excessive amounts of weeds, stones and foreign matter; acidity range (ph) of 5.5 to 7.5; containing an amount of organic matter normal to the region.
- E. Sand: Natural river or bank sand: Free of silt, clay, loam, friable or soluble materials or organic matter, graded in accordance with ASTM C136, all passing the No. 4 sieve and only 5 percent passing the No. 200 sieve.
- F. Gravel: Coarse aggregate; free of clay, shale and organic matter; ASTM D448, grading size 6 with 100 percent passing a 1 inch sieve and not more than 5 percent passing a No. 4 sieve.
- G. Pea Gravel: Natural Stone; washed, free of clay, slate, organic matter, graded in accordance with ASTM C136, 1/4 inch to 5/8 inch.
- H. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, graded in accordance with ASTM C136, with 100 percent passing a 1-1/2 inch sieve and not more than 5 percent passing a No. 4 sieve.
- I. Crushed Stone Base: Permeable base meeting California Department of Transportation 3/4 inch Permeable Class II Base designation according to the following gradation:

Mesh Size	% Passing
1 inch	100
3/4 inch	90-100
3/8 inch	40-100
#4	25-40
#8	18-33
#30	5-15
#50	0-7
#200	0-3

- J. Concrete: Structural concrete conforming to Section 03 30 00 with a compressive strength of 2,000 psi for fill to correct over-excavation.
- K. Materials (existing and import) shall be free of any toxic materials listed (by the federal or state EPA or federal or state health agencies) as hazardous material.
- L. Materials (existing and import) are subject to the approval of the Soils Engineer for use in the project.
- M. Provide imported materials when sufficient satisfactory soil materials are not available from on site sources.

2.2 ACCESSORIES

- A. Permeable Geotextile Fabric: Non-woven filter fabric, 60 mil thick, weighing 4.5 oz/sq yd; 14ON fabric manufactured by Mirafi Inc., www.tcmirafi.com. GN100 Green Geotextile fabric manufactured by American Engineering Fabrics, Inc., www.boomenviro.com.
- B. Impermeable Geotextile Fabric: Reinforced liner, 20 mils thick; Hercuscrim 20 Fabric manufactured by In-Line Plastics, LC, www.in-lineplastics.com.
- C. Substitutions: Under provisions of Section 01 25 13.

2.3 EQUIPMENT

- A. Equipment: Capable of excavating subsoil, mixing and placing materials, wetting, consolidation, grading, and compaction of material.

3. PART 3 EXECUTION

3.1 INSPECTION

- A. Verify agreement of existing site conditions with indicated conditions.
- B. Notify Architect of discrepancies found.
- C. Beginning work of this Section constitutes acceptance of existing conditions.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Identify known below grade utilities. Stake and flag locations.
- C. Identify and flag above grade utilities.
- D. Maintain and protect existing utilities remaining which pass through work area.
- E. Notify utility company and pay all costs to remove and relocate utilities.
- F. Upon discovery of unknown utility or concealed conditions, discontinue affected work; notify Architect.

3.3 EROSION AND SEDIMENTATION CONTROL

- A. Provide erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways .
- B. Inspect, repair, and maintain erosion and sedimentation control measures during earthwork operations.

3.4 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded.
- B. Stockpile in area designated on site.
- C. Stockpile topsoil to depth not exceeding 8 feet. Place, grade, and shape stockpile for proper drainage.

3.5 GRADING

- A. Uniformly grade areas within limits of grading including adjacent transition areas.
- B. Make such cuts or fills as may be required to bring subgrade to elevations shown and to tolerances specified.
- C. Plow or otherwise break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond to existing surface.
- D. Where grades are not indicated, grade uniformly level or slope between points for which elevations are given.
- E. In absence of more specific grading information, slope ground away from building for a distance of 20 feet at 2 percent.
- F. Make grade changes gradual. Blend slope into level areas.
- G. Compact each layer of fill to required density.

3.6 EXCAVATION FOR STRUCTURES

- A. Excavate subsoil required to accommodate building foundation, site structures and construction operations.
- B. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot.
- C. Extend a sufficient distance from footings and foundations to permit placing and removal of formwork, installation of services, other construction, and for inspection.
- D. Remove lumped subsoil, boulders and rock up to 1/3 cu yd measured by volume. Replace with approved fill material and compact as specified.
- E. Do not disturb bottom of excavations intended for bearing surface.
- F. Scarify bottom of excavation to a depth of 12 inches, moisture-condition to optimum moisture content and compact as specified.

3.7 EXCAVATION FOR PAVEMENTS

- A. Cut surface under pavements to comply with cross-sections, elevations, and grades as shown, to subgrade elevations required and to grade tolerances specified.
- B. Scarify subgrade beneath slabs-on-grade to a depth of 12 inches, moisture-condition to optimum moisture content and compact as specified.
- C. Scarify subgrade beneath paving to a depth of 12 inches, moisture-condition to optimum moisture content and compact as specified.

3.8 TRENCH EXCAVATION

- A. Excavate subsoil required to accommodate storm sewer, sanitary sewer, water, gas, electric and telephone conduits, and piping to municipal or private utilities.
- B. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 8 inch clearance on both sides of the pipe.
- C. Excavate trenches to depth indicated or required to establish indicated slope and invert elevations.
- D. Depth of excavations on the exterior of the building shall provide for the minimum coverage above the top of the pipe, conduit, or tank measured from the lowest adjacent finish grade, as follows unless otherwise indicated on the Drawings:
 - 1. Steel Pipe and Conduit 24 inches
 - 2. Copper Water Tube 18 inches
 - 3. Cast-Iron, Pressure Pipe 36 inches
 - 4. Plastic Pipe (other than waste) 30 inches
 - 5. Plastic Waste Pipe 24 inches
 - 6. Soil, Sewer & Storm Drain 18 inches
 - 7. Irrigation Pipe (pressure) 24 inches
 - 8. Irrigation Pipe (non-pressure) 12 inches
- E. For pipe or conduit less than 4 inches in nominal size, do not excavate beyond indicated depths. Hand-excavate bottom to accurate elevations and support pipe or conduit on undisturbed soil.

- F. For pipe or conduit, 4 inches and larger, carry excavation 4 inches below required elevation and backfill with sand bedding to support pipe or conduit.
- G. Hand trim excavation. Remove loose material.
- H. Excavation cut not to interfere with bearing splay of foundations.
- I. At each pipe joint dig bell hole to relieve pipe bell of loads and to ensure continuous bearing of pipe on bearing surface.
- J. Remove lumped subsoil, boulders and rock up to 1/3 cu yd measured by volume. Replace with sand bedding material and compact as specified.

3.9 STORAGE OF EXCAVATED MATERIALS

- A. Stockpile excavated materials in designated on-site area.
- B. Segregate excavated materials based upon intended use.
- C. Place, grade, and shape stockpile for proper drainage.
- D. Locate stockpile away from edge of excavations.
- E. Do not stockpile materials within drip line of trees.

3.10 UNAUTHORIZED EXCAVATION

- A. Correct unauthorized excavation at no cost to Owner.
- B. Backfill excavation to correct elevation with concrete or approved fill material compacted to 95% moisture compaction.

3.11 STABILITY OF EXCAVATIONS

- A. Comply with local codes, ordinances, and requirements of agencies having jurisdiction.
- B. Machine slope banks to angle of repose or less.
- C. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- D. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
- E. Provide shoring and bracing in good serviceable condition.
- F. Extend shoring and bracing as excavation progresses.
- G. Maintain shoring and bracing in excavations regardless of time period excavation will be open.
- H. Provide permanent steel sheet piling wherever subsequent removal of piling would permit lateral movement of soil under adjacent structures. Cut off top of piling 2'-6" below finish grade and leave permanently in place.
- I. Design and Calculations: Provide by licensed California engineer in accordance with requirements of the California Building Code and Safety Orders of the State of California, Division of Industrial Safety; Title 8, Division 1, Chapter 4, Subchapter 4, Article 6.

