



Business Services

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ADDENDUM NO. 2

Date: July 12, 2018

Issued by: Sacramento City Unified School District

Project: American Legion Core Academic Renovation

You are hereby notified of the following changes, clarifications, or modifications to the original Contract Documents, Specifications, and Drawings. This Addendum shall supersede the original project documents, and shall take precedence over anything to the contrary therein. All Addenda shall be acknowledged in the Bid Form. Failure to do so may result in disqualification of the bid. All other conditions remain unchanged.



CALIFORNIA DESIGN WEST ARCHITECTS INC.

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**AMERICAN LEGION HIGH SCHOOL
CORE ACADEMIC AND CAMPUS RENOVATION
SACRAMENTO CITY UNIFIED SCHOOL DISTRICT
DSA App # 02-116158; DSA File # 34-H7**

ADDENDUM # 2 – REBID
July 12, 2018

The following changes to the drawings and specifications shall become part of the contract documents and shall be reflected in bids.

SPECIFICATIONS

ITEM # 2R.1 General: Portions (pages) of the following spec sections are missing from the scanned DSA Approved set. Please replace these sections in the contract documents with the attached:

- A. Section 01 33 00 – Submittals
- B. Section 07 41 15 – Metal Roof Panels, Exposed Fastener
- C. Section 09 67 25 – Decorative Interior Wall Surfacing System
- D. Section 22 00 50 – Basic Plumbing Materials and Methods
- E. Section 31 20 00 – Earthwork
- F. Section 32 90 00 – Landscaping
- G. Section 33 40 00 – Storm Drainage

ITEM # 2R.2 Section 07 95 13 – Expansion Joint Cover Systems: Delete this spec from the contract documents. No expansion joint cover systems are used on this project.

DRAWINGS

ITEM # 2R.3 Sheet ADD-1R G001D – Cover Sheet, Sheet Index: Delete note for Sheet 3 – Hood Details & Schedules, as this sheet does not exist.

ITEM # 2R.4 Sheet ADD-1R GS102 – Enlarged Site Plan:

- A. Keyed Notes: Add the following Keyed Note to this Sheet:

6.12 PROVIDE PARKING LOT STRIPING AS INDICATED – ALL PARKING STRIPING THIS LOT.

- B. Changed all keynotes shown as 6.27 (on this sheet only) to **6.12**.

- ITEM # 2R.5** Sheet ADD-1R GS107 – Enlarged Site Plans; Detail 4 – Staff & Student Accessible Parking: Add the graphic representation of 12" high lettering stating NO PARKING to where Keyed Note 6.50 is pointing.
- ITEM # 2R.6** Sheet ADD-1R C3.1 – Utility Plan: Replace with the attached **Sheet ADD-2R C3.1 – Utility Plan**. All changes have been clouded.
- ITEM # 2R.7** Sheet ADD-1R C4.1 – Paving Plan: Replace with the attached **Sheet ADD-2R C4.1 – Paving Plan**. All changes have been clouded.
- ITEM # 2R.8** Sheet ADD-1R AG101 – Building G Floor Plan; Keyed Notes: Change Keyed Note 1.47 to read as follows:

PROVIDE WALL ATTACHED HUSSEY MAXAM TWO ROW FIXED BLEACHERS. SEATS TO BE CONTOURED 10" COURTSIDE. CENTER SECTION BE 19'-6" WIDE WITH ONE 4'-6" AISLE CENTERED IN SECTION. PROVIDE 22'-6" WIDE SECTIONS ON EACH SIDE OF THE CENTER SECTION WITH 4'-6" WIDE AISLES LOCATED AT 18" OFF CENTER TOWARD THE CENTER OF THE GYM. INSTALL THE THREE (3) SECTIONS WITH A 6'-0" MIN. SPACE BETWEEN SECTIONS. THE 6'-0" MIN. SPACE BETWEEN SECTIONS IS TO ACCOMMODATE TWO (2) 36" WIDE WHEEL CHAIR LOCATIONS; FOUR (4) TOTAL. INCLUDE DSA APPROVED COMPANION SEAT SIGNAGE ON BLEACHER SEAT ADJACENT TO THE WHEEL CHAIR SPACES. PROVIDE A/C GRADE SOUTHERN PINE PLYWOOD AT DECK BOARD LOCATIONS. DECK BOARD USE SURFACE TO HAVE ONE COAT OF MOISTURE RESISTANT SEALER AND ONE COAT OF CLEAR POLYURETHANE. TEXTURED SOLID COLOR PANELAM DECK FINISHES ARE NOT ACCEPTABLE. SEE SHEET ADD-1R AG102.

- ITEM # 2R.9** Sheet AG181 – Reflected Ceiling Plan; Detail 1 – Reflected Ceiling Plan: Delete Keyed Note 8.12 shown on grid line 1 between grid lines A and F.
- ITEM # 2R.10** Sheet ADD-1R AG291 – Interior Elevations; Keyed Note 1.47: Change this note to read as follows:

PROVIDE WALL ATTACHED HUSSEY MAXAM TWO ROW FIXED BLEACHERS. SEATS TO BE CONTOURED 10" COURTSIDE. CENTER SECTION BE 19'-6" WIDE WITH ONE 4'-6" AISLE CENTERED IN SECTION. PROVIDE 22'-6" WIDE SECTIONS ON EACH SIDE OF THE CENTER SECTION WITH 4'-6" WIDE AISLES LOCATED AT 18" OFF CENTER TOWARD THE CENTER OF THE GYM. INSTALL THE THREE (3) SECTIONS WITH A 6'-0" SPACE BETWEEN SECTIONS. THE 6'-0" SPACE BETWEEN SECTIONS IS TO ACCOMMODATE TWO (2) 36" WIDE WHEEL CHAIR LOCATIONS; FOUR (4) TOTAL. INCLUDE DSA APPROVED COMPANION SEAT SIGNAGE ON BLEACHER SEAT ADJACENT TO THE WHEEL CHAIR SPACES. PROVIDE A/C GRADE SOUTHERN PINE PLYWOOD AT DECK BOARD LOCATIONS. DECK BOARD USE SURFACE TO HAVE ONE COAT OF MOISTURE RESISTANT SEALER AND ONE COAT OF CLEAR POLYURETHANE. TEXTURED SOLID COLOR PANELAM DECK FINISHES ARE NOT ACCEPTABLE. SEE SHEET ADD-1R AG102.

- ITEM # 2R.11** Sheet AG294 – Interior Elevations; Detail 1 – Toilet Room – End Wall, and Detail 2 – Toilet Room – Side Wall: Change shown epoxy wall finish height from 5'-0" to **7'-2"**, as detailed for Wall Finish Type W2 on Sheet ADD-1R A-590.

- ITEM # 2R.12** Sheet ADD-1R A-542 – Wall & Misc. Details; Detail C3 – Fire-Rated Column Detail:
Replace with the attached **ADD-2R C3/A-542**.
- ITEM # 2R.13** Sheet A-571 – Door & Window Frame Types, Details; Glazing Types: Add Glazing Type # 4 to this sheet, as shown below:
4. **1" INSULATED GLASS, 20 MIN. FIRE RATING (RATED EXTERIOR WALLS ONLY).**
- ITEM # 2R.14** Sheet E001 – Sheet Index, Symbol List, Abbreviations, and Luminaire Schedule:
Remove the Count from the Luminaire Schedule.
- ITEM # 2R.15** Sheet ADD-1R E100 – Site Plan – Demolition: Replace with the attached **Sheet ADD-2R E100 – Site Plan – Demolition**. All changes have been clouded.
- ITEM # 2R.16** Sheet ADD-1R E230 – Floor Plan – Signal: Add the following general note to this sheet:
- NEW SPEAKERS AND CLOCKS SHALL MATCH EXISTING ON THE SITE.
- ITEM # 2R.17** Sheet E500 – Electrical Details; Detail 6 – Underground Pull Box Detail: Replace with the attached drawing **ADD-2R 6/E500**. The Underground Pull Box Schedule located above this detail to remain in the contract documents.

END OF ADDENDUM # 2 – REBID.

SECTION 01 33 00 – SUBMITTALS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Contractor's Submittals and Schedules, Drawings and Specifications;
- B. Special Conditions.

1.02 SECTION INCLUDES

A. Definitions:

- (1) Shop Drawings and Product Data are as indicated in the General Conditions and include, but are not limited to, fabrication, erection, layout and setting drawings, formwork and falsework drawings, manufacturers' standard drawings, descriptive literature, catalogues, brochures, performance and test data, wiring and control diagrams. In addition, there are other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment or systems and all positions conform to the requirement of the Contract Documents, including, without limitation, the Drawings.
- (2) "Manufactured" applies to standard units usually mass-produced; "fabricated" means specifically assembled or made out of selected materials to meet design requirements. Shop Drawings shall establish the actual detail of manufactured or fabricated items, indicated proper relation to adjoining work and amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure.
- (3) Manufacturer's Instructions: Where any item of Work is required by the Contract Documents to be furnished, installed, or performed, at a minimum, in accordance with specified product manufacturer's instructions, the Contractor shall procure and distribute copies of these to the District, the Architect, and all other concerned parties and shall furnish, install, or perform the work, at a minimum, in accordance with those instructions.

B. Samples, Shop Drawings, Product Data, and other items as specified, in accordance with the following requirements:

- (1) The submittal process shall be through e-Builder, unless otherwise directed by the District.

- (2) Contractor shall submit all Shop Drawings, Product Data, and Samples to the District, the Architect, the Project Inspector, and the Construction Manager.
- (3) Contractor shall comply with all time frames herein and in the General Conditions and, in any case, shall submit required information in sufficient time to permit proper consideration and action before ordering any materials or items represented by such Shop Drawings, Product Data, and/or Samples.
- (4) Contractor shall comply with all time frames herein and in the General Conditions and, in any case, shall allow sufficient time so that no delay occurs due to required lead time in ordering or delivery of any item to the Site. Contractor shall be responsible for any delay in progress of Work due to its failure to observe these requirements.
- (5) Time for completion of Work shall not be extended on account of Contractor's failure to promptly submit Shop Drawings, Product Data, and/or Samples.
- (6) Reference numbers on Shop Drawings shall have Architectural and/or Engineering Contract Drawings reference numbers for details, sections, and "cuts" shown on Shop Drawings. These reference numbers shall be in addition to any numbering system that Contractor chooses to use or has adopted as standard.
- (7) When the magnitude or complexity of submittal material prevents a complete review within the stated time frame, Contractor shall make this submittal in increments to avoid extended delays.
- (8) Contractor shall certify on submittals for review that submittals conform to Contract requirements. In event of any variance, Contractor shall specifically state in transmittal and on Shop Drawings, portions vary and require approval of a substitute. Also certify that Contractor-furnished equipment can be installed in allocated space.
- (9) Unless specified otherwise, sampling, preparation of samples, and tests shall be in accordance with the latest standard of the American Society for Testing and Materials.
- (10) Upon demand by Architect or District, Contractor shall submit samples of materials and/or articles for tests or examinations and consideration before Contractor incorporates same in Work. Contractor shall be solely responsible for delays due to sample(s) not being submitted in time to allow for tests. Acceptance or rejection will be expressed in writing. Work shall be equal to approved samples in every respect. Samples that are of value after testing will remain the property of Contractor.

C. Submittal Schedule:

- (1) Contractor shall prepare its proposed submittal schedule that is coordinated with the its proposed construction schedule and submit both to the District within five (5) days after the date of the Notice to Proceed. Contractor's proposed schedules shall become the Project Construction Schedule and the Project Submittal Schedule after each is approved by the District.
- (2) Contractor is responsible for all lost time should the initial submittal be rejected, marked "revised and resubmit", etc.
- (3) All Submittals shall be forwarded to the District by the date indicated on the approved Submittal Schedule, unless an earlier date is necessary to maintain the Construction Schedule, in which case those Submittals shall be forwarded to the District so as not to delay the Construction Schedule.

1.03 SHOP DRAWINGS

- A. Contractor shall submit one (1) PDF electronic file, via e-Builder, unless directed otherwise by the District and one (1) hard copy. The District and / or Architect will review and return via e-Builder, unless otherwise directed by the District.
- B. Before commencing installation of any Work, the Contractor shall submit and receive approval of all drawings, descriptive data, and material list(s) as required to accomplish Work. All drawings will be transmitted through e-Builder, unless directed otherwise by the District.
- C. Review of Shop Drawings is regarded as a service to assist Contractor and in all cases original Contract Documents shall take precedence as outlined under General Conditions. All drawings will be transmitted through e-Builder, unless directed otherwise by the District.
- D. No claim for extra time or payment shall be based on work shown on Shop Drawings unless the claim is (1) noted on Contractor's transmittal letter accompanying Shop Drawings and (2) Contractor has complied with all applicable provisions of the General Conditions, including, without limitation, provisions regarding changes and payment, and all required written approvals.
- E. District and / or Architect shall not review Shop Drawings for quantities of materials or number of items supplied.
- F. District's and/or Architect's review of Shop Drawing will be general. District and/or Architect review does not relieve Contractor of responsibility for accuracy, proper fitting, construction of Work, furnishing of materials, or Work required by Contract Documents and not indicated on Shop Drawings. Shop Drawing reviewed by District and/or Architect is not to be construed as approving departures from Contract Documents.
- G. Review of Shop Drawings and Schedules does not relieve Contractor from responsibility for any aspect of those Drawings or Schedules that is a violation of local, County, State, or Federal laws, rules, ordinances, or rules and regulations of commissions, boards, or other authorities or utilities having jurisdiction.

- H. Before submitting Shop Drawings for review, Contractor shall check Shop Drawings of its subcontractors for accuracy, and confirm that all Work contiguous with and having bearing on other work shown on Shop Drawings is accurately drawn and in conformance with Contract Documents.
- I. Submitted drawings and details must bear stamp of approval of Contractor:
- (1) Stamp and signature shall clearly certify that Contractor has checked Shop Drawings for compliance with Drawings.
 - (2) If Contractor submits a Shop Drawing without an executed stamp of approval, or whenever it is evident (despite stamp) that Drawings have not been checked the District and/or Architect will not consider them and will return them to the Contractor for revision and resubmission. In that event, it will be deemed that Contractor has not complied with this provision and Contractor shall bear risk of all delays to same extent as if it had not submitted any Shop Drawings or details.
- J. Submission of Shop Drawings (in either original submission or when resubmitted with correction) constitutes evidence that Contractor has checked all information thereon and that it accepts and is willing to perform Work as shown.
- K. Contractor shall pay for cost of any changes in construction due to improper checking and coordination. Contractor shall be responsible for all additional costs, including coordination. Contractor shall be responsible for costs incurred by itself, the District, the Architect, the Project Inspector, the Construction Manager, any other Subcontractor or contractor, etc., due to improperly checked and/or coordination of submittals.
- L. Shop Drawings must clearly delineate the following information:
- (1) Project name and address.
 - (2) Specification number and description.
 - (3) Architect's name and project number.
 - (4) Shop Drawing title, number, date, and scale.
 - (5) Names of Contractor, Subcontractor(s) and fabricator.
 - (6) Working and erection dimensions.
 - (7) Arrangements and sectional views.
 - (8) Necessary details, including complete information for making connections with other Work.
 - (9) Kinds of materials and finishes.
 - (10) Descriptive names of materials and equipment, classified item numbers, and locations at which materials or equipment are to be installed in the

Work. Contractor shall use same reference identification(s) as shown on Contract Drawings.

- M. Contractor shall prepare composite drawings and installation layouts when required to solve tight field conditions.
- (1) Shop Drawings shall consist of dimensioned plans and elevations and must give complete information, particularly as to size and location of sleeves, inserts, attachments, openings, conduits, ducts, boxes, structural interferences, etc.
 - (2) Contractor shall coordinate these composite Shop Drawings and installation layouts in the field between itself and its Subcontractor(s) for proper relationship to the Work, the work of other trades, and the field conditions. The Contractor shall check and approve all submittal(s) before submitting them for final review.

1.04 PRODUCT DATA OR NON-REPRODUCIBLE SUBMITTALS

- A. Contractor shall submit manufacturer's printed literature in original form. Any fading type of reproduction will not be accepted. Contractor must submit a minimum of two (2) hard copies each, to the District and / or Architect. District and / or Architect shall return one (1) to the Contractor, who shall reproduce whatever additional copies it requires for distribution.
- B. Contractor shall submit one (1) hard copy, one (1) PDF electronic of a complete list of all major items of mechanical, plumbing, and electrical equipment and materials in accordance with the approved Submittal Schedule, except as required earlier to comply with the approved Construction Schedule. Other items specified are to be submitted prior to commencing Work. Contractor shall submit items of like kind at one time in a neat and orderly manner. Partial lists will not be acceptable. All documents will be transmitted through e-Builder, unless directed otherwise by the District.
- C. Submittals shall include manufacturer's specifications, physical dimensions, and ratings of all equipment. Contractor shall furnish performance curves for all pumps and fans. Where printed literature describes items in addition to that item being submitted, submitted item shall be clearly marked on sheet and superfluous information shall be crossed out. If highlighting is used, Contractor shall mark all copies.
- D. Equipment submittals shall be complete and include space requirements, weight, electrical and mechanical requirements, performance data, and supplemental information that may be requested.

1.05 SAMPLES

- A. Contractor shall submit for approval Samples as required and within the time frame in the Contract Documents. Materials such as concrete, mortar, etc., which require on-site testing will be obtained from Project Site.

- B. Contractor shall submit four (4) samples except where greater or lesser number is specifically required by Contract Documents including, without limitation, the Specifications.
 - (1) Samples must be of sufficient size and quality to clearly illustrate functional characteristics, with integrally related parts and attachment devices.
 - (2) Samples must show full range of texture, color, and pattern.
- C. Contractor shall make all Submittals, unless it has authorized Subcontractor(s) to submit and Contractor has notified the District in writing to this effect.
- D. Samples to be shipped prepaid or hand-delivered to the District.
- E. Contractor shall mark samples to show name of Project, name of Contractor submitting, Contract number and segment of Work where representative Sample will be used, all applicable Specifications Sections and documents, Contract Drawing Number and detail, and ASTM or FS reference, if applicable.
- F. Contractor shall not deliver any material to Site prior to receipt of District's and/or Architect's completed written review and approval. Contractor shall furnish materials equal in every respect to approved Samples and execute Work in conformance therewith.
- G. District's and/or Architect's review, acceptance, and/or approval of Sample(s) will not preclude rejections of any material upon discovery of defects in same prior to final acceptance of completed Work.
- H. After a material has been approved, no change in brand or make will be permitted.
- I. Contractor shall prepare its Submittal Schedule and submit Samples of materials requiring laboratory tests to specified laboratory for testing not less than ten (10) days before such materials are required to be used in Work.
- J. Samples which are rejected must be resubmitted promptly after notification of rejection and be marked "Resubmitted Sample" in addition to other information required.
- K. Field Samples and Mock-Ups are to be removed by Contractor at District's direction:
 - (1) Size: As Specified.
 - (2) Furnish catalog numbers and similar data, as requested.

1.06 REVIEW AND RESUBMISSION REQUIREMENTS

- A. The District will arrange for review of Sample(s), Shop Drawing(s), Product Data, and other submittal(s) by appropriate reviewer and return to Contractor as provided below within five (5) days after receipt or within five (5) days after receipt of all related information necessary for such review, whichever is later.
- B. One (1) copy of product or materials data will be returned to Contractor with the review status. Material will be transmitted through e-Builder, if possible, unless directed otherwise by the District.
- C. Samples to be incorporated into the Work will be returned to Contractor, together with a written notice designating the Sample with the appropriate review status and indicating errors discovered on review, if any. Other Samples will not be returned, but the same notice will be given with respect thereto, and that notice shall be considered a return of the Sample.
- D. Contractor shall revise and resubmit any Sample(s), Shop Drawing(s), Product Data, and other submittal(s) as required by the reviewer. Such resubmittals will be reviewed and returned in the same manner as original Sample(s), Shop Drawing(s), Product Data, and other submittal(s), within five (5) days after receipt thereof or within five (5) days after receipt of all related information necessary for such review.
- E. Contractor may proceed with any of the Work covered by Sample(s), Shop Drawing(s), Product Data, and other submittal(s) upon its return if designated as no exception taken, or revise as noted, provided the Contractor proceeds in accordance with the District and/or the Architect's notes and comments.
- F. Contractor shall not begin any of the work covered by a Sample(s), Shop Drawing(s), Product Data, and other submittal(s), designated as revise and resubmit or rejected, until a revision or correction thereof has been reviewed and returned to Contractor.
- G. Sample(s), Shop Drawing(s), Product Data, and other submittal(s) designated as revise and resubmit or rejected and requiring resubmittal, shall be revised or corrected and resubmitted to the District no later than fourteen (14) days or a shorter period as required to comply with the approved Construction Schedule, after its return to Contractor.
- H. Neither the review nor the lack of review of any Sample(s), Shop Drawing(s), Product Data, and other submittal(s) shall waive any of the requirements of the Contract Documents, or relieve Contractor of any obligation thereunder.
- I. District's and/or Architect's review of Shop Drawings does not relieve the Contractor of responsibility for any errors that may exist. Contractor is responsible for the dimensions and design of adequate connections and details and for satisfactory construction of all the Work.

PART 2 – PRODUCTS – NOT APPLICABLE

PART 3 – EXECUTION – NOT APPLICABLE

END OF SECTION 01 33 00.

SECTION 07 41 15 – METAL ROOF PANELS, EXPOSED FASTENER

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Exposed-fastener, lap-seam metal roof and roof panels.

1.3 RELATED SECTIONS

- A. Section 05 12 00 – Structural Steel, for steel purlins supporting metal roof panels.
- B. Section 05 50 00 – Metal Fabrications, for miscellaneous metal items.
- C. Section 07 25 00 – Weather Barriers, for weather barrier sheet located behind metal roof panels.
- D. Section 07 62 00 – Flashing and Sheet Metal, for field- or shop- formed fascia, copings, flashings, roof drainage systems, and other sheet metal work not part of metal roof panel assemblies.
- E. Section 07 92 00 – Joint Sealants for field-applied sealants not otherwise specified in this Section.
- F. Section 09 24 00 – Lath and Plaster, for exterior wall surface.

1.4 DEFINITION

- A. Metal Roof Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight roof system.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, metal roof Installer, metal roof manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal roof panels.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

3. Review methods and procedures related to metal roof installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, penetrations, openings, and condition of other construction that will affect metal roof panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal roof panel assembly during and after installation.
8. Review roof panel observation and repair procedures after metal roof panel installation.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of roof panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details specific to project, signed and sealed by the qualified professional engineer responsible for their preparation]. Distinguish between factory- and field-assembled work.
- C. Samples for Initial Selection: For each type of metal roof panel indicated with factory-applied color finishes.
 1. Include similar Samples of trim and accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 1. Metal Roof Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal roof panel accessories.
 2. Trim and Closures: 12 inches (305 mm) long. Include fasteners and other exposed accessories.
 3. Accessories: 12-inch- (305-mm-) long Samples for each type of accessory.

1.7 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Warranties: Sample of special warranties.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal roof panels to include in maintenance manuals.

