LEDESMA & MEYER CONSTRUCTION CO., INC.
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ADDENDUM NO. 1

UTILITY VALVE AND PIPING REPAIR CAMPUS WIDE
BID# AVC2017/2018-4
Project #17-018

Antelope Valley Community College District
Lancaster, CA

_____

Ledesma & Meyer Construction Co., Inc.
9441 Haven Avenue
Rancho Cucamonga, CA 91730

NOTICE TO BIDDERS
This Addendum forms a part of the Contract and modifies the original documents dated June 18, 2018. It is intended that all work affected by the following modifications shall conform to the related provisions and general conditions of the contract of the original drawings and specifications. Modify the following items wherever appearing in any drawing or sections of the specifications. Acknowledge receipt of Addendum No. 1 in the space provided on the Bid Proposal Form. Failure to do so may subject bidder to disqualification.

1. CHANGES TO THE PROJECT MANUAL

1.1 Reference Table of Contents

Replace verbiage Boiler Replacement Campus Wide with Utility Valve & Piping Repair Campus Wide

Add the following Specifications in their entirety and utilize the applicable items as it relates to the actual scope of work within this project. Items that are not applicable to the scope of work can be disregarded.

26 00 00 – General Electrical Requirements
33 13 00 - Disinfecting of Water Utility Distribution
33 14 16 – Site Water and Fire Water Distribution Piping
33 71 19 – Electrical Underground Ducts and Manholes

1.2 Reference Specification 01011- Work Scope Special Conditions

Replace the Work Scope Special Conditions in its entirety with the attached Work Scope Special Conditions. Changes or additions are bolded.

1.3 Reference Section 01210 – Allowances
Replace the Allowance Specification in its entirety with the attached Allowance Specification.

1.4 Reference Pictures
Please add the attached reference pictures to the project manual in their entirety.

2. CHANGES TO THE DRAWINGS

2.1 Reference Sheet CMSK 5 Electrical
Change the following note, "New concrete pad 12'-6" x 12'-6"', to read as follows New concrete pad 13'-0" x 13'-0"'.

2.2 Reference Sheet CMSK 7
Change the following note, "New TUFF Shed size 12' x 12' See drawing CMSK 5" to read as follows, "New TUFF Shed size 12' x 12' See drawing CMSK 6".
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End of Addendum 1

Attachments:
01011 – Work Scope Special Conditions
01210 – Allowance
26 00 00 - General Electrical Requirements
33 13 00 – Disinfecting of Water Utility Distribution
33 14 16 – Site Water and Fire Water Distribution Piping
33 71 19 – Electrical Underground Ducts and Manholes
Reference Pictures

End of Addendum 1

ANTELOPE VALLEY COMMUNITY COLLEGE - Utility Valve and Piping Repair Campus Wide
WORK SCOPE SPECIAL CONDITIONS

		CONTRACTOR CATEGORY
ITEM	**DESCRIPTION:**	**4**
1	This Category Contractor shall reference the CMSK drawings as the Contract Documents for this project.	yes
2	This Category Contractor shall not interfere with the normal, regular, or existing business operations or activities of the College at the project site. If required schedule work for after hours or weekends, all costs for working after hours or weekends shall be included within	yes
3	Provide all project submittals no later than ten (10) calendar days after receipt of Notice of Award regardless of what any other particular specification may otherwise indicate. Also, this Category Contractor will need to provide electronic copies of each submittal regardless of what any other particular specification may otherwise indicate.	yes
4	This Category Contractor shall coordinate with the Antelope Valley College Facilities Services Department for parking passes and job site badges for all workers onsite.	yes
5	This Category Contractor shall provide trash containers and/or properly dispose of waste, trash, lunch trash and debris DAILY. This includes procurement of all hauling permits and/or dump fees which may be required. This applies equally to any/all subcontractors employed by the Prime Contractor. All trash is to be removed from the site within 48 hours of written notification from the Construction Manger,	yes
6	Whenever the term "contractor" or "general contractor" is used anywhere within the project manual, drawings, or any addenda, said term shall be interpreted as the applicable Category Contractor.	yes
7	This category contractor shall include ALLOWANCES as listed in specification section 01210 as applicable.	yes
8	This Category Contractor shall properly protect existing improvements scheduled to remain when performing work within this category.	yes
9	This Category Contractor shall properly & completely coordinate all work through the Construction Manager with all other trades to ensure that all work is properly & efficiently installed per the contract documents.	yes
10	This Category Contractor is advised that on-site parking is not guaranteed. There may be several times throughout the duration of the project, that contractors may have to park off-site due to weather conditions and/or jobsite space restrictions.	yes
11	All Category contractor's foremen are to be equipped with mobile phones for a constant communication line with the Construction Manager.	yes
12	This Category Contractor shall utilize suitable equipment for traversing the site, hauling or relocating of materials, and erection of items within this trade regardless of soil conditions or grades at no additional cost or delay to schedule. This includes use of alternate methods due to site access or lack thereof due to the small active school campus.	yes
13	This Category Contractor shall provide all job verification & field measuring as may be needed and/or required to ensure that the work is coordinated and fits properly.	yes
14	This Category Contractor shall provide & pay for all staking, & engineering as required to complete work in this Category.	yes
15	This Category Contractor shall furnish & install all braces, brackets, and specialty support or mounting systems which may be required to install work in this category	yes
16	This Category Contractor shall completely furnish all cutting & patching (match existing finish or new scheduled finish) as required due to the installation of work of this category.	yes
17	This Category Contractor shall provide all Traffic Control, barricades, warning lights & signs, etc. required for the execution of the work within this category	yes
18	This Category Contractor shall be advised - The project site is located in an area of potential high winds. The protection against and prevention of wind damage to incomplete work or on-site stored materials is the responsibility of each contractor.	yes

		CONTRACTOR CATEGORY
ITEM	**DESCRIPTION:**	**4**
19	This Category Contractor shall be advised - the project site is located in an area of potential high temperatures. The protection against and prevention of heat related damage to incomplete work or on-site stored materials is the responsibility of the contractor.	yes
20	This Category Contractor shall furnish & install all sleeves required for work within this category.	yes
21	This Category Contractor shall completely provide patching of utility trenches, both temporary & permanent, cut in existing concrete paving shall match existing materials, thickness, and finish of surrounding finish. Saw cut existing concrete paving to provide a smooth edge for patching and/or adjoining new work to existing improvements when performing work in this category as applicable.	yes
22	This Category Contractor shall repair and/or replace existing irrigation & landscaping damaged during the installation of work in this category to the satisfaction of the Construction Manager and District. All repairs are to be preformed utilizing the same quality of materials (or better) as presently installed.	yes
23	This category contractor shall keep all existing systems within its category fully operable in all occupied areas while performing work within this category during the school's regular hours at no additional cost to the District including temporary systems as may be needed and/or required. This includes all necessary means tor repair any damages caused during operations to ensure immediate resolution and restored service to minimize site interruption.	yes
24	**DELETED**	
25	This Category Contractor shall provide adequate and proper dust control during all operations within this category as required by applicable codes and/or ordinances. Including but not limited to all Construction areas, Site Lay down Areas, Storage Areas, Bins, and Trailer Areas. Provide adequate and proper dust and erosion temporary "Best Available Control Measures" during all operations within this category as required by all applicable laws, codes, regulations and/or ordinances. Properly maintain and service all required measures as required to meet proper control, and then remove all measures and devices from the site at the conclusion of their requirements. Ref: AQMD Rule 30, and NPDES-SWPPP requirements.	yes
26	This Category Contractor shall provide accurate & neatly drawn as-built/record drawings for work installed by this category contractor including line and grade for underground work as necessary. As builts shall also be submitted in a PDF format with all change of directions and elevations indicated.	yes
27	This Category Contractor shall repair any adjacent grades and/or finishes damaged as a result of the execution of the work in this category.	yes
28	This Category Contractor shall provide all underground utility excavation (including dewatering of excavations if necessary), bedding, backfill, and compaction work as required to perform work within this category. Including repair of any items and or systems damaged during said operation.	yes
29	This Category Contractor shall load, properly haul, and legally dispose of in an offsite location all unused excess or unsuitable "spoils" generated by this Category Contractor. This includes procurement & payment of all hauling permits and/or dump fees which may be required. Remove from site within 24 to 48 hours after receipt of written notice to do so.	yes

		CONTRACTOR CATEGORY
ITEM	**DESCRIPTION:**	**4**
30	This Category Contractor shall furnish & install all pea gravel when required in vaults, valve boxes, etc. furnished & installed by this category contractor.	yes
31	This Category Contractor shall cut and cap existing utilities as said utilities are related to this trade and as required by the contract documents.	yes
32	This Category Contractor shall provide whatever "pot holing" or investigation necessary or that is required in order to verify the exact location & depth of existing utilities to verify that the intended routings of underground improvements within this category are possible prior to excavating trenches for same.	yes
33	This Category Contractor shall backfill all concrete work furnished & installed by this Category Contractor	yes
34	This Category Contractor shall provide all demolition and legal disposal of same as indicated per CMSK-1, CMSK-2 and CMSK-3. Demolition activities shall only take place on a weekend so as not to disrupt the daily college activities.	yes
35	This Category Contractor shall complete the shut down of the water system, the demo of of the existing pipe and the installation of the shut off valve on a weekend so as not to impede the daily College Schedule. Notification of proposed shut down needs to be received in writing from the Contractor 72 hours in advance.	yes
36	This Category Contractor shall provide all proper environmental mitigation issues when demolishing the existing piping as the existing piping material is transite.	yes
37	This Category Contractor shall excavate, install sand bedding, water piping, sand shading and backfill for all of the new underground water line shown to be installed.	yes
38	This Category Contractor shall provide and install all new gate valves, backflow devices, water meters, booster pumps, master valves etc. so as to provide a complete and operable system. Refer to CMSK- 4.	yes
39	This category contractor shall provide and install all required fittings and flanges not necessary indicated but required in order to complete the installation of the new water system and provide a complete and operable system.	yes
40	**Temporary power will not be provided. This Category Contractor shall provide a portable generator if temporary power and/or temporary lighting is needed.**	**yes**
41	This Category Contractor shall provide and install all conduit, boxes, conductors, disconnects, breakers etc. so as to provide a complete and operable electrical system.	yes
42	This Category Contractor shall provide and install all warning tape and tracer wire for new underground electrical and water systems.	yes
43	This Category Contractor shall provide and install rigid galvanized conduit where conduit is above grade.	yes
44	This Category Contractor shall provide and install all rigid underground elbows.	yes
45	This Category Contractor shall provide and install the concrete pad including reinforcing and thickened edge as indicated per CMSK-7.	yes
46	It shall be this Category Contractors responsibility to provide all proper conduit size and wire size for electrical work indicated. It shall be this contractors responsibility to provide an engineered shop drawing showing all of the conduit sizes, conduit routing, wire sizes, breaker sizes, disconnect sizes, etc. in order to provide a complete and operable system.	yes