3.12 DEWATERING

- A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

- B. Grade top perimeter of excavations to prevent surface water from draining into excavations.
- C. Do not allow water to accumulate in excavations.
- D. Remove water to prevent softening of foundation bottoms and soil changes detrimental to stability of subgrades.
- E. Provide and maintain pumps, well points, sumps, suction and discharge lines and other components necessary to convey water away from excavations.
- F. Establish and maintain temporary drainage ditches and other diversions to convey rain water and water removed from excavations to runoff areas.
- G. Do not use trench excavations as temporary ditches.

3.13 BEDDING OF TRENCHES

- A. Support pipe and conduit during placement and compaction of bedding fill.
- B. Place a minimum of 4 inches of sand bedding beneath all piping and conduit 4 inches in diameter and larger.
- C. Place a minimum of 12 inches of sand bedding above all piping and conduit.
- D. Compact sand bedding to density required.

3.14 BACKFILLING

- A. Backfill excavations as promptly as work permits, but not until the following has been completed:
 - 1. Acceptance of subgrade.
 - 2. Construction below grade, where applicable, for damproofing.
 - 3. Inspection, testing, approval and record documentation of location of underground utilities.
 - 4. Removal of concrete formwork.
 - 5. Removal of shoring and bracing if not to be left in place.
 - 6. Backfill of voids in subgrade with satisfactory materials.
 - 7. Removal of trash and debris.
 - 8. Installation of bedding material.
 - 9. Permanent or temporary bracing of horizontally supported walls.
- B. Compact subgrade to density requirements for subsequent backfill.
- C. Backfill to contours and elevations required.
- D. Place geotextile fabric over drainage fill prior to placing backfill.
- E. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- F. Place and compact fill material in continuous layers not exceeding specified compacted depth for each layer.
- G. Employ a placement method that does not disturb or damage foundation dampproofing and utilities in trenches.

- H. Before placing successive layers, all ruts, and other hollows more than 6 inches in depth shall be regraded and compacted.
- I. Maintain optimum moisture content of backfill materials.
- J. Backfill against supported foundation walls.
- K. Backfill simultaneously on each side of unsupported foundation walls.
- L. Backfill trenches with concrete where excavation is less than 3 feet below bottom of footing. Place concrete to level of bottom of adjacent footing. Width of concrete backfill to match width of footing and be full width of trench. Maintain minimum 6 inch encasement on sides, top, and bottom.
- M. Place 4 inch thick concrete base slab then backfill trenches with concrete for piping or conduit where top of piping or conduit is less than 30 inches below finished elevation of paving or 18 inches below finished grade. Minimum 6 inches of encasement on sides and top.
- N. Remove and replace or scarify and air dry subgrade or fill material that is too wet to permit compaction to required density.

3.15 COMPACTION

- A. Control soil compaction during construction providing density specified for each area classification.
- B. Place and compact fill materials in continuous layers of not more than 8 inch thick compacted depth.
- C. Provide not less than the specified percentages of density of soil material compacted at optimum moisture content, for each layer of soil material in place.
- D. When existing ground surfaces have a density less than that specified for a particular area classification, scarify existing surface to a depth of 12 inches, moisture-condition to optimum moisture content and compact to required percentage of maximum density.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Moisture content shall be uniform throughout all layers. Add necessary moisture or aerate soil material at borrow source if it is not possible to obtain uniform moisture content at soil surface at time of placement.
- G. When moisture content and condition of each soil layer is satisfactory compact soils to specified density.
- H. Compaction of free draining material such as gravel shall be by treads of crawler type tractor, surface vibrator, smooth or pneumatic roller, hand or power tampers.
- I. Compaction of soils by use of water jetting or puddling is not an acceptable procedure.
- J. Correct improperly compacted areas or layers as directed by Architect if soil density tests indicate inadequate compaction.

3.16 DISPOSAL OF EXCESS AND WASTE MATERIAL

- A. Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of legally off site.
- B. Remove surplus backfill materials from site and dispose of legally off site.
- C. Remove surplus topsoil materials from site and dispose of legally off site.
- D. Leave material stockpile areas completely free of excess materials.

3.17 PROTECTION OF WORK

- A. Protect finished work under provisions of Section 01 61 00.
- B. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- C. Protect bottom of excavations from freezing, water saturation, and disturbance.

3.18 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01 45 29.
- B. Allow testing service to inspect, test, and approve each subgrade and fill layer before further backfill or construction work is performed
- C. Laboratory tests and analysis of fill material will be performed in accordance with ASTM D1557 and with Section 01 45 29.
- D. In place site tests and analysis of fill material will be performed in accordance with ASTM D1556, ASTM D2937 or ASTM D2922, and with Section 01 45 29.
- E. In place site moisture tests will be performed in accordance with ASTM D3017.
- F. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

3.19 GRADING TOLERANCES

- A. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevation.
- B. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.
- C. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1/2 inch above or below required subgrade elevation.
- D. Building Slab: Grade smooth and even, free of voids, to required subgrade elevation. Final grade tolerance to be within 1/2 inch when tested with a 10 foot straightedge.

3.20 MAINTENANCE

- A. Protect newly graded areas. Keep free of trash and debris.
- B. Provide erosion control methods to prevent erosion.
- C. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances and density.
- D. Where completed areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.
- E. Where settling occurs, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface finish to match adjacent work and eliminate evidence of restoration.

3.21 PLACEMENT SCHEDULE

- A. Interior Crawl Space:
 - 1. Subsoil fill, existing or import, to required subgrade, compacted to 95 percent.

- B. Exterior Side of Foundation Walls:
 - 1. Existing or imported subsoil fill, to subgrade elevation, compacted to 95 percent.
- C. Fill Under Footings:
 - 1. Existing or imported subsoil fill, 36 inches thick to subgrade elevation, compacted to 95 percent.
- D. Grass Areas:
 - 1. Subsoil fill, existing or import, to subgrade elevation, compact to 85 percent.
 - 2. Cover with topsoil, existing or import, to finish grade elevation, compact to 85 percent.
- E. Asphalt Paving:
 - 1. Subsoil fill, existing or import, to subgrade elevation, compact to 95 percent.
 - 2. Cover with aggregate base specified under Section 32 12 16.
- F. Concrete Paving:
 - 1. Subsoil fill, existing or import, to subgrade elevation, compact to 95 percent.
 - 2. Cover with sand base to subgrade elevation, compact to 90 percent.
 - 3. Cover with aggregate base specified under Section 32 13 13.
- G. Concrete Walks, Curbs, and Gutters:
 - 1. Subsoil fill, existing or import, to subgrade elevation, compact to 90 percent.
 - 2. Cover with sand, base to subgrade required, compact to 90 percent.
- H. Fill to Correct Overexcavation:
 - 1. Lean concrete of minimum compressive strength as specified.
 - 2. 24 fill, to required elevation, compact to 95 percent.
- I. Drainage Pipe:
 - 1. Drainage fill, to 6 inches below finished grade 6 inches above pipe, compact to 95 percent.
 - 2. Wrap drainage fill with geotextile fabric.
 - 3. Remaining fill of subsoil fill, existing or import, to subgrade elevation, compact to 95 percent.
- J. Utility Trenches on Interior of Building:
 - 1. Sand bedding to 12 inches above pipe, compact to 95 percent.
 - 2. Existing or imported subsoil fill, compact to 95 percent.
 - 3. Cover with gravel fill, 8 inches thick, compact to 95 percent.

K. Utility Trenches on Exterior of Building:

1. Sand bedding to 12 inches above pipe, compact to 95 percent.
2. Existing or imported subsoil fill, compact to 95 percent.

END OF SECTION

SECTION 32 12 16

ASPHALT PAVING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Weed killer.
- B. Geotextile paving grid.
- C. Prepared base.
- D. Headers and stakes.
- E. Asphaltic concrete paving.
- F. Surface sealer.
- G. Pavement striping.
- H. Concrete wheel stops.

