Well Pump Project
Equipping Replacement Well #4

Bid No. B14-05

***Specifications***

Bid RFI Questions Due:
Monday, March 17th, 2014 8:00PAM
Gale Stevens, Buyer
gasteven@cabrillo.edu

Bid Documents:  Gale Stevens, Buyer  831-477-5613
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Engineering Consultant:  Michael J. Freitas, Freitas + Freitas Engineering
And Planning Consultants, Inc.
SPECIFICATIONS
for
Equipping Replacement Well #4
Cabrillo College
February 2014

Existing Well #4
Cabrillo College

Prepared By:

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DIVISION 2 – SPECIAL PROVISIONS

SECTION 2-01 PROJECT DESCRIPTION
The work to be performed under this contract consists of construction of clearing, grubbing, demolition, piping, underground piping, site grading, installation of a submersible vertical turbine pump station including electrical, control, telemetry and appurtenances all work to the satisfaction of the College as shown on the drawings in complete working condition.

SECTION 2-02 REQUIRED PERMITS
The Contractor shall obtain and pay for all required permits.

SECTION 2-03 PERSONNEL AND EQUIPMENT
The Contractor shall have a valid Contractor's license from the State of California. The Contractor shall perform this work in a safe manner and shall comply with Health Department regulations and the requirements of the Industrial Safety Orders of the State of California.

The Contractor shall furnish all labor, material, tools, supplies, power, equipment, permits, licenses, and services required.

SECTION 2-04 CONTRACTOR'S UTILITIES
The Cabrillo General Conditions (Section 4.3.4) require that the Contractor shall furnish and install all necessary or appropriate temporary distribution of utilities at the site as necessary for the work, including utilities furnished by the District.

Electrical Power: The Contractor shall provide any construction power used at the site. The Contractor shall make all arrangements for power takeoff points, voltage and phasing requirements, transformers, and metering and shall pay all costs and fees arising therefrom. It shall be the Contractor's responsibility to provide all special connections required for this work.

Water: The College will provide the potable and construction water needed for the work. The College will provide water for testing. Testing water not incorporated into the final work shall be disposed of by the Contractor.

Sanitary Facilities: The Contractor shall make arrangements for use of adequate toilet facilities at or near the work site. The Contractor shall maintain the sanitary facilities in acceptable condition from the beginning of the work until completion. At completion, the Contractor shall remove the facilities and disinfect the premises. All portions of the work area shall be left in a clean and sanitary condition.

SECTION 2-05 REQUIRED SHOP DRAWINGS AND SUBMITTALS
For all equipment items, the Contractor shall submit for written approval to the College five copies of manufacturers scaled, dimensioned shop drawings complete with all information required to describe the item and demonstrate compliance with the contract drawings and these specifications. Neither fabrication nor on site preparation shall be started before receipt of written review of the College.

Each shop drawing submitted shall be sequentially numbered and labeled with the following required information:

Equipping Replacement Well #4
Cabrillo College

Date:
Freitas + Freitas, Engineering and Planning Consultants, Inc.
Identification: ____________________________
Drawing No.: ____________________________
Specification Section: ____________________
Submittal No.: ____________________________

This document has been detail checked for accuracy of content and for compliance with the contract documents. The information contained herein has been coordinated with all involved subcontractors.
The Contractor's responsibility for errors, omissions, and deviations from requirements of the contract documents in submittals is not relieved by the College's review.

The College will require at least two weeks for review of submittals.

**SECTION 2-06 LIST OF DRAWINGS**
The following Drawings are included as part of the Specifications:

- Sheet 1 - Cover Sheet
- Sheet 2 – Wellhead Plan
- Sheet 3 – Pipeline Details

**SECTION 2-07 EXISTING UTILITIES**
The locations of existing major utilities as provided by the serving agencies are shown on the drawings. Minor lines, such as water, gas, and sewer services, may not be shown. It shall be the sole responsibility of the Contractor to determine the exact location and depth of all major utilities shown on the drawings, and all minor lines, whether shown or not.

The Contractor shall call Underground Service Alert (USA), Phone number 1-800-642-2444 at least 2 full working days prior to construction to mark underground utilities in the work areas.

If existing major utilities are not shown on the drawings or not found to be within reasonable proximity as shown on the drawings, the Contractor shall take all precautionary measures to protect existing facilities and notify the College of these findings.

The Contractor shall bear full responsibility for all damages and costs of repairs to existing utilities. Should any such utility be damaged during construction, all expenses of whatever nature arising from the restoration of the utility to its original service shall be born by the Contractor, and no additional compensation will be allowed.

Unless otherwise shown on the drawings or specified herein, the Contractor shall maintain all water, gas, and sewer lines; lighting, power, and telephone conduits; structures; house connection lines and other surface or subsurface structures of any nature that may be affected by the work. If the Contractor fails to maintain and protect such facilities, the College reserves the right, if requested by the College, to permit the College to move or maintain the utility at the Contractor's expense.

Should it become necessary in the performance of the work to disconnect or reroute any underground utility due to a direct conflict with the new work, disconnection or rerouting will be paid for as extra work unless otherwise specified on the drawings or specifications.

**SECTION 2-08 OPERATING AND MAINTENANCE INSTRUCTIONS**
Before receiving payment for more than 60% of the total contract amount, the Contractor shall deliver to the College five sets of acceptable manufacturer's operating and maintenance instructions covering each item of equipment assembly provided under this contract. For the purpose of this section, "equipment" shall mean any mechanical, electrical, or instrumentation device and other items with one or more moving parts. Manufacturer's standard brochures or manuals shall be modified to reflect only the model or series of equipment installed on this project. All extraneous material shall be crossed out or otherwise altered as acceptable to the College.

The operating and maintenance instructions shall include, as a minimum, the following data on a separate sheet of paper for each item of equipment:
A. Name and location of the manufacturer, the manufacturer's local representative, the nearest supplier, and spare parts warehouse.

B. Accepted submittal information applicable to operation and maintenance.

C. Recommended installation, adjustment, startup, calibration, and troubleshooting procedures.

D. Recommended lubrication and an estimate of yearly quantity needed.

E. Complete internal and connection wiring diagrams.

F. Complete spare parts lists, by generic title and identification number, with exploded view of each assembly.

G. Recommended spare parts.

H. Disassembly, overhaul, and reassembly instructions.

Before final acceptance of the work, the Contractor shall assemble five complete sets of the information required in five appropriately labeled three ring binders. Each completed binder shall contain only that material which can be held in a non expanded position. A complete table of contents listing all items and their location in the binder shall be included. For ready reference, the Contractor shall compile a complete list of manufacturer's local representatives for each item provided.