1.9 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer of plant-fabricated metal roof panel systems listed in this Section and meeting performance requirements.
- B. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience installing similar work, able to communicate verbally with Contractor, Architect, and employees, and qualified by the manufacturer to furnish warranty of type specified.
- C. Manufacturer's Technical Representative Qualifications: An authorized full-time employee representative of manufacturer experienced in the installation and maintenance of the specified roof panel system and qualified to determine Installer's compliance with the requirements of this Project.
- D. Source Limitations: Obtain metal roof panels and accessories from a single source supplied or approved by metal roof panel manufacturer.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.
- B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal roof panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness, with positive slope for drainage of water. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal roof panel for period of metal roof panel installation.

1.11 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal roof panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and roof opening dimensions by field measurements before metal roof panel fabrication, and indicate measurements on Shop Drawings.

1.12 COORDINATION

- A. Coordinate metal roof panel assemblies with roofing work, rain drainage work, flashing, trim, and construction of other adjoining work to provide a leak-proof, secure, and noncorrosive installation.

1.13 WARRANTY

- A. Warranty, General: Warranties specified shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Special Warranty on Panel Finishes: Written warranty in which Manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes under normal atmospheric conditions within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include but are not limited to, the following:
 - 1. To establish a standard of quality, design and performance, Tremco, Inc. products have been selected. Alternatives will be considered provided they meet or exceed the specification criteria contained herein. The Architect shall be the sole determinant of equivalency.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal roof panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

- B. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of roof area when tested according to ASTM E 283 at the following test-pressure difference:
1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- D. Structural Performance: Provide metal roof panel assemblies capable of withstanding the effects the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:
1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure. as indicated on Drawings
 - b. Design pressure resulting from wind speed of 90 mph(40.2 m/s).
 2. Deflection Limits: Metal roof panel assemblies shall withstand wind loads with horizontal deflections as required by UL 250, with no evidence of failure.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.3 EXPOSED-FASTENER, LAP-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof and roof panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.
- B. Tapered-Rib-Profile, Exposed-Fastener Metal Roof and Roof Panels: Formed with three raised, tapered ribs with one small tapered rib and two pencil ribs between each major rib.
1. Basis-of-Design Product: TremLock R-Plus Roof Panels or Equal.
 2. Metallic-Coated Steel Sheet: Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 50 (Class AZM150 coating designation, Grade 340); structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

- a. Minimum Thickness: 0.0236-inch/24 ga. (0.71-mm).
 - b. Surface: Smooth, flat finish.
 - c. Exposed Coil-Coated Finish: Two-coat fluoropolymer.
 - d. Color: As selected by Architect from manufacturer's full range.
3. Major-Rib Spacing: 12 inches o.c.
 4. Panel Coverage: 36 inches.
 5. Panel Height: 1.187 inches.
 6. Wind Uplift: UL 580 Class 90.
 7. Application: Purlin-bearing.

2.4 ACCESSORIES

- A. Panel Accessories: Provide components required for a complete metal panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items.
1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal roof panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim: Formed: Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endroofs, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.

2.5 FIELD-INSTALLED THERMAL INSULATION

- A. Refer to Section 07 21 00 – Thermal Insulation.
- B. Metal Building Insulation: [ASTM C 991, Type I; or NAIMA 202] [ASTM C 991, Type II], glass-fiber-blanket insulation; 0.5-lb/cu. ft. (8-kg/cu. m) density; 2-inch- (50-mm-) wide, continuous, vapor-tight edge tabs; and with a flame-spread index of 25 or less.
1. Insulation Retainer Strips: 0.019-inch- (0.48-mm-) thick, formed galvanized steel or PVC retainer clips colored to match insulation facing.

2.6 MISCELLANEOUS METAL FRAMING

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G60 (Z180) hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.
- B. Subgirts: Manufacturer's standard C- or Z-shaped sections, 0.064-inch (1.63-mm) nominal thickness.
- C. Zee Clips: 0.079-inch (2.01-mm) nominal thickness.
- D. Base or Sill Angles and Channels: 0.079-inch (2.01-mm) nominal thickness.
- E. Hat-Shaped, Rigid Furring Channels:
 - 1. Nominal Thickness: 0.040 inch (1.02 mm).
 - 2. Depth: 7/8 inch (22 mm) or 1-1/2 inches (38 mm), as shown on plans.
- F. Cold-Rolled Furring Channels: Minimum 1/2-inch- (13-mm-) wide flange.
 - 1. Nominal Thickness: 0.064 inch (1.63 mm).
 - 2. Depth: 3/4 inch (19 mm).
 - 3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with 0.040-inch (1.02-mm) nominal thickness.
 - 4. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.57-mm-) diameter wire, or double strand of 0.048-inch- (1.22-mm-) diameter wire.
- G. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), roof attachment flange of 7/8 inch (22 mm), and depth required to fit insulation thickness indicated.
 - 1. Nominal Thickness: 0.025 inch (0.64 mm).
- H. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.7 MISCELLANEOUS MATERIALS

- A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating. Provide EPDM sealing washers.

2.8 FABRICATION

- A. General: Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
1. Site-rolled fabrication of panels or shop-rolling of panels using fixed equipment designed for site-rolling applications does not meet the requirements of this Section.
- B. Fabricate metal roof panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal roof panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, and that will minimize noise from movements within panel assembly.
- E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 2. Seams for Steel: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal roof panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal roof panel manufacturer for application but not less than thickness of metal being secured.

2.9 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.10 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 - 1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Metallic Fluoropolymer: AAMA 621. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of work.
 - 1. Examine framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal roof panel manufacturer.

2. Examine sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
 3. Verify that weather-resistant barrier material has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
 4. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous roof panel support members and anchorages according to ASTM C 754 and metal roof panel manufacturer's written recommendations.

3.3 METAL ROOF PANEL INSTALLATION

- A. General: Install metal roof panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor metal roof panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Commence metal roof panel installation and install minimum of 300 sq. ft. (27.8 sq. m.) in presence of factory-authorized representative.
 2. Shim or otherwise plumb substrates receiving metal roof panels.
 3. Flash and seal metal roof panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal roof panels are installed.
 4. Install screw fasteners in predrilled holes.
 5. Locate and space fastenings in uniform vertical and horizontal alignment.
 6. Install flashing and trim as metal roof panel work proceeds.
 7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.

8. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
9. Align bottom of metal roof panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
10. Provide weathertight escutcheons for pipe and conduit penetrating exterior roofs.

B. Fasteners:

1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal roof panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.

1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 – Joint Sealants.

E. Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal roof panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

5. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.
 6. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps; on side laps of nesting-type panels; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weathertight.
 7. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.
- F. Zee Clips: Provide Zee clips of size indicated or, if not indicated, as required to act as standoff from subgirts for thickness of insulation indicated. Attach to subgirts with fasteners.

3.4 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal roof panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Technical Representative: Engage a qualified manufacturer's technical representative acceptable to perform substrate examination, interim observations, and final roof inspections, and to prepare reports.

- B. Remove and replace metal roof panels where inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.
- B. After metal roof panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 41 15.

SECTION 09 67 25 – DECORATIVE INTERIOR WALL SURFACING SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK INCLUDED

- A. Furnish all necessary material, labor, and equipment required to prepare designated areas and install a Decorative Interior Wall Surfacing System.

1.3 RELATED SECTIONS

- A. Section 09 29 00 – Gypsum Board
- B. Section 09 67 23 – Decorative Flake Troweled Mortar System
- C. Section 09 67 24 – Decorative Flake Mortar Flooring System

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Obtain Decorative Interior Wall Surfacing System materials from a single manufacturer with a minimum of ten (10) years verifiable field installation experience providing antimicrobial system materials of the type specified in this section.
- B. Contractor's Qualifications: Installation must be performed by a manufacturer approved contractor with skilled mechanics having not less than ten (10) years satisfactory experience in the installation of the type of system as specified in this section, and must be approved in writing by the manufacturer of the Decorative Interior Wall Surfacing System.
 - 1. Due to the high gloss nature of the wall coating system in this section, poor workmanship in the substrate over which it is applied will be accentuated. The contractor providing each substrate is responsible for repairing imperfections in their work. Contractor to attend a Pre-Construction Coordination Meeting as specified under Job Conditions in this specification.

1.5 WARRANTY

- A. The contractor and the manufacturer shall furnish a standard guarantee of the Decorative Interior Wall Surfacing System for a period of one year after installation. This labor and material guarantee shall include loss of bond and wear-through to the substrate through normal wear and tear.
- B. Not included in the warranty are damage due to structural design deficiencies including but not limited to slab cracking from lateral, vertical or rotational movement, and gouging or other damage due to fork lifts, other equipment,

delamination caused by sub-surface hydrostatic pressure, Acts of God, or other elements beyond the scope of protection of this system nor causes not related to the system materials.

- C. In case of a warranty claim, the owner will notify the manufacturer and contractor in writing within 30 days of the first appearance of problems covered under this warranty, and will provide free access to the area during normal working hours. Property protection is also the owner's responsibility. Remedy is limited to direct repair of the Wall Surfacing System.

1.6 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications on cured system and individual components of the Decorative Interior Wall Surfacing System, including physical properties and performance properties and all tests described in part 2.1 B in this section and submit all Material Safety Data Sheets. Each individual component of the system will be evaluated on the basis of these standards. For any of these tests not listed in the manufacturer's standard nationally published data, the manufacturer must supply the missing data from an independent test laboratory tested according to the referenced standard. Furnish five (5) hard copy sets, or one (1) PDF of this information.
- B. Colors: Custom color (or colors) to be provided. Color mix to be provided by the Owner and/or Architect.
 - 1. The contractor shall submit a 6" x 6" system sample for verification purposes and finish texture approval.
- C. Contractor Experience: The contractor shall furnish a list projects using either specified material or another material pre-approved for this project that they have installed during the last ten (10) years. Information shall include: project name, square footage, contact name with owner address and phone number. Also, the contractor shall furnish resumes detailing the experience of key project personnel including supervisors and technicians.
- D. It is the intention of this Section to provide the products as named. Substitutions will be considered only when received by the Architect, Engineer or Design Professional through a bidding Prime Contractor at least ten days prior to the date set for receipt of bids. Upon receipt of any such submission, the Architect, Engineer or Design Professional will determine whether or not the proposed product is an approved equal. In the event the Architect, Engineer or Design Professional determines that a proposed system is an approved equal, he will issue an addendum and notify all bidders at least 48 hours prior to receipt of bids. No substitutions will be considered after contract bid date.
- E. The contractor shall submit a copy of the manufacturer's packing slip, tagged for this specific job, along with calculations, signed by an officer of the primary material supplier demonstrating that the quantity of material furnished for the project will achieve the specified coverage and mil thickness.

1.7 MATERIAL DELIVERY, HANDLING AND STORAGE

- A. Primary system materials shall be delivered in the manufacturer's undamaged, unopened containers. Each container shall be clearly marked with the following:
 - 1. Product name(s) and/or Number(s)
 - 2. Manufacturer's name
 - 3. Component designation (A, B, etc.)
 - 4. Product Mix Ratio
 - 5. Health and Safety Information
 - 6. CHEMTREC Emergency Response Information
- B. Provide equipment and personnel to handle the materials by methods which prevent damage.
- C. The contractor shall promptly inspect direct jobsite material deliveries to assure that quantities are correct, comply with requirements and are not damaged.
- D. The contractor shall be responsible for materials furnished by him, and he shall replace, at his own expense, such materials that are found to be defective in manufacture or that have become damaged in transit, handling or storage.
- E. Store material(s) in accordance with manufacturer's instructions, with seals and labels intact and legible. Maintain temperatures within the required range. Do not use materials which exceed the manufacturer's maximum recommended shelf life.

1.8 JOB CONDITIONS

- A. The contractor shall visit the jobsite prior to beginning the installation of the Decorative Interior Wall Surfacing System to evaluate substrate condition, including substrate moisture content, and the extent of repairs required, if any. Concrete substrates shall be tested to verify that the moisture content of the substrate does not exceed Decorative Interior Wall Surfacing System manufacturers' recommendations. Cost of repair and remediation of the substrate cannot be predicted prior to inspection and testing, and therefore is not encompassed within the installation estimates.
 - 1. Contractor to attend a Pre-Construction Coordination Meeting to discuss specific tolerances for the substrates to ensure a high quality installation of this product.
- B. The contractor should exercise care during surface preparation and system installation to protect surrounding substrates and surfaces, as well as in-place equipment. The contractor shall use his discretion as to the physical means used for preparation and protection. Any costs incurred for resultant damage from negligence or inadequate protection shall be the sole responsibility of the contractor.
- C. Job area to be free of and protected from the activities of other trades during installation and for a period of time recommended by the manufacturer upon completion of the job.

- D. The minimum substrate temperature must be conditioned to 60°F before commencing installation, during installation, and for at least 72 hours after installation is complete.
- E. Use of respirators and/or adequate ventilation must be provided.
- F. Maintain lighting at a minimum uniform level of 50 or more foot candles in all areas where the Decorative Interior Wall Surfacing System is being installed. It is the recommendation of the manufacturer that the permanent lighting be in place and working during the installation.
- G. All leaks from pipes and other sources must be corrected prior to the installation of the Decorative Interior Wall Surfacing System.

PART 2 – PRODUCTS

2.1 PRODUCT / MANUFACTURER

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include but are not limited to, the following:
 - 1. To establish a standard of quality, design and performance, The General Polymers BIOFLAKE Wall System, as manufactured by Sherwin-Williams product has been selected. Alternatives will be considered provided they meet or exceed the specification criteria contained herein. The Architect shall be the sole determinant of equivalency.

2.2 MATERIALS

- A. System Overview: The General Polymers BIOFLAKE Wall System, as manufactured by Sherwin-Williams consists of 5531 Pre-Primer / Tack Coat as optional Primer for Ceramic Tile, 3462 AquArmor Coating as primer, 6750D/6755D Vinyl Chips for broadcast, 3461 AquArmor Gloss Topcoat for bonding coat and 6750D/6755D Vinyl Chips second broadcast, grout and final seal coat.
- B. Typical Physical Properties @ 73°F (unless otherwise noted):

<u>Hardness, Shore D:</u> ASTM D 2240	70
<u>Tensile Strength:</u> ASTM D 412	3,000 psi
<u>Fungus & Bacteria Resistance:</u> MIL-D-3134F Sec. 4.4.2.11	Will not support growth or fungus or bacteria per test specified TT-P-34
<u>Adhesion:</u> ACI 503R	300 psi Substrate Failure
<u>Flammability:</u> ASTM E 84	Pass Class A Smoke and Flame
<u>Resistance to Elevated Temperatures:</u> MIL-D-3134J	No slip or flow at required Temperature of 158°F

PART 3 – EXECUTION

3.1 SURFACE PREPARATION

- A. Proper surface preparation prior to installation of materials is essential for interior wall coating systems. Read the following recommended methods of surface preparation carefully. Consult manufacturer for answers to questions prior to installation.
1. Closely examine all substrates for undulation, cleanliness, holes, cracks and soundness.
 2. Surface contaminants must be removed by mechanical abrasion or other approved methods to ensure proper adhesion of the system.
 3. Substrate finish will affect the final appearance of the wall coating. The contractor providing each substrate is responsible for repairing imperfections in their work.
 - a. Drywall: Must be finish to a minimum of Level #4 Finish utilizing materials compatible with the wall board product and the resinous wall coating system.
 - b. Cast-in-Place Concrete: Fill bugholes with compatible material and apply skim coat as needed for desired smoothness.
 4. Surface and air temperature should be a minimum of 50°F / 15°C.
 5. Air movement must be present in application area to prevent surface condensation during installation.

3.2 INSTALLATION

- A. General:
1. Apply each component of the Decorative Interior Wall Surfacing System in compliance with manufacturer's written installation instructions and strictly adhere to mixing and installation methods, recoat windows, cure times and environmental restrictions.
 2. If necessary, install Pre-formed Vinyl Corner Moldings with fast setting, high strength adhesive.
 3. Coordinate installation with Decorative Flake Troweled Mortar System for Flooring, to ensure seamless integration of the two products.
- B. Primer / Broadcast:
1. 3462 AquArmor Coating as primer
 2. 6750D/6755D Vinyl Chips for broadcast

- C. Bonding Coat / Broadcast:
 - 1. 3461 AquArmor Gloss Topcoat
 - 2. 6750D/6755D Vinyl Chips for broadcast
- D. Grout Coat: 3461 AquArmor Gloss Topcoat
- E. Final Finish Coat: 3461 AquArmor Gloss Topcoat

3.3 CURING, CLEANING AND PROTECTION

- A. Cure all Decorative Interior Wall Surfacing System materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of the installation and prior to completion of the curing process.
- B. Protect the Decorative Interior Wall Surfacing System from damage and wear during other phases of the construction operation, using temporary coverings as recommended by the manufacturer, if required. Remove temporary covering just prior to final inspection.
- C. Clean the Decorative Interior Wall Surfacing System just prior to final inspection, using materials and procedures suitable to the system manufacturer.
- D. Some cleaners will affect the color or texture of your polymer wall surfaces. To determine how your cleaner will perform, first test each cleaner, in a small area, utilizing your cleaning technique. This precaution will demonstrate the effect of your cleaner and technique. If no deleterious effects are observed, continue with the procedure. If deleterious effects do occur, modify the cleaning material and/or procedure.

END OF SECTION 09 67 25.

SECTION 22 00 50 – BASIC PLUMBING MATERIALS AND METHODS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Electric motors.
- B. Motor starters.
- C. Valves and fittings.
- D. Strainers.
- E. Valve boxes.
- F. Gauges.
- G. Thermometers.
- H. Access Doors.
- I. Expansion loops.
- J. Flexible joints.
- K. Insulation.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. This Section is a part of each Division 22 Section.

1.3 ADDITIONAL REQUIREMENTS

- A. Furnish and install any incidental work not shown or specified which is necessary to provide a complete and workable system.
- B. Make all temporary connections required to maintain services during the course of this Contract without additional cost to the Owner. Notify the Owner seven days in advance before disturbing any service.

1.4 REFERENCED STANDARDS

- A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.

1. CSA – Canadian Standards Association International.
2. ANSI – American National Standards Institute.
3. ASTM – American Society for Testing and Materials.
4. CCR – California Code of Regulations.
 - a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36.
5. NCPWB – National Certified Pipe Welding Bureau.
6. CEC – California Electrical Code.
7. NEMA – National Electrical Manufacturers' Association.
8. NFPA – National Fire Protection Association.
9. OSHA – Occupational Safety and Health Act.
10. UL – Underwriters' Laboratories, Inc.

1.5 DRAWINGS

- A. Examine Contract Documents prior to bidding of work and report discrepancies in writing to Architect.
- B. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.
- C. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The Plumbing Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.
 1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over Plumbing Drawings.
 2. Because of the small scale of Plumbing Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in the locations shown. Obtain the Architects approval prior to relocation of equipment and materials.
 3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contractors' expense upon Architects' direction.
 4. Minor changes in locations of equipment, piping, etc., from locations shown shall be made when directed by the Architect at no additional cost

to the Owner providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.

- D. Execute work mentioned in Specifications and not shown on Drawings, or vice versa, the same as if specifically mentioned or shown in both.

1.6 REQUIREMENTS OF REGULATORY AGENCIES

- A. The publications listed below form part of this specification; comply with provisions of these publications except as otherwise shown or specified.

1. California Building Code, 2016.
2. California Electrical Code, 2016.
3. California Energy Code, 2016.
4. California Fire Code, 2016.
5. California Green Building Standards Code, 2016.
6. California Mechanical Code, 2016.
7. California Plumbing Code, 2016.
8. California Code of Regulations, Title 24.
9. California Health and Safety Code.
10. CAL-OSHA.
11. California State Fire Marshal, Title 19 CCR.
12. National Fire Protection Association.
13. Occupational Safety and Health Administration.
14. Other applicable state laws.

- B. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or specifications to repeat requirements of codes except where necessary for clarity.

- C. Comply with State of California 2016 Energy Code for all systems, equipment, and construction.

1.7 FEES AND PERMITS

- A. Obtain and pay for all permits and service required in installation of this work; arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.
- B. Arrange for utility connections and pay charges incurred, including excess service charges.
- C. Prior to the start of construction, contact local gas company representative and coordinate location of gas meter and piping. In addition, coordinate time required for installation, in order to avoid delay to the Project.

1.8 UTILITY CONNECTIONS

- A. Bear the cost of construction related to utility services, from point of connection to utility services shown on Contract Documents. This includes piping, excavation, backfill, meters, boxes, check valves, backflow prevention devices, general service valves, concrete work, and the like, whether or not Work is performed by Contractor, local water/sanitation district, public utility, other governmental agencies or agencies' assigns.

1.9 FRAMING, CUTTING AND PATCHING

- A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.
- B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.
- C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.
- D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.
- E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

1.10 SUBMITTALS

- A. Submittal packages may be submitted via email as PDF electronic files, or as printed packages. PDFs shall be legible at actual size (100 percent). Provide seven copies of printed submittal packages.
- B. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used. Refer to Division 01 for complete instructions.
 - 1. Partial or incomplete submittals will not be considered.
 - 2. Quantities are Contractor's responsibility and will not be reviewed.
 - 3. Provide materials of the same brand or manufacturer for each class of equipment or material.
 - 4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.

5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.
 6. Organize submittals in same sequence as in Specification Sections.
 7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.
 - a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
 - b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
 - c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
 - d. Catalog cuts and published material may be included with supplemental scaled drawings.
- C. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.
- D. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect Shop Drawings or submittals on all items of equipment and materials provided. Provide submittal in at least seven copies and in complete package.
 1. Shop Drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.
- E. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.
- F. Provide product data for insulation products, including insulation, insulation facings, jackets, adhesives, sealants, and coatings, indicating compliance with requirement that these products contain less than 0.1 percent (by mass) polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations.

- G. Pipe, pipe or plumbing fittings, fixtures, solder and flux installed in a system providing water for human consumption shall comply with lead free requirements of the California Health and Safety Code Section 116875. Provide submittal information for products third-party certified by an approved laboratory as complying with California Health and Safety Code Section 116875.
- H. Delegated-Design Submittal: For seismic supports, anchorages, and restraints indicated to comply with performance requirements and design criteria.
1. Calculations performed for use in selection of seismic supports, anchorages, and restraints shall utilize criteria indicated in Structural Contract Documents.
 2. Supports, anchorage and restraints for piping, ductwork, and equipment shall be an OSHPD pre-approved system as shown on P001. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.
 - a. Bracing of Piping and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation. Gas pipe bracing shall be designed in accordance with California Building Code Section 1615A.1.22 and ASCE 7-10 Section 13.6. Coefficient $I_p = 1.5$ shall be used for gas piping bracing calculations.
 3. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, ductwork, and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with 2016 California Building Code
 4. Additional Requirements: In addition to the above, conform to all state and local requirements.

1.11 SUBSTITUTIONS

- A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In the case of conflict between requirements given herein and those of Division 01, Division 01 requirements shall apply.

- B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.
- C. Substitutions will be interpreted to be all manufacturers other than those specifically listed in the Contract Documents by brand name, model or catalog number.
- D. Only one request for substitution will be considered for each item of equipment or material.
- E. Substitution requests shall include the following:
 - 1. Reason for substitution request.
 - 2. Complete submittal information as described herein; see “Submittals.”
 - 3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
 - 4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
 - 5. Explanation of impact on connected utilities.
 - 6. Explanation of impact on structural supports.
- F. Installation of reviewed substitution is the Contractors’ responsibility. Any mechanical, electrical, structural, or other changes required for installation of reviewed substituted equipment or material must be made by the Contractor without additional cost to the Owner. Review by the Architect of the substituted equipment or material, including dimensioned Drawings will not waive these requirements.
- G. Contractor may be required to compensate the Architect for costs related to substituted equipment or material.