1.2 REFERENCES

- A. ASTM D979 - Standard Practice for Sampling Bituminous Paving Mixtures.
- B. ASTM D2041 - Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.
- C. ASTM D2726 - Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
- D. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete In Place by Nuclear Methods.
- E. ASTM D3549 - Standard test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
- F. Southern California Chapter, American Public Works Association - Standard Specifications for Public Works Construction.
- G. Redwood Inspection Service - Standard Specifications for Grades of California Redwood Lumber.
- H. Storm Water Quality Association - Storm Water Best Management Practice Handbook (BMP Handbook) Construction Edition.
- I. TAI (The Asphalt Institute) - Manual Series No. 2 (MS-2).

1.3 QUALITY ASSURANCE

- A. Perform work in accordance with Standard Specifications for Public Works Construction.
- B. Mixing Plant: Conform to State of California standards.
- C. Obtain materials from same source throughout.

1.4 REGULATORY REQUIREMENTS

- A. Conform to applicable Los Angeles County standards for paving work on public property.

1.5 SUBMITTALS

- A. Submit proposed mix design for review prior to commencement of work under provisions of Section 01 33 00.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt when base surface temperature is less than 40 degrees F.
- B. Perform asphalt paving waste management techniques as defined in Section 4 of the Storm Water Best Management Practice Handbook, (BMP Handbook) Construction Edition.

2. PART 2 PRODUCTS

2.1 GEOTEXTILE PAVING GRID

- A. Polypropylene Triax Geogrid TX160-16 as manufactured by Tensar International Corp., www.tensqrcorp.com.
- B. Substitutions: Under provisions of Section 01 25 13.

2.2 AGGREGATES

- A. Provide aggregates consisting of crushed stone, gravel, sand, or other sound, durable mineral materials processed and blended, and naturally combined.
- B. Granular base aggregate: In accordance with Section 200-2.2 of Standard Specifications for Public Works Construction.
- C. Granular base aggregate maximum size:
 - 1. Base courses over 6 inch thick: 1-1/2 inches.
 - 2. Other base courses: 3/4 inches.
- D. Aggregates for asphaltic concrete paving: In accordance with Section 203.6.2.2. of Standard Specifications for Public Works Construction.

2.3 WEED KILLER

- A. Commercial chemical for weed control, registered by EPA. Dry, free-flowing, dust-free chemical compound, nonflammable, not creating a fire hazard when applied in accordance with the manufacturer's recommendations, soluble in water, and capable of being spread dry or in solution.
- B. Weed Killer products:
 - 1. Oust: E.I. Dupont de Nemours and Co., www.dupont.com.
 - 2. Casoron 4G: Uniroyal Chemical Co., Inc., www.cromptoncorp.com.
 - 3. Substitutions: Under provisions of Section 01 25 13.

2.4 HEADERS AND STAKES

- A. Headers: Construction heart grade redwood in compliance with the Standard Specifications for Grades of California Redwood Lumber.
- B. Stakes: Redwood of grade specified for headers.
- C. Nails: Common, galvanized, 12d minimum.

2.5 CONCRETE WHEEL STOPS

- A. Prefabricated 5-1/2 inch high x 7-1/2 inch wide x 48 inch long, 3,500 psi concrete wheel stop.
- B. Chamfer corners and provide holes for anchoring to substrate.
- C. Dowels: Galvanized steel, 1/2 inch diameter, minimum 12 inch length.
- D. Substitutions: Under provisions of Section 01 25 13.

2.6 PAVEMENT STRIPING PAINT

- A. Vinyl emulsion type, white color, except at accessible parking spaces, provide blue color. Blue color to be equal to Color 15090 in accordance with Federal Standard 595C. Color of play pad markings shall be as indicated.
- B. Striping products:
 - 1. W801 Vin-L-Stripe Traffic Paint, manufactured by Dunn-Edwards, www.dunnedwards.com.
 - 2. Substitutions: Under provisions of Section 01 25 13.

2.7 ASPHALTS

- A. Comply with provisions of Standard Specifications for Public Works Construction, Section 203-1:
 - 1. Paving asphalt : PG-64-10
 - 2. Tack coat : SS-1h

2.8 ASPHALTIC PAVING MIX

- A. Provide hot plant mixed asphaltic concrete paving materials in accordance with Section 203-6 of Standard Specifications for Public Works Construction:
 - 1. Base Course Mix : B
 - 2. Parking and Drive Area Mix : C2
 - 3. Hardscape Play Area Mix : D2
 - 4. Binder Course - Running Track : C2
 - 5. Top Course - Running Track : D2
- B. Asphalt concrete paving mix to have 5 to 7 percent asphalt cement content by weight in accordance with TAI Publication MS-2.

2.9 SEAL COAT

- A. Hardscape Play Areas: Guardtop ultra high performance sealcoat, www.guardtop.com.

***** AND *****

- A. Parking Lot and Drive Areas: Emulsified asphalt and mineral aggregate mix complying with Section 203-9 of Standard Specifications for Public Works Construction, using Type SS-1h asphalt emulsion.
- B. Substitutions: Under provisions of Section 01 25 13.

3. PART 3 EXECUTION

3.1 INSPECTION

- A. Verify compacted subgrade is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.
- C. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

- A. Apply weed killer to entire area to be paved. Follow manufacturer's application directions.
- B. Install headers and stakes to achieve arrangement of paving shown on the Drawings.

3.3 PLACEMENT OF GEOTEXTILE PAVING GRID

- A. Place rolls of geotextile paving grid in position and roll out onto subgrade. Anchor beginning of roll to subgrade with 11-gauge, 6 inch x 1 inch x 6 inch sod staples at 4'-0" on center.
- B. Unroll geotextile paving grid in direction of travel so that long dimension of roll is perpendicular with traffic pattern.
- C. Overlap ends and edges of rolls by 2 feet. Secure ends and edges of adjacent rolls with zip ties.
- D. Overlap geotextile paving grid in direction that base course will be spread.
- E. Cut and overlap geotextile paving grid to accommodate curves with sharp shears. Cut grid to conform to manhole covers and other immovable protrusions.
- F. Maintain geotextile paving grid taut during base course installation.
- G. Do not drive track propelled equipment directly on geotextile paving grid.
- H. If damage occurs to geotextile paving grid, remove damaged area and place new section of grid overlapping damaged area by 3 feet in all directions. Secure new section of grid with zip ties spaced at 24 inches on center.

3.4 PLACEMENT OF GRANULAR BASE COURSE

- A. Spread granular base material to compacted thickness shown on the Drawings. Compact according to Section 31 20 00 to 95 percent.
- B. Do not displace geotextile paving grid during placement.
- C. Thickness tolerance: Minus 0.0 inch to plus 0.5 inch.
- D. Smoothness tolerance: 3/8 inch in 10 feet.
 - 1. Deviations: Correct by removing materials, replacing with new materials, and reworking and recompacting as required.
- E. Smoothness tolerance: Running Track
 - 1. 1/4 inch in 10 feet.
 - 2. Deviations: Correct by removing materials, replacing with new materials and reworking and recompacting as required.
- F. Moisture content: Only the amount needed to achieve the specified compaction.

3.5 PLACEMENT OF ASPHALTIC CONCRETE FINISHED PAVING

- A. Remove all loose materials from compacted base.
- B. Adjust frames and covers, if so required, to meet final grades.
- C. Tack Coat:
 - 1. Apply tack coat at the rate of 0.05 to 0.10 gallon per square yard to all existing pavement, curbs, gutters, manholes, and the like immediately before asphalt concrete is placed.
 - 2. Avoid smearing adjacent surfaces. Remove spillage and clean affected areas.
- D. Spreading Asphaltic Concrete Materials:
 - 1. Spread material in a manner which requires the least handling.
 - 2. Spread asphalt concrete to compacted thickness shown on drawings.
 - 3. Where thickness of asphalt concrete paving will be 3 inches or less, spread in one layer.
 - 4. Where thickness of asphalt concrete paving will be more than 3 inches, spread in two layers. Surface course shall be a minimum of 1 inch thick.
 - 5. Prime asphalt surface between layers.
 - 6. Offset layers of paving a minimum of 6 inches.
- E. Rolling:
 - 1. After material has been spread to proper depth, roll until the surface is hard, smooth, unyielding, and true to the thickness and elevations shown.
 - 2. Roll in at least two directions until no roller marks are visible.
- F. Compacting:
 - 1. Average density according to ASTM D2041 to be 92 percent but not less than 90 percent and not more than 96 percent.