SECTION 2-09 TRAINING

Ninety days before initial start-up, the Contractor shall submit for review and approval by the College, in addition to the Operations and Maintenance Manuals to be furnished under Section 2.08, a proposed step by step training course to instruct and acquaint the College's operating personnel with the operating and maintenance procedures for each item of equipment and piping, valves, and other accessories associated with it that make the equipment operate as a unit.

After approval, the Contractor shall arrange for qualified representatives to conduct the training course, which shall include both classroom and on the job instructions.

The Contractor shall provide a course schedule giving the name and title of the instructors, the instructors time (classroom and on the job) needed by each instructor for their equipment, and the time, date, and location of the training. The Contractor shall schedule the training when the equipment to be explained is in place and ready for start-up.

Each equipment supplier or instructor shall supplement the operating and maintenance manuals with 20 copies of a printed text covering the material to be presented during the instruction. The text shall include illustrations, tables, and wording necessary to supplement the manuals and to explain the presentation to the operating personnel. The printed material shall be reviewed and approved by the Engineer prior to the start of the training.

SECTION 2-10 DUST CONTROL

Whenever there is the presence of dust, the Contractor shall supply dust control materials as necessary to alleviate the problem. If, in the opinion of the Engineer, the presence of dust becomes excessive, the Engineer will specify a dust palliative according to these specifications, which the Contractor shall apply as necessary to alleviate the problem. No separate payment shall be made for the application of materials for dust control and full compensation for furnishing all labor, materials, tools, equipment, and incidentals.

SECTION 2-11 PROJECT RECORD DOCUMENTS

Project record documents are the Engineer’s construction documents for the Project, which have been modified by the Engineer, from input received from the Contractor to show the actual conditions of in-place construction installed by the Contractor as accurately as possible. They include:

A. Drawings marked where required to show changes in dimensions or configuration between the original design and final construction

B. Specifications, marked to indicate changes of materials, products or methods of installation

C. Modifications to Drawings or Specifications issued during the course of construction (including addenda, change orders, or clarifications issued by the Engineer or his consultants)

D. Approved shop drawings and product data

E. Field test records and reports
The Contractor shall maintain a set of project specifications and a full-size set of plans marked “Record Documents” upon which shall be legibly marked information detailing the actual materials used, location of newly constructed facilities, and the location and arrangement of existing facilities as actually encountered in the field. Prepare record documents as the Work progresses. Do not conceal in-place construction until field verifications are made for record purposes.

Locate internal utilities and items concealed in the construction, referenced to visible and accessible surface features. Note field changes of dimension and detail; and changes made by change order. Sketch details not on the original Drawings.

For Specifications and Addenda, legibly mark each Section to record the manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed. Note changes made by Change Order.

Submit one set of reproducible project record documents to the College at the end of the Work, before final payment is made.

SECTION 2-12  BID ITEMS
The Contractor shall furnish bids for the following items:

Base Bid
The base bid shall consist of furnishing of all labor, materials, transportation, tools, supplies, plant equipment, and appurtenances necessary for the complete and satisfactory construction of underground piping, site grading, and installation of a submersible vertical turbine well pump station including building electrical, control, telemetry, demolition of the existing well and appurtenances; all work to the satisfaction of the College as shown on the drawings in complete working condition.

SECTION 2-13  COST BREAKDOWN
Within thirty (30) days after signing the Contract, but in any event prior to the first Application For Payment, Contractor shall submit a Cost Breakdown of the Base Bid.

The Cost Breakdown shall itemize as separate line items the cost of each work activity and all other costs, including warranties, record documents, insurance, bonds, overhead expenses and the total allowance for profit, the total of which shall equal the Base Bid. The Cost Breakdown, when approved by the College, shall become the basis for determining the cost of Work performed for Contractor’s Applications For Payment.

END OF DIVISION 2
SECTION 3-01  DEMOLITION, CLEARING AND GRUBBING

3-01.01 Scope Of Work
Furnish all labor, materials, equipment, facilities, transportation and services to complete all clearing, demolition, recycling, replacement and restoration, and related work as shown on the Plans and/or specified herein.

Work Included: All work necessary to move or remove and recycle, when possible, all interfering or objectionable material from the project site. Also included is the protection of landscaping and trees, and the replacement and/or restoration of ground surface, landscaping, and trees damaged during construction.

Cleared trees and other organic debris shall be recycled.

3-01.02 Reference Standards
Clearing and grubbing shall be in accordance with the provisions of Section 16 of the Standard Specifications, except as modified herein. Well demolition shall be in accordance with Part III of California Water Well Standards (Bulletins 74-81 & 74-90).

3-01.03 Definitions
Clearing: Clearing shall consist of cutting, removing, and disposing of trees, shrubs, brush, limbs, and other vegetative growth. Clearing shall also include the removal and disposal of trash piles, rubbish and fencing, and the preservation of trees, shrubs, and vegetative growth which are not designated for removal. Grubbing: Grubbing is the removal and disposal of wood or root matter below the ground surface remaining after clearing. Stripping: Stripping refers to the removal and disposal of all organic sod, topsoil, grass, and grass roots; all evidence of surface improvements and other objectionable material remaining after clearing and grubbing. Demolition: The removal of existing well, structures, portions of existing structures, equipment, utilities, concrete curbs, sidewalks, and driveways, pipelines and other appurtenances.

3-01.04 Quality Assurance
Contractor shall notify the Engineer prior to recycling or disposing of cleared trees and shall provide evidence of proper disposition.

3-01.05 Equipment
Equipment shall be suitable for the work to be done and shall be in first-class condition. Equipment operators and workmen are to be skilled in such operations and shall be competently supervised.

3-01.06 Clearing, Grubbing And Stripping
Clear, grub and strip areas to be excavated or surfaced.

3-01.07 Demolition
Remove existing structures, portions of existing structures, and equipment called for on the Plans and as directed by the Engineer.

3-01.08 Preservation Of Property
The project area shall be cleared and grubbed only to the extent necessary to accommodate the work in conformance with the notes and details shown on the Plans. Trees or growth shall not be trimmed back unnecessarily. Attention is directed to Section 3-01.09 of the Specifications, regarding the protection of trees.

Contractor shall take extreme care not to damage shrubs, trees, fences, irrigation systems and other improvements of adjacent property owners.

All existing improvements not specifically designated on the Plans to be removed or relocated shall remain in their original condition and location undisturbed. However, upon written permission by the Engineer, existing improvements may, for the convenience of the Contractor, and at his expense, be removed and temporarily relocated.
during construction and shall be replaced in their original location in as good or better condition as when the Contractor entered upon the work site.

3-01.09 Plant And Tree Protection
No cutting of any part of College trees, including roots, shall be done unless indicated on the plans.

No cutting of any part of private trees, including roots, shall be done without approval of the College Engineer.