		CONTRACTOR CATEGORY
ITEM	**DESCRIPTION:**	**4**
47	This Category Contractor shall excavate, install conduit and backfill for the new underground electrical system as indicated per CMSK-5.	yes
48	This Category Contractor shall be responsible for implementing all SCAQMD fugitive dust requirements as required or needed per the jobsite conditions.	yes
49	Contractors that cause or allow a fugitive dust violation, shall be responsible for any and all fines issued by SCAQMD, including fines that would be issued to the Construction Manager and the Antelope Valley College.	yes
50	This Category Contractor shall fabricate, deliver and properly install a Tuff Shed as indicated per CMSK-6. Please note that the contractor is responsible to provide proper anchorage of the shed to the concrete. Contractor to submit anchorage type and method for approval prior to installing.	yes
51	This Category Contractor shall provide, install, pay for and maintain temporary fencing as required or needed in order to provide for a safe and secure work area. Upon completion of the contract this Category Contractor shall remove temporary fencing.	yes
52	This Category Contractor will provide and maintain temporary chemical type toilet facilities and temporary hand wash stations throughout the duration of the project as pursuant to OSHA Standard 1526. All temporary toilets and hand wash stations shall be properly serviced	yes
53	This Category Contractor shall be responsible prior to commencing work to provide all site investigation in order to verify existing underground utility locations prior to commencement of trenching activities. It shall be the sole responsibility of this Category Contractor to repair and/or replace all underground utilities that are damaged as a result of execution of this contract.	yes
54	Should this Category Contractor require a material laydown yard and storage containers, this category contractor shall utilize Parking Lot 16 and provide all temporary fencing to house and separate materials and storage containers from the remainder of the parking lot. This Category Contractor shall coordinate with the Construction Manager for exact location.	yes
55	This Category Contractor shall reference and utilize the Campus Infrastructure As-Builts provided and note that these are considered as part of the contract documents.	yes
56	**This Category Contractor shall provide a dimensioned shop drawing indicating all of the components and spacing for the water works and electrical items (backflow, booster pump, meter, flow sensor, master valve, shutoff valves, disconnect, controller, etc.). Please note that the concrete slab and Tuff Shed sizes noted on the drawings shall be noted as a minimum size required. If a larger slab and shed is required to house these items based upon the shop drawing, said contractor shall provide as part of the base bid.**	**yes**
57	**Please note that the Antelope Valley College Maintenance & Operations Department has consulted previously with Kern Turf Supply Inc. (661-664-5200) regarding the water works materials.**	**yes**

DOCUMENT 01210

ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY:

1.1.1 Section Includes: Allowances which the Contractor shall provide for designated construction activities in the Work and in his bid.

1.1.2 Related Documents: The Conditions of the Contract and other sections of Division apply to this section as fully as if repeated herein.

1.2 DESCRIPTION OF REQUIREMENTS:

1.2.1 Definitions and Explanations: Certain requirements of the construction related to each allowance are indicated and specified. The allowance has been established instead of additional requirements for that construction, and further requirements thereof will be issued by Change Order.

1.2.2 Type of allowance scheduled herein for the Work include the following:

1.2.2.1 Lump sum allowances

1.2.3 Selection and Purchase: At earliest feasible date after award of Contract, advise the Architect of scheduled date when final selection and purchase of each product or system described by each allowance must be accomplished in order to avoid delays in performance of the Work.

1.2.3.1 As requested by the Architect, obtain and submit proposals for construction activities involved in each allowance for use in making final selections; include recommendations for selections which are relevant to the proper performance of the work.

1.2.3.2 Purchase products and systems as specifically selected by the Architect

1.2.3.3 Submit proposals and recommendations, for purchase of products or systems of allowances, in form specified for Change Orders.

1.2.4 Change Order Data: Where applicable, include in each change order proposal both the quantities of products being purchased and unit cost, along with total amount of purchases to be made. When requested, furnish data to substantiate quantities. Indicate applicable taxes and delivery charges.

1.2.5 Unit Cost Allowances: Each change order amount for unit cost type allowance shall be based solely on the difference between the actual unit purchase amount and the unit allowance, multiplied by the final measure or count of construction in place with reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections and similar margins.

1.2.5.1 Include installation costs in the purchase amount as part of the allowance.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CASH ALLOWANCES

3.1.1 The following Category Contractors shall include the following noted cash allowances in their base bid to be used solely by the Construction Manager;

3.1.1.1 Category #04 $15,000.00

3.1.2 Cash allowances shall be "NET" cost amounts. The contractors shall include all cost associated with the processing of items that may be charged against the designated allowance amount including estimating, project management, supervision, withholding of retention, overhead, profit and bond costs in their base bid. The only allowable markup shall be a 10% overhead and profit fee by any subcontractor that may perform work (labor) submitted under the prime contractor. The prime contractor shall receive no additional markups. If any allowance amount (in whole or part) is deleted by change order at any given point of the project, the Contractor shall credit back the full or unused portion of the allowance amount stipulated. The Category contractor shall not be entitled to withhold any monies for overhead or profit or be obligated to return any overhead or profit included within their base bid. The use of any allowances is at the sole discretion of the Construction Manager/District.

END OF SECTION

SECTION 26 00 00
GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE

A. Work of this section includes everything necessary for or incidental to completing the electrical work, to provide a complete and operable electrical system, except as herein specifically excluded.

1.02 GENERAL REQUIREMENTS

A. Electrical System Characteristics: 480/277V. 3PH, 4W., 208/120V. 3PH, 4W.

B. Guarantee: Furnish a written guarantee for a period of one-year from date of acceptance.

C. Codes and Regulations: Work done under this Section shall comply with the latest edition of the following: California Electrical Code, State of California Title 24, State Building Standards, Occupational Safety and Health Administration (OSHA) requirements, State of California Title 17 and to all local codes having jurisdiction. In the case where the codes have different levels of requirements, the most stringent rule shall apply.

D. Wherever a discrepancy in quantity or size of conduit, wire, equipment, devices, circuit breakers, etc., (all materials), arises on the Drawing and/or Specifications, the Contractor shall be responsible for providing and installing all material and services required by the strictest condition noted on Drawings and/or in Specifications to insure complete and operable systems as required by the Owner and Engineer.

E. The General and Supplementary Conditions, as well as Special Conditions apply in addition to items in the Electrical Section. Special attention is directed to the following sections:

1. Drawings and Specifications at the site.
2. Shop drawings and samples.
3. Record drawings.
4. Cutting and Patching.
5. Cleaning up.
6. Guarantee.
7. Tests.

F. Additional Work: Refer to Mechanical and Plumbing specifications for additional Electrical requirements.

G. Provide minimum of twenty percent (20%) spare receptacles, switches, LED driver of each type, connectors/terminals for signal and communication systems, contacts in relays and contactors of each type, ports on network hubs, terminals on 110 blocks and RJ45 connectors.

H. Testing:

1. Scan:
   a. Infrascan test of the distribution branch circuit panels shall be required.
   b. Infrascan certified reports shall be submitted on completion to the Owner and Engineer.

c. Scans shall be performed by an independent testing laboratory with total connected loads in operation.

2. Megger:
   a. New branch circuit - phase, neutral and ground conductors.
   b. New insulated bonding conductors.
3. Current leakage test between the following:
   a. Grounding pole of receptacles and exposed conductive surface of non-electrical equipment.
   b. Grounding pole of receptacles and conductive surface of fixed or portable electrical equipment.
4. All circuits shall be tested for continuity and circuit integrity. Adjustments shall be made for circuits not complying with testing criteria.
5. Grounding System: Shall be tested by an independent testing laboratory to meet resistance specified in Part 3.1, D.3 of these Specifications. It shall be this Contractor's responsibility to make adjustments, as required, to upgrade non-complying systems to proper and safe operation.
6. All certified testing reports shall be submitted to the Owner at completion of project.

I. All Core Cutting, Drilling, and Patching:

1. For the installation of work under this Section, the aforementioned shall be performed under this Section of the Specifications and the Concrete section of the Specifications.
2. No holes will be allowed in any structural members without the written approval of D.S.A. or the Structural Engineer.
3. For penetrations of concrete slabs or concrete footings, the work will be as directed in the Concrete Section of Specifications.
4. The contractor shall be responsible for patching and repairing surfaces where he is required to penetrate for work under this contract.
5. Penetrations shall be sealed to meet the rated integrity of the surface required to be patched and repaired. The patched surface shall be painted or finished to match the existing surface.

J. Verifying Drawings and Job Conditions:

1. This Contractor shall examine all Drawings and Specifications in a manner to be fully cognizant of all work required under this Section.
2. This Contractor shall visit the site and verify existing conditions. Where existing conditions differ from Drawings, adjustment shall be made and allowances included for all necessary equipment to complete all parts of the Drawings and Specifications.

K. Shop Drawings:

1. Drawings shall be submitted in six (6) bound sets accompanied by Letter of Transmittal, which shall give a list of the number and dates of the drawings submitted. Drawings shall be complete in every respect and bound in sets.
2. The Drawings submitted shall be marked with the name of the project, numbered consecutively and bear the approval of the Contractor as evidence that the Drawings

have been checked by the Contractor. Any Drawings submitted without this approval will be returned to the Contractor for resubmission.

3. If the shop drawings show variations from the requirements of the Contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in his letter of transmittal. If the substitution is accepted, the Contractor shall be responsible for proper adjustment which may be caused by the substitution. Samples shall be submitted when requested.
4. Shop drawings shall be submitted on the following but not limited to:
    a. Lighting fixtures, lamps and ballasts.
    b. Switchgear and Panels.
    c. Fire alarm system.
    d. Switches/Disconnect switches.
    e. Occupant Sensors/Daylight Sensors
    f. Receptacles.
    g. Communication/Signal systems.
    h. Fuses.
    i. Pullboxes.
    j. Terminal Cabinets.
    k. Lighting control panels.
    l. Wire/Cable.
    m. Conduit and fittings.

L. Drawings of Record: The Contractor shall provide and keep up-to-date, a complete record set of blueprints. These shall be corrected daily and show every change from the original Drawings. This set of prints shall be kept on the job site and shall be used only as a record set. This shall not be construed as authorization for the Contractor to make changes in the layout without definite instruction in each case. Upon completion of the work, a set of reproducible Contract Drawings shall be obtained from the General Contractor and all changes as noted on the record set of prints shall be incorporated thereon with black ink in a neat, legible, understandable and professional manner. Refer to the Supplementary General Conditions for complete requirements.

1.03 WORK IN COOPERATION WITH OTHER TRADES

A. Examine the Drawings and Specifications and determine the work to be performed by the site utilities contractor, electrical, mechanical, plumbing, building contractor and other trades. Provide the type and amount of electrical materials and equipment necessary to place this work in proper operation, completely wired, tested and ready for use. This shall include all conduit, wire, disconnects, relays, and other devices for the required operation sequence of all electrical, mechanical and other systems or equipment.

B. Provide power and control circuits, conduit and wire as indicated on the Mechanical and Plumbing drawings as required for complete and operable systems.