3.6 TOLERANCES

- A. Free from birdbaths.
- B. Flatness, Parking Lot, and Drive Areas: Maximum variation of 1/8 inch in 6 feet.
- C. Flatness, Hardscape Play Areas: 1/8 inch in 10 feet.
- D. Compacted Thickness: Within 1/4 inch.
- E. Variation from True Elevation: Within 1/2 inch.

3.7 REPAVING

- A. Where existing pavement is cut, removed, or disturbed, existing pavement shall be saw cut.
- B. Where excavations are 12 inches or less in width, existing pavement to be cut 12 inches greater in length and width of excavation.
- C. Where excavations are greater than 12 inches in width, existing pavement to be cut 24 inches greater in length and width of excavation.

- D. Where existing pavement being cut is to be overlaid, pavement cutting outside limits of excavation is not required.
- E. Backfill shall conform to requirements of Section 31 20 00.
- F. Repaving shall match existing paving, but shall not be less than 3 inches of asphalt concrete placed upon 12 inches of crushed aggregate base in compliance with Section 200-2.2 of the Standard Specifications for Public Works Construction.

3.8 SEAL COAT

- A. Apply seal coat to hardscape play areas and parking and drive areas in accordance with manufacturer's instructions in two separate coats. Do not apply seal coat until 30 days after initial placement of asphaltic concrete paving.

3.9 PAVEMENT STRIPING

- A. Layout line markings and other painting in accordance with Drawings. Lines shall be 4 inches wide.
- B. Clean surfaces to be painted. Apply paint in accordance with manufacturer's directions only when weather conditions permit proper application. Machine apply paint in as many coats as are required to provide opaque markings.

3.10 WHEEL STOPS

- A. Place wheel stops at all parking stalls as indicated.
- B. Anchor permanently in place with two steel rods.

3.11 FIELD QUALITY CONTROL

- A. Field inspection and testing of granular base and of asphalt concrete paving mix will be performed under provisions of Section 01 45 29.
- B. Testing firm to take samples and perform tests in accordance with TAI MS-2 and as specified.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- D. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D3549.
- E. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- F. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D979.
- G. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D2041, and compacted as specified.
- H. In-place density of compacted pavement will be determined by testing core samples according to ASTM D2726.
 - 1. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
 - 2. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D2950 and correlated with ASTM D2726.

- I. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.12 PROTECTION

- A. Immediately after placement, protect pavement under provisions of Section 01 61 00 from mechanical injury for 2 days.
- B. Protect all new placed pavement from landscape irrigation overspray and planter area soil erosion.

3.13 FLOOD TEST

- A. Perform flood test of finished paving by use of water tank truck.
- B. Where water ponds to a depth of more than 1/8 inch, fill or otherwise correct to provide proper drainage.
- C. Feather and smooth edge of fill so that joint between fill and original surface is invisible.

END OF SECTION

SECTION 32 13 13

CONCRETE PAVING

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concrete sidewalks, curbs, gutters, utility slabs, parking areas, driveways, driveway aprons and approaches.
- B. Expansion, control and isolation joints.
- C. Finishing concrete pavements.
- D. Surface treatment with sealer and slip resistant coatings.
- E. Aggregate sand base course.
- F. Concrete pavement striping.
- G. Concrete Recycled composite wheel stops.
- H. Steel reinforcement.
- I. Fibrous secondary reinforcement.

1.2 REFERENCES

- A. 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ACI 117 - Standard Specification for Tolerances for Concrete Construction and Materials.
- C. ACI 301 - Specifications for Structural Concrete for Buildings.
- D. ACI 318 - Building Code Requirements for Structural Concrete.
- E. ASTM A184 - Specification for Fabricated Deformed Steel Bar Mats for Concrete.
- F. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- G. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
- H. ASTM C33 - Concrete Aggregates.
- I. ASTM C94 - Ready Mixed Concrete.
- J. ASTM C150 - Portland Cement.
- K. ASTM C260 - Air-Entraining Admixtures for Concrete.
- L. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- M. ASTM C494 - Chemical Admixtures for Concrete.
- N. ASTM C618- Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- O. ASTM C979 - Pigments for Integrally Colored Concrete.
- P. ASTM C1116 - Specification for Fiber-Reinforced Concrete and Shotcrete.

- Q. ASTM C1602 - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
- R. ASTM C1778 - Standard Guide for Reducing the Risk of Deleterious Alkali-Aggregate Reaction in Concrete.
- S. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- T. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.
- U. DSA/AC - Division of State Architect/Access Compliance.
- V. National Ready Mix Concrete Association - Plant Certification Program.
- W. Southern California Chapter, American Public Works Association - Standard Specifications for Public Works Construction.
- X. Stormwater Best Management Practice Handbook (BMP Handbook), Construction Edition, as published by the California Storm Water Quality Association.

1.3 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Obtain materials from same source throughout.

1.4 QUALIFICATIONS

- A. Manufacturer: Manufacturer of ready-mix concrete products complying with ASTM C94 requirements for production facilities and equipment. Certified according to National Ready Mix Concrete Association's Plant Certification Program.
- B. Pavement Installer: Company who has completed pavement work similar in material, design, and extent to that indicated for this project.
- C. Detectable Warning Pavement Installer: Company specializing in applying the work of this section with a minimum of 5 years experience and approved by manufacturer of the detectable warning products used.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable code for paving work on public property.
- B. Conform to (CBC) California Building Code, (CCR) Title 24, Part 2, and the 2010 ADA Standards for Accessible Design for access requirements for individuals with disabilities.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Provide concrete curing, finishing, and waste management techniques as defined in Section 4 of the Storm Water Best Management Practice Handbook, (BMP Handbook) Construction Edition.

1.7 SUBMITTALS

- A. Submit product data under provisions of Section 01 33 00.
- B. Include data on joint filler, admixtures and curing compounds.
- C. Submit proposed mix design to testing laboratory and to Architect for review prior to commencement of work.
- D. Submit manufacturer's instructions under provisions of Section 01 33 00.

1.8 SUSTAINABLE DESIGN SUBMITTALS

- A. LEED Submittal: Submit data for content of post-consumer and pre-consumer recycled content under provisions of Section 01 81 13.

1.9 MOCKUP

- A. Provide mockup of pavement finish under provisions of Section 01 43 00.
- B. Construct mockup area under conditions similar to those which will exist during actual placement, with coatings applied.
- C. Locate where directed.
- D. Mockup may remain as part of the work.

1.10 WARRANTY

- A. Provide five year warranty under the provisions of Section 01 77 00 for detectable warning pavement.
- B. Warranty: Shall indicate compliance with standards required by CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 12, Section 12-11B.209. Warranty coverage shall include durability criteria which indicates that the shape, color fastness, sound-on-cane acoustic quality, resilience, and attachment will not degrade significantly for at least five years after original installation. As used in this Article, "not degrade significantly" means that the product maintains at least 90 percent of its approved design characteristics, as determined by the Division of The State Architect.

2. PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement: ASTM C150 Normal-Type I or Type II Portland type, gray color, from single source throughout project.
- B. Fine and Coarse Aggregates: ASTM C33, non-reactive when tested in accordance with ASTM C1778 and Appendix X-1 of ASTM C33.
- C. Water: ASTM C1602, clean and not detrimental to concrete.

2.2 BASE MATERIALS

- A. Aggregate Base: Crushed rock conforming to Section 200-2.2 of the Standard Specifications for Public Works Construction.

2.3 FORM MATERIALS

- A. Conform to ACI 301.