Contractor shall tag and identify existing trees which are to remain within the project limits and on the public right-of-way prior to beginning work. Protect all such existing trees at all times from damage by men and equipment. Repair all minor damage to existing trees by using a licensed tree surgeon or other personnel approved by the Project Landscaping Consultant. Remove such trees permanently disfigured or killed, including roots from the site and replace each such tree or trees with equal sized trees if possible, or reimburse the owner the cost if such replacement is not possible. The Project Landscaping Consultant shall be the sole judge of the condition of any tree. Provide regular watering of existing landscaping within the construction area through the construction period.

3-01.10 Demolition Of Surface Improvements
Removal of sidewalks, curbs and gutters, driveways, concrete slabs and pavement if necessary shall be in accordance with the provisions of Section 15-3 of the Standard Specifications. Curbs, gutters, sidewalks, driveways, slabs and pavement shall be removed by full depth saw cut to the nearest joint from the lines shown on the Plans or as directed by the Engineer.

Where the Plans indicate pipeline construction under existing asphalt pavement or replacement of existing asphalt pavement, the existing pavement shall be removed and disposed of off-site.

3-01.11 Removal Of Debris
All demolished and cleared material shall become the property of the Contractor and shall be legally disposed of by the Contractor. Removed concrete shall be legally disposed of off the right-of-way at a location provided by the Contractor. Demolished concrete shall not be buried in structure backfill areas.

SECTION 3.02 EARTHWORK
3-02.01 Scope Of Work
Furnish all labor, materials, equipment, facilities, transportation and services to complete all excavation, backfill, grading and related work as shown on the Plans and/or specified herein.

Work Included: The general extent of all excavation, fill and grading is shown on the Plans and includes, but is not necessarily limited to, the following:
1. Removal of excess and unsuitable material from the site.
2. Excavation of material to allow for the placement of underground piping and structures, including any necessary shoring and bracing.
3. Backfilling of underground piping and structures.
4. Preparation of subgrade for concrete slab work and pavement.
5. Finish grading.

3-02.02 Definitions
Excavation: Work shall consist of excavation, storage and any necessary removal of native soil material for structures, cut slopes, foundations, and pavement. Excavation may include the removal and disposal of existing pavement or concrete slab materials.
Fill: Soil or soil-rock material placed to raise the existing grade of the site or to backfill excavations. On-Site Material: Material obtained from the project site.
Import Material: Material required for earthwork construction in excess of the quantity of suitable material available from required grading, cuts and excavations. Import material may be necessary even though not shown on Plans.
Select Material: Material meeting the requirements specified herein.
Degree of Compaction: The ratio of the in-place density of constructed fill to the maximum dry density determined by California Test No. 216.

In-Place Density: The dry density of constructed fill determined in accordance with the moisture-density gage method, ASTM D2922.

3-02.03 General Backfill

General Fill Requirements: Material for general site filling shall be free from sod, large lumps, boulders, rocks, roots, brush or other objectionable material; and should be obtained from on-site material insofar as practical. Should on-site material be unsuitable for general fill in quantity and/or quality, the Contractor shall furnish and place suitable import material.

Imported Materials: Imported materials shall be approved by the Engineer prior to use. The Contractor shall submit for review information on all backfill materials to be used on the project giving a description of the source of the material, past uses of the property at the source location, quantity of material and the purpose for which it is intended.

3-02.03 Pipe Bedding And Initial Backfill

Bedding material and initial backfill to a minimum depth of two inches above the top of pipe shall be sand.

3-02.04 Foundation Material

Soil surfaces exposed by excavation for the tank pad shall be compacted to 95 percent relative compaction per ASTM D1557.

3-02.05 Job Conditions

Existing Conditions: The Contractor shall, prior to submitting his bid, visit the site and become familiar with actual site and soil conditions. Soil boring logs are included in the geotechnical investigation. No allowance will be made by the College for any unfavorable conditions or events which could have been foreseen from a thorough examination of the Contract Documents, the geotechnical report, the site and working conditions.

Protection: If existing live utilities are encountered, they are to be protected from damage and the proper authorities notified. Service shall not be interrupted except as directed or accepted; allow sufficient time for utility companies to arrange for continuation of services. Record unmarked utility locations on Record Drawings. Open excavations, trenches, and the like are to be protected with fences, barricades, covers and railings as required. Every precaution shall be taken to prevent spillage when hauling on or adjacent to any public street or highway. Any spillage shall be promptly removed.

3-02.06 Safety

The contractor is solely responsible for excavation safety, including support to all adjacent improvements.

Excavation shall be in accordance with applicable provisions of the State of California Construction Safety Orders. The Contractor shall, in accordance with the California Labor Code Section 6705, submit a detailed drawing to the Engineer before excavation begins, showing the design of shoring, bracing, sloping or other provisions to be made for worker protection from the hazard of caving ground during any excavation of five (5) or more feet in depth.

Review by the Engineer of the calculations and Drawings or inspection performed by the Engineer will in no way relieve the Contractor for full responsibility for the shoring systems. Prior to applying any loading on the shoring, the Contractor's Engineer shall inspect the installation and certify in writing that the shoring system conforms to the Drawings and that the material and workmanship are satisfactory. This certification shall be provided to the College and be available on the project site in accordance with Article 1717 of the Construction Safety Orders, Title 8, California Administrative Code.

If the Contractor presents a drawing which varies from shoring system standards established by the Construction Safety Orders, the drawing shall be prepared and signed by a registered civil or structural engineer licensed by the State of California. Any Engineer's review of said drawings will in no way relieve the Contractor from responsibility and liability for the adequacy of shoring systems and trench excavations.
Trench excavation shall not begin until trench support drawings have been returned by the Engineer.

The Contractor shall pay for and comply with all provisions of the permit required by Section 6500 of the California Occupational Safety and Health Act.

3-02.07 Shoring
All vertical trenches deeper than five (5) feet shall be shored in accordance with this section.
The design of shoring support systems is solely the Contractor's responsibility. Dewatering systems shall be considered in conjunction with the shoring system used.

Shoring systems should be designed to resist the larger of either the earth pressure distribution prescribed by the safety regulations or the lateral pressures indicated in the Geotechnical Report. Traffic loads and surcharge weights, such as stockpiled materials, must also be considered in the shoring design.

3-02.08 Control Of Water
Groundwater may be encountered below ground surface.
Prior to the placement of pipe bedding, all utility pipe trenches shall be thoroughly dewatered by the use of sump pumps and dewatering equipment as necessary to safely convey water away from trench excavations to positive draining outlets.

The Contractor shall prevent surface water (e.g. rainwater) and subsurface or groundwater from flowing into excavations and from flooding the project site and surrounding areas.