C. The electrical contractor shall be responsible for obtaining back-boxes for all communication/ signal system devices/equipment from the low voltage contractor's for rough-in. He shall coordinate the delivery of the backboxes to avoid building construction delays. In the event that the backboxes are not delivered as scheduled, the electrical contractor shall be

responsible for installing the correct backboxes, patching and refinishing walls disturbed by the installation of the subject backboxes.

1.04 TESTING AND ADJUSTMENT

A. Upon completion of all electrical work, this Contractor shall test all circuits, switches, motors, breakers, motor starter(s) and their auxiliary circuits and any other electrical items to insure perfect operation of all electrical equipment.

B. Equipment and parts in need of correction and discovered during such testing shall be immediately repaired or replaced with all new equipment and that part of the system shall then be retested. All such replacement or repair shall be done at no additional cost to the Owner.

C. All circuit shall be tested for continuity and circuit integrity. Adjustments hall be made for circuits not complying with testing criteria.

D. All certified testing reports shall be submitted to the Engineer at completion of project.

1.05 IDENTIFICATION

A. Identification nameplates shall be Micarta 1/8" thick and of approved size, with bevelled edges and engraved white letters 1/4" high minimum on black background. Nameplates shall be provided for all circuits in the distribution switchboards, and selector switches. Inscriptions on equipment shall be identical to those indicated in panels and/or motor control centers and other similar devices. Each nameplate shall be provided with drillings and suitable mounting screws corresponding to finish of the nameplate. The inscriptions in each nameplate shall be as indicated on the Drawings.

B. Identification of Air Conditioning Equipment: Equipment to be so identified shall include, but shall not be limited to: Pressure and temperature controllers; switches; equipment motors and boxes or cans housing other control items. Mechanical equipment nameplates shall have letters a minimum of 3/8" high.

C. Identification of Signal/Communication Outlet Wall Plates: Outlet wall plates shall be engraved on the backside with its related signal/communication system and its serving conduit origin point.

1.06 MAINTENANCE, SERVICING, INSTRUCTION MANUALS AND WIRINGDIAGRAMS

A. Prior to final acceptance of the job, the Electrical Contractor shall furnish to the Owner at least four (4) copies of operating and maintenance and servicing instructions, as well as four (4) complete wiring diagrams for the following item(s) or equipment:

1. Communications/Signal systems.
2. Fire alarm system.
3. Panelboards.
4. Switchboards.
5. Disconnect switches/Motor starters.
6. Lighting controls.
7. LED drivers.
8. Circuit breakers.

B. All wiring diagrams shall specifically cover the system supplied. Typical drawings will not be accepted. Two (2) copies shall be presented to the Electrical Engineer and four (4) copies to the Owner.

1.07 ELECTRICAL CONTRACTOR'S RESPONSIBILITY

A. It shall be the Electrical Contractor's responsibility to obtain a complete set of Drawings and Specifications. He shall check the Drawings of the other trades and shall carefully read the entire Specifications and determine his responsibilities.

B. The contractor shall be responsible for reviewing the plans and specifications to ensure each room, where electrical line or low voltage equipment is to be installed, has sufficient space to accommodate the system cabinets, equipment and terminations while maintaining code mandated clearances about said equipment. The contractor shall identify problem areas prior to bid, include all costs required for corrective measures in his bid and submit alternate equipment and materials suitable for the installation to the Architect/Engineer for acceptance as part of the product submittal process.

1.08 FINAL INSPECTION AND ACCEPTANCE

A. After all requirements of the Specifications and/or the Drawings have been fully completed, representatives of the Owner will inspect the work. Contractor shall provide competent personnel to demonstrate the operation of any item or system to the full satisfaction of each representative.

B. Final acceptance of the work will be made by the Owner after receipt of approval and recommendation of acceptance from each representative.

1.09 RECORD DRAWINGS

A. Contractor shall furnish one set of reproducible record drawings before final payment of retention.

1.10 SUBSTITUTIONS

A. To receive consideration, requests for substitutions must be accompanied by documentary proof of its equality with the specified material. Documentary proof shall be in letter form and identify the specified values/materials alongside proposed equal values/materials. In addition, catalog brochures and samples must be included in the submittal.

B. In the event that authorization is given for a substitute equal to bid, after award of contract the Contractor shall submit to the Engineer certified quotations from suppliers of both the specified and proposed equal material for price comparison and delivery dates.

C. In the event of cost reduction, the Owner will be credited with 100 percent of the reduction, arranged by Change Order.

D. The Contractor warrants that substitutions proposed for specified items will fully perform the functions required.

E. Substitutions or requests for substitution shall not be accepted and rejected for failure to comply with items A-E above.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials and Equipment: All electrical materials and equipment shall be new and shall be listed by Underwriter's Laboratories and bear their label, or listed and certified by a nationally recognized testing authority where UL does not have an approval. Custom made equipment must have complete test data submitted by the manufacturer attesting to its safety. In addition, the materials and equipment shall comply with the requirements of the following:

1. American Society of Testing Materials (ASTM).
2. Insulated Cable Engineers Association (ICEA).
3. National Electrical Manufacturer's Association (NEMA).
4. National Fire Protection Association (NFPA).
5. American National Standard Institute (ANSI).

B. Switchboard (including solid state trip main circuit breaker).

1. Provide switchboard with rating, components, dimensions and features as indicated on the Drawings. Switchboard shall consist of a solid state trip main circuit breaker and thermal-magnetic, ambient compensated, bolt-on type circuit breakers and automatic transfer switch in floor-standing, dead front, totally metal enclosed, NEMA 3R enclosure, requiring front access only. All sections shall be constructed of code gauge sheet metal. Sections shall consist of a combination cable pull section and utility metering section and a distribution section. Switchboard and switchboard components shall be as manufactured by Eaton or approved equal Siemens, Square D or General Electric. Equipment manufactured by third party OEM is not acceptable.
2. Busbars:
    a. Busbars shall be rectangular cross-section copper with silver-plated joints, full-height in each vertical section with horizontal cross busbars between sections. Bus bracing shall not be less than short-circuit indicated on the Drawings or utility requirements. Provide all lugs suitable for copper conductors. Shop drawings must show lug sizes based on the actual conductors to be provided.
    b. Copper neutral busbar shall be 100% and shall have terminals for all active, spare, or inactive circuits.
    c. Copper ground busbar shall be full length with provisions for future length extension.
3. The main circuit breaker shall be molded case type and have short circuit interrupting capacity of 65,000 AMPS symmetrical or per serving utility's requirements, whichever is greater. Provide solid state trip units with long-time and short-time and field functional test set.
4. Feeder circuit breakers shall be the number of poles and current capacity indicated on the single line diagram. Provide circuit breakers with short circuit interrupting capacity to match the main circuit breaker.
5. Provide screw-on nameplates for all feeder circuit breakers and the switchboard cover.

6. Nameplates shall be 1/8" thick, Micarta or Lamacoid plate or approved size, with bevelled edges and engraved white letters on black background.
7. All circuit breakers shall be capable of being locked in the "OFF" position with terminals/lugs UL listed for 75°C.

C. Panels - Power Distribution:

1. Power distribution panelboards shall be floor mounted, dead front, totally metal enclosed, NEMA 1 enclosure, requiring front access only equipped with thermal-magnetic bolt-on type circuit breakers. Panels shall be minimum 32" wide, 24" deep and 90" high unless otherwise required by quantity of circuits indicated on the Single Line Diagram. Panelboard and panelboard components shall be as manufactured by Eaton Cutler-Hammer or approved equal Siemens, Square D or General Electric.
2. Circuit breakers shall be fully rated to provide the symmetrical interrupting capacity indicated on the single line diagram. Circuit breakers shall be the number of poles and current capacity as indicated on the single line diagram.
3. Provide screw-on nameplates for all feeder circuit breakers and the panelboard cover. Nameplates shall be 1/8" thick, Micarta or Lamacoid plate or approved size, with bevelled edges and engraved white letters on black background.
4. All wiring shall be neatly arranged and laced together.
5. All circuit breakers shall be provided with a device for locking circuit breaker in "OFF" position.
6. Phase, neutral and ground bus bars shall be full size, rectangular in cross section, constructed of copper and interconnections.
7. Panels shall be service entrance rated when used as the main panel in a building.

D. Panelboards - Branch Circuit:

1. Branch circuit panelboards shall be of the dead front safety type equipped with thermal-magnetic bolt-on type 40 deg C. circuit breakers. Panels shall be minimum 20" wide and 5-3/4" deep unless otherwise noted on plan. Panels shall be 3 phase, 4 wire, number of circuits shall be as indicated on the panel schedules. Provide panels with main circuit breakers/lugs and branch circuit breakers of the rating indicated on the panel schedule.
2. Circuit breakers shall be fully rated to provide the symmetrical interrupting capacity indicated on the panel schedule. Circuit breakers shall be the number of poles and current capacity as indicated on the panel schedule. Branch circuit panelboards shall be Eaton Cutler/Hammer or approved equal Siemens, Square D or General Electric to match the power distribution panelboard. Equipment manufactured by third party OEM is not acceptable.
3. Trims shall have doors equipped with flush type combination lock and catch, two milled type keys supplied with each panel. All locks shall be keyed alike and each door shall have a plastic covered directory frame with a typed identification card of all circuit and panel numbers for branch circuit panelboards and engraved lamacoid nameplates for power distribution panelboards.

4. Provide nameplate for all panelboards, 1/8" thick, Micarta or Lamacoid plate of approved size, with bevelled edges and engraved white letters on black background. Install nameplates on exterior trim of panel, above the panel door.
5. All wiring shall be neatly arranged and laced together.
6. All circuit breakers shall be provided with a device for locking circuit breaker in "OFF" position.
7. Phase, neutral and ground bus bars shall be full size, rectangular in cross section, constructed of copper and interconnections.
8. Where indicated on plan, panels housing time clocks and contactors for exterior lighting shall be provided with an auxiliary section. Panel shall consist of a two-section panelboard with two boxes and a single trim with two doors, each door with their own lock.
9. Where indicated on plan, panels housing time clocks and contactors for control of lighting shall be provided with an auxiliary section. Panel shall consist of a two-section panelboard with two boxes and one trim/cover, each with their own door/lock.