2.4 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615; 40 ksi yield grade; deformed billet steel bars, uncoated finish.
- B. Welded Steel Wire Fabric: Plain type, ASTM A1064; in coiled rolls or flat sheets; uncoated finish.
- C. Fabricated Bar Mats: ASTM A184; welded or clip-assembled steel bar mats of ASTM A615, Grade 60 steel bars.
- D. Tie Wire: ASTM A1064, annealed steel, minimum 16 gage size.
- E. Dowels: ASTM A615; 40 ksi yield grade, plain steel, uncoated finish.

F. Supports: Chairs, spacers, dowel bar supports and other devices for spacing, supporting and fastening reinforcing bars, welded wire fabric, and dowels in place.

G. Secondary Fibrous Reinforcement:

1. Collated, fibrillated, polypropylene fibers for secondary reinforcement of concrete slabs with length varying from 1-1/2 to 2 inches; nylon filamentized fibers of 3/4 inch length; cellulose fibers of 1/8 inch length meeting requirements of ASTM C1116, Type III or IV.

2. Manufacturers:

(a) Forta Mono or Forta, Forta Corp., www.fortacorp.com.

(b) Fibermix or Fibermesh, SI Concrete Corp., www.fibermesh.com.

(c) Nycon, Nycon, Inc., www.nycon.com.

(d) Grace Fibers or Micro Fibers, W.R. Grace and Co., www.graceconstruction.com.

(e) Buckeye Building Fibers, www.ultrafiber500.com.

3. Substitutions: Under provisions of Section 01 25 13.

2.5 ACCESSORIES

A. Curing Compound: ASTM C309, Type 1-D, Class B.

B. Preformed Joint Filler: ASTM D1751, 1/2 inch thick.

C. Colored Sealer: Type recommended by manufacturer of colored concrete pigment.

D. Clear Sealer: One component alkylalkoxy, silane penetrating sealer.

E. Joint Sealers: As specified in Section 07 92 00.

F. Rock Salt: Commercial standard packaged rock crystals, No. 2 size, free of fines.

2.6 ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Surface Retarder: ASTM C494, Type B or D.

C. Fly Ash: ASTM C618, Class F.

D. Water Reducing Admixture: ASTM C494, Type A.

E. Colored Concrete Pigment: ASTM C979 of color selected.

2.7 FINISH MATERIALS

A. Slip Resistant Aggregate: 95 percent minimum fused homogeneous aluminum oxide.

B. Substitutions: Under provisions of Section 01 25 13.

2.8 DETECTABLE WARNING PAVEMENT

A. Surface applied detectable warning system meeting nominal dimensional and color contrast requirements of the CBC, California Building Code, (CCR), California Code of Regulations, Title 24, Part 2, Section 11B-705 and be approved by DSA/AC.

- B. Detectable warning pavement to be constructed using the Vitrified Polymer Composite Armor-Tile System manufactured by Engineered Plastics, Inc., www.armor-tile.com.
- C. Color of pavement shall be of contrasting yellow color conforming to Color 33538 in accordance with standard SAE AMS-STD-595.
- D. Substitutions: Under provisions of Section 01 25 13.

2.9 CONCRETE MIX

- A. Mix concrete in accordance with ASTM C94, Alternative No. 3.
- B. Provide concrete of the following characteristics:
 - 1. Driveways, aprons and approaches: Compressive strength of 3,500 psi at 28 days.
 - 2. Sidewalks, curbs, gutters and utility slabs: Compressive Strength of 2,500 psi at 28 days.
 - 3. Slump: 4 to 6 inches.
 - 4. Maximum aggregate size: 1 inch.
 - 5. Cement Content: Minimum 540 lbs/cu. yd.
 - 6. Fly Ash: Maximum 25 percent by weight.
 - 7. Air Entrainment: 2 to 4 percent.
 - 8. Water Cement Ratio: 0.50.
 - 9. Fibrous Reinforcement: 1.5 to 1.6 lbs/cu. yd. of polypropelene fibers or 1 lb/cu yd of nylon and cellulose fibers in all mix designs except for curb and gutters.
- C. When automatic machine placement is used, determine mix design and obtain laboratory test results that comply with or exceed requirements.

2.10 PAVEMENT STRIPING PAINT

- A. Vinyl emulsion type, yellow color, except at accessible parking spaces, blue color. Blue color to be equal to Color 15090 in accordance with Federal Standard SAE AMS-STD-595. Color of fire lane curb marking to be red with white letters.
- B. Acceptable products:
 - 1. W801 Vin-L-Stripe Traffic Paint, manufactured by Dunn-Edwards, www.dunnedwards.com.
 - 2. 506 Traffic Line Paint-Vinyl, manufactured by Frazee, www.frazeepaint.com.
- C. Substitutions: Under provisions of Section 01 25 13.

3. PART 3 EXECUTION

3.1 INSPECTION

- A. Verify compacted subgrade is ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.
- C. Beginning of installation means acceptance of existing conditions.

3.2 BASE

- A. Prepare and compact base materials in accordance with provisions of Section 31 20 00.

3.3 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Coat surfaces of adjacent curbs, gutters, manholes, catch basins, inlets, light pole bases and other fixed objects with form release agent to form isolation joint and prevent bond with paving.
- C. Notify Architect minimum 24 hours prior to commencement of concreting operations.

3.4 FORMING

- A. Place and secure forms to correct location, dimension, and profile.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint fillers vertical in position, in straight lines. Secure during concrete placement.

3.5 REINFORCEMENT

- A. Place reinforcement at mid-height of slabs-on-grade.
- B. Lap adjoining pieces of welded wire fabric one full mesh and lace splice with wire. Offset laps of adjoining sheets.
- C. Place fabricated bar mats in lengths as long as practical. Overlap adjacent mat 2 inches.
- D. Interrupt reinforcement at expansion joints.
- E. Place secondary fiber reinforcement in concrete mix in quantities as specified for concrete pavements.
- F. Place reinforcement to achieve slab and curb alignment as detailed.
- G. Provide doweled joints at interruption of concrete with one end of dowel set in capped sleeve to allow longitudinal movement.
- H. Where joining existing concrete pavement, drill and set new dowels with epoxy grout into existing paving. Set opposite end of dowel in capped sleeve to allow for longitudinal movement.

3.6 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301.
- B. Hot and Cold Weather Placement: ACI 301.
- C. Place concrete formwork on public property in conformance with applicable code.
- D. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
- E. Place concrete continuously between predetermined construction joints and expansion joints. Do not break or interrupt successive pours such that cold joints occur.
- F. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Place concrete to pattern indicated in strip sequence.

- H. Curb and Gutter: For automatic machine placement, produce curbs and gutters to required cross section, lines, grades, finish and jointing.
- I. Slip - Form Paving: For automatic machine placement, produce paving to required thickness, line, grade, finish and jointing.

3.7 JOINTS

- A. Review locations of joints when indicated and make recommendations for any additional joints or suggestions for new locations. Lack of joints or misplacement of joints will not constitute justification of pavement cracking.
- B. Place expansion joints at not to exceed 24 foot intervals to correct elevation and profile. Align curb, gutter, and sidewalk joints.
- C. Place joint filler at expansion joints and building or other appurtenances.
- D. Provide control joints at not to exceed 6 foot indicated intervals.
- E. Hand tool control joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.
- F. Provide keyed joints as indicated.
- G. Finish each edge of joint with radiused jointer tool.
- H. Use form release agent at isolation joints where paving abutts curbs, gutters, manholes, catch basins, inlets, light pole bases, and other fixed objects to prevent bonding with pavement.
- I. Where joining existing pavement, align new expansion, control and isolation joints with previously placed joints.