The Contractor shall remove all water which accumulates in all excavations during the progress of work so that all work can be done in the dry. Excavated areas shall be kept free from water while pipe or structures are constructed, while concrete is setting and until backfill has been placed to a sufficient height to anchor the work against possible flotation.

3-02.09 Preparation Of Subgrade
Strip surface vegetation, weeds, and at least the top six (6) inches from areas underlying surface structures and areas to be paved. Excavate soft, wet, or otherwise unsuitable base grade to firm, unyielding soil.

3-02.10 Excavation
Contractor shall notify the Engineer of any site condition not reflected on the Plans or in these Specifications, such as conflict in grade, bad soil, or unexpected utility lines. The Engineer will inspect the excavation bottom prior to placing material, and may recommend further excavation and soil replacement if required compaction with existing soil cannot be achieved.

Excavate to the lines, grades and dimensions shown on the Plans. Excavations shall be made to such width outside the lines of the structure to be constructed as may be required for proper working methods, the erection of forms, and the protection of work. Any resulting over-excavation extending beyond the lines, grades, and dimensions shown on the Plans shall be backfilled with material complying with these Specifications at no additional cost to the College.

Care shall be taken to preserve foundation surfaces in an undisturbed condition, and excavation at or near property lines shall be performed in a manner that minimizes disturbances to adjacent property. Any foundation surfaces disturbed without the Engineer's authorization shall be replaced at the Contractor's expense with compacted gravel fill or other material approved by the Engineer so that by test, the bearing capacity of the replacement material is equal to or better than the undisturbed foundation material.

Existing structures and completed work shall be adequately braced and cared for so that no damage will result.
As directed by the Engineer, soft, spongy, or unsuitable bearing material of any kind shall be removed down to solid bearings and replaced with materials specified herein. Such over-excavations not specifically specified or shown on the Plans will be paid for as extra work. Unauthorized excavations shall be corrected at no cost to the College.
If previous trenches are encountered, any loose materials shall be excavated, backfilled and re-compacted in accordance with these Specifications.

Excavated material unsuitable for backfill or in excess of the amount required for backfill shall be disposed of by the Contractor off the site at his expense.

3-02.11 Filling
Prior to the placement of fill, the Engineer shall be notified of the source of materials and their suitability for the particular fill application. Work shall not be backfilled without Engineer’s approval. Any work so covered prior to approval shall be uncovered at the Contractor's expense.

All debris, form work, etc. shall be removed from the excavation prior to backfilling.

Pipe shall be supported during the placement and compaction of bedding and backfill.

Fill materials shall be spread in level layers of appropriate thickness for the compaction equipment to be used and moisture content of the material. Each layer shall be compacted as required.

Granular backfill shall be tamped mechanically or manually along the sides of pipes and structures to minimize voids in the material between the pipe or structure and excavation walls. No flooding or jetting shall be used to compact bedding or backfill materials.

**Moisture Content:** Fill materials shall have the uniform moisture content necessary for compaction to the specified dry density. Fill shall not be placed during conditions that will alter the moisture content of the fill material sufficiently to make adequate compaction impossible. After placing operations have been stopped due to adverse conditions, no additional fill material shall be placed until the last layer compacted has been checked and found to be compacted to the specified densities.

**Tests:** Tests are to be made on each layer of fill to assure adequate compaction throughout the entire area. If the dry densities are not satisfactory, the Contractor will be required to re-compact each layer and/or work area as necessary to achieve the specified densities. Compaction testing will be performed in accordance with ASTM D1557.

3-02.12 Compaction
Fill materials shall be compacted so that the relative compaction is as follows:

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<th>Description</th>
<th>Required Percentage</th>
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<tr>
<td>Pipe Bedding</td>
<td>95%</td>
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<tr>
<td>Trench Backfill under Paved Areas</td>
<td>95%</td>
</tr>
<tr>
<td>Trench Backfill under Non-Paved Areas</td>
<td>90%</td>
</tr>
<tr>
<td>All Other Backfill</td>
<td>90%</td>
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3-02.13 Grading
Contractor shall grade the site to establish finish grades of constructed elements. The remainder of site may be graded as required to match improvements to existing contours with a minimal amount of change.

All ground surfaces shall be finished to uniform grades and slopes as indicated on the Plans so that the ground drains properly and is free from depressions which may cause areas of standing water. Drainage shall be away from foundations and slabs. Clods are to be broken up and the surface of the ground shall be uniformly pulverized and graded to a relatively smooth surface.

Finish grades should be at least one (1) inch below the surface of adjacent walks, curbs, paved areas, etc. without abrupt change in gradient either in the surface of the soil or where the soil meets such features.

At the completion of grading work, the site shall be left in a clean and finished condition.

**SECTION 3-03 CONCRETE STRUCTURES**

3-03.01 Description
The Contractor shall furnish all labor, materials, equipment and incidentals necessary for concrete facilities and portions of structures. The work shall include, but not necessarily be limited to, excavating, compacting, forming, placing, and finishing all concrete and all related work.
3-03.02 Submittals
Submittals in accordance with Section 2-05 shall be required for all materials in this Section.

3-04.03 Materials

Concrete:
Use a minimum of 6 sacks of cement per cubic yard of concrete.
Concrete strength shall be 5,000 psi concrete at 28 days.
Special inspection is required for all concrete pours.
Concrete to have a maximum slump of 4 inches.
Water used in mixing concrete shall be clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete or reinforcement.
Water shall be potable water free of taste or odor.
Maximum water cement ratio to be 0.40.
Maximum air entrainment is 6.0%.
Use type II cement.
Proposed designed mixes to be certified by a California registered civil engineer and submitted to the engineer, at least 7 calendar days prior to first pour.

Frequency of testing: Samples for strength tests for each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 100 cubic yards. Of concrete, nor less than once for each 5000 sq. ft of surface area for slabs or walls. Ready-mix supplier to keep duplicate test cylinders at is testing laboratory.

Mixing: All concrete shall be mixed until there is a uniform distribution of materials and shall be discharged completely before mixer is recharge. Ready mixed concrete shall be mixed and delivered in accordance with requirements of “Specifications For Ready- Mixed Concrete” (ASTM C 94) or “specification for concrete made by volumetric batching and continuous mixing” (ASTM C 685).

Curing: Concrete shall be maintained above 50 degrees F. And in a moist condition for at least the first 7 days of after placement.

Cold weather requirements: Adequate equipment shall be provided for heating concrete materials and protecting concrete during freezing or near-freezing weather. All concrete materials and all reinforcement, forms, fillers, and ground with which concrete is to come in contact shall be free from frost. Frozen materials or materials containing ice shall not be used.

Hot weather requirements: During hot weather, proper attention shall be given to ingredients, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation that could impair required strength or serviceability of the member or structure.