E. Lighting Fixtures:

1. Furnish, install and connect a lighting fixture at each outlet where a lighting fixture type symbol (designated on plans) is shown as being installed. Each fixture shall be complete with all required accessories including sockets, glassware, boxes, spacers, mounting devices, fire rating enclosure, chips and drivers.
2. LED Driver shall be Class 1, 120-277V, 50/60HZ (constant current) with surge protection in accordance with IEEE/ANSI C62.41.2 guidelines with a surge current rating of 10,000 amps. Operating temperature for interior fixtures shall range from 0°C to 35°C (32°F to 95°F). Operating temperature for exterior fixtures shall range from -40°C to 40°C (-40°F to 104°F). All defective drivers shall be replaced at no cost to the Owner.
3. LED chips shall be as manufactured by CREE or Xicato.
4. Interior fixtures installed in individual rooms shall be provided with LED chips of the same manufacturer. Mixing of chip manufacturers will not be allowed. All fixtures in any one room must be replaced with new fixtures when the fixtures in the room display dissimilar illumination colors.
5. Exterior fixtures shall be provided with LED chips of the same manufacturer. Mixing of chip manufacturers will not be allowed. All fixtures within line of sight must be replaced with new fixtures when the fixtures in the line of sight display dissimilar illumination colors.
6. LED chips shall have 4000º Kelvin color temperature. Interior fixtures shall meet IESNA LM-79-08. Exterior fixtures shall meet IESNA LM-80-08.
7. Where indicated on the Lighting Fixture Schedule, interior light fixtures shall be provided with integral occupancy sensor, daylight sensor and the CREE SmartCast Technology. Provide two (2) CREE configuration tools for programming the SmartCast Technology fixtures and control devices.
8. Refer to Architectural reflected ceiling plan for type of ceiling being installed in each room and provide each fixture with required mounting devices and accessories for the particular ceiling.

9. All light fixtures shall be individually supported and properly anchored to the surfaces indicated on the Architectural elevations.
10. Locations of fixtures shall be per the architectural reflected ceiling plan and shall be coordinated at time of rough-in.

F. Conduit:

1. Rigid conduit shall be full weight threaded type aluminum or steel, except where specifically required to be steel. Steel conduit shall be protected by overall zinc coating to inside and outside surfaces, applied by the hot dip, metallizing or sherardizing process.
2. Galvanized Rigid Conduit (GRC), shall be full weight threaded type aluminum or steel, except where specifically required to be steel. Steel conduit shall be protected by overall zinc coating to inside and outside surfaces, applied by the hot dip, metallizing, or sherardizing process.
3. Intermediate Metal Conduit (IMC), shall be hot-dipped galvanized in accordance with UL 1242 and meeting Federal Specification WWC-581 (latest revision).
4. Electrical Metallic Tubing (EMT), shall be zinc-coated steel with baked enamel or plastic finish on inside surfaces.
5. Flexible metal conduit shall be constructed of aluminum or hot-dipped galvanized steel strips wound spirally with interlocking edges to provide greatest flexibility with maximum strength. Interior surfaces shall be smooth and offer minimum drag to pulling in conductors. Used only as directed by the Engineer.
6. Liquid-tight conduit (Seal-Tite) shall be galvanized steel flexible conduit as above except with moisture and oil-proof jacket, pre-cut lengths and factory installed fittings. For outdoor installations and motor connection.
7. Non-Metallic Conduit:
    a. Polyvinyl chloride (PVC) rigid conduit, Schedule 40, Type II for underground installation only.
    b. Conduit and fitting shall be produced by the same manufacturer.

G. Fittings:

1. Condulet type fittings shall be smooth inside and out, taper threaded with integral insulating bushing and of the shapes, sizes and types required to facilitate installation or removal of wires and cables from the conduit and tubing system. These fitting shall be of metal, smooth inside and out, thoroughly galvanized, and sherardized cadmium plated.
2. Metallic condulet covers shall have the same finish as the fitting and shall be provided for the opening of each fitting where conductor do not pass through the cover.
3. Connector, coupling, locknut, bushings and caps used with rigid conduit shall be steel, threaded and thoroughly galvanized. Bushings shall be insulated.
4. EMT fittings, connectors and couplings, shall be steel, zinc or cadmium plated, raintight, threadless, compression or tap-on multiple point, steel locking ring type with insulated throat.
5. Flexible steel conduit connectors shall be or malleable iron clamp or squeeze type or steel twist-in type with insulated throat. The finish shall be zinc or cadmium plating.
6. Die cast, set screw or indenter type fittings are not acceptable.

7. Conduit unions shall be "Erickson" couplings, or approved equal. The use of running threads will not be permitted.

H. 600 Volt Conductors - Wire and Cable:

1. All conductors shall be stranded copper. Simpull type or equal.
2. Type THHN/THWN thermoplastic, 600 volt, UL approved, dry and wet locations, for conductor sizes up to and including #4 AWG.
3. Type XHHW cross-linked synthetic polymer, 600 volt, UL approved, for dry and wet locations, for conductor sizes #2 AWG. and above.
4. Cross-linked synthetic polymer, XHHW, 600 volts, UL approved, for installation underground, in concrete or masonry.
5. Wire and cable shall be new, manufactured not more than six (6) months prior to installation, shall have size, type of insulation, voltage rating and manufacturer's name permanently marked on outer covering at regular intervals.
6. Wire and cable shall be factory color coded by integral pigmentation with a separate color for each phase and neutral. Each system shall be color coded and it shall be maintained throughout.
7. Systems Conductor Color Coding:
   a. Power 480/277V, 3PH, 4W:
      1) Phase A = Brown
      2) Phase B = Orange
      3) Phase C = Yellow
      4) Neutral = White
   b. Power 208/120V, 3PH, 4W:
      1) Phase A = Black
      2) Phase B = Red
      3) Phase C = Blue
      4) Neutral = White
   c. Ground Conductors:
      1) Green
   d. Communication/Fire Alarm System:
      1) As recommended by the manufacturer.
8. All color coding for #8 conductor and above shall be as identified above, utilizing phase tape at each termination.
9. No conductors carrying 120 volt or more shall be smaller than #12 AWG.

I. Junction and Pullboxes:

1. For interior dry locations, boxes shall be galvanized one-piece drawn steel, knockout type, with removable, machine screw secured covers.
2. For outside, damp or interior/exterior surface mounted locations, boxes shall be heavy cast aluminum or cast iron with removable, gasketed, non-ferrous machine screw secured covers.
3. All boxes shall be sized for the number and sizes of conductors and conduits entering the box and equipped with plaster rings where required. Each conductor shall be terminated

at an insulated, barriered terminal connector and completely identified with an engraved fiber identification marker, Electrovert or Underwriter's Safety Device Company.

J. Outlet Boxes:

1. For fixtures, boxes shall be galvanized, one-piece drawn steel, knockout type equipped with 3/8" fixture studs and plaster rings where required.
2. Unless otherwise noted on plan or specified herein, outlet boxes shall be 4” square x 2 1/8” deep, one-piece drawn steel, knockout type, mounted flush with in wall. Provide with plaster rings and wall plate.
3. For data and combination telephone/data system outlets, outlet boxes shall be 4 11/16” square x 2 1/8” deep, one-piece drawn steel, knockout type, mounted flush with in wall. Provided with plaster rings and leave outlet box ready for installation of Owner furnished wall plate.
4. For all other communication/signal system devices, outlet boxes shall be as recommended by the system manufacturer and provided complete with plaster rings and covers.
5. For locations where standard boxes are not suitable due to number and size of conduit to be terminated, special boxes shall be designed to fit space or meet other requirements and submitted for approval.
6. For surface mounting or exposure to wet or damp locations, outlet boxes shall be heavy cast aluminum or cast iron with threaded hubs; covers shall be watertight with gaskets and non-ferrous screws.
7. Floor boxes shall be cast iron, fully adjustable type, with flange and brass covers suitable for the outlets/connectors specified on plan and in the project manual. Boxes shall be suitable for terminating the conduit specified on plan. Wiremold Omnibox series or approved equal.

K. Switches:

1. Standard single pole switches shall be flush tumbler, A.C. rated, quiet type, heavy duty back or side wired with binding screws, standard rocker Hubbell #1221, 20A, 120/277V, or approved equal, color as elected by Architect. Two pole three-way and other switches shall be similar. Refer to Device Plate Section of Specifications for other requirements.
2. Dimmers shall be provided with multi-function tap switch with small, raised rocker for dimmer adjustment. Dimmer shall perform the following functions: Rocker shall raise/lower light levels with the new level becoming the current preset level. Switch single tap raises lights to preset level or fades lights to off. Switch double tap raises light to full on level. Switch tap and hold slowly fades lights to off over an extended period. LEDs adjacent to tap switch indicate light level when dimmer is on, and function as locator light when dimmer is off. The contractor shall ensure the dimmers are fully compatible with the LED drivers being controlled.
3. Switches located outdoors or in damp or wet locations shall be the same as above provided with steel locking weatherproof lift cover.
4. Switches controlling or disconnecting single phase motor loads in excess of 1/3HP shall be horsepower rated and approved or motor control service. Switches shall be complete with overload device of proper motor nameplate rating, where required.

5. Disconnect (safety) switches shall be fused, heavy duty type meeting NEMA Specifications. Switches shall be provided with rejection type fuse blocks. Provide switches with the number of poles, the voltage, current and horsepower ratings as required. Provide externally operable, quickmake, quick-break type mechanism with cover interlock and padlockable in either the open or closed position. Unless indicated otherwise, provide switches indoors in NEMA Type 1 enclosure and in NEMA Type 3R rain-tight enclosure where indicated to be outdoors or weatherproof. Provide nameplate indicating equipment served. Provide unit as manufactured by Challenger or approved equal Siemens or Westinghouse.
6. Occupant sensors shall be low voltage, dual technology type, suitable for ceiling or wall mounting. Stand-alone ceiling mounted sensors shall be provided complete with relay/power pack and slave-packs to perform the switching indicated on plan. Sensors that are part of an automatic lighting control system shall be provided with integral, factory installed, connectors to accept the system control wiring. Sensors shall provide minimum 1,000 square foot coverage and provide complete coverage of the areas indicated on plan. Stand-alone sensors shall be as manufactured by Sensor Switch, Watt Stopper or Leviton. System sensors shall be as manufactured by the automatic lighting control system manufacturer and shall be fully compatible with the lighting control system.
7. Wall mounted, switch type, combination sensor and dimmer shall be dual technology type with single or dual circuit to provide the control indicated on plan. Sensors shall provide minimum 900 square feet major motion and 400 square feet minor motion coverage. Sensor shall have a multi-function tap switch with small, raised rocker, for dimmer adjustment. Sensors shall be as manufactured by Lutron Maestro CL dimmer sensor or approved equal WattStopper or Leviton. Custom color as selected by the Architect. The contractor shall ensure the dimmers are fully compatible with the LED drivers being controlled.
8. All switches, dimmers and sensors shall be listed and certified by the California Energy Commission.

L. Receptacles:

1. Convenience outlet shall consist of duplex convenience receptacle mounted in an outlet box in the wall, flush with the finish surface and shall be complete with wall plate.
2. Receptacles for convenience outlets, unless otherwise indicated, shall be industrial heavy duty type, duplex 3W grounding type, 20A, 125V, Hubbell-Bryant #5362-*. (*) color as selected by Architect.
3. Weatherproof receptacle shall be industrial heavy duty type, ground fault interrupter, 20 ampere, three wire grounding type, 120 volt, Hubbell-Bryant # GF-5362-I, with steel lockable lift cover U.L. listed for “wet” locations when in operation.
4. Receptacles in Kindergarten classrooms shall be industrial heavy duty type, tamper proof, 20A, 125V, Hubbell-Bryant #-HBL8300SGA or approved equal, color as selected by Architect. GFI receptacles shall be Hubell-Bryant #GFR5362TR, color as selected by the Architect.
5. Receptacles located outdoors shall be provided with steel weatherproof box and lockable lift cover U.L. listed for “wet” locations when in operation.