3.8 FINISHING

- A. Uniformly spread, screed and consolidate concrete. Do not spread concrete by vibration.
- B. Smooth Form Finish:
 - 1. Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces, with number of seams kept to a practical minimum and in a uniform, orderly pattern.
 - 2. Patch tie holes and defects.
 - 3. Trowel to smooth even finish.
 - 4. Use for curbs, gutters, and mowstrips.
- C. Medium Broom Finish:
 - 1. Float surface and trowel to smooth even finish.
 - 2. While surface is still plastic draw a soft fiber bristle broom uniformly over surface in perpendicular direction to traffic.
 - 3. Use for sidewalks utility slabs parking areas driveways which have a slope of 6 percent or less.
- D. Slip Resistant Heavy Broom Finish:
 - 1. Float surface and trowel to smooth even finish.
 - 2. While concrete is still plastic, uniformly broadcast aluminum oxide particles onto surface at the rate of 25 pounds per 100 sq. ft.

3. Trowel particles into surface of concrete to provide embedment. Do not force below surface.
4. While surface is still plastic, draw a stiff fiber bristle broom uniformly over surface in perpendicular direction of traffic.
5. Use for ramps with slope of 6 percent or greater, stair treads, and areas indicated.

3.9 DETECTABLE WARNING PAVEMENT

- A. Install detectable warning pavement on curb ramps and other areas indicated on the drawings.
- B. Install detectable warning pavement in accordance with manufacturer's requirements and the 2010 ADA Standards for Accessible Design and CBC, Title 24, Part 2, Section 11B-705 requirements.

3.10 CURING

- A. Cure concrete surfaces in accordance with ACI 301.
- B. Apply curing compound on finished slab surfaces in accordance with manufacturer's instructions.

3.11 PAVEMENT STRIPING

- A. Lay out line markings and other painting in accordance with Drawings. Lines shall be 4 inches wide.
- B. Clean surfaces to be painted.
- C. Apply paint in accordance with manufacturer's directions.
- D. Apply only when weather conditions permit proper application.
- E. Machine apply paint in as many coats as are required to provide opaque markings.
- F. Allow for 300 linear feet of fire lane curb marking.

3.12 CONCRETE WHEEL STOPS

- A. Place wheel stops at all parking stalls as indicated.
- B. Anchor permanently in place with two steel rods.

3.13 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01 45 29.
- B. Owners's Inspector will take cylinders and perform slump, air entrainment, temperatures, density, and compressive strength cylinder tests per ACI 301. Preparing compressive strength test cylinder shall be per ACI 301 and the number of cylinders for a valid 28-day compressive strength test shall be determined in accordance with ACI 318, Item 26.12.1 (a). Project Inspector will arrange for pickup by Testing Laboratory.
- C. Three concrete test cylinders will be taken for every 50 or less cu yds of each class of concrete placed each day.
- D. One slump test will be taken for each set of test cylinders taken.
- E. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.14 TOLERANCES

- A. Provide tolerances under provisions of Section 01 43 00 in accordance with ACI 117.

- B. Maximum Variation of Surface Flatness: 1/4 inch in 10 feet.
- C. Maximum Variation from True Position: 1/4 inch.
- D. Variation of Pavement Thickness: Plus 3/8 inch, minus 1/4 inch.
- E. Maximum Variation of Pavement Joints: 1/8 inch vertical alignment.

3.15 PROTECTION

- A. Immediately after placement, protect concrete under provisions of Section 01 61 00 from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit traffic over pavement for 7 days after finishing.
- C. Maintain pavement free of stains, discoloration, dirt and other foreign materials. Remove surface stains and spillage of material as they occur.

3.16 REPAIR

- A. Remove and replace pavement that is broken, damaged, defective or does not comply with requirements of this Section.
- B. Refinishing pavement that is broken, damaged, or defective is not acceptable.
- C. Remove pavement in complete sections from joint to joint.
- D. Recycle pavement debris under provisions of Section 01 74 19.

END OF SECTION

SECTION 33 10 00

WATER UTILITIES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Water mains, valves, fittings, and accessories.
- B. Fire hydrants and assemblies.
- C. Backflow preventer.
- D. Thrust blocks.

1.2 REFERENCES

- A. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers.
- B. ASSE 1015 - Performance Requirements for Double Check Backflow Prevention Assembly.
- C. AWWA C104 - Standard for Cement-Mortar Lining for Ductile- Iron and Gray Iron Pipe and Fittings for Water.
- D. AWWA C105 - Standard for Polyethylene Encasement for Ductile-Iron Piping for Water and other Liquids.
- E. AWWA C110 - Standard for Gray-Iron and Ductile-Iron Fittings, 3 inch through 48 inch for Water and Other Liquids.
- F. AWWA C111 - Standard for Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
- G. AWWA C151 - Standard for Ductile-Iron Pipe Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.
- H. AWWA C300 - Standard for Reinforced Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids.
- I. AWWA C502 - Standard for Dry-Barrel Fire Hydrants.
- J. AWWA C600 - Standard for Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances.
- K. AWWA C651 - Standard for Disinfecting Water Mains.
- L. AWWA C900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch for Water.
- M. AWWA C901 - Standard for Polyethylene Pressure. Pipe and Tubing 1/2 inch through 3 inch, for Water Service.
- N. AWWA M17 - Manual for Installation, Field Testing, and Maintenance of Fire Hydrants.
- O. AWWA M23 - Manual for PVC Pipe-Design and Installation.
- P. ASTM B88 - Seamless Copper Water Tube.
- Q. ACPA - American Concrete Pipe Association, Concrete Pipe Handbook.
- R. CDA - Copper Development Association, Copper Tube Handbook.
- S. NFPA 1963 - Standard for Screw Threads and Gaskets for Fire Hose Connections.

T. UL 246 - Standard for Hydrants for Fire Protection Service.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the Work of this Section.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Submit product data for pipe and pipe accessories.
- C. Submit reports on piping disinfecting.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01 77 00.
- B. Accurately record location of pipe runs, connections, and depths.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

2. PART 2 PRODUCTS

2.1 PIPE AND PIPE FITTINGS

- A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in potable water systems. Where more than one type of materials or product are indicated, selection is Installer's option.
- B. Piping: Provide pipes of the following materials, of weight/ class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes , with joining method as indicated.
- C. Copper Tube: ASTM B88; Type K hard drawn.
- D. Ductile-Iron Pipe: AWWA C151, with cement mortar lining complying with AWWA C104; Class 51 unless otherwise indicated.
 - 1. Fittings: Ductile-iron, AWWA C110; cement lined, AWWA C104; and rubber-gasket joints, AWWA C111.
 - 2. Encasement: AWWA C105, polyethylene film tube.
- E. Concrete Pipe: Reinforced steel cylinder type, AWWA C300.
 - 1. Fittings: Reinforced concrete pipe fittings.
- F. Polyvinyl Chloride (PVC) Pipe: AWWA C900, Class 150.
 - 1. Fittings: Integral wall (thickened bell end), integral sleeve reinforced bell end or elastomeric gasket couplings meeting the requirements of AWWA C900.
- G. Polyethylene (PE) Pipe: AWWA C901, Class 160.
 - 1. Fittings: Copper alloy or nylon barbed insert type with 2 strap-type stainless steel clamps over pipe at each insert.

2.2 PIPE IDENTIFICATION

- A. Metallic-Lined Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - WATER LINE BURIED BELOW."
- B. Nonmetallic Piping Label: Engraved plastic-laminate label, for installation on main electrical meter panel; not less than 1 inch by 3 inches, with captions "CAUTION - THIS STRUCTURE HAS A NONMETALLIC WATER SERVICE."

2.3 PIPE ACCESSORIES

- A. Valves and Fittings: Conform to AWWA Specifications. All valves and fittings shall be designed for an operating pressure larger than the design pressure of lines on which they are installed.
- B. Gate Valves: Double disk parallel seat type, iron body, bronze mounted inside screw, non-rising stem, flanged or screw filling standard hub nut.
- C. Thrust Blocking: Provide on water lines at bends, tees and fire hydrants. Use 2,500 psi concrete as specified in Section 03 30 00. Locate and place in accordance with standard practice.
- D. Access Boxes: Unless otherwise specified in accordance with Section 22 30 00.

2.4 FILL MATERIAL

- A. Sand: Type specified in Section 31 20 00.

3. PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that trench cut is ready to receive work, and excavations, dimensions, and elevations are as indicated.
- B. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with fill material of sand.
- B. Remove large stones or other hard matter which could damage drainage tile or impede consistent backfilling or compaction.

3.3 INSTALLATION - PIPE AND FITTINGS

- A. Maintain separation of water main from sewer piping in accordance with code.
- B. Install pipe to indicated elevation to within 5/8 inches.
- C. Route pipe in straight line.
- D. Install pipe to allow for expansion and contraction without stressing pipe of joints.
- E. Slope water pipe and position drains at low points.
- F. Form and place concrete for thrust restraints at each elbow or change of direction of pipe.
- G. Copper Tube: Install in accordance with CDA "Copper Tube Handbook"
- H. Ductile-Iron Pipe: Install in accordance with AWWA C600 "Appurtenances."

- I. Polyvinyl Chloride (PVC) Pipe: Install in accordance with AWWA M23.
- J. Polyethylene (PE) Pipe: Install in accordance with manufacturer's installation instructions.
- K. Form and place concrete for thrust blocks.
- L. Install warning tape during back-filling of trench for underground water service piping. Locate 8 inches below finished grade directly over piping. Attach non-metallic piping label permanently to main electrical meter panel.
- M. Water Main Connection: Arrange and pay for tap in water main, of size and in location as indicated, from water Purveyor.
- N. Water Service Termination: Terminate water service piping 5'-0" from building foundation in location and invert as indicated. Provide temporary pipe plug for piping extension into building.

3.4 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered, and after thrust blocks have sufficiently hardened. Fill pipeline 24 hours prior to testing, and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Test: Test at not less than 1-1/2 times working pressure for two hours.

3.5 ADJUSTING AND CLEANING

- A. Use disinfecting procedure prescribed by authority having jurisdiction.
- B. In case a method is not prescribed by that authority, use procedure described in AWWA C651, or as described below:
 - 1. Fill system or part thereof with water/chlorine solution containing at least 50 ppm of chlorine. Valve off system or part thereof and allow to stand for 24 hours.
 - 2. Drain system or part thereof of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine. Valve off system or part thereof and allow to stand for three hours.
 - 3. Flush system with clean potable water until chlorine does not remain in water coming from system.
- C. Prepare reports for all disinfecting activities and submit to Architect.

END OF SECTION

SECTION 33 30 00

SANITARY UTILITIES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sanitary drainage piping, fittings, and accessories.
- B. Connection of building sanitary drainage system to municipal sewers.
- C. Manhole access, cleanout access.

1.2 REFERENCES

- A. ACPA - American Concrete Pipe Association.
- B. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- C. ASTM C12 - Practice for Installing Vitrified Clay Pipe Lines.
- D. ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- E. ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.
- F. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- G. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- H. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated.
- I. ASTM D2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
- J. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
- K. ASTM D2855 - Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
- L. ASTM D3212 - Specifications for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- M. ASTM D3034 - Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- N. AWWA C105 - Standard for Polyethylene Encasement for Ductile-Iron Piping for Water and other Liquids.
- O. CISPI - Cast Iron Soil Pipe Institute.

1.3 REGULATORY REQUIREMENTS

- A. Conform to applicable code for materials and installation of the Work of this Section.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Submit product data for pipe and pipe accessories.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01 77 00.
- B. Accurately record location of pipe runs, connections, manholes, cleanouts and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

2. PART 2 PRODUCTS

2.1 SEWER PIPE MATERIALS

- A. Vitrified Clay Pipe: ASTM C700; extra strength, unperforated; plain end joints.
- B. Vitrified Clay Pipe Joint Device: ASTM C425, compression gasket joint.
- C. Plastic Pipe: ASTM D2751, SDR 35, acrylonitrile-butadiene-styrene (ABS) material; bell and spigot style solvent sealed end joints.

2.2 PIPE ACCESSORIES

- A. Fittings: Same material as pipe, molded or formed to suit pipe size and end design, in required 'T', bends, elbows, cleanouts, reducers, traps, and other configurations required.

2.3 PIPE IDENTIFICATION

- A. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - SANITARY SEWER LINE BURIED BELOW."
- B. Metallic-Lined Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - SANITARY SEWER LINE BURIED BELOW."

2.4 MANHOLES AND CLEANOUTS

- A. Lid and Frame: Cast iron construction, removable lid, closed lid design; nominal lid and frame diameter as indicated.
- B. Shaft Construction and Concentric Cone Top Section: Reinforced precast concrete pipe sections, lipped male/female dry joints; cast steel ladder rungs into shaft sections at 12 inches nominal shaft diameter as indicated.
- C. Base Pad: Cast-in-place concrete of type specified in Section 03 30 00; levelled top surface to receive concrete shaft sections, sleeved to receive sewer pipe sections.
- D. Cleanouts: Cast-iron ferrule and countersunk brass cleanout plug, with round cast-iron access frame and heavy-duty secured, scoriated cast-iron cover.

2.5 FILL MATERIAL

- A. Sand: Type specified in Section 31 20 00.

3. PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that trench cut is ready to receive work, and excavations, dimensions, and elevations are as indicated.
- B. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with fill material of sand.
- B. Remove large stones or other hard matter which could damage drainage tile or impede consistent backfilling or compaction.

3.3 INSTALLATION - PIPE

- A. Extend sanitary sewerage system to connect to building sanitary drain, of sizes and in locations indicated.
- B. Join and install cast-iron soil pipe and fittings with compression gaskets in accordance with CISPI Handbook, Volume I. Use service class gaskets.
- C. Join vitrified clay pipe and fittings with rubber sealing elements and install piping in accordance with ASTM C12.
- D. Join concrete pipe and fittings with rubber gaskets and install piping in accordance with ACPA Installation Manual.
- E. Solvent cement ABS pipe and fittings in accordance with ASTM D3212 and install piping in accordance with ASTM D2321.
- F. Solvent cement PVC pipe and fittings in accordance with ASTM D2855 and install piping in accordance with ASTM D2321.
- G. Place pipe on minimum four inch deep bed of sand.
- H. Lay pipe to slope gradient noted on Drawings with maximum variation from true slope of 1/8 inch in 10 feet.
- I. Install warning tape during back-filling of trench for underground sanitary sewer piping. Locate 8 inches below finished grade directly over piping.
- J. Install sand at sides and over top of pipe. Provide top cover to minimum compacted thickness of 12 inches.
- K. Place sand in maximum 6 inch lifts, consolidating each lift.
- L. Increase compaction of each successive lift. Refer to Section 31 20 00 for compaction requirements. Do not displace or damage pipe when compacting.
- M. Connect to municipal sewer system.

3.4 INSTALLATION - MANHOLES

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.
- C. Establish elevations and pipe inverted for inlets and outlets as indicated.
- D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.5 INSTALLATION - CLEANOUTS

- A. Install cleanouts and extension from sewer pipe to cleanout at grade as indicated.
- B. Set cleanout frame and cover in concrete block 18 x 18 x 12 inches deep.
- C. Set top of cleanouts flush with paved surfaces. Elsewhere, set top 1 inch above surrounding earth grade.
- D. Install accessories as indicated.

E. Set top of frame and covers flush with paved surfaces. Elsewhere, set top 3 inches above grade.

3.6 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01 45 29.

3.7 PROTECTION

A. Protect finished installation under provisions of Section 01 61 00.

B. Protect pipe from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 40 00

STORM DRAINAGE UTILITIES

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Storm drainage piping, fittings, and accessories.
- B. Connection of building and site storm drainage system to point of disposal.
- C. Catch basins, cleanouts and manhole access,
- D. Paved area drainage, and site surface drainage.