Concrete Admixtures:
Admixtures to be used in concrete shall be subject to prior approval by the engineer.
Water reducing admixtures, retarding admixtures, accelerating admixtures, shall conform to “Specifications For Chemical Admixtures For Concrete” (ASTM C 494) or “specification for chemical admixtures for use in producing flowing concrete” (ASTM C 1017).

Calcium chloride or admixtures containing chloride other than from impurities in admixture ingredients shall not be used.

Fly ash or other pozzolans used as admixtures shall conform to the “Specifications Of Fly Ash And Raw Or Calcined Natural Pozzolan For Use As A Mineral Admixture In Portland Cement Concrete” (ASTM C 618).

Ground granulated blast-furnace slag used as an admixture shall conform to “Specification For Ground Granulated Blast-Furnace Slag For Use In Concrete And Mortars” (ASTM C 989).
Admixtures used in concrete containing C 845 expansive cements shall be compatible with the cement and produce
on deleterious effects.

Silica fume used as an admixture shall conform to “Specifications For Silica Fume For Use In Hydraulic-Cement
Concrete And Mortar” (ASTM C 1240).

**Concrete Aggregate:**
Maximum aggregate size shall be 3/4 inch.
Aggregate shall be crushed aggregate, not round rock.
Aggregate shall have no Modification, and low shrinkage characteristics.
Concrete aggregates shall conform to “specifications for concrete aggregates”(ASTM c 33).
No alkali-reactive aggregates shall be used.

**Reinforcing Steel:**
Reinforcing steel shall be deformed bars, ASTM A 615. Use grade 60 for #5 bars and larger. Use grade 40 for #4
bars and smaller.
Embed all reinforcing bars a minimum 24 bars diameters, but in no case less than 12”. Lap all reinforcing splices a
minimum 40 bars diameters, but in no case less than 24”. For top bar embedments and laps increase above lengths
25%.
For reinforcement in which the protective concrete is deposited against the ground, there shall be no less than 3
inches of concrete between the reinforcement and the ground contact surface.
Unless noted, all other main reinforcement shall be protected by 2 inches of concrete cover.

**Bolts:**
When bolts are in used in concrete-to-steel connections use cut washers between the steel and the bolt head and
between the steel and the nut.
Machine bolts and anchor bolts shall conform to ASTM a307.
Epoxied all-thread or anchors to be set with Simpson epoxy.
Bolt designs are as follows unless otherwise noted on drawing:

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>BOLT EMB.</th>
<th>RFB EMB</th>
<th>MIN. EDGE DISTANCE</th>
<th>MIN. END DISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8”</td>
<td>7”</td>
<td>12”</td>
<td>1 ¼”</td>
<td>5”</td>
</tr>
<tr>
<td>¾”</td>
<td>10”</td>
<td>14”</td>
<td>2 ¾”</td>
<td>5”</td>
</tr>
<tr>
<td>7/8”</td>
<td>12”</td>
<td>15”</td>
<td>2 ¼”</td>
<td>5”</td>
</tr>
<tr>
<td>1”</td>
<td>15”</td>
<td>16”</td>
<td>3”</td>
<td>5”</td>
</tr>
</tbody>
</table>

For epoxy embedded bolts and retro-fit bolts ((rft = all thread), drill hole per Simpson requirements. Provide
Simpson "et" adhesive concrete and anchor system. Installed per manufacturer's requirements and ICBO Report #
4945.

**3-03.04 Execution**
Excavation and backfill shall conform to Section 3-03 of these Specifications.

Steel rebar installation shall conform to Section 52 of the CALTRANS Standard Specifications.

All surfaces shall have ordinary finish.

Typical details shall apply where no specific detail or section is given.

Because of site condition, dimensions are approximate. The contractor shall verify all dimensions, elevations and
conditions prior to starting construction.
Any discrepancies on the plans or any deviations from the plans, which are necessitated by field conditions or any condition different from those indicated on plans, shall be called to the attention of the engineer and the building department prior to continuing construction.

All dimensions to take precedence over scale shown on plans, elevations, sections and details.

Notes and details on drawings shall take precedence over general notes and typical details.

Contractor is responsible for all temporary bracing during construction.

Contractor shall repair or replace all damaged finish material and structural members as required.

The contractor's work shall conform to all applicable federal, state, and local building codes. The following shall specifically apply to this job: OSHA and Cal OSHA shall govern all platforms, ladders, and safety issues. Code requirements for environmental engineering concrete structures (ACI 350-01) and commentary (ACI 350-01).

Contractor is responsible for dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.

The construction contractor agrees that, in accordance with generally accepted practices, construction contractor will be required to assume sole and complete responsibility for job sited conditions during the course of construction of the project, including safety of all persons and property; that this requirement shall be made to apply continuously and not be limited to normal working hours, and construction contractor further agrees to defend, indemnify and hold design professional harmless from any and all liability, real or alleged, in connection with the performance of work on this project, excepting liability arising from the sole negligence of design professional.

Unauthorized changes and uses: the engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. All changes to the plans must be in writing and must be approved by the preparer of these plans.

The structural engineering performed by , consulting engineer, is limited to new construction only and its effects, if any, on existing structures. Does not make any judgments or conclusions as to the structural integrity of existing structures.

**SECTION 3-04 PIPE AND FITTINGS**

**3-04.01 Scope Of Work**
Work includes all pipe, fittings, couplings, and other necessary appurtenances as shown, specified, and/or required.

**3-04.02 Quality Assurance**
The Contractor shall furnish all labor necessary to assist the Engineer in inspecting pipe upon delivery. The Contractor shall remove rejected pipe immediately.

All pipe of any manufacturer may be rejected if there are unsatisfactory joint assembly operations, even if the pipe conforms to ASTM Specifications. The Contractor shall remove all unsatisfactory pipe of that manufacturer of same shipment from work and shall furnish pipe from another manufacturer conforming to these Specifications. All tests shall be made in conformance with methods prescribed by ASTM and AWWA specifications, and acceptance or rejection is based on the test results.

**3-04.03 Submittals**
Certification: Manufacturer certification sheets shall be submitted to the Engineer with each delivery that pipe showing compliance reference standard specified herein.
3-04.04 General Products
Materials used in construction shall be as herein specified. When material is not listed specifically herein or on the drawings, the material shall be as approved, in advance, by the Engineer. The Engineer shall be the sole judge as to the acceptability of any and all materials to be used and of the acceptability of manufacturer's specifications, methods and products.

Pipe sizes are nominal inside diameter unless otherwise noted. All sizes shall be as called out on the Plans and specified herein. All pipe and fittings delivered to the job site shall be clearly marked to identify the material, class, thickness, and manufacturer. All material shall be new and free of blemishes.