6. Receptacles in indoor damp locations shall be 20A, 125V, Hubbell-Bryant #5362WR or approved equal, color as selected by Architect. Provide with steel locking lift cover, Hubbell-Bryant #96067 or approved equal.
7. Specialty receptacles, identified on plans, for use with Owner furnished equipment shall be provided complete with outlet box, wall plate and receptacle to match the configuration of the plug being provided with the subject equipment.

M. Device Plates:

1. Shall be smooth thermoplastic wall plates, for the number of gang and types of openings necessary. Color shall match device or as selected by the Architect.
2. Plates shall be fitted, when specified for more than two gangs.
3. All switch and receptacle plates shall be engraved with related serving panel and circuit number identification on the front.
4. Wall plates for switches used in conjunction with lighting control panels/systems shall be as manufactured by the lighting control system manufacturer to match the switch and/or dimmer.
5. Plates for interior high abuse, damp or wet areas (i.e. kitchen, multi-purpose rooms, restrooms/toilets) shall be stainless steel complete with neoprene gaskets (weatherproof).

N. Terminal Cabinets:

1. Terminal cabinets shall be fabricated of hot dipped galvanized code gauge sheet metal for flush or surface mounting, as indicated on plan, size as indicated on plan but in no case less than 24” high, 30” wide and 6” deep. Doors shall be hinged and lockable. Locks shall be keyed to match the branch circuit panelboards. Terminal cabinet trims shall match the branch circuit panels.
2. Provide each terminal cabinet with a full size plywood backboard and terminal blocks (minimum 25% or 12 spare terminal blocks). All wires terminating on the terminal blocks shall be identified with an engraved fiber tag.
3. Surface mounted terminal cabinets shall be installed complete with full length skirts of the same construction and finish as the terminal cabinet.
4. Where mounted outdoors, terminal cabinets shall be NEMA 3R, weatherproof complete with gaskets and required sealant to prevent moisture from entering the terminal cabinet.

O. Plywood Backboards:

1. Where indicated for telephone or communications system terminals or other equipment assemblies, provide full room height and width backboards. Use Douglas Fir Plywood, fire resistive, exterior grade, finished one side and prime coat painted on all surfaces with finish coat of gray enamel. Unless otherwise indicated, use 3/4" thick plywood. Where terminal cabinets are used, provide full size plywood backboard to mount inside the terminal cabinet.

P. Painting:

1. Terminal cabinets, panels, junction boxes, pull boxes, etc., and conduit installed outdoors and in public view shall be painted with colors selected by the Architect to

match the subject exterior surface. Refer to painting section of the specifications for additional requirements.

Q. Seismic Design and Anchoring of Electrical Equipment:

1. Seismic anchorage of electrical equipment shall conform to C.C.R. Title 24, 2016 CBC. Anchorage details for roof/floor mounted equipment shall be as shown on plans.

R. Transformers (600V and below):

1. Transformers shall be self-cooled type with copper windings, Class H insulation and a temperature rise of 115ºC in 40ºC ambient under continuous full load conditions, kilovolt ampere ratings shall be as shown on the Drawings. Design, construction, and operational characteristics shall be in accordance with ASA, AIEE, and NEMA standards. All insulating materials shall be in accordance with NEMA ST20-1972 Standards for a 220ºC, UL component recognized insulation system. Primary windings shall be rated at 480V, with six (6) 2-1/2 percent full capacity taps, two above and four below normal. Secondary windings shall be rated at 208/120V, 3 phase with neutral brought out. Windings shall be of the fire-resistant type, designed for natural convection cooling through air circulation. Coils with exposed wire shall not be accepted. Core mounting frame and enclosures shall be of the welded and bolted construction, seismic rated, with sufficient mechanical rigidity and strengths to withstand shipping, erection and short circuit stresses. Enclosure shall be suitable for outdoor installation and shall have suitable ventilating openings with rodent-proof screens. Transformers shall be furnished complete with mounting channel and mounting bolts. Enclosures shall be provided with lifting lugs and jacking plates as required. Noise level shall be guaranteed by the manufacturer not to exceed 45 decibels for transformers up to and including 50 KVA, 50 decibles up to and including 112-1/2KVA, 55 decibels up to and including 300KVA as measured by NEMA Standards. Transformers shall be provided with vibration dampers consisting of Korfund spring loaded shock mounts and Elasti-zorb sheeting. Size and number of shock mounts shall be in accordance with manufacturer's recommendations for accommodation of weight and dampening of critical sound frequencies. Mounting bolts on floor mounted transformer shall extend into pads only and shall not be in direct contact with building structural members. All conduit shall be isolated from transformer enclosures by the use of neoprene grommets at conduit entrances to enclosures and the use of a grounding bushing. Flexible jumpers shall be installed for grounding continuity from enclosure to conduit or bus ducts. Primary and secondary terminals shall be terminated at a Micarta terminal board. A separate neutral grounding.

2. Floor mounted transformer shall be installed on concrete pad, 12" from walls and all case ventilation openings (6" where allowed by the manufacturer and approved by the Electrical Engineer).

3. Each Transformer Must Receive The Following Commercial Tests: Ratio, Polarity, Exciting Current, No-Load Loss, Resistance, Copper Loss, Impedance, Induced and Applied Potential Test. Approval shall be granted unless certified test reports covering commercial tests are made available for each unit with shop drawing submittal.

4. Each transformer shall be furnished with a manufacturer's nameplate located on the front of the unit. The nameplate shall be anodized aluminum with the following information etched or stenciled on the face: Voltage, KVA Rating; Phase; DB Rating; tap adjustments and wiring diagrams.

5. For exterior locations each transformer shall be provided complete with weathershields.

PART 3 - EXECUTION

3.01 PREPARATION AND INSTALLATION

A. Installation of Conduit and Outlet Boxes:

1. All conduit exposed or installed in concrete and masonry, shall be galvanized rigid steel conduit (GRC), or intermediate metal conduit (IMC).
2. Rigid conduit may be installed under floor slabs, under concrete sidewalls an as noted on the Drawings. Rigid conduit installed under slabs shall be 1" trade size minimum and shall be wrapped with 20 mil. polyvinyl chloride plastic tape. No conduit shall be installed/run horizontally in concrete slabs/floors.
3. All conduit except as hereinafter specified, installed in concrete/masonry walls, damp locations, hazardous locations, surface mounted up to 8’-0” above finished floor or subject to mechanical injury shall be heavy wall, threaded, galvanized rigid steel conduit (GRC), or intermediate metal conduit (IMC).
4. Flexible steel conduit shall only be permitted to be used at light fixture outlets and connections to vibrating electrical equipment. All flexible steel conduit runs shall be less than 6'-0". All outdoor installation shall be made using liquid-tight flex with approved fittings. Use of flexible conduit shall be as approved by the Engineer.
5. Intermediate metal conduit (IMC), is approved for use in all locations as approved for GRC or EMT and in accordance with Article 345 of CEC and UL Information card #DYBY.
6. All conduit installed in the dry walls or ceilings of the building shall be steel tube (EMT), Galvanized Rigid Steel (GRC), or Intermediate Metal Conduit (IMC).
7. Conduit shall be run so as not to interfere with other piping fixtures or equipment.
8. The ends of all conduit shall be cut square, carefully reamed out to full size and shall be shouldered in fitting.
9. No running threads will be permitted in locations exposed to the weather, in concrete or underground. Special union fittings shall be used in these locations.
10. Underground conduit shall be, unless otherwise indicated, Schedule 40 PVC (polyvinyl chloride) installed at depth of not less than 24" below grade. Concrete encased with 2” minimum between conduits and 3” minimum between the last conduit and the edge of the duct-bank. Conduit separation shall be maintained using plastic spacers located at 10'-0" intervals. Where power and communication/signal conduits are run in a common trench a (12") inch minimum separation shall be maintained between power and communication/signal conduits. The grounding wire in plastic conduit shall be rated in accordance with Section 250-of 2008 CEC.
11. All underground conduit shall be 1" minimum trade size for steel and for PVC.
12. Where underground conduit runs stub-up, conduit shall transition to GRC underground. The contractor shall use GRC elbows and GRC risers wrapped in 20 mil. PVC tape for stub-ups.
13. PVC conduit shall not be run in walls or above grade.

14. Where underground conduit runs penetrate floor slab, conduit shall terminate 6” above finished floor with a grounding bushing.
15. Where conductors enter a raceway in a cabinet, pull box, junction box, or auxiliary gutter, the conductors shall be protected by a plastic bushing type fitting providing a smoothly rounded insulating surface.
16. Where conduit extends through roof to equipment on roof area, this Contractor shall provide 24 gauge galvanized sheet metal flashing cones with 4" flanges on roof surface. This flashing shall be delivered to the roofing contractor for installation. The actual location of all such roof penetrations and outlet shall be verified by the Contractor.
17. All conduit underground, in masonry and concrete and where concealed under floor slabs shall have joints painted with thread compound prior to makeup.
18. All conduit shall be supported at intervals not less than 10'-0" and within 12" from any outlet and at each side of bends and elbows. Conduit supports shall be galvanized, heavy stamped, two hole conduit clamp properly secured.
19. Where conduit racks are used the rack shall consist of two piece conduit clamps attached to galvanized steel slotted channels, properly secured via threaded rods attached directly to the building structure.
20. Nail-in conduit supports will not be allowed. One piece set-screw type conduit clamps or perforated iron for supporting conduit will not be permitted.
21. Seismic Conduit Support:
    a. All conduit shall be supported in such a manner that it is securely attached to the structure of the building. Attachment is to be capable of supporting the tributary weight of conduit and contents in any direction. Maximum spacing of support and braces are to be as follows:

	CONDUIT SIZE	MAXIMUM SPACING
1)	1/2" to 3" Standard incl.	6'-0"
2)	3-1/2" to 4" Standard incl.	8'-0"

22. All conduit runs shall be installed parallel or perpendicular to walls, structural members, or intersection of vertical planes and ceilings. Field made bends and offset shall be avoided where possible. Crushed or deformed raceway shall not be installed.
23. Open knockouts in outlet boxes only where required for inserting conduit.
24. Outlet boxes on metal studs shall be attached to metal hangers, tack welded or bolted to studs; on wood studs attachment shall be with wood screws, nails not acceptable.
25. Surface mounted panels secured to stud walls shall be secured to wall using 1/2" x 3" screws into steel backing plate provided by the Architect.
26. Provide four (4) ¾” conduit stub-ups into accessible ceiling space from all recessed panels.
27. All boxes shall be covered with outlet box protector, Appleton SB-CK. Keep dirt from entering box or panels. If dirt does get in, it shall be removed prior to pulling wires.
28. All boxes installed outdoors shall be suitable for outdoor installations, gasketed, screw cover and painted as directed by the Architect with weatherproof paint to match building.