1.2 REFERENCES

- A. ACPA - American Concrete Pipe Association.
- B. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- C. ASTM C12 - Practice for Installing Vitrified Clay Pipe Lines.
- D. ASTM C33 - Specification for Cement Aggregates.
- E. ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- F. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated.
- G. ASTM C858 - Specifications for Underground Precast Concrete Utility Structures.
- H. ASTM D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
- I. ASTM D2855 - Practice for making Solvent - Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
- J. ASTM D2321 - Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications.
- K. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- L. ASTM D3350 - Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.
- M. AWWA C105 - Standard for Polyethylene Encasement for Ductile-Iron Piping for Water and other Liquids.
- N. CISPI - Cast Iron Soil Pipe Institute.

1.3 REGULATORY REQUIREMENTS

- A. Conform to applicable code for materials and installation of the Work of this Section.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Submit product data indicating pipe, pipe accessories and drainage structure.
- C. Submit manufacturer's installation instructions.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01 77 00.
- B. Accurately record location of pipe runs, connections, catch basins, manholes, cleanouts, and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

2. PART 2 PRODUCTS

2.1 STORM DRAINAGE PIPE MATERIALS

- A. Polyvinyl Chloride Pipe (PVC): ASTM D3034; SDR 35 minimum wall thickness; bell and spigot style; solvent cement joints conforming to ASTM D2564.
- B. Perforated Polyvinyl Chloride Pipe (PVC): ASTM D3034; SDR 35 minimum wall thickness; bell and spigot style; solvent cement joints conforming to ASTM D2564; perforations to be symmetrically located in an arc of 160 degrees. Perforations shall have a total open area of at least 0.3 square inches per lineal foot of pipe. Perforations shall be either holes or slots. Diameter of holes may vary from 1/4 inch minimum to 3/8 inch maximum; the width of the slots may vary from 3/16 inch minimum to 5/16 inch maximum; the length of the slot shall not exceed 4 inches.
- C. Athletic Field Turf Underdrain Pipe: ASTM D3350, 1-1/2 inch high x 12 inch wide fabric wrapped high density polyethylene drainage pipe equivalent to AvanEDGE pipe manufactured by Advanced Drainage Systems, www.ads-pipe.com.
- D. Slot Drain: ACO Sports System 3000, www.acousa.com or Sports Edge XT-6 Slot Drain System, www.sportsedge.com.
- E. Substitutions: Under provisions of Section 01 25 13.

2.2 PIPE ACCESSORIES

- A. Fittings: Same material as pipe, molded or formed to suit pipe size and end design, in required 'T', bends, elbows, cleanouts, reducers, traps, and other configurations required.
- B. Geotextile Fabric: As specified in Section 31 20 00.

2.3 PIPE IDENTIFICATION

- A. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - STORM SEWER SERVICE BURIED BELOW."
- B. Metallic-Lined Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - STORM SEWER SERVICE BURIED BELOW."

2.4 CATCH BASINS

- A. Basin Lid and Frame: Galvanized cast iron construction, hinged lid, linear grill lid design; nominal lid and frame size as indicated. Grate bars to be less than 1/2 inch apart.
- B. Base Pad: Cast-in-place concrete of type specified in Section 32 13 13; levelled top surface sleeved to receive storm sewer pipe sections.

2.5 MANHOLES AND CLEANOUTS

- A. Lid and Frame: Cast iron construction, removable lid, open checkerboard grill bars to be pedestrian safety lid design; nominal lid and frame diameter as indicated.

- B. Shaft Construction and Concentric Cone Top Section: Reinforced precast concrete pipe sections, lipped male/female dry joints; cast steel ladder rungs into shaft sections at 12 inches; nominal shaft diameter as indicated.
- C. Base Pad: Cast-in-place concrete of type specified in Section 03 30 00; levelled top surface to receive concrete shaft sections, sleeved to receive sewer pipe sections.
- D. Cleanouts: Cast-iron ferrule and countersunk brass cleanout plug, with round cast-iron access frame and heavy-duty, secured, scoriated cast-iron cover.

2.6 CURB INLETS

- A. Cast-in-place reinforced concrete of type specified in Section 03 30 00. Conform to standards of authority having jurisdiction and as indicated.
- B. All exposed face plates and metal parts to be galvanized.

2.7 OUTFALLS

- A. Cast-in-place reinforced concrete of type specified in Section 03 30 00.
- B. Provide head wall, apron, tapered sides and rip-rap as indicated.
- C. Rip rap to be irregular broken stone weighing between 10 to 40 pounds each.

2.8 FILL MATERIAL

- A. Sand: Type specified in Section 31 20 00.

3. PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that trench cut is ready to receive work, and excavations, dimensions, and elevations are as indicated.
- B. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with fill material of sand.
- B. Remove large stones or other hard matter which could damage drainage tile or impede consistent backfilling or compaction.

3.3 INSTALLATION - PIPE

- A. Extend storm sewerage piping to connect to building storm drain, of sizes and in locations indicated.
- B. Include storm sewerage system piping and appurtenances from a point 5'-0" outside building foundation to point of disposal.
- C. Join and install cast iron soil pipe and fittings with compression gaskets in accordance with CISPI Handbook, Volume I. Use service class gaskets.
- D. Encase cast iron soil pipe and fittings in polyethylene tubing in accordance with AWWA C105.
- E. Join vitrified clay pipe and fittings with rubber sealing elements and install piping in accordance with ASTM C12.
- F. Join concrete pipe and fittings with rubber gaskets and install piping in accordance with ACPA Installation Manual.

- G. Solvent cement PVC pipe and fittings in accordance with ASTM D2855 and install piping in accordance with ASTM D2321.
- H. Place pipe on minimum 4 inch deep bed of sand.
- I. Install perforated PVC pipe at a minimum slope of 0.05 percent. Coordinate with installation of drainage fill and filter fabric specified in Section 31 20 00.
- J. Install warning tape during back-filling of trench for underground storm drain piping. Locate 8 inches below finished grade directly over piping.
- K. Lay pipe to slope gradients noted with maximum variation from true slope of 1/8 inch in 10 feet.
- L. Install coarse sand at sides and over top of pipe. Provide top cover to minimum compacted thickness of 12 inches.
- M. Place sand in maximum 6 inch lifts, consolidating each lift.
- N. Increase compaction of each successive lift. Refer to Section 31 20 00 for compaction requirements. Do not displace or damage pipe when compacting.
- O. Connect to existing storm drain system.

3.4 INSTALLATION - CATCH BASINS, AND MANHOLES

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place cast-in-place concrete base pad, with provision for storm drainage pipe end sections.
- C. Establish elevations and pipe inverts for inlets and outlets as indicated.
- D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.
- E. Install accessories as indicated.
- F. Set top of frame and covers flush with paved surfaces. Elsewhere, set tops 3 inches above grade.

3.5 INSTALLATION - CLEANOUTS

- A. Install cleanouts and extension from sewer pipe to cleanout at grade as indicated.
- B. Set cleanout frame and cover in concrete block 18 x 18 x 12 inches deep.
- C. Set top of cleanout flush with paved surfaces. Elsewhere, set top 1 inch above surrounding earth grade.

3.6 INSTALLATION - DRYWELL

- A. Install as indicated on undisturbed native soil.
- B. Fill around drywell with 1 to 2 inch crushed rock on gravel to a minimum of 12 inches beyond drywell perimeter. Fill drywell full depth with crushed rock or gravel.
- C. Set top of drywell flush with adjacent grade finish grade.

3.7 INSTALLATION - INLETS AND OUTFALLS

- A. Construct as indicated of reinforced concrete to elevations required.
- B. Surfaces shall be formed by forms and shall not be shaped by plastering.
- C. Install steps, grating and face plate assemblies as indicated.

D. Extend rip-rap beyond outfall as indicated.

3.8 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01 45 29.

B. Clear interior of piping and structures of dirt and other debris as work progresses.

3.9 PIPELINE FLUSHING

A. Flush newly constructed storm drain piping with water.

B. Collect and remove any rock, debris and silt using a metal screen during flushing procedure.

3.10 PROTECTION

A. Protect finished installation under provisions of Section 01 61 00.

B. Protect pipe from damage or displacement until backfilling operation is in progress.

END OF SECTION