The Contractor is responsible for furnishing and installing all items necessary to make a complete and workable piping system. These include, but are not limited to, valve boxes, manholes, insulating couplings and gaskets, piping specialties and all other items required by the nature of the installation. Any item not specified herein but required by the nature of the installation shall be of the first quality and equal in grade to similar materials specified herein.

3-04.05 Ductile Iron Pipe
Ductile Iron Pipe shall conform to the requirements of ANSI/AWWA C111/A21.11-90 and ANSI/AWWA C151/A21.51-90 and shall be cement mortar lined in accordance with ANSI/AWWA C104/A21.4-90. Pipe class thickness shall be Class 50 and pipe pressure rating shall be 250. Pipe shall have joints with “FIELD LOK” Gasket System or equal.

Any flanged pipe shall be fabricated in the shop and delivered to the site with flanges in place and properly faced. Threaded flanges shall be individually fitted and machine tightened on matching threaded pipe by manufacturer. Manufacturer's certificates showing conformance with AWWA C115 shall be delivered to the Engineer prior to installation.

All buried Ductile Iron Pipe shall be encased in polyethylene conforming to AWWA C105.

3-04.06 Pipe Fittings And Joints For Ductile Iron Pipe
All fittings shall be furnished with mechanical joint thrust resistant fittings, such as Field-Lok or approved equal. Units shall have epoxy coating per these Technical Provisions.

**Push-On fittings** for pipe shall be ductile iron or grey iron and shall conform to the requirements of ANSI/AWWA C153/A21.10-87 and C110 and ANSI/AWWA C111/A21.11-90 and shall meet a two hundred fifty (250) psi working pressure.

**Flange fittings** for pipe shall be ductile iron, faced and drilled, 125-pound flat face or 250-pound raised face conforming to the requirements of ANSI/AWWA C110/A21.10-87 and ANSI B16, 1-89. All fittings shall be cement mortar lined to match the specified pipe. **Push-on joints** shall conform to the requirements of ANSI/AWWA C153/A21.10-87 and C111/A21.11-90 and shall meet a two-hundred-fifty (250) psi working pressure. **Flanged joints** shall be ductile iron and shall be 125-pound flat face or 250-pound raised face, and threaded, conforming to the requirements of ANSI B16.1 for Class 125 and ANSI B16.1 for Class 250. Manufacturer's certificates showing conformance with required specifications shall be delivered to the Engineer at least ten (10) days prior to inclusion in the work.

All fittings shall be equipped with “FIELD LOK” Gasket System or equal. Flexible couplings and flanged couplings shall have wedge shaped, natural rubber gaskets, and ASTM 316 stainless steel bolts.

Gaskets for flanged joints shall be ring type. The gasket thickness shall be one-sixteenth-inch. Flange assembly bolts shall be stainless steel, hex head machine bolts with heavy hexagonal nuts. Bolt length shall be such that after the joints are made up the bolts shall protrude through the nut not more than ½-inch.

3-04.06 Bolting
Bolting shall conform to ASTM A193 Grade B8M studs and washers and ASTM A194 Grade 8M hex head nuts (ANSI Type 316 stainless steel).
3-04.07  Thrust Blocking And Thrust Resistant Fittings
Thrust blocks as indicated on the plans to supplement thrust resistant fittings, shall be in accordance with Details shown on the Drawings.
Cement for concrete thrust blocking shall be Portland Cement conforming to the applicable requirements of ASTM Designation C150 for Type V High Early Strength concrete.
Reinforcement for concrete thrust blocking shall be deformed billet-steel bars conforming to the applicable requirements of ASTM Designation A615 for Grade 60 bars.
All exposed reinforcing bars required for thrust blocks shall be epoxy coated or stainless steel bars with equivalent load carrying capabilities as specified for deformed steel bars to the satisfaction of the Engineer.
Contractor shall form thrust blocks to prevent bearing on other underground utilities. Where this is not practical the Contractor shall form an annular space with Styrofoam around other utilities within thrust blocks.

3-04.07  General Execution
Pipes, connections, and appurtenant work shall be installed in accordance with these specifications.
Excavation for thrust blocking shall be neat to the lines and dimensions shown or called for on the Drawings.
Existing landscaping, planting, or surface improvements removed, damaged or disturbed due to the installation of water mains, services, or appurtenances shall be replaced in kind to the satisfaction of the College.

3-04.08  Connections
Pipe connections shall be made in accordance with applicable standards and manufacturer's recommendations.
Non-conducting connections shall be provided wherever joining dissimilar metals.

3-04.09  Pipe Installation
General: Pipe, valves, fittings, and appurtenances shall be installed in accordance with applicable provisions of AWWA C600 (Ductile Iron). Unless otherwise indicated, the pipe shall have a minimum cover of 3.0 feet measured to finish grade.
Handling and Storage of Pipe: Broken or damaged pipe, fittings, or appurtenances will be rejected by the Engineer and shall thereupon be removed from the work site and replaced at the Contractors expense.
Alignment: Each length shall be jointed as specified herein.
Pipe Deflections: The laying of pipe on curved alignment by means of unsymmetrical closure of joints will be permitted only up to eighty percent (80%) of the deflection recommended by the respective pipe manufacturer. Minimum radius for deflected eight-inch (8”) ductile iron water mains shall be three hundred feet (300’) without the use of short pipe sections. Short pipe sections may be used for other deflections as approved by the Engineer.
Cleaning: Before each new length of pipe is placed, the interior of the preceding pipe shall be carefully cleaned of all dirt and debris. Each pipe shall be maintained free of contaminants and Contractor shall adhere to applicable portions of AWWA C651-92, Section 4 (Disinfection of Water mains) and, if necessary, corrective actions noted therein shall be employed by the Contractor, at his expense, when unsuitable water or debris enters into the new pipeline.
Bearing: Pipe in the trench shall have continuous uniform bearing along its bottom, except at bell holes. Blocking may be used to support the pipe during laying. However, it shall be used only at the end of the section and shall be removed before laying the next section.
Positioning: After final positioning, the pipe shall be held in place in the trench with backfill material placed equally on both sides of the pipe at as many locations as are required to hold the pipe section in place. After joints are completed, the backfill shall be redistributed and compacted as herein required.
Closure: At the end of each day and when work is not in progress, the open ends of pipe and fittings installed in the line shall be closed with watertight plugs or caps to the satisfaction of the Engineer.
Thrust Block: Concrete thrust blocks shall be provided at all changes in horizontal or vertical alignment where, in the opinion of the Engineer, thrust resistant fittings do not provide adequate protection and at such other points as may be called for on the Drawings. Thrust blocks shall be installed in strict conformance with the details shown on College of Greenfield Standard Details, included in the Appendix.