1.12 OPERATION AND MAINTENANCE MANUAL

- A. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Start compiling data upon approval of submittals.
 - 1. Sets shall incorporate the following:
 - a. Service telephone number, address and contact person for each category of equipment or system.
 - b. Complete operating instructions for each item of plumbing equipment.
 - c. Copies of guarantees/warrantees for each item of equipment or systems.
 - d. Test data and system balancing reports.

- e. Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
 - f. Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
 - g. Control diagrams and literature.
 - h. A complete list or schedule of all scheduled valves giving the number of the valve, location and the rooms or area controlled by the valve. Identify each valve with a permanently attached metal tag stamped with number to match schedule. Post list in frame under plastic on wall in mechanical room or where directed by Architect.
 - i. Check test and start reports for each piece of plumbing equipment provided as part of the Work.
 - j. Commissioning and Preliminary Operation Tests required as part of the Work.
- B. Post service telephone numbers and/or addresses in an appropriate place as designated by the Architect.

1.13 SITE CONDITIONS

- A. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

1.14 EXISTING MATERIALS

- A. Remove existing equipment, piping, wiring, construction, etc., which interferes with Work of this Contract. Promptly return to service upon completion of work in the area. Replace items damaged by Contractor with new material to match existing.
- B. Removed materials which will not be re-installed and which are not claimed by Owner shall become property of Contractor and shall be removed from Project site. Consult Owner before removing any material from Project site. Carefully remove materials claimed by Owner to prevent damage and deliver to Owner-designated storage location.
- C. Existing piping and wiring not reused and are concealed in building construction may be abandoned in place and all ends shall be capped or plugged. Remove unused piping and wiring exposed in Equipment Rooms or occupied spaces. Material shall be removed from Project premises. Disconnect power, water, gas, pump or any other active energy source from piping or electrical service prior to abandoning in place.
- D. Existing piping, ductwork, and equipment modified or altered as part of this Work shall comply with the most recent applicable code requirements.

1.15 WARRANTY

- A. Refer to Division 01 for warranty requirements, including effective date of warranty. Refer to specific items of equipment specified herein for warranty duration if different from that specified in Division 01.
- B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.
- C. On failure to comply with the above warranty within a reasonable length of time after notification is given, the Architect/Owner shall have the repairs made at the Contractor's expense.

1.16 RECORD DRAWINGS

- A. Refer to Division 01, Record Documents, for requirements governing Work specified herein.
- B. Upon completion of the work, deliver to Architect the following:
 - 1. Originals of drawings showing the Work exactly as installed.
 - 2. One complete set of reproducible drawings showing the Work exactly as installed.
 - 3. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
- C. Provide Contractor's signature, verifying accuracy of record drawings.
- D. Obtain the signature of the Project Inspector for all record drawings.

1.17 DELIVERY AND STORAGE

- A. Protect equipment and piping delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

1.18 COORDINATION

- A. General:
 - 1. Coordinate Work in this Section with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.
- B. Electrical Coordination:
 - 1. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:
 - a. Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.

- b. If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.
 - c. Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.
- C. Mechanical Coordination:
- 1. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
 - 2. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during progress of construction.
 - 3. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section “Access Doors and Frames.”

PART 2 – PRODUCTS

2.1 GENERAL

- A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.
- B. All sizes, capacities, and efficiency ratings shown are minimum, except that gas capacity is maximum available.
- C. Refer to Sections 22 10 00 and 23 80 00 for specific system piping materials.

2.2 MATERIALS

- A. No material installed as part of this Work shall contain asbestos.

2.3 ELECTRIC MOTORS

- A. General Motor Requirements: Comply with NEMA MG 1 unless otherwise indicated. Comply with IEEE 841 for severe-duty motors.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. U.S. Motors.

- b. Century Electric.
 - c. General Electric.
 - d. Lincoln.
 - e. Gould.
- B. Motor Characteristics: Designed for continuous duty at ambient temperature of 40 deg. C and at altitude of 3300 feet above sea level. Capacity and torque shall be sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
- 1. Motors exceeding the nameplate amperage shall be promptly replaced at no cost to the Owner. Horsepower shown is minimum and shall be increased as necessary to comply with above requirements. Furnish motors with splash-proof or weatherproof housings, where required or recommended by the manufacturer. Match the nameplate voltage rating with the electrical service supplied. Check Electrical Drawings. Provide a transformer for each motor not wound specifically for system voltage.
- C. Polyphase Motors: NEMA MG 1, Design B, medium induction motor, premium efficiency as defined in NEMA MG 1. Select motors with service factor of 1.15. Provide motor with random-wound, squirrel cage rotor, and permanently lubricated or regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading. Temperature rise shall match insulation rating. Provide Class F insulation.
- 1. Multispeed motors shall have separate windings for each speed.
- D. Polyphase Motors with Additional Requirements:
- 1. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
 - 2. Motors Used with Variable Frequency Controllers:
 - a. Separately Connected Motors: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - b. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - c. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - d. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - e. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
 - f. Each motor shall be provided with a shaft grounding device for stray current protection.

3. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.
- E. Single-Phase Motors:
1. Select motors with service factor of 1.15.
 2. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - a. Permanent-split capacitor.
 - b. Split phase.
 - c. Capacitor start, inductor run.
 - d. Capacitor start, capacitor run.
 3. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
 4. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
 5. Motors 1/20 HP and Smaller: Shaded-pole type.
- F. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.4 MOTOR STARTERS

- A. Square D, Allen Bradley, or equal, in NEMA Type 1 enclosure, unless otherwise specified or required. Minimum starter size shall be Size 1. Provide NEMA 3R enclosure where exposed to outdoors.
- B. Provide magnetic motor starters for equipment provided under the Mechanical Work. Starters shall be non-combination type. Provide part winding or reduced voltage start motors where shown or as hereinafter specified. Minimum size starter shall be Size 1.
 1. All starters shall have the following:
 - a. Cover mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.
 - b. Ambient compensated thermal overload.
 - c. Fused control transformer (for 120 or 24 volt service).
 - d. Pilot lights, integral with the starters. Starters located outdoors shall be in NEMA IIIR enclosures.
 2. Where three phase motors are provided for two-speed operation, provide two speed motor starters.
 3. Starters for single-phase motors shall have thermal overloads. NEMA I enclosure for starters located indoors, NEMA IIIR enclosure for starters located outdoors.

4. Provide OSHA label indicating the device starts automatically.

2.5 VALVES AND FITTINGS FOR POTABLE WATER SYSTEMS

A. General:

1. Provide valves and fittings conforming to lead-free requirements of California Health and Safety Code Section 116875.
 - a. Provide valves listed to NSF/ANSI 61-G or NSF/ANSI 372 for valve materials for potable-water service.
 - i. Exception: Main distribution gate valves above 1-1/2 inches located underground outside building are not required to conform lead-free requirements of California Health and Safety Code Section 116875.

B. Gate Valves:

1. General: Furnish valves in copper lines with adapters to suit valve/line requirements.
2. 1-1/2 inches and smaller: Minimum 200 psi CWP, bronze body, threaded bonnet, rising or non-rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Milwaukee UP148, UP149, Nibco T-113-LF, S-113-LF, or equal.
3. 2 inches through 3 inches: Minimum 200 psi CWP, bronze body, threaded bonnet, non-rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Nibco T-113-LF, S-113-LF, or equal.
4. Main distribution gate valves underground outside building above 1-1/2 inches:
 - a. Underground valves 2 inches thru 12 inches: 250 psi, iron body, Non-rising stem, bolted bonnet, resilient wedge valves, conforming to AWWA C509, equipped with operating nuts, Mueller Series 2360, Nibco F-619-RW-SON, or equal.
 - i. Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
 - ii. Furnish and deliver to Owner one wrench of each size required for operating underground valves.

C. Ball Valves:

1. 2 inches and smaller: 600 psi CWP, cast bronze or brass body, full port, two piece, threaded ends, and reinforced PTFE seal, conforming to MSS

SP-110. Nibco T-685-80-LF, Milwaukee UPBA400, Apollo 77C-LF10, Kitz 868, or equal.

2. 2-1/2 inches: Apollo 77C-LF10, or equal.

D. Swing Check Valves: Minimum 200 psi CWP, bronze or brass body, suitable for regrinding, threaded ends, conforming to MSS SP-80. Milwaukee UP509, Nibco T-413LF, Kitz 822T, or equal.

E. Butterfly Valves:

1. General: Tight closing, full lug type, with resilient seat suitable for minimum working pressure of 200 psig, conforming to MSS SP-67. Bi-direction dead end service with downstream flange removed.

2. Provide valves with the following:

a. Seats: suitable for 40 degrees F for cold water service and 250 degrees F for hot water service. Seats shall cover inside surface of body and extend over body ends.

b. Bodies: ductile iron or cast iron.

c. Discs: Bronze or stainless steel.

d. Stems or Shafts: Stainless steel. Install valves with stems horizontal.

e. Control Handles: Suitable for locking in any position or with 10 degree or 15 degree notched throttling plates to hold valve in selected position. Provide extended necks to compensate for insulation thickness. Provide gear operator for valves 5 inches and larger.

3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

a. 2 through 12 inches: Watts Regulator Co., model DBF-03.

F. Silent Check Valves (for use on pump discharge):

1. General: Provide spring loaded check valves at pump discharge of all pumps.

a. 2 inches and smaller: Minimum 300 psi CWP, bronze body, Apollo 61LF, Milwaukee UP548-T, or equal.

b. 2-1/2 inches and larger: Class 250, cast iron body, suitable for regrinding, Mueller 103MAP, or equal.

G. Calibrated Balancing Valves:

1. General: Calibrated orifice ball type rated for 400 psig maximum operating pressure and 250 degrees F. maximum operating pressure.

a. Body: Brass.

- b. Ball: 304 Stainless Steel.
 - c. Seat: Glass and Carbon filled TFE.
 - d. End Connections: Threaded.
 - e. Pressure Gage connections: Integral capped readout valves with internal check valves and drain port, for use with portable pressure differential meter.
 - f. Handle Style: Dial, with memory stops to retain set position.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
- a. 1 inch and smaller: Bell & Gossett model CB, “LF” series.

2.6 VALVES AND FITTINGS FOR NON-POTABLE WATER, COMPRESSED AIR, AND GAS SYSTEMS

A. Gate Valves:

1. 2-1/2 inches and smaller: Class150, bronze body, union bonnet, rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Hammond IB641, IB648, Nibco T-134, S-134, Milwaukee 1151, 1169, or equal.
2. 3 inches and larger: Class 125, iron body, bronze mounted, bolted bonnet, non-rising stem, solid wedge, flanged ends, conforming to MSS SP-70. Hammond IR-1138, Nibco F619, Milwaukee F2882A, Stockham G-612, or equal.
3. Underground valves 2 inches thru 12 inches: 250 psi, iron body, Non-rising stem, bolted bonnet, resilient wedge valves, conforming to AWWA C509, equipped with operating nuts, Mueller Series 2360, Nibco F-619-RW-SON, or equal.
 - a. Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
 - b. Furnish and deliver to Owner one wrench of each size required for operating underground valves.

B. Ball Valves:

1. 2 inches and smaller: 600 psi CWP, 150 psi SWP, cast bronze body, full port, two piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco T585-70, Milwaukee BA-400, Stockham T-285, or equal.
2. 2-1/2 inches and larger: Class 150, carbon steel body, full port, two piece, stainless steel vented ball, flanged ends, and reinforced PTFE seal, conforming to MSS SP-72. Nibco F-515-CS-F-66-FS, Milwaukee F20-CS-15-F-02-GO-VB, or equal.

3. Compressed Air Services: 600 psi CWP, 150 psi SWP, bronze body, full port, three piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco Model T-595-Y, Milwaukee BA-300, or equal.
- C. Swing Check Valves: Class 125 or 150, bronze body, suitable for regrinding, threaded ends, conforming to MSS SP-80. Stockham B-321, Milwaukee 509, Nibco T-433, or equal.
- D. Butterfly Valves:
1. General: Tight closing, full lug type, with resilient seat suitable for minimum working pressure of 200 psig, conforming to MSS SP-67. Bi-direction dead end service with downstream flange removed.
 2. Provide valves with the following:
 - a. Seats: Suitable for 40 degrees F for cold water service and 250 degrees F for hot water service. Seats shall cover inside surface of body and extend over body ends.
 - b. Bodies: Ductile iron or cast iron.
 - c. Discs: Bronze or stainless steel.
 - d. Stems or Shafts: Stainless steel.
 - e. Control Handles: Suitable for locking in any position or with 10 degree or 15 degree notched throttling plates to hold valve in selected position. Provide extended necks to compensate for insulation thickness. Provide gear operator for valves 5 inches and larger.
 3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. 2 through 12 inches: Milwaukee Valve, CL series, Nibco, Inc., Model LD2000-3, or equal.
- E. Silent Check Valves (for use on pump discharge):
1. General: Provide spring loaded check valves at pump discharge of all pumps.
 2. 2 inches and smaller: 250 psi CWP, bronze body, Nibco Model T-480, Milwaukee 548-T, or equal.
 3. 2-1/2 inches and larger: Class 250, cast iron body, wafer style, suitable for regrinding. Nibco Model F960, Milwaukee 1400, Mueller 103MAP, or equal.
- F. Calibrated Balance Valves (Symbol CBV): Provide globe style valves for precision regulation and control rated 175 psi for sizes 2-1/2 inches through 12 inches and rated 240 psi for bronze sizes 2 inches and below. Each valve shall have two metering/test ports with internal check valves and protective caps. All valves must be equipped with visual position readout and concealed memory stops for repeatable regulation and control.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. Bell & Gossett Circuit Setter Plus.
 - b. Armstrong CBV.
 - c. Flow Design Inc. Accusetter.
 - d. Tour & Andersson.
 - e. Circuit Sensor with butterfly valve above 3 inches.
 - f. Illinois Series 5000 through 2 inches.

- G. Flow Control Valve: Automatic pressure compensating flow control valves shall be Griswold, Flow Design, Inc., or equal.

- H. Building Gas Shut-Off Valve:
 1. 2 inches and smaller: Provide 175 psi SWP ball valve, CSA listed, full port, lockwing type, with AGA painted grey finish. Jomar 175-LWN, or equal.
 2. Above 2 inches: Provide ReSun D-126, Key Port, or equal, lubricated plug cock, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes. Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.
 3. Provide valves same size as upstream piping. Make any reduction in size of gas piping downstream of shutoff valves.

- I. Gas Shut-off Valve Above Grade:
 1. 2 inches and smaller: Provide Milwaukee BB2-100, Jomar T-100NE, or equal, ball valve, CSA listed, full port.
 2. Above 2 inches: Provide ReSun D-126, Key Port, or equal, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes. Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.
 3. Provide valves same size as upstream piping. Make any reduction in size of gas piping downstream of shutoff valves.

- J. For Gas Service Below Grade:
 1. Lubricated plug cocks: ReSun Model D-126, Key Port, or equal, lubricated plug cock, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide extended lubrication stem, arranged to allow

for lubrication of the valve from grade. The extension must be constructed to allow for lubrication of the valve and for operation of the valve from grade. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes. Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.

- a. Provide flanged ends on valves installed below grade. Connect to polyethylene piping with flanges and stainless steel bolts.
 - b. Anchor each valve flange to valve box with welded angle iron, or provide vertical stiff leg, minimum 18 inches into earth.
 - c. Provide Central Double O Seal Transition Fittings, or equal, flanged style for connection between valve and piping system.
 - d. Wrap valve, flanges and exposed pipe with PASCO Specialty & Mfg., Inc., or equal tape wrap, installed in accordance with requirements listed under "Pipe Protection".
2. Molded polyethylene body ball valve: Nordstrom Valves - Polyvalve II for sizes 1-1/4 inches to 2 inches, and Polyvalve for sizes 2 inches and larger, or equal. Valves 1 inch and smaller shall be listed lubricated plug cocks, with transition fittings..
- a. Provide stub ends to match SDR of the piping, arranged for butt fusion welding. Provide valve body material to suit the adjacent piping system.
 - b. Provide wrench to suit the valve operator.
- K. Seismic Gas Shut-Off Valve: Certified by State of California and compliant with ASCE 25. Provide standard or high pressure model as required to match site gas pressure. Provide unit arrangement per Drawings schedule and details.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Little Firefighter Corporation, models NAGV, VAGV, and AGV.
 - b. Seismic Safety Products, LLC, Northridge series.

2.7 JOINING MATERIALS

- A. Refer to Division 22 and 23 piping sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated
 - a. Full-Face Type: For flat-face, Class 125, cast iron and cast bronze flanges.

- b. Narrow-Face Type: For raised-face, Class 250, cast iron and steel flanges.
 - 2. AWWA C111, rubber, flat face, 1/8-inch (3.2mm) thick, unless otherwise indicated; and full-face or ring type, unless other indicated.
 - 3. Flange Bolts and Nuts: AWWA C111, carbon steel, unless otherwise indicated.
 - 4. Plastic, Pipe-Flange Gasket, Bolts and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- C. Brazing Filler Metals: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
- D. Welding Filler Metals: Comply with ASME B31.1 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.8 STRAINERS FOR POTABLE WATER SYSTEMS

- A. Strainers: Full line size, conforming to lead-free requirements of California Health and safety Code Section 116875. "Y" pattern, 125 psi SWP minimum, with 304 stainless steel screens. Install all strainers with a blow-off hose valve with hose adapter. Strainer shall have gasketed cover with straight thread.
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. 3 inches and smaller: bronze or brass body, threaded ends, with 20 mesh screen. Watts LF777SI, Wilkins SXL.
 - b. 4 inches and larger: Cast iron body, flanged ends, 1/16 inch or 1/8 inch screen as normally supplied for each size. Watts 77F-DI-125, Mueller 758.

2.9 STRAINERS FOR NON-POTABLE WATER SYSTEMS

- A. Charles M. Bailey #100A, Armstrong, Muessco, or equal, Fig. 11 "Y" pattern, 125 psi WP minimum, with monel screens with 20 square mesh for 2 inches and smaller and 3/64 inch perforations for 2-1/2 inches and larger. Install all strainers with a blow-off hose valve with hose adapter. Strainer shall have gasketed cover with straight thread.

2.10 VALVE BOXES

- A. General:

1. Where several valves or other equipment are grouped together, provide larger boxes of rectangular “vault” type adequately sized for condition and similar in construction to those specified above.
 2. Provide valve box extensions as required to set bottom of valve box tight up to top of piping in which valve is installed.
 3. Provide a tee handle wrench for each size, Alhambra Foundry Co. #A-3008, or equal.
- B. Valve Boxes in Traffic Areas: Provide Christy No. G5 traffic valve box, Brooks, or equal, 10-3/8 inches inside diameter with extensions to suit conditions, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves.
- C. Valve Boxes in Non-Traffic Areas: Provide Christy No. F22, Brooks, or equal, 8 inches inside diameter by 30 inches long, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves. Cut bottom of plastic body for operation of valves.
- D. Valve Box (Rectangular Vault Type): Precast concrete or cast iron with cast iron or steel locking type covers lettered to suit service – Brooks No. 3-TL, Christy No. B3, Fraser No. 3, Alhambra A-3004 or A-3005, Alhambra E-2202, or E-2702, or equal, with extension to suit conditions.

2.11 GAUGES

- A. Marsh "Series J", U.S. Gage, Danton 800, or equal, with bronze bushed movement and front recalibration. Dials shall be white with black numerals, 3-1/2 inch dial face. Normal reading shall be at mid-scale. Provide a needle valve on each gauge connection. Supply a gauge piped with branch isolation valves across the inlet and outlet of each pump and where shown on the Drawings.
- B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core {and gasketed cap}, on inlet and outlet of each coil, boiler, condenser, chiller and heat exchanger and where shown on Drawings.

2.12 THERMOMETERS

- A. Marsh, Taylor, Palmer, or equal, 5 inch diameter bimetal dial, adjustable from face, with adjustable positioner, located to be easily read from normal personnel approach. Normal reading shall be at mid-scale.
1. Provide extension for insulation.
 2. Provide thermometers with steel bulb chambers and brass separable sockets.
- B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core, on inlet and outlet of each coil, boiler, and heat exchanger and provide two digital

electronic test thermometers for each range of fluid temperature and where shown on Drawings.

2.13 ACCESS DOORS

- A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.
 - 1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.
- B. Access doors shall match those supplied in Division 08 in all respects, except as noted herein.
- C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.
- D. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.
- E. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.
- F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:
 - 1. Milcor
 - a. Style K (plaster).
 - b. Style DW (gypsum board).
 - c. Style M (Masonry).
 - d. Style "Fire Rated" where required.

2.14 EXPANSION LOOPS

- A. Manufactured assembly consisting of inlet and outlet elbow fittings, two sections of flexible metal hose and braid, and 180-degree return bend or center section of flexible hose. Flexible hose shall consist of corrugated metal inner hose and braided outer sheath. Provide assembly selected for 4 inches of movement.
- B. Provide CSA certified expansion loops listed for 4 inches of movement for use in natural or propane gas piping systems.

- C. Where used in potable water systems, provide expansion loops of certified lead-free construction.
- D. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - 1. Metraflex Inc., Metraloop series.
 - 2. Unisource Manufacturing, Inc., V series.

2.15 FLEXIBLE JOINTS

- A. Where indicated on Drawings, provide Metraflex Metrasphere, Style R, Mason Industries, or equal, Spherical Expansion Joints. Provide control units at each expansion joint, arranged to limit both expansion and compression.
- B. Flexible joints at entry points to building shall be Barco Ductile iron, Advanced Thermal Systems, or equal, threaded style with stainless ball and mineral filled seal.

2.16 PIPE GUIDES

- A. Where flexible connections are indicated on Drawings, provide Metraflex style IV, B-Line, or equal, pipe guides in locations recommended by manufacturer. Maximum spacing from flexible connection to first pipe guide is 4 pipe diameters, and maximum spacing from second pipe guide is 14 pipe diameters.

2.17 EQUIPMENT IDENTIFICATION

- A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

2.18 PIPE IDENTIFICATION

- A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.
- B. The legends and flow arrows shall conform to ASME A13.1.

2.19 INSULATION WORK

- A. General:
 - 1. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

2. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
3. The term "piping" used herein includes pipe, valves, strainers and fittings.
4. Apply insulating cement to fittings, valves and strainers and trowel smooth to the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to the bonnet. Leave strainer cleanout plugs accessible.
5. Provide pre-formed PVC valve and fitting covers.
6. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.
7. Test insulation, jackets and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723 or ASTM E84.
8. Clean thoroughly, test and have approved, all piping and equipment before installing insulation and/or covering.
9. Repair all damage to existing pipe and equipment insulation whether or not caused during the work of this contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.