29. All conduit entries to outdoor mounted panels, cabinets, boxes, etc., shall be made using Myers "SCRU-TITE" hubs Series ST.
30. All conduit shall have a 200 lb test poly-propylene pull line left in place for future use in all runs tagged with a plastic tag at terminating end indicating the location of the opposite end of the conduit.
31. All rotating electrical equipment shall be supplied with flexible, liquid-tight conduit with appropriate slack and shall not exceed thirty-six (36) inches.
32. All multiple conduit runs within suspended ceilings shall be suspended from building structure by means of unistrut hangers/rack, see note 19. Refer to note 18 for support of single conduit runs within suspended ceilings. Conduit shall not be allowed to lay on ceiling or be supported from ceiling suspension wires or other suspension system.
33. All conduit shall be installed concealed in walls, under floors or ceilings. Exposed conduit will not be permitted unless specifically approved in writing by the Architect/Engineer. When approved by the Architect/Engineer exposed conduits shall be painted to match the finish of the wall or ceiling to which it is supported to.
34. Provide complete conduit system for all line voltage systems. Provide conduit for low voltage systems installed over inaccessible ceilings and in rooms with no dropped ceilings. The Contractor shall coordinate the location of inaccessible or open ceilings with the Architectural Reflected Ceiling Plan and in the filed with the ceiling contractor
35. Provide conduit stub-ups into ceiling spaces from all wall mounted communications/signal devices (except Fire Alarm) for routing of wire/cable from the devices to the designated terminal backboard or cabinet.
36. Provide a complete conduit system for routing of Fire Alarm system wire/cables.
37. Provide conduit only for routing of HVAC control wiring. Refer to Mechanical drawings for conduit requirements.
38. Provide ceiling access panels for junction/pull boxes in stalled over inaccessible ceilings.

B. Installation of 600 Volt Conductors:

1. All line voltage wire, including control circuits, shall be installed in conduit.
2. All communications wire/cable shall be listed for open wiring (without conduit) and shall be plenum rated. Communications wire/cable shall be supported by “J” hooks installed along the perimeter walls of the building or full-height interior walls. Low voltage wiring installed over inaccessible ceilings shall be installed in conduit.
3. All line voltage circuits and feeder wires shall be continuous from the service point to terminal or farthest outlet. No joints shall be made except in pull, junction or outlet boxes, or in panel or switchboard gutters.
4. All low voltage wire/cables shall be continuous from the service point to terminal or farthest outlet. No joints will be allowed.
5. Thoroughly clean all conduit and wire-ways and see that all parts are perfectly dry before pulling any wires. No joint shall be made except in pull, junction or outlet boxes, or in panel or switchboard gutters.
6. Provide conduit only for routing of HVAC control wiring. Refer to Mechanical drawings for conduit requirements.

7. Install UL approved, fixture wire from all lighting fixture lamp sockets into fixture outlet or junction box.

C. Joints in 600 Volt Conductors:

1. Joints in 600 volt conductors smaller than No. 4 AWG shall be made with Scotchlok spring type connectors. Wires No 4 AWG and larger shall be joined together with approved type of pressure connector and taped with #33 3M tape, three (3) layers minimum to provide insulation not less than that of conductor. Connections to switch or busbar shall be made with one-piece copper lugs. Splicing of all 600 volt or less in-line connections #2 AWG through 350 MCM shall be made with 3M brand PST connector.
2. Joints/splices shall be done in junction or pull boxes.
3. Splices of communications wire/cable will not be permitted. Communications wire/cable shall run continuously from its point of origin to its destination point.

D. Grounding:

1. Provide grounding for entire electric installation as shown on plans and as required by applicable codes. Included as requiring grounding are:
   a. Conduit.
   b. Neutral or identified conductors of interior wiring system.
   c. Switchboards and Branch Circuit Panelboards.
   d. Non-current carrying metal parts of fixed equipment.
   e. Telephone distribution equipment.
2. Ufer ground shall be provided at the building's "service" panel to meet the resistance specified herein. The size of the ufer grounding conductor shall be not less than that set forth in the latest edition of the California Code of Regulations, Title 24, State of California and CEC, unless otherwise indicated.
3. Grounding and bonding conductors shall be sized per the latest edition of the California Code of Regulations, Title 24, State of California and CEC,
4. Provide and install a grounding conductor in all feeder and branch circuit conduits.
5. Where required to be installed, ground rods shall be 3/4" x 10', copper clad, installed individually or grouped as required to meet the specified resistance. Provide ground rods with all required clamps, fittings, wire and concrete boxes.
6. Building grounding system resistance to ground shall not exceed 25 ohm.

E. Prefabricated Equipment: Installation of all prefabricated items and equipment shall conform to the requirements of the manufacturer's specifications and installation instruction pamphlets. Where code requirements affect installation of materials and equipment, the more stringent requirements, code or manufacturer's instructions and/or specifications, shall govern the work.

END OF SECTION

SECTION 33 13 00

DISINFECTING OF WATER UTILITY DISTRIBUTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Disinfection of site domestic water lines and site fire water lines specified in Section 33 14 16.

B. Disinfection of building domestic water piping specified in Division 22.

C. Testing and reporting results.

1.02 RELATED REQUIREMENTS

A. Section 33 14 16 - Site Water and Fire Line Distribution Piping.

1.03 REFERENCE STANDARDS

A. AWWA B300 - Hypochlorites; 2011.

B. AWWA B301 - Liquid Chlorine; 2010.

C. AWWA B302 - Ammonium Sulfate; 2010.

D. AWWA B303 - Sodium Chlorite; 2010.

E. AWWA C651 - Disinfecting Water Mains; 2005.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Test Reports: Indicate results comparative to specified requirements.

C. Certificate: From authority having jurisdiction indicating approval of water system.

D. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.

E. Disinfection report:

1. Type and form of disinfectant used.
2. Date and time of disinfectant injection start and time of completion.
3. Test locations.
4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
5. Date and time of flushing start and completion.
6. Disinfectant residual after flushing in ppm for each outlet tested.

F. Bacteriological report:

1. Date issued, project name, and testing laboratory name, address, and telephone number.
2. Time and date of water sample collection.
3. Name of person collecting samples.

4. Test locations.
5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for each outlet tested.
7. Certification that water conforms, or fails to conform, to bacterial standards of County of Riverside.

1.05 QUALITY ASSURANCE

A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three years documented experience.

B. Testing Firm: Company specializing in testing potable water systems, certified by governing authorities of California.

C. Submit bacteriologist's signature and authority associated with testing.

PART 2 PRODUCTS

2.01 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping system and water well has been cleaned, inspected, and pressure tested.

B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.02 DISINFECTION

A. Use method prescribed by the applicable state or local codes, or health authority or water purveyor having jurisdiction, or in the absence of any of these follow AWWA C651.

B. Provide and attach equipment required to perform the work.

C. Inject treatment disinfectant into piping system.

D. Maintain disinfectant in system for 24 hours.

E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.

F. Replace permanent system devices removed for disinfection.

G. Pressure test system to 120 psi. Repair leaks and re-test.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00.

B. Test samples in accordance with AWWA C651.

END OF SECTION

SECTION 33 14 16
SITE WATER DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and fittings for site water lines including domestic water lines and fire water lines.

1. Site water lines up to approximately 5 feet from the building perimeter. See individual building systems for continuation.

B. Valves.

1.02 RELATED REQUIREMENTS

A. Section 21 13 13 - Fire Suppression System: Underground fire line extension into the building.

B. Division 22 - Plumbing: Underground water line extension into the building.

C. Section 33 13 00 - Disinfecting of Water Utility Distribution: Disinfection of site service utility water piping.

1.03 REFERENCES

A. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.

B. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015.

C. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2015.

D. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2013.

E. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).

F. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 1998 (Reapproved 2011).

G. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.

H. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2012.

I. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2009.

J. AWWA C203 - Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape-Hot-Applied; 2008.

K. AWWA C205 - Cement-Mortar Protective Lining and Coating for Steel Water Pipe, 4 in. (100 mm) and Larger - Shop Applied; 2012.

L. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service; 2009.

M. AWWA C504 - Rubber-Seated Butterfly Valves 3 In. (75 mm) Through 72 In. (1,800 mm); 2010.

N. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances; 2010.

O. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution; 2007.

P. NACE SPO169 - Control of External Corrosion on Underground or Submerged Metallic Piping Systems; 2013.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, joints, couplings, valves and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1. Submit a certificate stating that the meters have been tested and that the accuracy and capacity meet the requirements of AWWA C700 when tested in accordance with AWWA Standards according to type installed.

D. Shop Drawings: Submit shop drawings for potable water system, showing piping materials, size, locations, and elevations. Include details of underground structures, connections, thrust blocks, and anchors. Show interface and spatial relationship between piping and proximate structures.

E. Project Record Documents:

1. Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.

2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

3. On a set of Contractor Drawings, kept at the site during construction, mark construction that is installed differently from that indicated.

a. Locate materials installed underground by dimensions from fixed identifiable points whether installed as indicated or not.

F. Maintenance Data:

1. Submit maintenance data and parts list for potable water system materials and products.

2. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Section 01 78 00 - Closeout Submittals.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with utility company requirements.

B. Manufacturer's Qualification: Firms regularly engaged in manufacture of potable water system materials and products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

C. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with potable water piping work similar to that required for project.

1.07 REGULATORY REQUIREMENTS

A. Materials and installation shall be in accordance with the following documents hereinafter referred to as the "Greenbook".

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

B. Do not store materials directly on the ground. Support the pipe uniformly during shipping and storage.

1. Do not stack higher than 4 feet nor stack with weight on bells.
2. Cover plastic pipe to protect it from sunlight.
3. Keep inside of pipe and fittings free of dirt and debris.
4. Avoid scratching the pipe surface.

C. Do not install pipe that is cracked, broken, gouged, scratched or forming a clear depression. Remove damaged pipe from the site.

D. Do not install pipe contaminated with a petroleum product or any other toxic material whether inside or outside of pipe.

E. Take special care to avoid injury to coatings and linings on pipe and fittings; make satisfactory repairs if coatings or linings are damaged.

1. Hoist pipe with mechanical equipment using a cloth belt sling or a continuous fiber rope which avoids scratching the pipe.
2. Pipes may be lowered by rolling on two ropes controlled by snubbing.

PART 2 PRODUCTS

2.01 WATER PIPE

A. General:

1. Provide piping materials and factory-fabricated piping products of size, type, pressure ratings, and capacities as indicated.
2. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements.
3. Provide size and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in potable water systems.
4. Where more than one type of materials or products are indicated, selection is Installer's option.

B. Piping:

1. Provide pipes of one of the following materials, of weight/class indicated.
2. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.

C. Ductile Iron Pipe: AWWA C151:

1. Fittings: Ductile iron, standard thickness.
   a. Ductile-iron, AWWA C110/A21.10; asbestos-cement couplings.
2. Joints: AWWA C111/A21.11, rubber gasket with rods.
3. Jackets: AWWA C105/A21.5 polyethylene jacket.