3-04.10  Cleaning And Testing
A. Disinfection
The Contractor shall pay all expenses and provide a lab for disinfection of all facilities.
Prior to acceptance and before being placed in service, all new water lines shall be chlorinated in accordance with the requirements of AWWA Standard C651. The Contractor shall have the option of applying chlorine to the entire water content of the line, including services, fire hydrants and stubs, in sufficient quantity to produce a residual of at least ten (10) ppm after twenty-four (24) hours retention; or of applying the chlorine to a portion of the water at a higher concentration which is passed through the line as a "slug", at a velocity which will result in a contact period of at least one (1) hour; all as stipulated in the above mentioned AWWA Standard.

1. If the Contractor elects to employ the use of the "Tablet" form of chlorination by mounting HTH into the pipe sections as they are installed, he shall determine the minimum number of tablets per pipe length that will be allowed. In the event that adequate disinfection is not obtained using said minimum number of tablets, it shall be the Contractor's responsibility to re-chlorinate until a satisfactory result is obtained.

2. After chlorination has been completed to the satisfaction of the Engineer the lines shall be thoroughly flushed until the chlorine content in all parts of the system has been proven by test to be less than one (1) part per million (ppm).

3. It shall be the responsibility of the Contractor to dispose of the flushing water in a manner to be approved by the Engineer and to avoid flooding or damage to adjacent properties or facilities.

4. After flushing the chlorine from the water system, the Contractor shall engage the services of an approved Commercial Water Laboratory, designated by the State of California Department of Public Health, to gather an approved number of representative water samples, the location and number of which shall be determined by the Engineer.

5. No section of the water system shall be accepted when any sample of water tests reveal the presence of any coliform bacteria, i.e., MPN shall not exceed zero coliform bacteria per 100 ml sample. Should the laboratory report show that any sample taken contains any coliform bacteria, it is not acceptable. Contractor shall rechlorinate and test the water again as hereinbefore specified. This process shall be repeated until a satisfactory result has been obtained.

6. Contractor shall direct the laboratory to send copies of its Report of Bacteriological Examination to the Engineer, within two (2) days following completion of laboratory testing.

7. Chlorinated water shall be treated with a neutralizing agent prior to discharge to the storm drain system. Alternatively, chlorinated water meeting all DHS drinking water standards may be released to the water system upon prior approval of the Engineer.

B. Pressure Testing
The Contractor shall provide all pumps, fittings, labor, equipment and materials and all assistance necessary for the pressure testing of all pipelines. Pressure testing shall be performed in the presence of the College. Test pressures shall be a minimum of 150 psi or 150 percent of the service pressure for the pipeline, whichever is greater. At no time shall the test pressure be allowed to exceed the working pressure rating of the weakest pipe, valve, fitting or service on the line to be pressure tested.

Test pressures shall be held for a minimum of 2 hours.

Upon completion of pipeline construction all pipelines and pump suction barrels shall be pressure tested and observed for leaks. The Contractor shall schedule the pressure test with the College at least 24 hours in advance of the test. The pipelines or pump suction barrels shall be filled and carefully brought to the test pressure. Failure of any portion of the system shall be cause for rejection and the Contractor shall promptly identify and correct the deficiencies causing the failure.

This procedure will be followed until an acceptable test is achieved. The Contractor may be charged for the Engineer's time for reinspection for all tests past the first retest.

Allowable Leakage - The allowable leakage will be calculated by the following formula:

\[ La = \frac{(N D \sqrt{P})}{7,400} \]

where:
- \( La \) = Allowable Leakage
- \( N \) = Number of joints in the pipe run
- \( D \) = Nominal diameter of the pipe in inches
- \( P \) = Test pressure
The allowable leakage per 1,000 feet of pipe run at a test pressure of 150 psi for the Class 150 pipelines and 200 psi for the Class 200 pipeline are as follows:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>150 psi</th>
<th>200 psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>0.34</td>
<td>0.38</td>
</tr>
<tr>
<td>6&quot;</td>
<td>0.50</td>
<td>0.57</td>
</tr>
<tr>
<td>8&quot;</td>
<td>0.67</td>
<td>0.76</td>
</tr>
<tr>
<td>10&quot;</td>
<td>0.84</td>
<td>0.95</td>
</tr>
<tr>
<td>12&quot;</td>
<td>1.01</td>
<td>1.15</td>
</tr>
<tr>
<td>16&quot;</td>
<td>1.17</td>
<td>1.35</td>
</tr>
</tbody>
</table>

The allowable leakage for differing lengths of pipe runs and higher test pressures will be provided for by direction of the Engineer.

Equipment - The Contractor shall provide a test pump capable of supplying 300 psi static pressure, a means of adding replacement water during the test and gauges and meters to monitor the pressure and replacement water used.

C. Cleanup: All surplus materials and construction debris remaining upon completion of the Work shall become the property of the Contractor unless otherwise specified herein or noted on the Drawings, and shall be removed from the work site by the Contractor and disposed of off-site in a lawful manner to the satisfaction of the Engineer.

3-04.11 Abandonment
All abandoned pipes within the trench limits shall be removed. Exposed ends of abandoned water pipes shall be filled with a minimum of twelve inches (12") of concrete outside of the trench limits. Other abandoned pipes shall be plugged with a minimum of 12 inches (12") of concrete at both ends outside of the trench limits. Contractor shall remove completely the existing pipes within the trench limit and backfill with structural material to be compacted to ninety-five percent (95%) relative compaction. The Contractor shall restore paved sections in kind in conformance with the Standard Trench Detail.

All water mains that are taken out of service shall be abandoned in place. Open ends of pipes shall be plugged with a minimum of 12 inches (12") of concrete. Valves on abandoned lines shall be closed and the valve box and concrete collar shall be removed. Asphalt concrete shall be cut to neat vertical lines around abandoned valves. The valve shall be covered in Portland Cement Concrete to within four inches (4") of pavement surface. The remaining four inches (4") shall be filled with asphalt concrete one-half inch (½"), maximum gradation, properly placed and compacted. An asphalt crack sealer shall be placed around the joint between existing and new asphalt.

SECTION 3-05 VALVES

3-05.01 Scope Of Work
The Contractor shall provide all tools, supplies, materials, equipment, and labor necessary for furnishing, coating, installing, adjusting, and testing of all valves and appurtenant work, complete and operable, in accordance with the requirements of the Contract Documents. The Contractor shall furnish and install valve boxes to grade, with covers, extensions, and position indicators. The provisions of this Section shall apply to all valves and valve operators specified in these Specifications except where otherwise specified in the Contract Documents.

3-05.02 Quality Assurance

Valve Testing: Unless otherwise specified, each valve body shall be tested under a test pressure equal to twice its design water-working pressure in both directions.

Bronze Parts: Unless otherwise specified, all interior bronze parts of valves shall conform to the requirements of ASTM B62, or, where not subject to dezincification, to ASTM B584.