B. Insulation of Piping:

1. Insulate domestic hot and tempered water with minimum 3-1/2 pounds per cubic foot density fiberglass with ASJ-SSL jacket. Insulation thickness shall be the following:
 - a. Pipe 3/4 inches and smaller: 1 inch thick.
 - b. Pipe 1 inch through 1-1/2 inches: 1-1/2 inches thick.
 - c. Pipe 2 inches and larger: 2 inches thick.
2. Insulate domestic hot water piping under slab on grade and cold water piping exposed to the weather with 3/4 inch thick Therma-Cel, Armaflex, or equal; seal water tight per manufacturer's directions.
3. Insulate roof drain and overflow drain bodies, horizontal sections of rainwater leader piping and overflow piping, and condensate drains within the building envelope with 1 inch thick fiberglass, minimum 3-1/2 pound per cubic foot density, with ASJ-SSL jacket.
4. Insulate domestic cold water piping outside of insulation envelope in outside walls, vented attic spaces, and unheated spaces, including equipment rooms and below raised floor with 1 inch thick molded

fiberglass, minimum 3-1/2 pound per cubic foot density, with ASJ-SSL jacket.

5. Exposed insulated piping within the building shall have a Zeston 2000 25/50, Proto Lo-Smoke, or equal, PVC jacket and fitting cover installed over the insulation, applied per manufacturer's instructions. Insulation shall be vapor tight before applying PVC jacket and fitting covers. Verify suitability with manufacturer of insulation. Insulation with pre-applied polymer jacket may be substituted at Contractor's option.
6. Insulate condensate drain piping in freezer with 3/4 inch thick Therma-Cel, Armaflex, or equal. Seal water tight per manufacturer's directions. Install heat tape prior to insulation of piping, in accordance with manufacturer's directions.
7. Where insulated piping is exposed to the weather apply aluminum jacket secured with 1/2 inch stainless-steel bands on 12 inch centers. Insulation shall be vapor tight before applying metal jacket, and aluminum fitting covers. Install jacketing with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Cover fittings with glass cloth, two coats of Foster Sealfas 30-36, and factory-fabricated aluminum fitting covers, of same material, finish, and thickness as jacket. Insulation shall be vapor tight before applying metal jacket and fitting covers.
 - a. Fitting covers:
 - i. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - ii. Tee covers.
 - iii. Flange and union covers.
 - iv. End caps.
 - v. Beveled collars.
 - vi. Valve covers.
 - vii. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
 - b. Jacket thickness:
 - i. Pipes 10 inches diameter and smaller: Minimum .016 inch thick jacket with smooth finish.
 - ii. Pipes 12 inches diameter and larger: Minimum .020 inch thick jacket with smooth finish.

PART 3 – EXECUTION

3.1 PLUMBING DEMOLITION

- A. Refer to Division 01 Sections “Cutting and Patching” and “Selective Demolition” for general demolition requirements and procedures.

- B. Disconnect, dismantle and remove mechanical systems, equipment, and components indicated to be removed. Coordinate with all other trades.
 - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material. Refrigerant system must be evacuated per EPA requirements.
 - 3. Equipment to Be Removed: Drain down and cap remaining services and remove equipment.
 - 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 ELECTRICAL REQUIREMENTS

- A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.
- B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.
- C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

3.3 PIPING SYSTEM REQUIREMENTS

- A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other

design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

3.4 PRIMING AND PAINTING

- A. Perform all priming and painting on the equipment and materials as specified herein.
- B. Priming:
 - 1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed. Black steel pipe exposed to the weather shall be painted one coat of Rust-Oleum #1069 primer for black steel piping or Rust-Oleum #5260, Kelly Moore, or equal, primer for galvanized piping.
 - 2. Metal surfaces of items to be jacketed or insulated except piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the best available grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.
 - 3. Where equipment is provided with nameplate data, the nameplate should be masked off prior to painting. When painting is completed, remove masking material.
- C. See Painting Section for detailed requirements.

3.5 EXCAVATING

- A. Perform all excavating required for work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.
- B. Unless shown otherwise, provide a minimum of 2'-6" cover above top of pipe to finished grade for all service piping, unless otherwise noted. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For all PVC pipe and for PE gas pipe, bed the pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. All other materials should have a minimum sand equivalent of 50. Only a small proportion of the native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be

compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such that less than 100 percent will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.

- C. Maintain all warning signs, barricades, flares, and red lanterns as required.
- D. For all trenches 5 feet or more in depth, submit copy of permit detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trenches. Obtain a permit from the Division of Industrial Safety prior to beginning excavations. A copy of the permit shall be available at the site at all times.

3.6 BACKFILLING

- A. Backfill shall comply with applicable provisions of Division 31 of these Specifications.
- B. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.
 - 1. Backfill plastic pipe and insulated pipe with sand for a minimum distance of 12 inches above the top of the pipe. Compact using mechanical tamping equipment.
- C. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase the minimum compaction within the uppermost two feet of backfill to 95 percent.
- D. Replace or repair to its original condition all sod, concrete, asphalt paving, or other materials disturbed by the trenching operation. Repair within the guarantee period as required.

3.7 INSTALLATION OF VALVES

- A. Install valves as indicated on Drawings and in the following locations:
 - 1. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.
 - 2. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each

riser, at base of each rise or drop in piping system, and elsewhere indicated or required to completely drain potable water system.

3. Provide gate or globe valves on inlet and outlet of each water heater or pump.

B. General:

1. Valves shall be full line size unless indicated otherwise on Drawings.
2. Install horizontal valves with valve stem above horizontal, except butterfly valves.
3. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
4. Locate valves for easy access and provide separate support where necessary.
5. Install valves in position to allow full stem movement.
6. Install exposed polished or enameled connections with special care showing no tool marks or exposed threads.
7. Butterfly valves conforming to the paragraph "Butterfly Valves" may be used in lieu of gate or globe valves for locations above grade.
8. Ball valves conforming to the paragraph "Ball Valves" may be used in lieu of gate valves for locations above grade for services 2-1/2 inches and smaller.
9. Valves 2-1/2 inches and smaller (except ball valves) in nonferrous water piping systems may be solder joint type with bronze body and trim.
10. Rigidly fasten hose bibbs, hydrants, fixture stops, compressed air outlets, and similar items to the building construction.

C. Gate Valves:

1. Furnish valves in copper lines with adapters to suit valve / line requirements.
2. Underground gate valves:
 - a. Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
 - b. Furnish and deliver to Owner one wrench of each size required for operating underground valves.

D. Swing Check Valves: Install in horizontal position with hinge pin level.

- E. Butterfly Valves: Install with stems horizontal.
- F. Silent Check Valves: Install in horizontal or vertical position between flanges.
- G. Calibrated Balancing Valves: Install calibrated balancing valves per manufacturers' recommendations, including requirements for straight pipe lengths at valve inlet and outlet.
- H. Gas Shut-Off Valves:
 - 1. Provide line size ball valve in gas line to each appliance.
 - 2. Provide line size electric solenoid gas valve in gas line to kitchen equipment (if not supplied with appliance) under Type 1 hood. Interlock with hood fire alarm system.
- I. Valve Adjustment: Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.8 INSTALLATION OF PIPING SYSTEMS

- A. At time of final connection, and prior to opening valve to allow pressurization of water and gas piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, or gas pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.
- B. General:
 - 1. All piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.
 - 2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.
 - 3. Install piping to permit application of insulation and to allow valve servicing.
 - 4. Where piping or conduit is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
 - 5. Horizontal runs of pipes and/or electrical conduit suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from the Architect.
 - 6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.

7. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.
8. Pipe the discharge of each relief valve, air vent, backflow preventer, and similar device to floor sink or drain.
9. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
10. Install horizontal valves with valve stem above horizontal.
11. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
12. Verify final equipment locations for roughing-in.
13. Service Markers: Mark the location of each plugged or capped pipe with a 4 inch round by 30 inch long concrete marker, set flush with finish grade. Provide 2-1/2 inch diameter engraved brass plate as part of monument marker.
14. Furnish and install anchors or thrust blocks on PVC water lines in the ground, at all changes in direction of piping, and at all connections or branches from mains 1-1/2 inch and larger. Form anchors or thrust blocks by pouring concrete between pipe and trench wall. Thrust blocks shall be of adequate size and so placed as to take thrusts created by maximum internal water pressure. Sizing and placement shall be per manufacturer's recommendations, CPC, and IAPMO installation standards. Anchor piping to building construction.
15. Sanitary Sewer and Storm Drain: Grade piping inside building uniformly 1/4 inch per foot if possible but not less than 1/8 inch per foot. Run piping as straight as possible. Make piping connections between building piping and outside service pipe with cast iron reducers or increasers. Slope sewers uniformly between given elevations where invert elevations are shown.
16. Where piping is installed in walls within one inch of the face of stud, provide a 16 gauge sheet metal shield plate on the face of the stud. The shield plate shall extend a minimum of 1-1/2 inches beyond the outside diameter of the pipe.

C. Expansion Loops:

1. Install expansion loops where piping crosses building expansion or seismic joints, between buildings, between buildings and canopies, and as indicated on Drawings.
2. Install expansion loops of sizes matching sizes of connected piping.
3. Install grooved-joint expansion joints to grooved-end steel piping.

4. Materials of construction and end fitting type shall be consistent with pipe material and type of gas or liquid conveyed by the piping system in which expansion loop is installed.

D. Sleeves:

1. Install Adjus-to-Crete, Pipeline Seal and Insulator, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations as directed shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.
2. At Contractor's option, Link-Seal, Metraflex Metraseal, or equal, casing seals may be used in lieu of caulking. Wrap pipes through slabs on grade with 1 inch thick fiberglass insulation to completely isolate the pipe from the concrete.

E. Floor, Wall, and Ceiling Plates: Fit all pipes with or without insulation passing through walls, floors, or ceilings, and all hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.

F. Firestopping:

1. Pack the annular space between the pipe sleeves and the pipe through all floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.
 - a. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.
2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators for each pipe penetration or fixture opening passing through floors, walls, partitions or floor/ceiling assemblies. All Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and in accordance with Chapter 7, CBC requirements.
3. Sleeve penetrators shall have a built in anchor ring for waterproofing and anchoring into concrete pours or use the special fit cored hole penetrator for cored holes.
4. Copper and steel piping shall have SpecSeal plugs on both sides of the penetrator to reduce noise and to provide waterproofing.
5. All above Systems to be installed in strict accordance with manufacturer's instructions.
6. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the

proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.

G. Flashing:

1. Flashing for penetrations of metal or membrane roof for mechanical items such as flues and pipes shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
 - a. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
 - b. Furnish and install counterflashing above each flashing required. Provide Stoneman, or equal, vandalproof top and flashing combination. Provide vandalproof top for each plumbing vent through roof. Elmdor/Stoneman Model 1540, 1550, 1570, or equal.
2. For all other types of roofing system, furnish and install around each pipe, where it passes through roof, a flashing and counterflashing. All flashing shall be made of four pound seamless sheet lead with 6 inch minimum skirt and steel reinforced boot. Counterflashing shall be cast iron. For vents, provide vandalproof top and flashing combination. Elmdor/Stoneman Model 1100-4, 1100-5, 1100-7, or equal.

H. Hangers and Supports:

1. General: Support equipment and piping so that it is firmly held in place by approved iron hangers and supports and special hangers. Hanger and support components shall support weight of equipment and pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments or hangers, of same size as pipe or tubing on which used, or nearest available. Rigidly fasten hose faucets, fixture stops, compressed air outlets, and similar items to the building construction. The Architect shall approve hanger material before installation. Do not support piping with plumbers' tape, wire rope, wood, or other makeshift devices. Where building structural members do not match piping support spacing, provide "bridging" support members firmly attached to building structural members in a fashion approved by the structural engineer.
 - a. Materials, design, and type numbers per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.
 - i. Provide copper-plated or felt-lined hangers for use on copper tubing.

2. Hanger components shall be provided by one manufacturer: B-Line, Grinnell, Unistrut, Badger, or equal.
3. Riser clamps: B-line model B3373, or equal.
4. Pipe Hanger and Support Placement and Spacing:
 - a. Vertical piping support spacing: Provide riser clamps for piping, above each floor, in contact with the floor. Provide support at joints, branches, and horizontal offsets. Provide additional support for vertical piping, spaced at or within the following maximum limits:

Pipe Diameter	Steel Threaded or Welded (Note 3)	Steel Gas	Copper Brazed or Soldered (Note 3)	CPVC & PVC (Note 2)
1/2 - 1"	12 ft.	6 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
1-1/4 - 2"	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft..	Base and Each Floor (Note 1)
2-1/2 - 3"	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
Over 4"	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)

- i. Note 1: Provide mid-story guides.
 - ii. Note 2: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
 - iii. Note 3: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
- b. Vertical cast iron piping support spacing: Base and each floor not to exceed 15 feet.
 - c. Horizontal piping, hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced at or within following maximum limits:

Pipe Diameter	Steel Threaded or Welded (Note 2)	Steel Gas	Copper Brazed or Soldered (Notes 2, 3)	CPVC & PVC (Note 1)
1/2 - 1"	6 ft.	6 ft.	5 ft.	3 ft.
1-1/4 - 2"	7 ft.	10 ft.	6 ft.	4 ft.
2-1/2 - 3"	10 ft.	10 ft.	10 ft.	4 ft.
Over 4"	10 ft.	10 ft.	10 ft.	4 ft.

- i. Note 1: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
 - ii. Note 2: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
 - iii. Note 3: Includes all refrigerant piping, including vapor and hot gas pipes.
- d. Horizontal cast iron piping support spacing:
- i. Support piping at every other joint for piping length of less than 4 feet.
 - ii. For piping longer than 4 feet, provide support on each side of the coupling, within 18 inches of each joint.
 - iii. Hanger shall not be installed on the coupling.
 - iv. Provide support at each horizontal branch connection.
 - v. Provide sway brace at 40 foot maximum spacing for suspended pipe with no-hub joints, except where a lesser spacing is required by the seismic design criteria used in delegated design for seismic systems. Refer to Article, Submittals.
 - vi. Provide a brace on each side of a change in direction of 90 degrees or more.
5. Suspended Piping:
- a. Individually suspended piping: B-Line B3690 J-Hanger or B3100 Clevis, complete with threaded rod, or equal. All hangers on supply and return piping handling heating hot water or steam shall have a swing connector at point of support.

Pipe Size	Rod Size Diameter
2" and Smaller	3/8"

2-1/2" to 3-1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

- b. Provide 3/8 inch rod for support of PVC and CPVC and provide continuous support.
- c. Trapeze Suspension: B-Line 1-5/8 inch width channel in accordance with manufacturer's published load ratings. No deflection to exceed 1/180 of a span.
- d. Trapeze Supporting Rods: Shall have a safety factor of five; securely anchor to building structure.
- e. Pipe Clamps and Straps: B-Line B2000, B2400; isolate copper pipe with two thicknesses of 2 inches wide 10-mil polyvinyl tape. Where used for seismic support systems, provide B-Line B2400 series pipe straps.
- f. Concrete Inserts: B-line B22-I continuous insert or B2500 spot insert. Do not use actuated fasteners for support of overhead piping unless approved by Architect.
- g. Steel Connectors: Beam clamps with retainers.

6. Support to Structure:

- a. Wood Structure: Provide and install wood blocking as required to suit structure. Provide lag screws or through bolts with length to suit requirements, and with size (diameter) to match the size of hanger rods required.
 - i. Do not install Lag screws in tension without written review and acceptance by Structural Engineer.

Side Beam Angle Clip	B-Line B3062	MSS Type 34
Side Beam Angle Clip	B-Line B3060	
Ceiling Flange	B-Line B3199	

- ii. Blocking for support of piping shall be not less than 2 inch thick for piping up to 2 inch size. Provide 3 inch blocking for piping up through 5 inch size, and 4 inch blocking for larger piping. Provide support for blocking as shown on plumbing detail sheets.
- iii. Where lag screws are used, length of screw shall be 1/2 inch less than the wood blocking. Pre-drill starter holes for each lag screw.
- b. Steel Structure: Provide and install additional steel bracing as required to suit structure. Provide through bolts with length to suit

requirements of the structural components. Burning or welding on any structural member may only be done if approved by the Architect.

7. Rubber Neoprene Pipe Isolators:
 - a. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Refer to Architectural Drawings for location of acoustical walls.
 - b. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. The rubber shall have between a 45 to 55 durometer rating and a minimum thickness of 1/2 inch.
 - c. Acceptable Suppliers:
 - i. Vertical runs: Acousto-Plumb or equal.
 - ii. Horizontal runs: B-Line, Vibraclamp; Acousto-Plumb or equal.
8. Provide continuous V channel support for all horizontal plastic piping.
9. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.
10. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.
11. Insulate copper tubing from ferrous materials and hangers with two thicknesses of 3 inch wide, 10 mil polyvinyl tape wrapped around pipe.
12. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.
13. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.

3.9 PIPE JOINTS AND CONNECTIONS

A. General:

1. Cutting: Cut pipe and tubing square, remove rough edges or burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt and debris from inside and outside of pipe before assembly.
3. Boss or saddle type fittings or mechanically extracted tube joints will not be allowed.

- B. Threaded Pipe: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply thread compound to external pipe threads: Rectorseal No. 5, Permatex No. 1, or equal.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- C. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- D. Copper Pipe and Tubing (Except pneumatic control piping): All joints shall be brazed according to ASME Section IX, Welding and Brazing Qualifications, except domestic water piping 1-1/4 inches and smaller when not buried in the ground or concrete and type DWV plumbing piping may be soldered.
1. Soldered joints: Apply water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828.
- E. Cast Iron Soil Pipe:
1. No-Hub fittings shall be made with a torque wrench.
 2. Hub joints shall be with Ty-Seal couplings.
 3. Wrought iron, steel, or copper pipe shall have a ring or part of a coupling screwed on to form a spigot end if caulked into a joint.
 4. Connect cast iron sewer piping to outside service pipe with cast iron or vitrified clay reducers or increasers as required. Caulking of smaller pipe into the larger without a reducer or increaser will not be permitted.
- F. Welded Pipe:
1. Make up with oxyacetylene or electric arc process.
 2. All welding shall conform to the American Standard Code for Power Piping ASME B-31.1. When requested by the Architect, furnish certification from an approved testing agency or National Certified Pipe Welding Bureau that the welders performing the work are qualified.
 3. All line welds shall be of the single "V" butt type. Welds for flanges shall be of the fillet type.
 4. Where the branch is two pipe sizes smaller than the main or smaller, Bonney Weldolets, Thredolets, Nibco, or equal, may be used in lieu of welding tees.
- G. PVC Sewer and Drainage Pipe (outside building as allowed only): Four inches and larger shall be bell and spigot, assembled in accordance with manufacturer's recommendations. Joint shall be tested in accordance with ASTM D3212. Solvent weld joints below 4 inches in size, schedule 40 PVC with matching fittings, assembled per manufacturer's instructions.

H. Flexible Connections:

1. Furnish and install Thermo Tech., Inc. F/J/R, Metraflex, or equal, flexible couplings with limiter bolts on piping connections to all equipment mounted on anti-vibration bases, on each connection to each base mounted pump and where shown. Couplings shall be suitable for pressure and type of service.
2. Anchor piping securely on the system side of each flexible connection.

3.10 UNIONS AND FLANGES

- A. Install Watts, Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel or cast iron pipe or material except in drain, waste, vent, or rainwater piping. Bushings or couplings shall not be used. Dielectric unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 116875.
- B. Install unions in piping NPS 2" and smaller, and flanges in piping NPS 2-1/2" and larger whether shown or not at each connection to all equipment and tanks, and at all connections to all automatic valves, such as temperature control valves. Unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 116875.
- C. Locate the unions for easy removal of the equipment, tank, or valve.

3.11 ACCESS DOOR

- A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers, traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

3.12 CONCRETE WORK

- A. Concrete work required for work of this Section shall be included under another section of the Specification, unless otherwise noted, including poured-in-place concrete work for installing precast manholes, catch basins, etc., and shall include reinforced concrete bases for pumps, tanks, compressors, fan units, boilers, unless the work is specifically indicated on the Drawings to be furnished under this Section.
- B. Thrust blocks, underground anchors, and pads for cleanouts, valve access boxes and washer boxes are included under this Section of the Specification. Concrete shall be 3000 psi test minimum. Refer to Division 03 for concrete types.

3.13 PIPE PROTECTION

- A. Wrap bare galvanized and black steel pipe buried in the ground and to 6" above grade, including piping in conduit, with one of the following, or equal:

1. Polyethylene Coating: Pressure sensitive polyethylene coating, "X-Tru-Coat" as manufactured by Pipe Line Service Corporation or "Green Line" wrap as manufactured by Royston Products, or equal.
 - a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Royston Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.
 2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-10 or V-20", "Scotchwrap 50", Slipknot 100, PASCO Specialty & Mfg., Inc., or equal, with continuous identification. Tape shall be a minimum of 20 mils thick for fittings and irregular surfaces, two wraps, 50 percent overlap, 40 mils total thickness. Tape shall be laminated with a suitable adhesive; widths as recommended by the manufacturer for the pipe size. Wrap straight lengths of piping with an approved wrapping machine.
- B. Field Joints: Valves and Fittings: double wrap polyvinyl chloride tape as above. Provide at least two thicknesses of tape over the joint and extend a minimum of 4 inches over adjacent pipe covering. Build up with primer to match adjacent covering thickness. Width of tape of fittings shall not exceed 3 inches. Tape shall adhere tightly to all surfaces of the fittings without air pockets.
- C. Testing: Test completed wrap of piping, including all epoxy painted piping with Tinker and Razor Co. test machine (San Gabriel, CA - 818-287-5259), Pipeline Inspection Company (Houston, TX - 713-681-5837), or equal.
- D. Cleaning: Clean all piping thoroughly before wrapping.
1. Inspection: Damaged or defective wraps shall be repaired as directed. No wrapped pipe shall be covered until approved by Architect.
- E. Sleeve copper piping/tubing installed below slab with "Polywrap-C" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping and orange for other piping. Install sleeve per manufacturer's recommendations and instructions.
- F. Sleeve copper piping/tubing installed outside building below grade with "Polywrap-C" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping. Install sleeve per manufacturer's recommendations and instructions.
- G. Sleeve cast iron and ductile iron pipe below grade and below slab with "Polywrap" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 8 mils thick, colored natural. Install sleeve per manufacturer's recommendations and instructions.

- H. Covering: No rocks or sharp edges shall be backfilled against the wrap or sleeve. When backfilling with other than sand, protect wrap with an outer wrapping of Kraft paper; leave in place during backfill.

3.14 PIPE IDENTIFICATION

- A. Provide temporary identification of each pipe installed, at the time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the work.
- B. Apply the legend and flow arrow at all valve locations; at all points where the piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with the approval of the Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.
 - 1. Apply legend and flow arrow at approximately 10'-0" intervals in science classrooms and science prep rooms.
- C. Wherever two or more pipes run parallel, the markings shall be supplied in the same relative location on each.
- D. Each valve on non-potable water piping shall be labeled with a metal tag stamped "DANGER -- NON-POTABLE WATER" in 1/4 inch high letters.
- E. Apply markings after painting and cleaning of piping and insulation is completed.

3.15 EXPANSION ANCHORS IN HARDENED CONCRETE

- A. Refer to Structural Drawings.
- B. Qualification Tests: The specific anchor shall have a current ICC-ES report and evaluated in cracked concrete in accordance with Acceptance Criteria AC193. If the specific anchor satisfies cyclic testing requirements per Acceptance Criteria AC01, Section 5.6, the full allowable shear and tension loads listed in the current ICC-ES report and manufacturer's recommendations for the specific anchor may be used. Otherwise, the design shear and tension loads shall not be more than 80% of the listed allowable shear and tension loads for the specific anchor.
- C. Installation: The anchors must be installed in accordance with the requirements given in ICC Research Committee Recommendations for the specific anchor.
- D. Testing: Fifty percent of the anchors shall be load-tested on each job to twice the allowable capacity in tension, except that if the design load is less than 75 pounds; only one anchor in ten need be tested. If any anchor fails, all anchors must be tested. The load test shall be performed in the presence of a special inspector.
- E. The load may be applied by any method that will effectively measure the tension in the anchor, such as direct pull with a hydraulic jack, a torque wrench calibrated

using the specific anchor or calibrated spring-loading devices. Anchors in which the torque is used to expand the anchor without applying tension to the bolt may not be verified with a torque wrench.