D. PVC Pipe: ASTM D 1785, Schedule 80 for sizes 1/2 inch through 3 inches.

1. Fittings: ASTM D2466, PVC, socket type, solvent cement joints; or elastomeric gaskets joints.
2. Joints: ASTM D2855, solvent weld.

E. PVC Pipe: AWWA C900 FM approved, Class 235 (formerly 150): for sizes 4 inches through 12 inches; UL Listed.

1. Dimension Ratio: DR 18.
2. Fittings: AWWA C111/A21.11, ductile-iron, cement lined, with rubber gaskets.
3. Joints: ASTM D3139 compression gasket ring, bell and spigot.

F. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Water Service" in large letters.

2.02 VALVES

A. Valves: Manufacturer's name and pressure rating marked on valve body.

B. Gate Valves Up To 3 Inches:

1. Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, compression ends, with control rod, post indicator, valve key, and extension box.

C. Gate Valves 3 Inches and Over:

1. AWWA C500, iron body, bronze trim, non-rising stem with square nut, single wedge, flanged ends, control rod, post indicator, valve key, and extension box.

D. Ball Valves Up To 2 Inches:

1. Brass body, Teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA inlet end, compression outlet with electrical ground connector, with control rod, valve key, and extension box.

E. Butterfly Valves From 2 Inches to 24 Inches:

1. AWWA C504, iron body, bronze disc, resilient replaceable seat, water or lug ends, ten position lever handle.

F. Valve Ends: Provide flanged, threaded, hub or sleeve type mechanical joint ends designed to suit pipe or tapping sleeves connections.

2.03 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 31 23 16.13.

B. Cover: As specified in Section 31 23 16.13.

2.04 ACCESSORIES

A. Anchorages: Provide anchorages for tees, wyes, crosses, plugs, caps, bends, valves, and hydrants. After installation, apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of ferrous anchorages.

1. Clamps, Straps, and Washers: Steel, ASTM A506.
2. Rods: Steel, ASTM A575.
3. Rod Couplings: Malleable-iron, ASTM A 197.
4. Bolts: Steel, ASTM A307.
5. Cast-Iron Washers: Gray-iron, ASTM A126.

B. Concrete: Ready-mixed, complying with ASTM C 94/C 94M; normal Portland cement; 2,500 psi strength at 28 days, 3 inch slump; 3/4 inch nominal size aggregate.

C. Identification

1. Underground-Type Plastic Line Marker: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6 inches wide x 4 mils thick. Provide blue tape with black printing reading "CAUTION WATER LINE BURIED BELOW".
    a. Manufacturer: Subject to compliance with requirements, provide identification markers of one of the following:
        1) Allen Systems Inc.
        2) Seton Name Plate Corp.
    b. Substitutions: See Section 01 60 00 - Product Requirements.
2. Nonmetallic Piping Label: If nonmetallic piping is used for water service, provide engraved plastic laminate, label permanently affixed to main electrical meter panel stating "THIS STRUCTURE HAS A NONMETALLIC WATER SERVICE".

D. Corrosivity Protection: All underground metallic pipe and fittings shall be protected against corrosive soil by wrapping with 8 mil minimum polyethylene sheet.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

B. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.03 TRENCHING

A. See the sections on excavation and fill for additional requirements.

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Form and place concrete for pipe (larger than 4 inches) thrust restraints at each change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide 4 sq ft thrust restraint bearing on subsoil.

D. Do not backfill until installation has been approved and as-built drawings are up to date. Promptly install all piping after excavation or cutting for same has been done, so as to keep the excavations open as short a time as possible.

E. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.04 INSTALLATION - PIPE

A. General: During back-filling/topsoiling of underground potable water piping, install continuous underground-type plastic line markers located directly over buried lines at 6 to 8 inches below finished grade.

B. Maintain separation of water main from sewer piping in accordance with plumbing code.

C. Group piping with other site piping work whenever practical.

D. Establish elevations of buried piping to ensure not less than 2 ft of cover.

E. Install pipe to indicated elevation to within tolerance of 5/8 inches.

F. Install ductile iron piping and fittings to AWWA C600.

G. Polyvinyl Chloride Pipe: Install in accordance with manufacturer's installation instructions.

1. Pressure water lines (4 inch and larger): Install in accordance with pipe manufacturers recommendations, or as shown in J-M Installation Guide "Ring-Tite PVC Pipe". Provide thrust blocks as required by "J-M Installation Guide".

H. Route pipe in straight line.

I. Install pipe to allow for expansion and contraction without stressing pipe or joints.

J. Install access fittings to permit disinfection of water system performed under Section 33 13 00.

K. Slope water pipe and position drains at low points.

L. Install trace wire 6 inches above top of pipe; coordinate with Section 31 23 16.13.

M. Provide and install 14 gauge copper "Tracer" wire, continuous for entire length, for all underground non-metallic piping. Secure to piping at alternate joints, at each fitting and at each valve. Locate "Tracer" wire along side pipe, but not under pipe.

N. Installation of identification: During backfilling/top-soiling of underground water piping systems, install continuous underground-type plastic line marker, located directly over buried line at 6 to 8 inches below finished grade.

3.05 INSTALLATION - VALVES AND HYDRANTS

A. Check operation of all valves before installing. Install valves true to line and grade. Install valves in accordance with AWWA C600 and manufacturer's written instructions. Wrap all

buried, ferrous metal valves with polyethylene film in conformance with Section 5-4 of AWWA C105/A21.5.

B. Set valves on solid bearing.

C. Install valves as indicated with stems pointing up. Provide valve box over underground valves.

D. Center and plumb valve box over valve. Set box cover flush with finished grade.

3.06 CORROSION PROTECTIVE COATING APPLICATION

A. Comply with NACE SP0169.

B. Steel Pipe or Valve Assemblies:

1. Implement all the following measures:
    a. Underground steel pipe with rubber gasketed, mechanical, grooved end, or other nonconductive type joints should be bonded for electrical continuity. Electrical continuity is necessary for corrosion monitoring and cathodic protection.
    b. Install corrosion monitoring test stations to facilitate corrosion monitoring and the application of cathodic protection:
        1) At each end of the pipeline.
        2) At each end of all casings.
        3) Other locations as necessary so the interval between test stations does not exceed 1,200 feet.
    c. To prevent dissimilar metal corrosion cells and to facilitate the application of cathodic protection, electrically isolate each buried steel pipeline per NACE SP0286 from:
        1) Dissimilar metals.
        2) Dissimilarly coated piping (cement-mortar vs. dielectric).
        3) Above ground steel pipe.
        4) All existing piping.
    d. Choose one of the following corrosion control options:
        OPTION 1
        1) Apply a suitable dielectric coating intended for underground use such as:
            (a) Polyurethane per AWWA C222; or
            (b) Extruded polyethylene per AWWA C215; or
            (c) A tape coating system per AWWA C214; or
            (d) Hot applied coal tar enamel per AWWA C203; or
            (e) Fusion bonded epoxy per AWWA C213.
        2) Apply cathodic protection to steel piping as per NACE SP0169.
        OPTION 2
        3) As an alternative to dielectric coating and cathodic protection, apply a 3/4 inch cement mortar coating per AWWA C205 or encase in concrete 3 inches thick, using any type of cement. Joint bonds, test stations, and insulated joints are still required for these alternatives.
2. NOTE: Some steel piping systems, such as for oil, gas, and high-pressure piping systems, have special corrosion and cathodic protection requirements that must be evaluated for each specific application.

C. Iron Pipe or Valve Assemblies:

1. Implement all the following measures:
    a. Electrically insulate underground iron pipe from dissimilar metals and from above ground iron pipe with insulating joints per NACE SP0286.
    b. Bond all nonconductive type joints for electrical continuity. Electrical continuity is necessary for corrosion monitoring and cathodic protection.
    c. Install corrosion monitoring test stations to facilitate corrosion monitoring and the application of cathodic protection:
        1) At each end of the pipeline.
        2) At each end of any casings.
        3) Other locations as necessary so the interval between test stations does not exceed 1,200 feet.
    d. Choose one of the following corrosion control options:
        OPTION 1
        1) Apply a suitable coating intended for underground use such as:
            (a) Polyethylene encasement per AWWA C105/A21.5; or
            (b) Epoxy coating; or
            (c) Polyurethane; or
            (d) Wax tape.
        2) NOTE: The thin factory-applied asphaltic coating applied to ductile iron pipe for transportation and aesthetic purposes does not constitute a corrosion control coating.
        3) Apply cathodic protection to cast and ductile iron piping as per NACE SP0169.
        OPTION 2
        4) As an alternative to coating systems described in Option 1 and cathodic protection, concrete encase all buried portions of metallic piping so that there is a minimum of 3 inches of concrete cover provided over and around surfaces of pipe, fittings, and valves using any type of cement.

D. Copper Tubing:
    1. Protect buried copper tubing by one of the following measures:
        a. Prevention of soil contact. Soil contact may be prevented by placing the tubing above ground or encasing the tubing using PVC pipe with solvent-welded joints.
        b. Installation of a factory-coated copper pipe with a minimum 25-mil thickness such as Kamco's Aqua Shield™, Mueller's Streamline Protec™, or equal. The coating must be continuous with no cuts or defects.
        c. Installation of 12-mil polyethylene pipe wrapping tape with butyl rubber mastic over a suitable primer. Protect wrapped copper tubing by applying cathodic protection per NACE SP0169.

E. Plastic and Vitrified Clay Pipe
    1. No special precautions are required for plastic and vitrified clay piping placed underground from a corrosion viewpoint.
    2. Protect all metallic fittings and valves with wax tape per AWWA C217 or epoxy.

F. All Pipe or Valve Assemblies:

1. On all pipes, appurtenances, and fittings not protected by cathodic protection, coat bare metal such as valves, bolts, flange joints, joint harnesses, and flexible couplings with wax tape per AWWA C217 after assembly.
2. Where metallic pipelines penetrate concrete structures such as building floors, vault walls, and thrust blocks use plastic sleeves, rubber seals, or other dielectric material to prevent pipe contact with the concrete and reinforcing steel.

G. Concrete

1. From a corrosion standpoint, any type of cement may be used for concrete structures and pipe because the sulfate concentration is negligible, 0 to 0.1 percent. (American Concrete Institute (ACI 318) Table 4.3.1)
2. Standard concrete cover over reinforcing steel may be used for concrete structures and pipe in contact with these soils due to the low chloride concentration found onsite. (Design Manual 303: Concrete Cylinder Pipe. Ameron. p.65)

3.07 IDENTIFICATION INSTALLATION

A. During backfilling/top-soiling of underground water piping systems, install continuous underground-type plastic line marker, located directly over buried line at 6 to 9 inches below finished grade.

B. Attach nonmetallic piping label permanently to main electrical meter panel.

3.08 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00.

B. Test valves for leakage and alignment prior to backfilling.

C. 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.

D. Pressure test water piping to 200 psi.

1. PVC Water Pipelines: Test all water lines in accordance with manufacturers recommendations.
   a. Test pipe in accordance with Division 22 - Plumbing.
2. Increase pressure in 50 psi increments and inspect each joint between increments. Hold at test pressure for one hour, decrease to 0 psi. Slowly increase again to test pressure and hold for one more hour.
3. Test fails if leakage exceeds 2-qts per hour per 100 gaskets or joints, irrespective of pipe diameter.

E. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to District.

3.09 CLEANING

A. Clean and disinfect water-distribution piping as indicatedin Section 33 13 00 - Disinfection of Water Distribution Systems.

END OF SECTION

SECTION 33 71 19

ELECTRICAL UNDERGROUND DUCTS AND MANHOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit and duct:

1. Rigid polyvinyl chloride (PVC) conduit.
2. Polyvinyl chloride (PVC) plastic utilities duct.

B. Precast concrete manholes.

C. Accessories:

1. Underground warning tape.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

1.03 REFERENCE STANDARDS

A. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2012).

B. ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures; 2014.

C. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures; 2010.

D. ASTM C891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures; 2011.

E. ASTM F512 - Standard Specification for Smooth-Wall Poly(Vinyl Chloride) (PVC) Conduit and Fittings for Underground Installation; 2012.

F. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.

G. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.

H. NEMA TC 6&8 - Polyvinyl Chloride (PVC) Plastic Utilities for Underground Installations; 2013.

I. NEMA TC 9 - Fittings for Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installation; 2004.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide for metallic conduit, nonmetallic conduit, and manhole accessories.

C. Shop Drawings: Indicate dimensions, reinforcement, size and locations of openings, and accessory locations for precast manholes.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Project Record Documents: Record actual routing and elevations of underground conduit and duct, and locations and sizes of manholes.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 CONDUIT AND DUCT

A. Rigid Polyvinyl Chloride (PVC) Conduit: NFPA 70, Type PVC; comply with NEMA TC 2 and list and label as complying with UL 651; Schedule 40 unless otherwise indicated; rated for use with conductors rated 90 degrees C.

1. Manufacturers:
    a. Cantex Inc: www.cantexinc.com.
    b. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com.
    c. JM Eagle: www.jmeagle.com.
    d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Fittings: Comply with NEMA TC 3 and list and label as complying with UL 651.
    a. Manufacturer: Same as manufacturer of conduit to be connected.

B. Polyvinyl Chloride (PVC) Plastic Utilities Duct: Comply with NEMA TC 6&8 and ASTM F512; Type EB-20 listed and labeled as complying with UL 651, suitable for burial with concrete encasement.

1. Manufacturers:
    a. Cantex Inc: www.cantexinc.com.
    b. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com.
    c. JM Eagle: www.jmeagle.com.
    d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Fittings: Comply with NEMA TC 9.
    a. Manufacturer: Same as manufacturer of duct to be connected.

2.02 PRECAST CONCRETE MANHOLES

A. Description: Precast manhole designed in accordance with ASTM C858, comprising modular, interlocking sections complete with accessories.

B. Loading: ASTM C857, Class A-16.

C. Shape: Square.

D. Top Section: Include 39 inch diameter grooved opening for frame and cover.

E. Frames and Covers: ASTM A48/A48M; Class 30B gray cast iron, 27 inch size, machine finished with flat bearing surfaces. Provide cover marked ELECTRIC to indicate utility.

F. Duct Entry Provisions: Single duct knockouts.

G. Duct Entry Locations: As indicated.

H. Duct Entry Size: 4 inch.

I. Cable Pulling Irons: Use galvanized rod and hardware. Locate opposite each duct entry. Provide watertight seal.

J. Cable Rack Inserts: Minimum load rating of 800 pounds (365 kg). Locate at 2 feet on center.

K. Cable Rack Mounting Channel: 1-1/2 x 3/4 inch steel channel, 48 inch length. Provide cable rack arm mounting slots on 1-1/2 inch centers.

L. Cable Racks: Steel channel, 1-1/2 x 3/4 x 14 inches, with fastener to match mounting channel.

M. Cable Supports: Porcelain clamps and saddles.

N. Sump Covers: ASTM A48/A48M; Class 30B gray cast iron.

2.03 ACCESSORIES

A. Underground Warning Tape: Polyethylene tape suitable for direct burial.

1. Manufacturers:
    a. Brady Corporation: www.bradyid.com.
    b. Brimar Industries, Inc: www.brimar.com.
    c. Seton Identification Products: www.seton.com.
    d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.
3. Legend: Type of service, continuously repeated over full length of tape.
4. Color:
    a. Tape for Buried Power Lines: Black text on red background.
    b. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify routing and termination locations of duct bank prior to excavation for rough-in.

C. Verify locations of manholes prior to excavating for installation.

D. Duct bank routing is shown in approximate locations unless dimensions are indicated. Route as required to complete duct system.

3.02 DUCT BANK INSTALLATION

A. Install power and communications duct to locate top of ductbank minimum 30 inches below finished grade.

B. Install duct with minimum slope of 4 inches per 100 feet (0.33 percent). Slope duct away from building entrances.

C. Cut duct square using saw or pipe cutter; de-burr cut ends.

D. Insert duct to shoulder of fittings; fasten securely.

E. Join nonmetallic duct using adhesive as recommended by manufacturer.

F. Wipe nonmetallic duct dry and clean before joining. Apply full even coat of adhesive to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

G. Install no more than equivalent of three 90-degree bends between pull points.

H. Provide suitable fittings to accommodate expansion and deflection where required.

I. Stagger duct joints vertically in concrete encasement 6 inches minimum.

J. Use suitable separators and chairs installed not greater than 4 feet on centers.

K. Band ducts together before backfilling.

L. Securely anchor duct to prevent movement during concrete placement.

M. Place concrete under provisions of Section 03 30 00. Use mineral pigment to color concrete red.

N. Provide minimum 3 inch concrete cover at bottom, top, and sides of ductbank.

O. Provide two No. 4 steel reinforcing bars in top of bank under paved areas.

P. Connect to existing concrete encasement using dowels.

Q. Provide suitable pull string in each empty duct except sleeves and nipples.

R. Swab duct. Use suitable caps to protect installed duct against entrance of dirt and moisture.

S. Interface installation of underground warning tape with backfilling. Install tape 6 inches below finished surface.

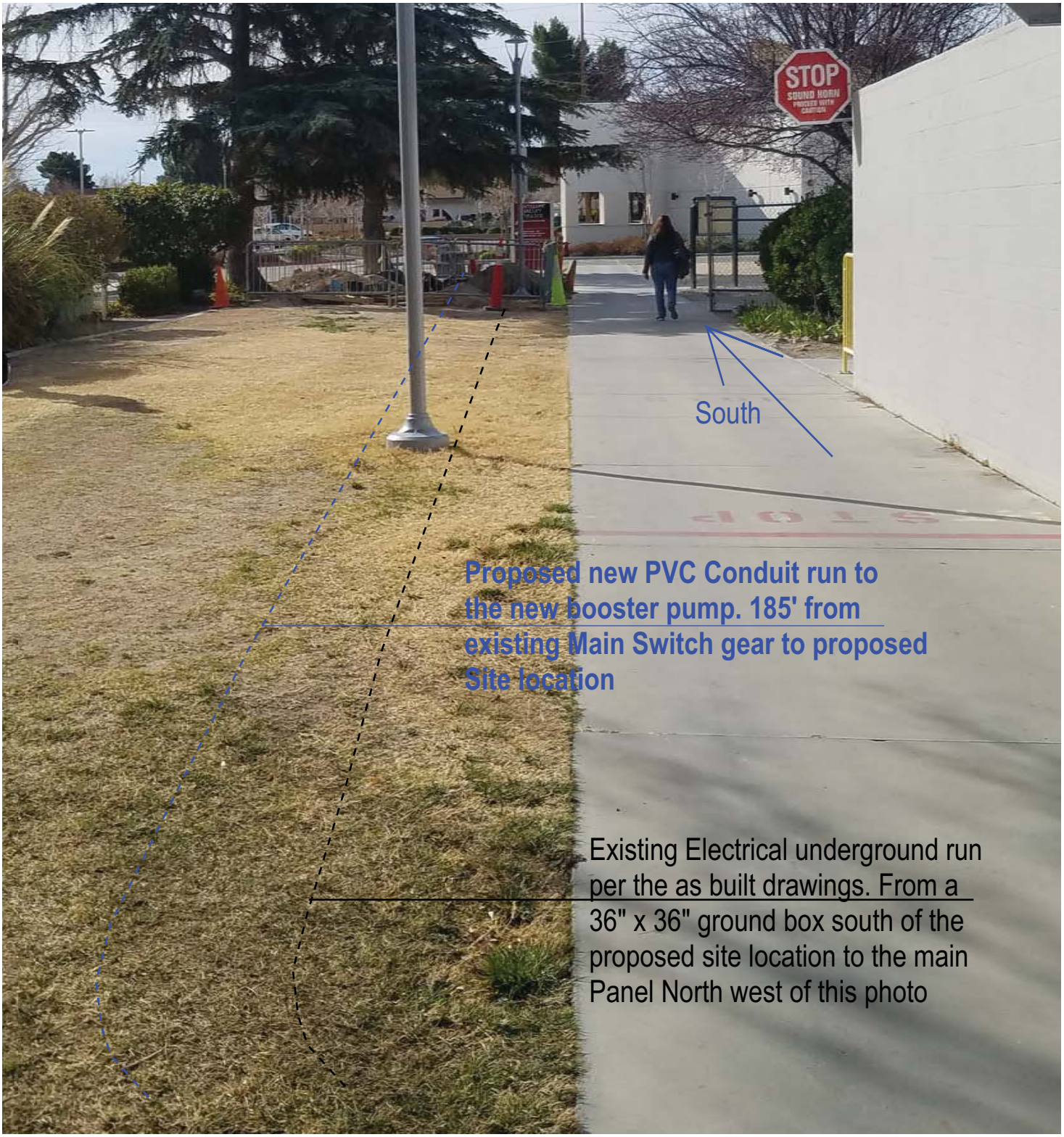
3.03 PRE-CAST MANHOLE INSTALLATION

A. Install and seal precast sections in accordance with ASTM C891.

B. Install manholes plumb.

C. Use precast neck and shaft sections to bring manhole cover to finished elevation.

END OF SECTION


STOP
South
Proposed new PVC Conduit run to the new booster pump. 185' from existing Main Switch gear to proposed Site location
Existing Electrical underground run per the as built drawings. From a 36" x 36" ground box south of the proposed site location to the main Panel North west of this photo


FINE ARTS ART GALLERY BUILDING
EAST SIDE OF THE BUILDING LOOKING WEST
GE 800 amp Main Panel
120/208 3Ø 4 wire
Proposed new underground PVC conduit from this main Panel to the new equipment location 185' from this POC
Existing Gas Line Depth Not known
Existing Water line depth not known


FINE ARTS BUILDING #1
STOP
Existing 800Amp Main
Existing 480/277 Volt Main PVC conduit run
per the as-built drawings
NORTH
Existing Direct burial wires
going from existing light pole
to the next. Panel LC Circuit #38
Location Fina Art & Music Offices
proposed new 1" PVC conduit to the
main Distribution panel