3.16 PIPING SYSTEM PRESSURE TESTING

A. General:

1. Perform operational tests under simulated or actual service conditions, including one test of complete plumbing installation with fixtures and other appliances connected.
2. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

B. Piping Systems: Test piping systems in accordance with the following requirements and applicable codes:

1. Authority having jurisdiction shall witness tests of piping systems.
2. Notify Architect at least seven days in advance of testing.
3. All piping shall be tested at completion of roughing-in, or at other times as directed by Architect.
4. Furnish necessary materials, test pumps, gases, instruments and labor required for testing.
5. Isolate from system equipment that may be damaged by test pressure.
6. Make connections to existing systems with flanged connection. During testing of new work, provide a slip-in plate to restrict test pressure to new systems. Remove plate and make final connection to existing system at completion of testing.
 - a. Authority having jurisdiction shall witness final connection to system.

C. Test Schedule: No loss in pressure or visible leaks shall show after four hours at the pressures indicated.

D. Testing of Sanitary Sewer, Drain, Vent, and Storm Drain may be done in segments in order to limit pressure to within manufacturer's recommendations. Test to 10 feet above highest point in the system.

System Tested	Test Pressure PSI	Test With
Sanitary Sewer, Drain, Vent	10 Ft. Hd.	Water
Storm Drain, Condensate Drains	10 Ft. Hd.	Water
Domestic Water	125	Water
Natural Gas (PE)	60	Air & Non-corrosive

		Leak Test Fluid
Natural Gas (Steel)	100	Air & Non-corrosive Leak Test Fluid
Compressed Air	200 lb.	Air & Non-corrosive Leak Test Fluid
Deionized Water	50	Water

1. Flush deionized water lines with deionized water after test and approval.
2. Non-corrosive leak test fluid shall be suitable for use with piping material specified, and with the type of gas conveyed by the piping system.

3.17 TRACER WIRES

- A. Provide tracer wire for non-metallic gas and water pipe in ground outside of buildings. Use AWG #12 tracer wire with low density high molecular weight polyethylene insulation, and lay continuously on pipe so that it is not broken or stressed by backfilling operations. Secure wire to the piping with tape at 18 inch intervals. Solder all joints. Tracer wire insulation shall be colored yellow for gas piping, blue for water piping.
- B. Terminals: Precast concrete box and cast iron locking traffic cover, Brooks 3TL, or equal; cover marked with name of service; 6 inches of loose gravel below box. Plastic terminal board with brass bolts; identify line direction with plastic tags. Test for continuity between terminals, after backfilling, in presence of Inspector.
- C. Alternate: Use electronically detectable plastic tape with metallic core, Terra Tape D, manufactured by Reef Industries, Inc., Seton, Inc., Marking Services, Inc., or equal; tape 2 inches wide, continuously imprinted "CAUTION WATER (GAS, etc.) LINE BELOW". Install, with printed side up, directly over pipe, 18 inches below finish grade. Backfill material shall be as specified for the particular condition where pipe is installed, but avoid use of crushed rock or of earth with particles larger than 1/2 inch within the top 12 inches of backfill. Take precautions to insure that tape is not damaged or misplaced during backfill operations. Terminal boxes not required.

3.18 OPERATION OF SYSTEMS

- A. Do not operate any plumbing equipment for any purpose, temporary or permanent, until all of the following has been completed:
 1. Complete all requirements listed under "Check, Test and Start Requirements."
 2. Piping has been properly cleaned. Piping systems shall be flushed and treated prior to operation.
 3. Filters, strainers etc. are in place.

4. Bearings have been lubricated, and alignment of rotating equipment has been checked.
 5. Equipment has been run under observation, and is operating in a satisfactory manner.
- B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.

3.19 CHECK, TEST AND START REQUIREMENTS

- A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of plumbing equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.
1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.
 2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
 3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
 4. When work has been completed, provide copies of reports for review, prior to final observation of work.
- B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.
- C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each operating and maintenance manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

3.20 PRELIMINARY OPERATIONAL REQUIREMENTS AND TESTS

- A. Prior to observation to determine final acceptance, put all mechanical systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.
1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations.

2. Correct rotation of motors and ratings of overload heaters are verified.
 3. Specified filters are installed and spare filters have been turned over to Owner.
 4. All manufacturers' certificates of start-up specified have been delivered to the Owner.
 5. All equipment has been cleaned, and damaged painted finishes touched up.
 6. Missing or damaged parts have been replaced.
 7. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.
 8. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
 9. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
 10. Preliminary test and balance work is complete, and reports have been forwarded for review.
 11. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.
 12. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.
- B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.
1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.
 2. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.
 3. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.
 4. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.
- C. Review of Contractor's Tests:
1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.
- D. Test Logs:
1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.

E. Preliminary Operation:

1. The Owner reserves the right to operate portions of the plumbing system on a preliminary basis without voiding the guarantee.

3.21 CERTIFICATES OF INSTALLATION

- A. Contractor shall complete applicable “Certificates of Installation” forms contained in the California Building Energy Efficiency Standards and submit to the authorities having jurisdiction for approval and issuance of final occupancy permit, as described in the California Energy Code.

3.22 DEMONSTRATION AND TRAINING

- A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.
1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.
 2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer’s employees. See specific equipment Articles in these Specifications for this requirement.
 3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner’s representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:
 - a. Listing of Owner-designated personnel completing training, by name and title.
 - b. Name and title of training instructor.
 - c. Date(s) of training.
 - d. List of topics covered in training sessions.
 4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

END OF SECTION 22 00 50.

SECTION 31 20 00 – EARTHWORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01 50 00 – Construction Facilities and Temporary Controls.
- B. Section 01 57 13 – Erosion Control
- C. Section 31 23 33 – Trenching and Backfilling.
- D. Section 32 12 00 – Asphalt Concrete Paving.
- E. Section 32 16 00 – Site Concrete.
- F. Section 32 80 00 – Sprinkler Irrigation.
- G. Section 32 90 00 – Landscaping.
- H. Section 33 40 00 – Site Drainage.

1.3 QUALITY ASSURANCE

- A. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
- B. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.
- C. The representatives of the Owner's testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner's testing lab representatives nor the testing by the Owner's testing lab shall excuse the contractors or subcontractors for defects discovered in their work during or following completion of the project. Correcting of inadequate compaction or moisture content is the sole responsibility of the contractor.
- D. Tests (See Part 3 for Compaction Testing).
- E. Contractor shall be solely responsible for all subgrades built. Failures resulting from inadequate compaction or moisture content are the responsibility of the contractor. Contractor shall be solely responsible for any and all repairs.

1.4 SUBMITTALS

- A. Refer to Section 01 33 00.
- B. Manufacturer's Data: Submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, published warranty or guarantee, installation instructions, and maintenance instructions.
- C. Test Reports: Submit following reports directly to DSA via Box (as required), Architect, and Contractor:
 - 1. Test reports on borrow material.
 - 2. Verification of suitability of each footing subgrade material, in accordance with specified requirements.
 - 3. Field reports; in-place soil density tests.
 - 4. One optimum moisture-maximum density curve for each type of soil encountered.
 - 5. Report of actual unconfined compressive strength and/or results of bearing tests of each strata tested.

1.5 WARRANTY

- A. Refer to General Conditions and Section 01 78 36.

1.6 REFERENCES AND STANDARDS

- A. General: Site survey, included in the drawings, was prepared by Warren Consulting Engineers, Inc., dated May 24, 2017, and is the basis for data regarding current conditions. While the survey is deemed generally accurate, there exists discrepancies and variations due to elapsed time, weather, etc. Existing dirt grades may vary 0.2 ft. from that shown.
- B. Geotechnical Engineering Report: The geotechnical engineering report was prepared by Wallace-Kuhl & Associates. Report is entitled "American Legion High School Gymnasium and Other Improvements", WKA No. 11526.01P, and a copy is included at the end of Division 1 in this project manual. Soils information is taken from this Report. Contractor is responsible for any conclusions drawn from this data; should he prefer not to assume such risk he is under obligation to employ his own experts to analyze available information and/or to make additional explorations, at no cost to Owner, upon which to base his conclusions. Neither Owner, Soils Engineer nor Architect guarantees information will be continuous over entire site of work.
- C. Site Visitation: All bidders interfacing with existing conditions shall visit the site prior to bid to verify general conditions of improvements. Discrepancies must be reported prior to the bid for clarification.

D. Reference Standards:

1. 2016 California Building Code (CBC) with Amendments.
2. ANSI/ASTM D698 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.
3. ANSI/ASTM D1556 – Test Method for Density of Soil in Place by the Sand-Cone Method.
4. ANSI/ASTM D1557 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
5. ANSI/ASTM D3017 – Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).
6. ANSI/ASTM D422-63(2007)e2 – Standard Test Methods for Particle Size Analysis of Soil.
7. ANSI/ASTM D4318 – Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
8. CALTRANS Standard Specifications Section 17.
9. CAL-OSHA, Title 8, Section 1590 (e).
10. Any work within the street, highway or right-of-way shall be performed in accordance with the requirement of the governmental agencies having jurisdiction, and shall not begin until all of those governing authorities have been notified.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Transport, store and handle in strict accord with the local jurisdiction.
- B. Make delivery to job when notified by Contractor verifying that the job is ready to receive the work of this Section and that arrangements have been made to properly store, handle and protect such materials and work.

1.8 PROJECT CONDITIONS

- A. Existing civil, mechanical and electrical improvements are shown on respective site plans to the extent known. Should the Contractor encounter any deviation between actual conditions and those shown, he is to immediately notify the Architect before continuing work.
- B. Excavation dewatering may be necessary. Contractor shall provide any and all tools, equipment and labor necessary for excavation dewatering no matter what

the source. Dewatering shall be continuous until all site utilities are installed and backfilled

1.9 EXISTING SITE CONDITIONS

- A. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.

1.10 SITE UTILITY VERIFICATION AND REPAIR PROCEDURES

A. Ground-Breaking Requirements:

1. All underground work performed by a Contractor must be authorized by the District's Construction Manager or the Low Voltage Consultant prior to start of construction.
2. The Contractor is to obtain and keep the original School's construction utility site plans on site during all excavation operations. Contractor can contact the District's Construction Manager, Facilities Manager, or the Low Voltage Consultant to procure the drawings.

B. Underground Utility Locating:

1. The contractor shall hire an Underground Utility Locating Service to locate existing underground utility pathways in areas affected by the scope of work for excavation.
2. Contractor must use an underground utility locator service with a minimum of 3 years' experience. The equipment operator must have demonstrated experience. Contact Norcal Underground Locating (800/986-6722) or Precision Locating (800/577-7324)
3. The Underground Utility Locator Service must have the use of equipment with the ability to locate by means of inductive clamping, induction, inductive metal detection, conductive coupling, or TransOnde (Radio detection) to generate signals, passive locating (free scoping) for "hot" electric, and metal detector.
4. The Underground Utility Locator Service must be able to locate existing utilities at a depth of at least 72".
5. The Underground Utility Locator Service must be able to locate but are not limited to locating the following types of utility pathways:
 - a. All conduit pathways containing 110 volt or greater 50-60Hz electrical wire.
 - b. All conduit pathways containing an active cable TV system.

- c. All conduit pathways containing wire or conductor in which a signal can be attached and generated without damaging or triggering the existing systems.
 - d. All empty conduit pathways or pipe in which a signal probe or sonde (miniature transmitter) can be inserted.
 - e. All conduit pathways containing non-conductive cables or wires in which a signal probe or sonde (miniature transmitter) can be inserted.
 - f. All plastic and other nonconductive water lines in which a TransOnde Radio detection or other “transmitter” can be applied to create a low frequency pressure wave (signal) without damaging or triggering the existing systems.
 - g. All copper or steel waterlines and plastic or steel gas lines
- 6. All markings made by the Underground Utility Locator Service or other shall be clear and visible.
 - 7. The contractor shall maintain all markings made by Underground Utility Locator Service or other throughout the entire length of the project.
 - 8. The Underground Utility Locator Service shall provide the contractor with two sets of maps showing the location of utilities and average depth. They will be referenced to permanent buildings. Contractor will deliver one copy to the district at no additional charge.
 - 9. Contractor is responsible to contact Underground Service Alert (U.S.A. 800/227-2600) and receive clearance prior to any excavation operations.
 - 10. Contractor shall inform the District’s Construction Manager, Architect, and Owner no later than five (5) days prior to the date scheduled for the utility locator service to be on site.

1.11 PROTECTION

- A. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.
- B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.

- C. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.
- D. Provide shoring, sheeting, sheet piles and or bracing to prevent caving, erosion or gulying of sides of excavation.
- E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The contractor shall make a reasonable effort on a daily basis to keep all excavations and the site free from water during entire progress of work, regardless of cause, source, or nature of water.
- F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.
- G. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance. Dust control measures shall be in accordance with the local jurisdiction.
- H. Trees: Carefully protect existing trees that are to remain. Provide temporary irrigation as necessary to maintain health of trees.

1.12 SEASONAL LIMITS

- A. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by rains, fill operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.
- B. Excessively wet fill material shall be bladed and aerated per section 3.8.B.

1.13 TESTING

- A. General: Refer to Section 01 45 23.
- B. Geotechnical Engineer: Owner is retaining a Geotechnical Engineer to determine compliance of fill with Specifications, and to direct adjustments in fill operations. Costs of Geotechnical Engineer will be borne by Owner; except those costs incurred for re-tests or re-inspection will be paid by Owner and back charged to Contractor.
 - 1. If Contractor elects to process or mine onsite materials for use as Suitable Fill, Aggregate Sub Base, Aggregate Base, Rock, Crushed Rock or sand the cost of all testing of this material shall be paid for by the Contractor.
 - 2. Testing of import fill for compliance with Department of Toxic Substance Control (DTSC) shall be paid for by the Contractor.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Engineered Fill Materials: All fill shall be of approved local materials supplemented by imported fill if necessary. "Approved" local materials are defined as local soils tested and approved by Geotechnical Engineer free from debris, and concentrations of clay and organics; and contain rocks no larger than 3-inches in greatest dimension. The soil and rock should be thoroughly blended so that all rock is surrounded by soil. This may require mixing of the soil and rock with a dozer prior to placement and compaction. Clods, rocks, hard lumps or cobbles exceeding 3-inches in final size shall not be allowed in the upper 24 inches of any fill. Native clay or clayey soils will not be permitted within the upper 24 inches of building pad areas or paved areas.
- B. Imported Engineered Fill Material: Imported fill may be required to complete work. Proposed import fill material shall meet the above requirements; shall be similar to the native soils. Import fill shall meet the above requirements; shall have plasticity index of 15 or less; an Expansion Index of 20 or less; be free of particles greater than 3-inch in largest dimension; be free of contaminants and have corrosion characteristics within the acceptable limits. All import fill material shall be tested and approved by Soils Engineer prior to transportation to the site. Proposed fill material shall comply with DTSC guidelines to include Phase 1 environmental site assessment and related tests. Refer to the October 2001 DTSC Information Advisory for clean imported fill material.
1. DTSC TESTING: Site work contractor is to coordinate testing with an analytical lab, hired by the owner, licensed by the State of California for the DTSC testing. The costs associated with the testing will be paid by the contractor.
 2. DTSC testing shall include documentation as to the previous land use, location, and history. Soils shall be analyzed for all compounds of concern to ensure the imported soil is uncontaminated and acceptable. Testing shall be performed per the recommendations included in DTSC Imported Fill Advisory (http://www.dtsc.ca.gov/Schools/upload/SMP_FS_Cleanfill-Schools.pdf). Soils shall be tested prior to import to the project site.
 3. Lab shall determine geographically which tests and analysis comparison will be appropriate for the testing. (CAM 17 / Title 22); (RWQCB) Regional Water Quality Control Board; or (OEHHA) Office of Environmental Health Hazard Assessment.
 4. Frequency of testing shall be conducted in accordance with DTSC's Imported Fill Advisory as follows:

Fill Material Sampling Schedule

Area of Individual Borrow Area	Sampling Requirements
2 Acres or less	Minimum of 4 samples
2 to 4 Acres	Minimum of 1 sample every 1/2 Acre
4 to 10 Acres	Minimum of 8 Samples
Greater than 10 Acres	Minimum of 8 locations with 4 subsamples per location

Volume of Borrow Area Stockpile

Up to 1,000 Cubic Yards	1 sample per 250 cubic yards
1,000 to 5,000 Cubic Yards	4 samples for the first 1000 cubic Yards + 1 sample per each additional 500 cubic yards
Greater than 5,000 Cubic Yards	12 samples for the first 5,000 cubic yards + 1 sample per each additional 1,000 cubic yards

5. Reports / Documentation: Results of the testing analysis shall be sent to the Owner; Architect; Project Inspector, Project Civil Engineer, DTSC, and DSA. Letter shall reference DSA file and application numbers.

C. Landscape Backfill Material:

1. The top 3" of native topsoil stripped from the site may be used for landscape backfill material provided it meets the requirements as specified in Section 32 90 00.
2. Imported Topsoil may be required to complete work. See Section 32 90 00 for requirements. Proposed Topsoil material shall comply with DTSC guidelines to include Phase 1 environmental site assessment and related tests. Refer to the October 2001 DTSC Information Advisory for clean imported fill material.

- D. Water: Furnish all required water for construction purposes, including compaction and dust control. Water shall be potable.

- E. Aggregate Base: Provide Class 2-3/4" Aggregate Base conforming to standard gradation as specified in Cal Trans Standard Specifications, Section 26-1.02A.

- F. Decomposed Granite: Decomposed Granite shall be well graded mixture of fine to 1/8" particles in size with no clods. The material shall be free of vegetation, other soils, debris and rock. The material shall be reddish-tan to tan in color.

- G. Decomposed Granite Solidifier: PolyPavement or equal.

PART 3 – EXECUTION

3.1 INSPECTION LAYOUT AND PREPARATION

- A. Prior to installation of the work of this Section, carefully inspect and verify by field measurements that installed work of all other trades is complete to the point where this installation may properly commence
- B. Layout all work, establish grades, locate existing underground utilities, set markers and stakes, setup and maintain barricades and protection facilities; all prior to beginning actual earthwork operations. Layout and staking shall be done by a licensed Land Surveyor or Professional Civil Engineer.
- C. Verify that specified items may be installed in accordance with the approved design.
- D. In event of discrepancy, immediately notify Owner and the Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

3.2 PERFORMANCE – GENERAL

- A. General: Do all grading, excavating and cutting necessary to conform finish grade and contours as shown. All cuts shall be made to true surface of subgrade.
- B. Archaeological Artifacts: Should any artifacts of possible historic interest be encountered during earthwork operations, halt all work in area of discovery and immediately contact the Architect for notification of appropriate authorities.
- C. Degree of Compaction: Percentage of maximum density, hereinafter specified as degree of compaction required, means density equivalent to that percentage of maximum dry density determined by ASTM D1557 Compaction Test method, and such expressed percentage thereof will be minimum acceptable compaction for specified work.
- D. Moisture Content: Moisture content shall be as noted below and as called for on the plans. Moisture content shall be maintained until subgrade is covered by surfacing materials.

3.3 DEMOLITION, DISPOSAL AND DISPOSITION OF UNDESIRABLE MAN-MADE FEATURES

- A. All other obstructions, such as abandoned utility lines, septic tanks, concrete foundations, and the like shall be removed from site. Excavations resulting from these removal activities shall be cleaned of all loose materials, dish shaped, and widened as necessary to permit access for compaction equipment. Areas exposed by any required over-excavation should be scarified to a depth of 12", moisture-conditioned to near optimum moisture content, and recompacted to at least 90% of the maximum dry density.

3.4 TESTING AND OBSERVATION

- A. All grading and earthwork operations shall be observed by the Geotechnical Engineer or his representative, serving as the representative of the Owner.
- B. Field compaction tests shall be made by the Geotechnical Engineer or his representative. If moisture content and/or compaction are not satisfactory, Contractor will be required to change equipment or procedure or both, as required to obtain specified moisture or compaction. Notify Geotechnical Engineer at least 48 hours in advance of any filling operation.
- C. Earthwork shall not be performed without the notification or approval of the Geotechnical Engineer or his representative. The Contractor shall notify the Geotechnical Engineer at least two (2) working days prior to commencement of any aspect of the site earthwork.
- D. If the Contractor should fail to meet the compaction or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory, as determined by the Geotechnical Engineer or Architect/Engineer.
- E. After each rain event Geotechnical Engineer shall test fill material for optimum moisture. Do not place any fill material until desired moisture is achieved.

3.5 CLEARING AND GRUBBING

- A. Prior to grading, remove all debris off-site. Remove trees and brush including the root systems. Holes resulting from tree and brush removal should be prepared and backfilled in accordance with paragraphs 3.7, 3.8, 3.9, and 3.10. This may require deepening and/or widening the holes to adequately remove disturbed soil and provide room for compaction equipment. Strip the surface of all organics. Stripping's meeting the requirements of Section 32 90 00 may be used in landscape areas only.

3.6 CUTTING

- A. Do all cutting necessary to bring finish grade to elevations shown on Drawings.
- B. When excavation through roots is necessary, cut roots by hand.
- C. Carefully excavate around existing utilities to avoid unnecessary damage. The contractor shall anticipate and perform hand work near existing utilities as shown on the survey, without additional claims or cost.

3.7 STRUCTURAL EXCAVATION

- A. General: Excavate to bear on firm material at contract depth shown on Structural Drawings.
- B. Footings: All footing excavations shall be of sufficient width for installation of formwork, unless earth will retain its position during concreting. All portions of

footings above grade must be formed. In the event that footings are placed against earth, footing widths below grade shall be increased 2" from those shown on Drawings and positive protection shall be provided for top corners of trench.

- C. Unsuitable Ground: Any errors in structural excavation, soft ground, or clay soils found when excavating shall be reported to Architect. In no case shall work be built on any such soft or clayey unsuitable surface. Restore excavations to proper elevation with engineered fill material compacted to 90% of dry density.

3.8 SUBGRADE PREPARATION

- A. Grade compact and finish all subgrades within a tolerance of 0.10' of grades as indicated on Drawings and so as not to pool water. Subgrade within building pads and concrete walks shall be within 0.05' of grades indicated.
- B. After clearing and grubbing, building pads and areas within five feet of the exterior foundation shall be over excavated to a minimum depth of two feet below existing or finished site grades, whichever is lower to expose undisturbed native materials. The exposed subgrade shall be evaluated by the geotechnical engineer prior to scarification and placement of engineered fill.
- C. After clearing, grubbing, cutting and over excavating, subsurface shall be plowed or scarified to a depth of at least 12", until surface is free from ruts, hummocks or other uneven features and uniform and free from large clods. Moisture condition to at least optimum moisture content and recompact to at least 90% of the maximum dry density as determined by ASTM Test Method D1557. If the existing soils are at a water content higher than specified, the contractor shall provide multiple daily aerations by ripping, blading, and/or disking to dry the soils to a moisture content where the specified degree of compaction can be achieved. After seven consecutive working days of daily aerations, and the moisture content of the soil remains higher than specified, the contractor shall notify the architect. If the existing soils have a moisture content lower than specified, the contractor shall scarify, rip, water and blade existing soil to achieve specified moisture content. The contractor shall make proper allowance in schedule and methods to complete this work.
- D. Subgrade in areas to receive landscaping shall be compacted to 90%.
- E. Where Contractor over-excavates building pads through error, resulting excavation shall be recompact as engineered fill at Contractor's expense.

3.9 PLACING, SPREADING AND COMPACTING FILL MATERIAL IN BUILDING PAD AND PAVEMENT AREAS

- A. Selected fill material shall be placed in layers which, when compacted, shall not exceed 6 inches in compacted thickness. Each layer shall be spread evenly and thoroughly mixed to insure uniformity in moisture content.
- B. Selected fill material shall be moisture-conditioned to specified moisture content. Selected fill material shall be unfrozen. When moisture content of fill material is below that specified, add water until proper moisture content is achieved. When

moisture content is above that specified, aerate by blading or other methods mentioned in 3.8.B until moisture content is satisfactory.

- C. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to a minimum of 90% as determined by the ASTM D1557 Compaction Test. Compact each layer over its entire area until desired density has been obtained.
- D. Recompaction of Fill in Trenches and Compaction of Fill Adjacent to Walls: Where trenches must be excavated, backfill with material excavated. Place in lifts that when compacted do not exceed 6", moisture conditioned to at least optimum moisture content, and compact to a minimum of 90% relative compaction in building pad and paved areas, and to 90% relative compaction in landscape areas.
- E. Jetting of fill materials will not be allowed.

3.10 FINAL SUBGRADE COMPACTION

- A. Building Pads: Upper 36" of all final building pad subgrades (including future buildings) shall be uniformly compacted at specified moisture content to at least 90% of maximum dry density, as determined by ASTM D1557 Compaction Test, regardless of whether final subgrade elevation is attained by filling, excavation, or is left at existing grade. After acceptance of final compaction test, contractor shall maintain the required moisture content of subgrade until concrete flatwork is placed.
- B. Paved Areas: Upper 6" of all final subgrades supporting pavement sections and all other flatwork shall be brought to specified moisture content and shall be uniformly compacted to not less than 95% of maximum dry density, regardless of whether final subgrade elevation is attained by filling, excavation, or is left at existing grade. After acceptance of final compaction test, contractor shall maintain the required moisture content of subgrade until concrete flatwork is placed.
- C. Other Fill and Backfill: Upper 12" of all other final subgrades or finish grades shall be compacted to 90% of maximum dry density.
- D. Gravel Fill: Do not place compacted gravel fill until after underground work and foundations are in place. Compact gravel fill with vibratory plate or similar equipment to preclude settlement.

3.11 PLACING, SPREADING, AND COMPACTION OF LANDSCAPE BACKFILL MATERIALS

- A. All landscaped areas shall receive topsoil. After subgrade under landscape area has been scarified and brought to 90% maximum dry density, top soil shall be placed evenly to depth of 12" at 85% of maximum dry density.
- B. Project Inspector must verify that materials are uniformly spread to minimum depth specified.

3.12 SLOPE CONSTRUCTION

- A. Cut slopes shall be constructed to no steeper than 2:1 (horizontal:vertical). Fill slopes shall be constructed to no steeper than 2:1 (horizontal:vertical).

3.13 FINISH GRADING

- A. At completion of project, site shall be finished graded, as indicated on Drawings. Finish grades shall be “flat graded” to grades shown on the drawing. Mounding of finish grades will not be allowed unless otherwise directed on the landscape drawings. Tolerances for finish grades in drainage swales shall be $\pm 0.05'$. Tie in new and existing finish grades. Leave all landscaped areas in finish condition for lawn seeding. Landscaped planters shall be graded uniformly from edge of planter to inlets. If sod is used for turf areas the finish grade on which it is placed shall be lowered to allow for sod thickness.
- B. All landscape areas shall be left free of rock or foreign material as specified in Section 32 90 00.
- C. All landscape areas shall be approved by Architect prior to any planting.

3.14 SURPLUS MATERIAL

- A. Excavated material not required for grading or backfill shall be removed from site at contractor's expense.

3.15 CLEANING

- A. Refer to Section 01 74 00.
- B. Remove from fill all vegetation, wood, form lumber, casual lumber, and shavings, in contact with ground; buried wood will not be permitted in any fill.

END OF SECTION 31 20 00.

SECTION 32 90 00 – LANDSCAPING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

- A. Scope of Work: Furnish all labor, materials, tools, equipment, and transportation required to perform and complete the following work as specified herein:
 - 1. Soil Preparation and Fertilization
 - 2. Planting
 - 3. Sodding
 - 4. Weed Control
 - 5. Mulch
 - 6. Clean-up
 - 7. Landscape Maintenance Period
 - 8. Guarantee
 - 9. **Contractor shall water all landscaping on campus during construction including, but not limited to, all existing trees, plants, grass, sod, etc., as well as all new trees, plants, grass, sod, etc.**
- B. Work not included in this Section: Landscape elements such as concrete walks, fencing, outdoor lighting, rough grading, and clearing are not a part of this Section unless shown on the landscape Drawings.

1.3 RELATED SECTIONS

- A. Section 01 33 00 – Submittals.
- B. Section 01 77 00 – Contract Closeout and Final Cleaning.
- C. Section 01 78 23 – Operation and Maintenance Data.
- D. Section 01 78 36 – Warranties.
- E. Section 01 78 39 – Record Documents.
- F. Section 31 20 00 – Earthwork.

G. Section 32 80 00 – Sprinkler Irrigation.

1.4 GUARANTEE

- A. The guarantee period for lawn and plant material shall be the duration of the landscape maintenance period, from commencement until final acceptance of the work of this Section. See Division 01 for other applicable guarantee requirements.
- B. During the guarantee period, repair and/or replace plants and lawn not in satisfactory growing condition, as determined by Owner's Representative, without additional cost to Owner. Plants are to be replaced as per "Landscape Maintenance" in Part 3.9 of this Section, using plants of the same kind and size specified in plant list.

1.5 QUALITY CONTROL

- A. Qualifications: Provide proof of five years of continuous experience in landscaping and irrigation of projects of similar size (+/- 20% of the construction cost) and scope for education campuses. Contractor to have a minimum of two projects either completed or in construction in the last five years.
- B. Work Force: Ensure that an experienced foreman is present at all times during installation. Keep the same foreman and workers on the job from commencement to completion.
- C. Reviews: Specifically request reviews of all items listed below in "Inspection Requirements" prior to progressing to the next level of work. The Owner's Representative reserves the right to inspect and reject material, both at place of growth and at site, before and/or after planting, for compliance with requirements for name, variety, size and quality.
- D. Reference Standards: Meet or exceed Federal, State and County laws requiring inspection of all plants and planting materials for plant disease and insect control.
- E. Delivery, Storage, and Handling:
 - 1. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.
 - 2. Bulk Materials:
 - a. Do not dump or store bulk materials near structures, utilities, walkways or pavements, or on existing turf areas or plants.
 - b. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

- c. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

F. Plant Material:

1. Conform to the current edition of Horticultural Standards for quality of Number 1 grade nursery stock as adopted by the American Association of Nurserymen. Conform to sizes specified on plant legend. Select plants which have a natural shape and appearance.
2. Select only plants that are true to name, and tag one of each bundle or lot with the name of the plant in accordance with the standards of practice of the American Association of Nurserymen. In all cases, botanical names shall take precedence over common names.
3. Tag each plant of a patented variety with the variety and identification number, where applicable, as it is delivered to the job site.
4. Select only plants which have been nursery-grown in accordance with good horticultural practices and which have been grown under climatic conditions similar to those in the locality of the project for at least one year.
5. Select only plants which are typical of their species or variety; have normal habits of growth; are sound, healthy, vigorous, well-branched and densely-foliated when in leaf; are free of disease, insect pests, eggs or larvae; and have a healthy and well-developed root system.
6. Select only container stock that has been grown in the containers in which delivered for at least six (6) months, but not over two (2) years. Provide samples to show that there are no root-bound conditions.
7. Do not use plants that are severely pruned or headed-back to meet size requirements.
8. Do not plant container-grown plants that have cracked or broken balls of earth when taken from the container. Remove canned stock carefully from cans after containers have been cut on two sides with tin snips or other approved cutter.
9. Coordinate a time for the Landscape Architect to inspect the plants upon their delivery to the project site.
10. At any time prior to final acceptance, be prepared to replace any plants that are rejected by the Owner's Representative because of physical damage to the plant.
11. Do not remove container-grown stock from containers before time of planting.

12. Be prepared to replace plants which are rejected by the Owner's Representative for the following reasons:
 - a. Trunk bark damage caused by sunburn,
 - b. Trunk bark wounds caused by rubbing stakes or ties,
 - c. Trunk bark damage caused by ties that have girdled the tree,
 - d. Tree head development that is lopsided and not symmetrical in form,
 - e. Tree branches that cross or touch,
 - f. Tree branches with double leaders (unless multi-trunk trees are specified).
 13. Stake shrubs with one-inch by one-inch by eighteen-inch (1"x1"x18") stakes in such manner that the stakes are not visible, and tie to upright position if they lean and/or are not growing in a vertical position.
 14. Furnish quantities necessary to complete the work as shown on the Drawings and, if necessary, make up for any discrepancies in the quantities given in the Plant List at no additional cost to Owner.
- G. Comply with the requirements of Section 01 77 00 – Contract Closeout and Final Cleaning.

1.6 INSPECTION REQUIREMENTS

- A. Landscape Architect reserves the right to examine and reject plant material both at place of growth and at site, before and after planting, for compliance with requirements of name, variety, size, and quality.
- B. Request and hold a pre-construction meeting prior to beginning the work of this Section. Parties required to be in attendance are the Landscape Contractor, Project Inspector, Owner's Representative, and Landscape Architect.
- C. Obtain verification from Project Inspector for the following at the appropriate times during construction and prior to further progression of work in this Section:
 1. Rough grading is to tolerances specified in Section 31 20 00 – Earthwork.
 2. The placement of landscape backfill material is as specified in this Section.
 3. Prior to the commencement of the work specified in this Section, the coverage and operation of the sprinkler irrigation system are as specified in Section 32 80 00 – Irrigation.

4. The soil amendment does not include any metal fragments. (Obtain a letter from the manufacturer stating that the material submitted for use on this project has no metal or foreign objects. Submit this letter as part of the Data Sheet submittal package [see “Submittals and Substitutions” in this Section])
 5. Required Test: For each load of soil amendment delivered to the site, spread at least two cubic yards (2 cy) of material onto a paved surface approximately two inches (2") deep. Pass a magnetic rake over the material in two directions. If any metal is found, test the entire load in the same manner. Perform all testing in the presence of the Project Inspector.
 6. Soil amendments, fertilizer, bark mulch have been delivered to the site by the supplier, the invoices from the supplier indicate the project name and quantities delivered, and the Project Inspector has received copies of all such documents.
 7. Prior to planting, amendments and conditioners have been incorporated as per pre-planting recommendations, and planting areas have been made ready to receive planting.
- D. In case of failure to obtain any verification by the Project Inspector as required above, remove and replace work as necessary to obtain the verification at no additional cost to the Owner.
- E. Beginning of Maintenance Period: Verify all work is complete, then request and hold a meeting to include the Landscape Architect, Project Inspector, Architect and Owner’s Representative for authorization to begin the landscape maintenance period.
- F. End of Maintenance: Verify that all work is complete and acceptable, and that the maintenance has been completed per specifications; and continue to provide landscape maintenance until the Owner’s Representative has accepted the work.

1.7 SUBMITTALS AND SUBSTITUTIONS

- A. See Section 01 33 00 – Submittals for additional requirements.
- B. Plant Material: Within fifteen (15) days after award of contract, locate plant materials required for construction. Ensure that trees and shrubs are contract-grown from a certified nursery. Notify Owner’s Representative of plant material “tied off” for review at selected nursery. If specified material is not obtainable, submit the following to Owner’s Representative: proof of non-availability, proposal for use of equivalent material, photographs of alternative choices of plant material. Include clear, written description of type, size, condition, and general character of plant material.
- C. Data Sheets: Provide product data for each type of landscape material indicated in the Drawings and Specifications.

- D. Samples: Submit samples of the following materials to Landscape Architect for approval:
 - 1. Soil amendment: (3) one-quart zip-locked plastic bags.
 - 2. Bark Mulch: (3) one-quart zip-locked plastic bags.
- E. Provide soils analysis reports prepared by a qualified soils laboratory in compliance with the Soil Testing Requirements under “Soil Testing” in Part 3.2 of this Section.
- F. Prior to planting, submit copies of all trucking or packaging tags for all soil amendment, fertilizer and other additives to Landscape Architect so the quantities can be verified.

1.8 PROTECTION AND CLEAN-UP

- A. Provide protection for persons and property throughout progress of work. Use temporary barricades as required. Proceed with work in such manner as to minimize spread of dust and flying particles and to provide safe working conditions for personnel. Store materials and equipment where directed.
- B. Existing Construction: Execute work in an orderly and careful manner to protect paving, work of other trades, and other improvements.
- C. Existing Utilities: Provide protection for existing utilities within construction area. At no additional cost to Owner, repair any damages to utility lines that occur as a result of this work.
- D. Landscaping: Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods.
- E. Paving: Maintain cleanliness of paving areas and other public areas used by equipment, and immediately remove spillage; remove rubbish, debris, and other material resulting from landscaping work, leaving site in a safe and clean condition.

1.9 PLANTING SCHEDULE / ENVIRONMENTAL REQUIREMENTS

- A. Install, establish, and maintain all lawn areas for a minimum of ninety (90) days prior to date of substantial completion. Coordinate schedule with other work and overall project schedule. Failure to install lawn areas by this date shall result in assessment of liquidated damages.
- B. Proceed with work in an orderly and timely manner to complete installation of landscaping within contract limits.
- C. Planting Season Limits: Do not plant when grounds are wet or temperature is

below 25°F. Do not proceed with any soil preparation and fertilization if all planting cannot be completed within Planting Season Limit.

1.10 LANDSCAPE MAINTENANCE PERIOD REQUIREMENTS

A. Beginning of Landscape Maintenance Period:

1. General: Landscape Maintenance Period does not begin until all work is installed, as determined by Landscape Architect, in writing.
2. Booster Pump: Upon successful completion of testing by the booster pump technician, request that a checklist/certification be completed and signed by the technician. Deliver copies of the certification to both the Owner's Representative and the Landscape Architect prior to the commencement of the landscape maintenance period.
3. Central Control System: Upon successful completion of testing by the technician from Hunter, request that a checklist/certification be completed and signed by the technician. Deliver copies of the certification to both the Owner's Representative and the Landscape Architect prior to the commencement of the landscape maintenance period.
4. On-site Inspection: When all work is complete, request and hold a meeting to include the Landscape Architect, Project Inspector, Architect and Owner's Representative who must together authorize and determine the start date for the landscape maintenance period. Coordinate and give notice of the date and time of the on-site meeting to all parties at least forty-eight (48) hours in advance.
5. Acceptability: In cases where the lawn has reached adequate fullness and germination in some areas but not all, and authorization has not been given to begin the maintenance period, proceed with mowing, trimming, spraying, etc., as necessary prior to the beginning of the maintenance period.

B. Duration of Landscape Maintenance Period:

The Landscape Maintenance Period shall continue for a minimum of ninety (90) calendar days. During this time, continuously maintain all areas involved until final acceptance of the work by the Owner's Representative. See Landscape Maintenance Period procedure in Part 3.09 of this Section.

C. Final Acceptance of the Landscape Maintenance Period:

Request the final inspection forty-eight (48) hours in advance. If items require attention, hold on-site meetings until Landscape Architect can certify, in writing, and in concurrence with the Owner's Representative, the successful completion of the Landscape Maintenance Period.

1.11 RECORD DRAWINGS

- A. Upon completion of work, and as a precedent to final payment, deliver to Owner's Representative one complete set of reproducible originals of Drawings showing work exactly as installed.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Use material in new and perfect condition as specified. Any deviations or substitutions from the Specification and Drawings must first be approved by Owner's Representative in writing prior to use.

2.2 SOIL PREPARATION MATERIALS

- A. Topsoil: Fertile; friable; natural loam surface soil; reasonably free of subsoil, clay lumps, brush, weeds and other litter; and free of roots, stumps, stones/rocks, and other extraneous or toxic matter harmful to plant growth.
- B. Soil Amendment: One-percent nitrogen-impregnated bark product with a ninety-percent (90%) bark base and zero to one-quarter inch (0-1/4") particle size, or approved equivalent. Do not spread until testing requirements have been satisfied.
- C. Fertilizer/Soil Conditioner: Gro-Power Plus or approved equal.
- D. Fertilizer for Trees and Shrubs: Seven-gram Gro-Power Planting Tablets (12-8-8 NPK) or approved equal.
- E. Vitamin B-1: "Superthrive", "Liquinox Start", "Cal-Liquid", or approved equal.

2.3 MISCELLANEOUS LANDSCAPE MATERIALS

- A. Bark Mulch: Untreated, shredded cedar.
- B. Tree-staking System: As indicated on Drawings.
- C. Root Barrier: As indicated on Drawings.

2.4 PLANT MATERIAL

- A. Nursery Plant Stock:
 - 1. As indicated on Drawings. Do not remove container-grown stock from containers until planting time. Plants shall be true to name.
 - 2. Healthy, shapely, well-rooted, not pot-bound, free from insect pests or plant diseases and properly "hardened off" before planting. Replace plants that are not alive or are not in satisfactory growing condition, as determined by the Landscape Architect, without additional cost to Owner. The Landscape Architect may reject plants before and/or after planting.

3. Labeled. Label at least one tree and one shrub of each species with a securely-attached, waterproof tag bearing legible designation of botanical and common name.
- B. Lawn Sod: Eighty percent (80%) Perennial Ryegrass and twenty percent (20%) Kentucky Bluegrass.

PART 3 – EXECUTION

3.1 SITE CONDITIONS

- A. Examine the site, verify grade elevations, and observe conditions under which work is to be performed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Owner's Representative.
- B. Proceed with complete landscape work as rapidly as portions of the site become available, working within seasonal limitations for each kind of landscape work required.
- C. Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand-excavate, as required, to minimize possibility of damage to underground utilities. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.
- D. When conditions detrimental to sod or plant growth are encountered, such as rubble fill, adverse drainage condition, or other obstructions, notify the Owner's Representative before planting.

3.2 SOIL TESTING

- A. Coordinate soil testing in an expeditious and timely manner as required for on-site topsoil materials. Contract with a soil laboratory and include cost of sampling and testing in contract price. Take one (1) sample for every 5,000 square feet of landscape area up to a maximum of six (6) samples under the direction of and in the presence of the Owner's Representative.
- B. Submit each sample, according to the quantity of soil required by testing laboratory, to a competent laboratory approved by the Owner's Representative.
- C. Provide analysis of soil samples for pH, salinity, ammonia, phosphate, potassium, calcium, magnesium, boron, and sodium levels. Provide appraisal of chemical properties, including particle size determination, and recommendations for types and quantities of amendments and fertilizers.

3.3 PREPARATION

- A. Clearing of Vegetation:
 1. If live perennial weeds exist on site at the beginning of work, spray with a non-selective systemic contact herbicide as recommended and applied by an approved licensed landscape pest control advisor and applicator.

Leave sprayed plants intact for at least 15 days.

2. Clear and remove existing weeds by mowing or grubbing off all plant parts at least one-quarter inch (1/4") inch below surface of soil over entire areas to be planted.

B. Soil preparation:

1. Loosen soil in all planting areas, and on slopes flatter than 3:1 gradient, to a depth of six to eight inches (6"- 8") below finish grade. All debris, foreign matter, and stones shall be removed prior to the placing of any fertilizers or conditioners. Soil preparation is for all shrub planting beds, sodded lawn areas.
2. Conduct the required soil tests and instruct the lab to include a minimum of the following soil improvements in the recommendation on the soils report.
 - a. Soil Amendment: Two cubic yards (2 cy) per 1,000 square feet.
 - b. Gro-Power Plus: One hundred fifty pounds (150 lbs) per 1,000 square feet.
 - c. If the lab recommends less than six cubic yards (6 cy) of soil amendment, the excess bid amount shall be applied to the cost of any additional recommended soil improvements, or returned to the Owner as a credit
3. Apply amendments as follows, using rates recommended by the soils testing laboratory (the rates of amendments shown below are for bidding purposes only):
 - a. Fertilizer/Soil Conditioner: Broadcast 150 pounds of Gro Power Plus per 1,000 square feet in all planting areas and rototill to a depth of six to eight inches (6"-8"). Remove from the site any rock and debris brought to the surface by cultivations.
 - b. Apply soil amendment to all planting areas at the rate of six cubic yards (6 cy) per 1,000 sf and rototill into the top six to eight inches (6"- 8").
4. Upon completion of finish grading, request a review and obtain approval of Landscape Architect prior to commencement of planting.

C. Finish Grading for all Planting areas

1. Refer to Earthwork Specification Section for Rough Grading.
2. Grade to elevations and contours shown on Drawings. Fill low spots with landscape backfill material and grade to surface drain in manner indicated on Drawings.

3. Finish-grade so that the entire area within the contract lines has a natural and pleasing appearance as specified and as directed by Landscape Architect.
 4. Adjust sprinkler heads one-half inch above finish grade in preparation to receive sod. Reset sprinkler heads flush to grade after turf has germinated.
 5. Flag the sprinkler heads and valve markers.
- D. Planting Pits for Trees:
1. Excavate pits with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage.
 2. Set container-grown stock in center of pit on earth pedestal. Separate roots and/or prune roots as directed by Landscape Architect. In hot weather, pre-wet pit. Loosen outside roots from sides and bottom of root ball. When set, place additional backfill around base and sides of root ball. Work each layer to settle backfill and eliminate voids and air pockets. Water after placing final layer of backfill.
 3. Loosen hard subsoil in bottom of excavation. Extend excavation as required to insure proper drainage from plant pits.
 4. Fill excavated planting pits with water to half the depth of pit. Pits should drain within four hours (4 hrs). If planting pits do not drain, notify Project Inspector immediately. Do not proceed with planting until Landscape Architect has resolved a method to provide drainage.

3.4 ROOT BARRIER INSTALLATION

- A. Install root barrier where trees are planted within sixty inches (60") of paving or other hardscape elements, such as walls, curbs, and walkways, unless otherwise shown on Drawings.
- B. Align root barrier vertically and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.
- C. Install root barrier continuously for a distance of five feet (5') in each direction from the tree trunk, for a total distance of ten feet (10') per tree. If trees are spaced closer, use a single continuous piece of root barrier.
 1. Position top of root barrier one inch (1") below finish grade.
 2. Do not distort or bend root barrier during construction activities.
 3. Do not install root barrier surrounding the root ball of tree.

3.5 PLANTING

A. Lawn Sod:

1. Cultivate all lawn areas to a depth of six inches (6"). If cultivation does not break lumps, pull a spike-toothed harrow over the area behind the tractor.
2. Give all lawn areas that are to be sodded a smooth finish to prevent pockets. Do not allow any abrupt changes of surface. Prior to installation of sod, roll the grade with a 200-pound water-ballast roller. Request that the lawn grade be inspected and approved by the Landscape Architect prior to sodding to determine its suitability for planting. Obtain such approval prior to commencing sodding operations.
3. Do not take heavy objects (except lawn rollers) over lawn areas after they have been prepared for planting.
4. Completely lay the sod within twelve hours (12 hrs.) of delivery. Do not leave sod on pallets in the hot sun longer than necessary.
5. Unroll sod carefully. Lay sod tight without any visible open joints, and without overlapping; stagger end joints twelve inches (12") minimum. Do not stretch or overlap sod pieces. Do not place sod in pieces smaller than twenty-four inches (24") in length by width of roll.
6. When new sod is to match existing turf, cut the edge of the existing turf in a series of straight lines that will accept new sod rolls in full width of the sod roll. Make the transition of grade between existing turf and new sod to be seamless with no change in elevation.
7. Immediately after laying sod, roll lawn areas with a 200-pound water-ballast roller.
8. Trim sod to conform to lawn shapes designated in Drawings.
9. On slopes of six inches (6") per foot and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at a maximum of two feet (2') on center. Drive pegs flush with soil portion of sod.
10. Ensure that finished appearance is that of one continuous lawn.
11. Do not lay whole lawn before watering. When a conveniently large area has been sodded, water lightly to prevent drying. Continue to lay sod and to water until installation is complete.
12. All sod areas must be approved by Landscape Architect.
13. Water the complete lawn surface thoroughly. Moisten soil at least eight inches (8") deep. Repeat sprinkling at regular intervals to keep sod moist

at all times until rooted. After sod is established, decrease frequency and increase amount of water per application as necessary.

B. Trees:

1. Lay out individual tree and shrub locations and areas for multiple plantings. Stake the locations, outline the areas, and secure the Owner's Representative's acceptance before beginning the planting work. Make minor adjustments as requested.
2. Scarify root ball prior to planting. Plant in holes twice the diameter of the root ball and to a depth equal to the container's height. Place the shrub and/or groundcover so the top of the root ball is one inch (1") higher than the surrounding grade; place the tree so that the crown of the trunk is two inches (2") higher than the surrounding grade. Set container-grown stock in center of pit. In hot weather, pre-wet the pit. When set, place additional backfill around base and sides of root ball. Work each layer to settle backfill and eliminate voids and air pockets. Thoroughly compact lower half of backfill in plant pit. See staking or guying detail. Water after planting. Provide a berm or watering basin for each tree. Add Vitamin B-1, in the proper solution as recommended by the manufacturer, to the second watering of the basin.
3. Place fertilizer planting tablets in root zone and alongside each plant. Follow manufacturer's instructions for number of tablets to use for each container size.
4. See Drawings for additional information.
5. Grooming and Staking of Trees:
 - a. Prune, thin-out and shape trees in accordance with standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed by Landscape Architect, do not cut tree leaders, and remove only injured or dead branches from flowering trees.
 - b. Paint cuts over one-half inch ($\frac{1}{2}$ ") in size with standard tree paint or compound, covering exposed, living tissue. Use paint that is waterproof, antiseptic, adhesive, elastic and free of kerosene, coal tar, creosote, and other substances harmful to plants. Do not use shellac.
 - c. Stake or guy trees immediately after planting, as indicated on Drawings.

- C. Request review by the Landscape Architect after locating, but prior to planting all trees. Under the direction of the Landscape Architect, make slight adjustments to plant material location as necessary to reflect original intention of Drawings.

3.6 WEED CONTROL

- A. Apply pre-emergent weed control to all planting areas (except lawn) after completion of all planting and one complete watering. Follow manufacturer's directions. To prevent washing away of weed control, do not over-water after its application. Do not allow any weed control into lawn areas. Treat any existing noxious weeds, such as Johnson grass, with Roundup in successive treatments until all roots are destroyed, then remove all grass and roots. Notify Owner's Representative of time of installation for verification of application.

3.7 BARK MULCH

- A. Apply mulch at the rate of two inches (2") deep to all planting areas, exclusive of lawn, after the planting and weed control are completed. Twelve inches (12") from planter edges, taper full depth of mulch to meet adjacent grades. Do not place mulch within three inches (3") of trunk or stems.

3.8 CLEAN-UP

- A. During construction, keep the site free of rubbish and debris, and clean up the site promptly when notified to do so. Take care to prevent spillage on streets from hauling and immediately clean up any such spillage and/or debris deposited on streets due to the work of this Section.
- B. During all phases of the construction work, take all precautions to abate dust nuisance by clean-up, sweeping, sprinkling with water, or other means as necessary.

3.9 LANDSCAPE MAINTENANCE

- A. The Landscape Maintenance Period will begin when all the Landscape Maintenance Period Requirements have been met (See Part 1 of these Specifications).
- B. Cleaning: Maintain cleanliness on paving areas and other public areas used by equipment and immediately remove all spillage. Remove from project site all rubbish and debris found thereon and all material and debris resulting from landscaping work, leaving the site in a safe and clean condition.
- C. Maintenance:
 - 1. Sprinkler Irrigation System:
 - a. Check system weekly for proper operation. Flush lateral lines out after removing last sprinkler head or two at each end of lateral. Adjust all heads as necessary for unimpeded coverage.
 - b. Set and program automatic controllers for seasonal water requirements. Provide the Owner's Representative with keys to the controllers and instructions on how to turn off system in case of emergency.

- c. Repair all damages to sprinkler irrigation system as part of the contract work. Make repairs within one watering period or one week, whichever is the least amount of time.

2. Turf Areas:

- a. Begin mowing turf when grass has reached a height of three inches (3") and cut to a height of one and one-half inches to two inches (1 ½"- 2"). Mow at least weekly after the first cut. Turf must be well-established and free of bare spots and weeds, to satisfaction of Landscape Architect, prior to final acceptance. Do not mow lawns when the soil is not able to support maintenance equipment. Repair wheel marks and ruts caused by the maintenance equipment at no additional cost to the Owner.
- b. Pick up grass clippings and remove from the site and premises.
- c. Trim edges at least twice monthly for neat appearance. Vacuum or blow clippings off walks.
- d. Water the lawns at such frequency as weather conditions require to replenish soil moisture below the root zone. Normally, a total of one and one-half inches (1 ½") of water is needed weekly in hot weather.
- e. Fertilize the lawn areas at the beginning of the Landscape Maintenance Period and at the completion of the Landscape Maintenance Period. Use a fertilizer with the following characteristics:
 - 1.) Slow release, Best 16-6-8, or approved equal, at the rate of 6.25 lbs per 1,000 square feet from March through October.
 - 2.) Calcium Nitrate (15-0-0) at the rate of 6.5 lbs per 1,000 square feet from November through February.
- f. Broadcast fertilizer using a mechanical spreader; do not apply by hand-broadcasting. Sweep all fertilizer off hardscape into adjacent planters.
- g. Weekly as needed and as directed, re-sod lawn areas with material that matches previously installed material. Use sod to repair any bare areas. Repair areas to receive sod as follows:
 - 1.) Mark out areas to receive new sod repair.
 - 2.) Cut straight lines that will accept sod the full width of the roll and a minimum of twenty-four inches (24") in length.

- 3.) Transition the grade between existing turf and new sod seamlessly, with no change in elevation.
3. Trees and Shrubs:
 - a. Water enough that moisture penetrates throughout root zone and only as frequently as necessary to maintain healthy growth.
 - b. Construct and/or remove water basins around each plant, depending on the time of the year and as directed.
 - c. Do not prune unless directed by the Landscape Architect.
 - d. Re-stake and re-tie trees as needed and as directed by the Landscape Architect. Do not allow tops of tree stakes to protrude into head of tree.
 - e. Replace any dead, dying or vandalized plant material on a weekly basis throughout the Landscape Maintenance Period.
 4. Insecticide and Herbicide Application:
 - a. If needed, control weeds with selective herbicides and sprays. In areas where crabgrass has infested the lawn, apply pre-emergent herbicides such as Dacthal by Amvac, Balan, or Betasan by Gowan for control prior to crabgrass germination. Control insect pests if necessary.
 - b. Use only a licensed Pest Control Operator to apply herbicides and sprays and to maintain a log for applications indicating material, timing, and rate.
 5. Pre-scheduled On-site Meetings: Hold regularly-scheduled (monthly or bimonthly as determined by the Landscape Architect) on-site meetings with the Landscape Architect, Project Inspector and Owner's Representative. Dates and times will be jointly agreed upon.
 6. Request, forty-eight hours (48 hrs.) in advance, on-site visits by the Landscape Architect to determine the end of the Landscape Maintenance Period.

END OF SECTION 32 90 00.

SECTION 33 40 00 – STORM DRAINAGE

PART 1 – GENERAL

1.1 SECTION INCLUDES

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

1.2 REFERENCES

- A. 2016 California Building Code, with Amendments.
- B. ASTM C33 – Specification for Cement Aggregates.
- C. ASTM C858 – Specifications for Underground Precast Concrete Utility Structures.
- D. ASTM D2564 – Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
- E. ASTM D2855 – Practice for making Solvent - Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
- F. ASTM D2321 – Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications.
- G. ASTM D3034 – Type PSM (Poly (VinylChloride) (PVC) Sewer Pipe and Fittings.

1.3 REGULATORY REQUIREMENTS

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

1.4 SUBMITTALS

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

1.5 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01 77 00.
- B. Accurately record location of pipe runs, connections, catch basins, manholes, cleanouts. and invert elevations.

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

PART 2 – PRODUCTS

2.1 STORM DRAINAGE PIPE MATERIALS

- A. Polyvinylchloride Pipe (PVC): ASTM D3034; SDR 35 minimum wall thickness; bell and spigot style; solvent cement joints conforming to ASTM D2564.
- B. Plastic Pipe: ASTM D2751, SDR 35, acrylonitrile-butadiene-styrene (ABS) material; bell and spigot style solvent sealed end joints.
- C. Plastic Pipe: High-density Polyethylene Pipe (HDPE) and Fittings (up to and including 36 inches shall conform to the specifications of ASTM D3350 minimum cell classifications 335420C; or ASTM D1248 Type III, Class C, Category 4, Grade P33.
 - 1. All joints shall be bell and spigot meeting AASHTO M294 and MP6-95. The bell and gaskets shall be made of polyisoprene meeting the requirements of ASTM F477 with according to ASTM D1149 after 72 hour exposure to 50 PPHM ozone at 104 Fahrenheit.
 - 2. Fittings shall conform to AASHTO M294 and MP6-95. Fabricated fittings shall be welded on the interior and exterior at all junctions. Pipe deflection shall conform to the manufacturer's recommendations. At any location where the deflection is determined to be excessive, the Owner may require the Contractor to remove, re-bed, and if required, replace the pipe.
 - 3. Installation shall be in accordance with ASTM D2321 and in conformance with the manufacturer's requirements. Connections to manholes, drop inlets or other concrete structures shall be watertight. The openings around the pipe shall be sealed with a stiff mix of concrete mortar thoroughly compacted. The mortar shall be composed on one part Type II Portland Cement and three parts clean sand.

2.2 PIPE ACCESSORIES

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

2.3 PIPE IDENTIFICATION

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

2.4 CATCH BASINS

- A. As indicated on drawings.

2.5 MANHOLES AND CLEANOUTS

- A. Lid and Frame: Cast iron construction, removable lid, closed checkerboard grill lid design; nominal lid and frame diameter as indicated.
- B. Shaft Construction and Concentric Cone Top Section: Reinforced cast-in-place concrete pipe sections, lipped male/female joints; cast steel ladder rungs into shaft sections at 12 inches; nominal shaft diameter as indicated.
- C. Base Pad: Cast-in-place concrete of type specified in Section 03 30 00; leveled top surface to receive concrete shaft sections, sleeved to receive sewer pipe sections.

2.6 FILL MATERIAL

- A. Bedding and Initial Backfill: Type specified in Earthwork section.

PART 3 – EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 INSTALLATION – PIPE

- A. Extend storm sewerage piping to connect to building storm drain, of sizes and in locations indicated.
- B. Include storm sewerage system piping and appurtenances from a point 5 feet 0 inches outside building foundation to point of disposal.
- C. Solvent cement PVC pipe and fittings in accordance with ASTM D2855 and install piping in accordance with ASTM D2321.
- D. Place pipe on minimum 6 inch deep bedding.

- E. Install warning tape during back-filling of trench for underground storm drain piping. Locate 8 inches below finished grade directly over piping.
- F. Lay pipe to slope gradients noted with maximum variation from true slope of 1/8 inch in 10 feet.
- G. Install initial backfill at sides and over top of pipe. Provide top cover to minimum compacted thickness of 6 inches.
- H. Place finish backfill in maximum 6 inch lifts, consolidating each lift.
- I. Increase compaction of each successive lift. Refer to Section 31 20 00 for compaction requirements. Do not displace or damage pipe when compacting.
- J. Connect to municipal drainage system.

3.4 INSTALLATION – CATCH BASINS AND MANHOLES

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

3.5 INSTALLATION – CLEANOUTS

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

3.6 FIELD QUALITY CONTROL

- A. Field inspection will be performed under provisions of Section 01 45 23.
- B. Clear interior of piping and structures of dirt and other debris as work progresses.

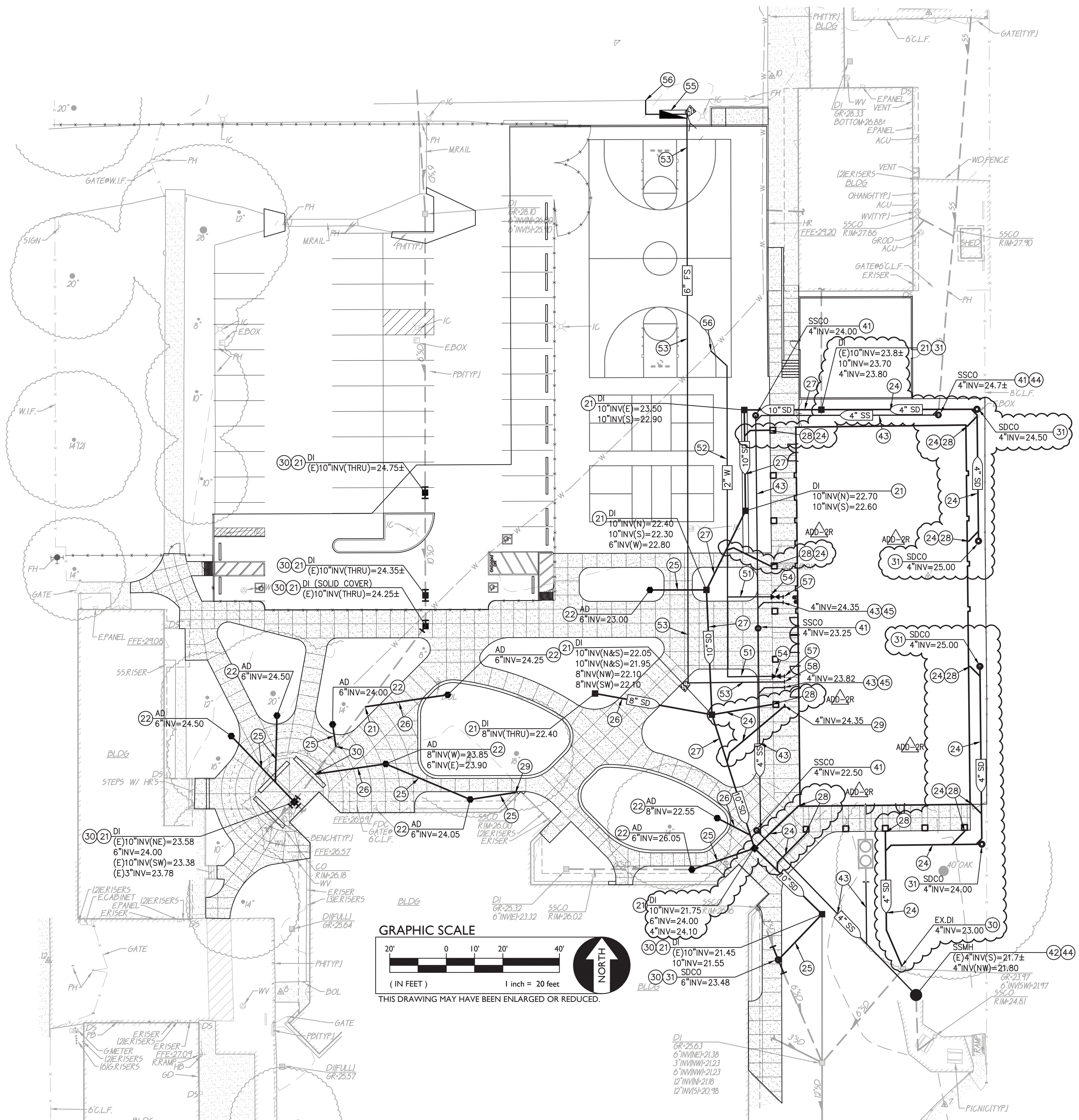
3.7 PIPELINE FLUSHING

- A. Flush newly constructed storm drain piping with water.
- B. Collect and remove any rock, debris and silt using a metal screen during flushing procedure.

3.8 PROTECTION

- A. Protect finished installation under provisions of Section 01 62 00.
- B. Protect pipe from damage or displacement until backfilling operation is in progress.

END OF SECTION 33 40 00.



○ DRAINAGE NOTES

- 21. CONSTRUCT DROP INLET PER 3
C6.1
- 22. CONSTRUCT AREA DRAIN TYPE 1 PER 4
C6.1
- 23. CONSTRUCT AREA DRAIN TYPE 2 PER 5
C6.1
- 24. PLACE 4" STORM DRAIN, SLOPE VARIES, 0.02 MIN.
- 25. PLACE 6" STORM DRAIN, SLOPE VARIES, 0.01 MIN.
- 26. PLACE 8" STORM DRAIN, SLOPE VARIES, 0.005 MIN.
- 27. PLACE 10" STORM DRAIN, SLOPE VARIES, 0.005 MIN.
- 28. PROVIDE DOWNSPOUT CONNECTION. COORDINATE THE LAYOUT AND EXACT LOCATIONS WITH THE ARCHITECTURAL DRAWINGS. COORDINATE INVERT ELEVATION WITH THE SITE PLUMBING CONTRACTOR AND DETAIL PROVIDED PRIOR TO EXCAVATION.
- 29. CONNECT TO RAINWATER LEADER. COORDINATE THE LAYOUT AND EXACT LOCATIONS WITH THE PLUMBING DRAWINGS. COORDINATE INVERT ELEVATION WITH THE SITE PLUMBING CONTRACTOR PRIOR TO EXCAVATION.
- 30. CONNECT TO EXISTING STORM DRAIN. POT HOLE TO VERIFY DEPTH AND LOCATION PRIOR TO TRENCHING. PROVIDE NECESSARY FITTINGS TO MAKE CONNECTION.
- 31. CONSTRUCT STORM DRAIN CLEANOUT PER 8
C6.1

○ SANITARY SEWER NOTES

- 41. CONSTRUCT SEWER CLEANOUT PER 8
C6.1
- 42. CONSTRUCT SANITARY SEWER MANHOLE PER 7
C6.1
- 43. PLACE 4" SEWER, SLOPE VARIES, 0.020 MIN.
- 44. CONNECT TO EXISTING SEWER STUB. POT HOLE AND FIELD VERIFY DEPTH AND CONDITION OF EXISTING STUB PRIOR TO ANY ON SITE TRENCHING. IF CONFLICT IS DISCOVERED NOTIFY ARCHITECT BEFORE PROCEEDING.
- 45. FOR CONTINUATION REFER TO PLUMBING PLANS. COORDINATE DEPTH AND LOCATION PRIOR TO TRENCHING.

○ WATER NOTES

- 51. PLACE 3/4" WATER LINE PER 9
C6.1
- 52. PLACE 2" WATER LINE PER 12
C6.1
- 53. PLACE 6" PVC C900 CL 200 WATER LINE PER 9
C6.1
- 54. PROVIDE GATE VALVE SIZE TO MATCH LINE SIZE.
- 55. PLACE AIMES MODEL 3000SS 6" DOUBLE CHECK VALVE ASSEMBLY WITH FIRE DEPARTMENT CONNECTION PER CITY OF SACRAMENTO STANDARD DRAWING W-510, SEE SHEET C6.2.
- 56. CONNECT TO EXISTING WATER LINE. CONTRACTOR TO OBTAIN AN ENCROACHMENT PERMIT FROM THE CITY OF SACRAMENTO. POT HOLE TO VERIFY DEPTH AND LOCATION PRIOR TO ANY TRENCHING. IF CONFLICT IS DISCOVERED NOTIFY ARCHITECT.
- 57. CONNECT TO BUILDING WATER SERVICE. COORDINATE DEPTH AND LOCATION OF CONNECTION WITH PLUMBING PLANS PRIOR TO TRENCHING.
- 58. CONNECT TO BUILDING FIRE SERVICE. COORDINATE DEPTH AND LOCATION OF CONNECTION WITH PLUMBING PLANS PRIOR TO TRENCHING.



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ARCHITECT: CONSULTANT:



CONSULTANT: 7/11/2016



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PROJECT NAME:

AMERICAN LEGION HIGH SCHOOL

3801 BROADWAY
SACRAMENTO, CA 95817

CORE ACADEMIC AND CAMPUS RENOVATION

SACRAMENTO CITY UNIFIED SCHOOL DISTRICT

SACRAMENTO COUNTY

KEY PLAN:

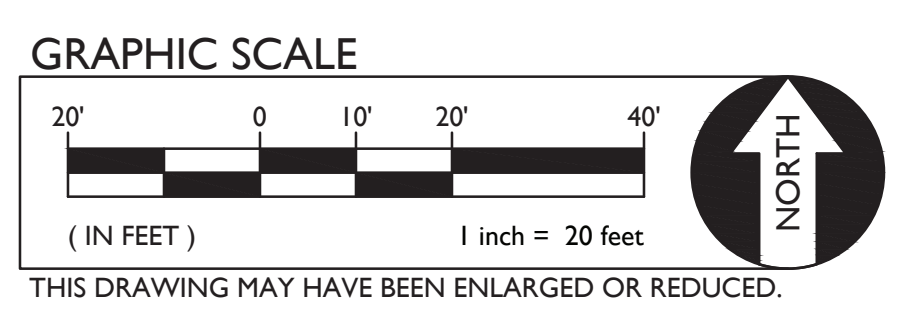
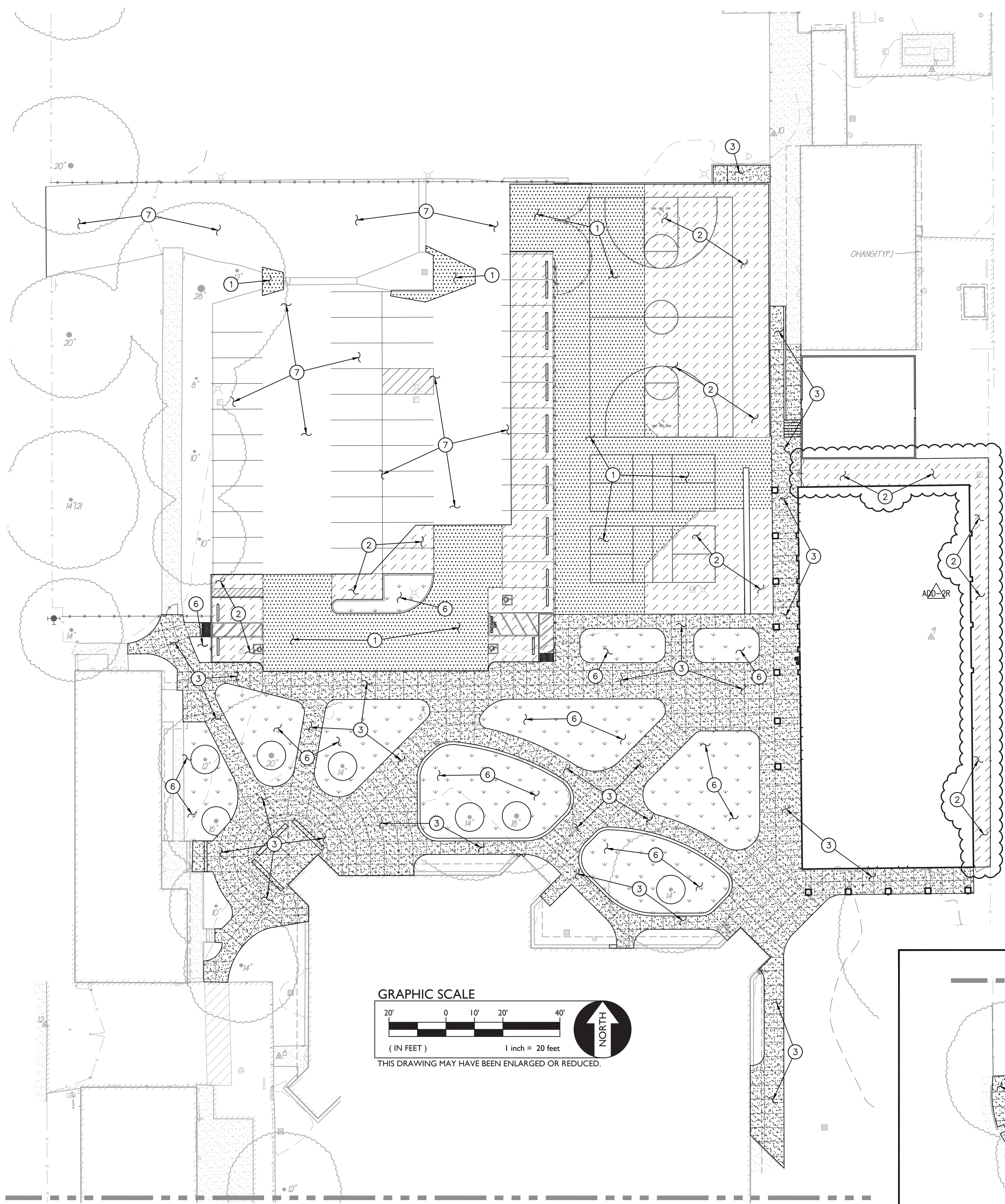


UTILITY PLAN

JOB NUMBER: SHEET NUMBER:

DATE: 28 SEPTEMBER 2017
REVISION: ADD-2R C3.1

FILENAME: \\17-084\CIVIL\DWG\17-084-C4.1.DWG

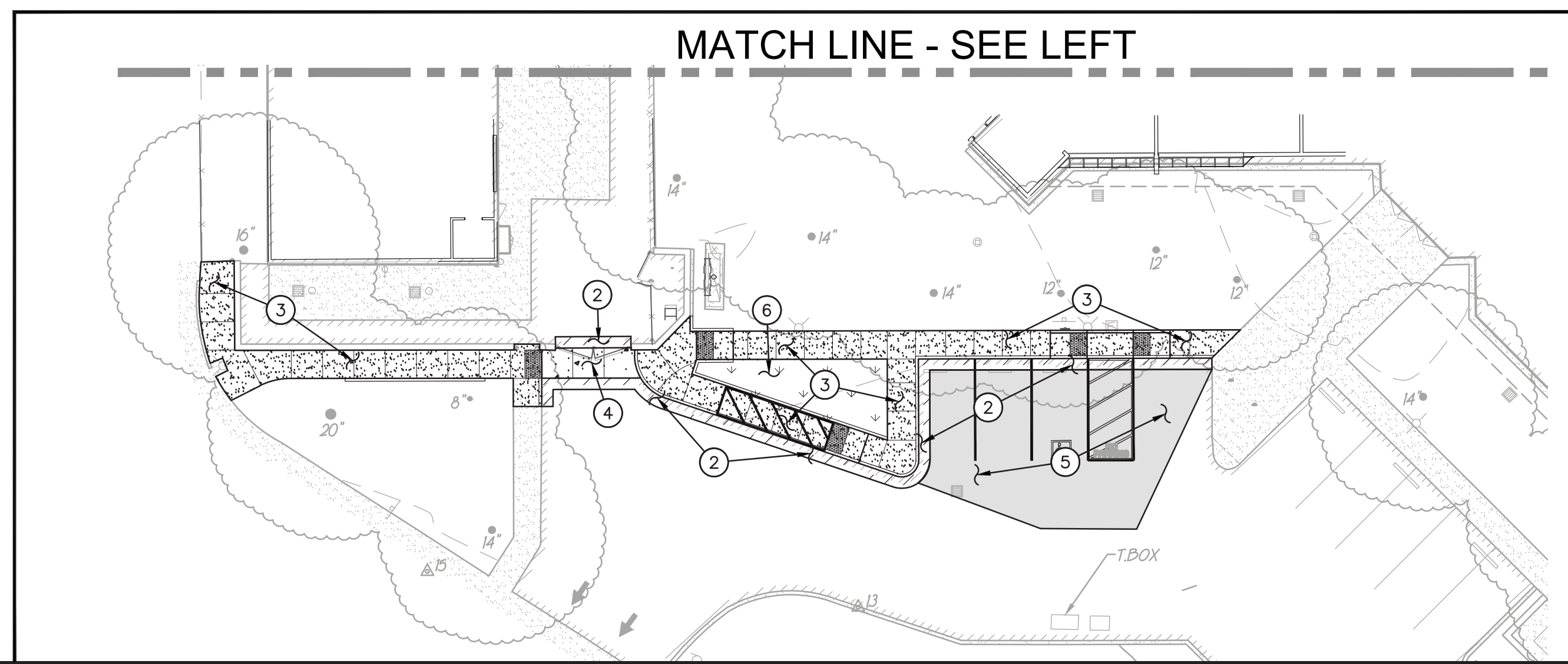


PAVING GENERAL NOTES:

1. PAVEMENT SUBGRADE PREPARATION, I.E. SCARIFICATION, MOISTURE CONDITIONING, AND COMPACTION SHALL BE PERFORMED AFTER;
 - A. POT HOLE ALL EXISTING UTILITIES.
 - B. THE INSTALLATION OF UNDERGROUND UTILITIES AND TRENCHES BACKFILLED IN ACCORDANCE WITH THESE PLANS.
2. ALL AREAS DISTURBED BY GRADING, DEMOLITION, OR CONSTRUCTION ACCESS, WHICH ARE NOT SURFACED BY THIS SET OF PLANS, OR LANDSCAPE PLANS, SHALL BE REVEGETATED WITH HYDROSEED.
3. REFER TO GRADING PLANS FOR CURBS, CURB GUTTERS, VALLEY GUTTERS, AND OTHER CONCRETE STRUCTURES AND PAVING FEATURES NOT SPECIFICALLY NOTED ON THIS PLAN.
4. ADJUST TO FINISH GRADE ALL BOXES, FRAMES, COVERS SLEEVES, POST HOLES, GRATES, ETC. FOUND IN NEW ASPHALT OR CONCRETE PAVING AREAS, WHICH ARE NOT NOTED FOR REMOVAL. CLEAN/OR REPLACE AS NECESSARY TO ENSURE PROPER SEATING. NOTE, BOXES/COVERS AT UTILITIES LOCATED IN PARKING LOT OR DRIVE AISLE SHALL BE SET 1/2" BELOW FINISH HARDSCAPE GRADE.

PAVING LEGEND

- 1 TYPE 1 PAVING
PLACE 3" AC OVER 8" AB ON SUBGRADE COMPACTED PER SPECIFICATIONS.
- 2 TYPE 2 PAVING
PLACE 2.5" AC OVER 4" AB ON SUBGRADE COMPACTED PER SPECIFICATIONS.
- 3 TYPE 3 PAVING
PLACE 6" PCC OVER 4" AB ON SUBGRADE COMPACTED PER SPECIFICATIONS. PLACE #3 REBAR AT 24" O.C.E.W.
- 4 TYPE 4 PAVING
PLACE 6" PCC OVER 6" AB ON SUBGRADE COMPACTED PER SPECIFICATIONS. PLACE #4 REBAR AT 18" O.C.E.W.
- 5 TYPE 5 PAVING
PROVIDE MIN. 1.5" AC OVERLAY. MATCH FINISH GRADE SHOWN ON GRADING PLAN.
- 6 TYPE 6 - TOP SOIL
PLACE 6" TOP SOIL, TO ACHIEVE FINISH GRADES AS SHOWN ON GRADING PLAN FOR ALL AREAS TO RECEIVE PLANTING, AS SHOWN ON GRADING PLANS. SUBGRADE TO BE GRADED TO PROVIDE SLOPE AND SMOOTH LINES CONSISTENT WITH FINISH GRADES TO ALLOW FOR UNIFORM THICKNESS OF TOP SOIL.
- 7 TYPE 7 - SEAL COAT
CLEAN CRACKS, APPLY WEED KILLER IN CRACKS AND FILL. APPLY 2 COATS OF SEAL COAT PER SPECIFICATIONS.



CALIFORNIA DESIGN WEST ARCHITECTS INC.

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ARCHITECT: CONSULTANT:

CONSULTANT: 7/17/2016

PROJECT NAME:
AMERICAN LEGION HIGH SCHOOL

3801 BROADWAY
SACRAMENTO, CA 95817

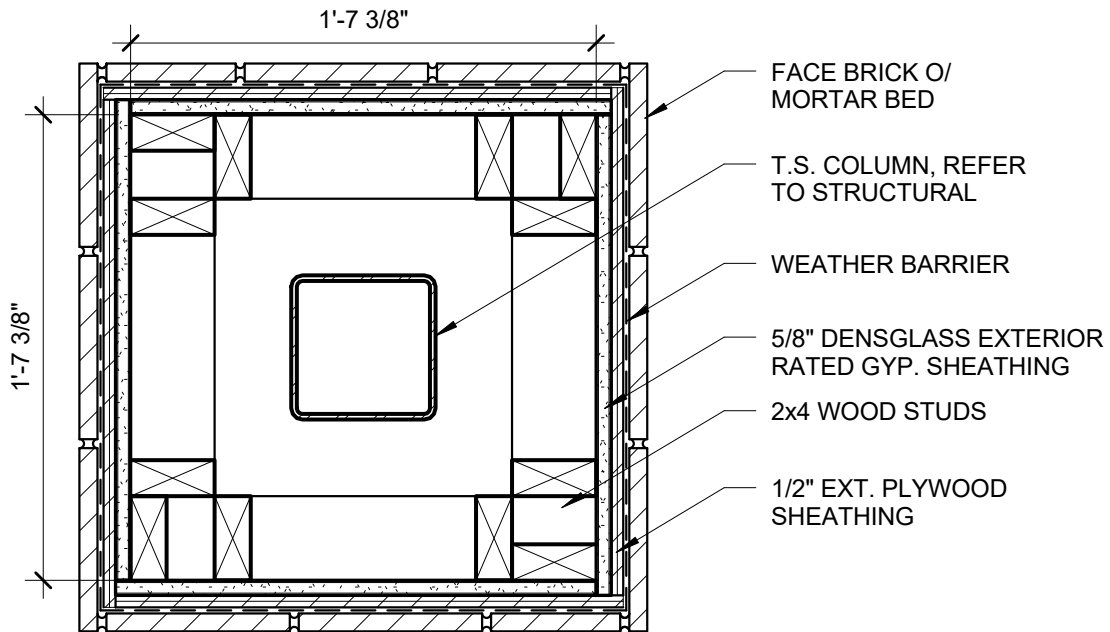
CORE ACADEMIC AND CAMPUS RENOVATION
SACRAMENTO CITY UNIFIED SCHOOL DISTRICT

SACRAMENTO COUNTY

KEY PLAN:

SHEET TITLE:
PAVING PLAN

JOB NUMBER: SHEET NUMBER:
DATE: 28 SEPTEMBER 2017
REVISION: ADD-2R
C4.1



NOTE:
SIMILAR TO WALL TYPE 1A, WALLS AROUND
COLUMN TO BE 1-HR RATED ASSEMBLY AS PER
2016 CBC TABLE 721.1(2), ITEM # 15-1.3 OR UL DES
NUMBER U356 (REFER TO WALL TAGS AND CODE
PLAN)

C3

FIRE-RATED COLUMN DETAIL

1 1/2" = 1'-0"

DESIGN
California
WEST

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SACRAMENTO CITY UNIFIED SCHOOL DISTRICT
**CORE ACADEMIC AND CAMPUS
RENOVATION**

DSA FILE NO: **34-H7**

DSA APPL. NO: 02-116158

OPSC APPL. NO:

UNIT: SHT. OF SHTS.

JOB NO. DATE:
JULY 11, 2018

DRAWN BY DRAWING NO:

NE

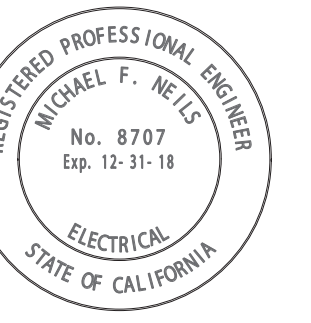
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**ADD-2R
C3/A-542**

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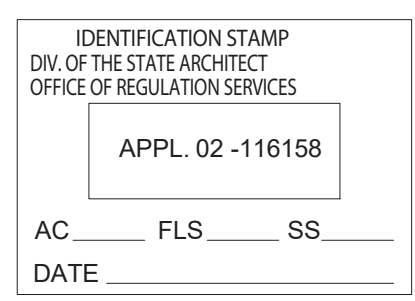
CONSULTANT:

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PROJECT #: 17165.21

PROJECT NAME:

**American Legion
High School Core
Academic and
Campus
Renovation**

CA DESIGN WEST
ARCHITECTS

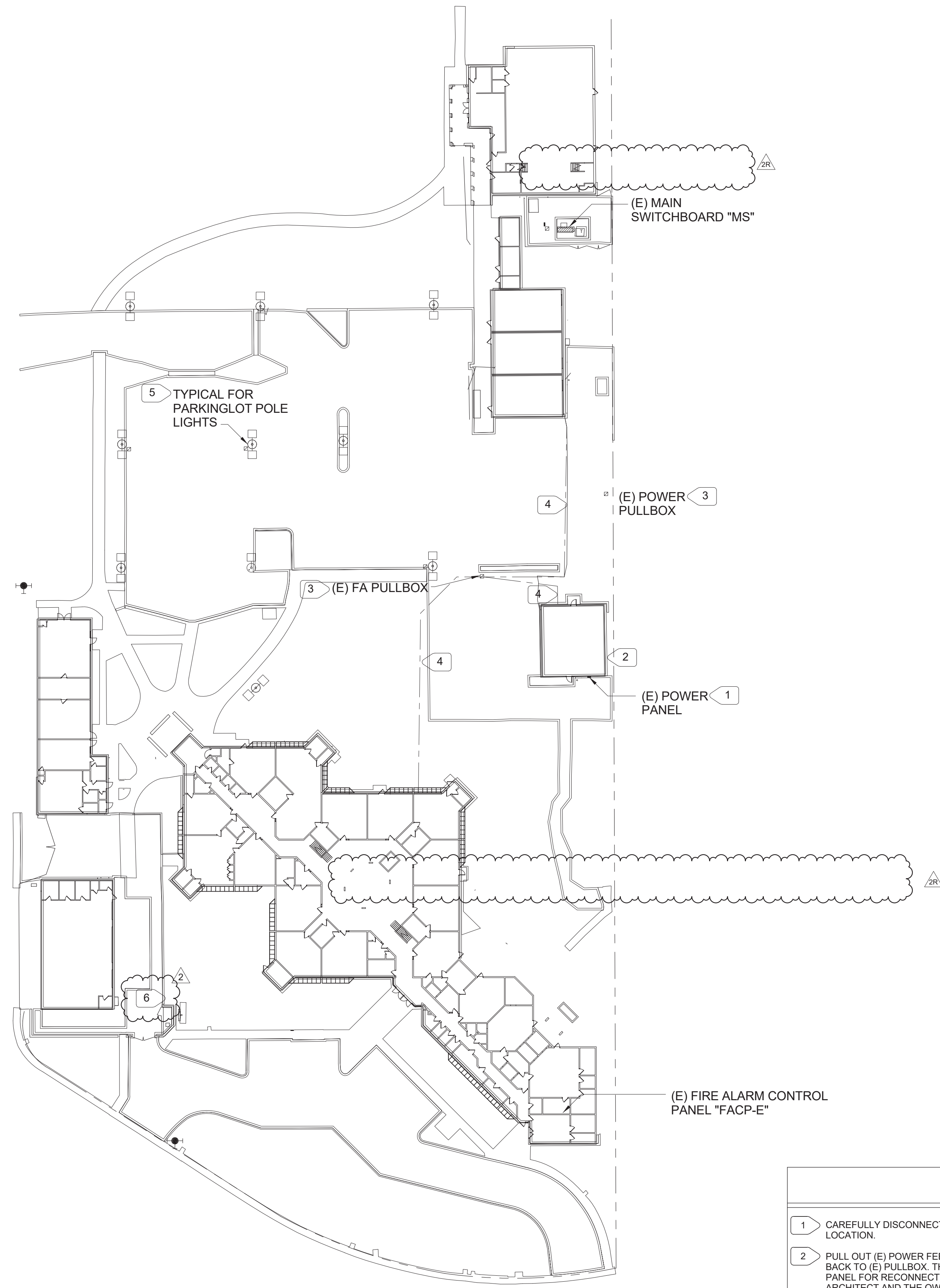


KEY PLAN:



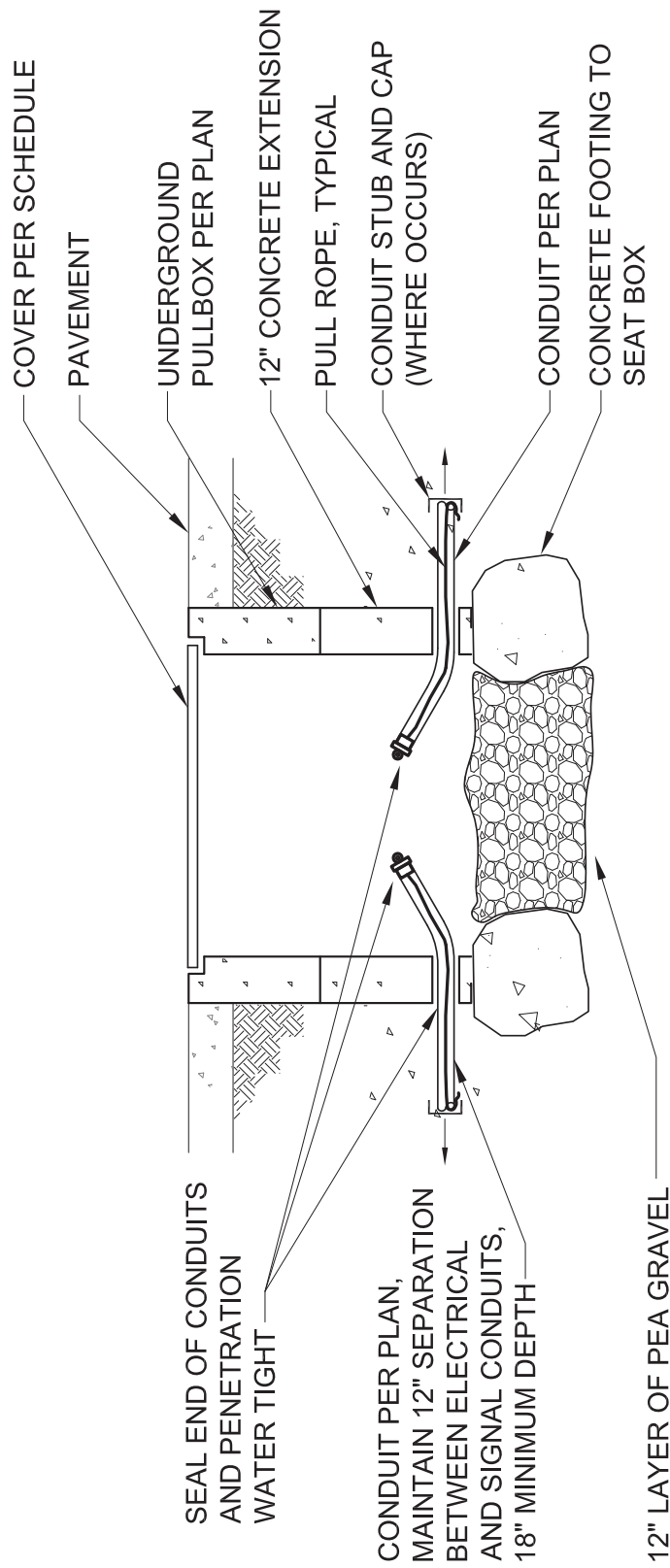
SHEET TITLE:
**SITE PLAN -
DEMOLITION**

JOB NUMBER: 17165.21	SHEET NUMBER: ADD-2R E100
DATE:	
REVISION: 2R ADD-2R	



- NUMBERED NOTES**
- 1 CAREFULLY DISCONNECT PANEL AND LOW VOLTAGE FEEDER AND PREPARE TO RECONNECT AT DIFFERENT LOCATION.
 - 2 PULL OUT (E) POWER FEEDER BACK TO (E) PULLBOX. COIL WIRING, PROTECT FOR REUSE. REMOVE CONDUIT BACK TO (E) PULLBOX. THERE IS EXISTING INTRUSION ALARM CONTROL PANEL IN THE BUILDING. PROTECT THE PANEL FOR RECONNECTION. THE CONTRACTOR SHALL COORDINATE INTRUSION ALARM DOWN TIME WITH THE ARCHITECT AND THE OWNER. ANY COST ASSOCIATED WITH INTRUSION ALARM SHALL BE INCLUDED IN THE CONTRACT.
 - 3 PROTECT (E) PULLBOX.
 - 4 (E) FA SIGNAL CONDITS/CONDUCTORS. REMOVE PORTION UNDER (N) BUILDING. PREPARE TO REROUTE AS SHOWN ON SITE PLAN - ELECTRICAL.
 - 5 PREPARE TO REPLACE (E) LIGHT HEADS AS SHOWN ON SITE PLAN - ELECTRICAL. PROTECT CONDUITS/CONDUCTORS BETWEEN POLE LIGHTS.
 - 6 (E) IRRIGATION EQUIPMENT. DISCONNECT, REMOVE WIRING BACK TO SOURCE. COORDINATE WITH LANDSCAPE CONTRACTOR.

1 SITE PLAN - DEMOLITION
E100 1" = 40'-0"



6 UNDERGROUND PULL BOX DETAIL

E500 NO SCALE



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DSA FILE NO: 34-H7
 DSA APPL. NO: 02-116158
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