Certification: The Contractor shall submit for all valves certified copies of the hydrostatic factory tests showing compliance with the applicable standards of AWWA, ANSI, ASTM, etc.
3-05.03 Resilient-Seated Gate Valves
Flanged gate valves larger than 3 inches shall be AWWA C500, wheel actuated, resilient seated, all iron body with bronze trim. All small gate valves of a size less than 3 inches shall be Crane Company #438 low pressure gate valve with wedge disc, rising stem and screwed ends.

3-05.04 Pressure Gauge Assemblies
Pressure gauge assemblies shall be furnished and installed as shown on the drawings. Dials shall be nominal 4-1/2 inch diameter. Gauges shall have a shut off valve and pulsation damper between the gauge and the line. Gauge shall be graduated from zero to 200 psi with an accuracy of 2%. Gauges shall be manufactured by Marsh, Ashcroft or equal.

3-05.05 Flanged Coupling Adaptors
Line size flanged coupling adapters with thrust stud restraint shall be as used where required to meet existing pipe.

3-05.06 Check Valve
The check valve shall be a flanged globe type swing check without outside spring and lever, pressure class 150, bronze trim, complete with all piping. The manufacturer shall set up and calibrate the valve in the field prior to startup.

3-05.07 Flowmeter
Flow meters required shall be a Water Specialties ML-04 propeller meter with flow indicator and recorder.

3-05.08 Pressure Relief and Sustaining Valve
Pressure relief valve shall be Class 150 CLA-VAL Model 50-01 with stainless steel interior trim fusion epoxy lined and coated with stainless steel tube and fittings. Sustaining pressure and reducing pressure to be set in the field. All actuator piping shall be stainless steel and surrounded by insulation to prevent freezing.

3-05.09 Valve Installation
All valves, gates, operating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the manufacturer's written instructions and as shown and specified. All gates shall be adequately braced to prevent warpage and bending under the intended use. Valves shall be firmly supported to avoid undue stresses on the pipe.

Butterfly valves shall be installed in such an orientation as to allow the placement of the actuator unit directly above the valve assembly. The actuator display, controls, and hand crank shall be readily accessible.

3-05.10 Testing
Valves shall be tested at the same time the adjacent pipeline is tested. Joints shall show no visible leakage under test. Joints that show signs of leakage shall be repaired prior to final acceptance. If there are any special parts of control systems or operators that might be damaged by the pipeline test, they shall be properly protected. The Contractor shall be held responsible for any damage caused by the testing.

SECTION 3.06 PAINTING
The all exposed piping, valves, and metal appurtenances shall be painted. Surfaces to be painted shall be clean, dry, and all foreign materials shall be removed from the surface. Iron and steel surfaces shall be prepared in accordance with the surface preparation specifications of the Steel Structures Painting Council (SSPC).

Owner shall select colors for painting.

Galvanized surfaces shall be solvent cleaned, washed with a 10% muriatic acid, and washed with fresh water. A pretreatment primer shall be immediately applied after washing.

Ferrous metal surfaces shall have a prime coat of phenolic primer at least 1.6 mills thick, followed by two coats of alkyd paint at least 1.5 mills thick each.
Galvanized surfaces shall have a prime coat of a passivator at least 0.5 mills thick, followed by two coats of vinyl/enamel at least 1.5 mills thick each.

Code required labels or equipment identification, performance ratings, name or nomenclature plates shall not be painted.

Prior to painting, the Contractor shall submit a color chart and complete manufacturer's information on the painting system and manufacturer selected. Paint shall be as manufactured by Sherwin-Williams Company, Koppers Company Inc., Tnemec Company Inc., or equal.

### SECTION 3.07 WELL PUMP

#### 3.07.01 Scope of Work
The Contractor shall furnish and install one submersible multistage deep well vertical turbine pump that conforms to Part B Sections of AWWA E101. The pump for the well shall have the general characteristics and be suitable for installation at the setting shown below:

<table>
<thead>
<tr>
<th>Speed: 3450 rpm</th>
<th>Flow Rate (gpm): 100 150 200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluid: Potable Water</td>
<td>TDH (ft): 775 590 310</td>
</tr>
<tr>
<td>S.G: 1.0</td>
<td>Max NPSHR (ft): 8 8 8</td>
</tr>
<tr>
<td>Viscosity: 1.2x10⁻⁵ sq. ft</td>
<td>Min Eff. (%): 68 72 68</td>
</tr>
</tbody>
</table>

- **Type:** Submersible Deep Well Turbine
- **Check Valves:** Installed at discharge from pump
- **Column Size:** 3" ID
- **Column Length:** 340 feet
- **Case or Bowls:** Bronze
- **Bowl Diameter:** 5.75" maximum
- **Motor Type:** Submersible Premium Efficiency VFD Acceptable
- **Voltage:** 460 Volt, 60 Hz
- **Horsepower:** 30 HP
- **Ambient Temp.:** 40 Degrees C
- **Phase:** 3
- **Sync. Speed:** 3450 rpm
- **Altitude:** 250 feet
- **S.F.:** 1.15

The pump shall be a Grunfoss 135S300-18 30 hp pump or equal.

#### 3.07.02 Submittals
The Contractor shall submit performance curves, shop and assembly drawings. The drawings shall show the dimensions, rating, component parts, arrangements, and materials of construction for all items covered under this specification. The performance curves shall be based on data secured during actual tests run at the factory on the model pump proposed for installation and signed by a representative of the manufacturer. The curves shall show model, size and trim of the impeller, and the developed head, brake horsepower, NPSH, and efficiency at intervals of 100 gpm in capacity for the pump operating at the specified speed over the operating range of the pump.

No pump equipment shall be shipped until the required drawings and curves have been submitted to and approved by the Owner.
3.07.03 Requirements
All manufactured items provided shall be new, of current manufacture, latest design, and shall be the products of reputable manufacturers specializing in the manufacture of such products; such manufacturers shall have not less than 5 years of experience in such manufacturer and shall upon request, furnish the names of not less than 5 successful installations of their equipment of comparable nature to that offered under this contract.

3.07.04 Design
The pump shall be designed for pumping clear, cool ground water. The pump characteristics shall be such that the motor name plate rating is not exceeded at any point on the operating curve of the pump.

Anchor bolts, discharge head, and discharge support framing required to support the pump and adapt to the conditions shown on the drawings, shall be furnished by the Contractor.

The pumping unit shall be suitable for outdoor installation. The weight of the revolving parts of the pump, including the unbalanced hydraulic thrust of the bowls, shall be carried by a thrust bearing in the motor. The pump shall be supported from a skid baseplate by means of a vertical column having horizontal surface discharge.

All hydraulic velocity head and friction losses between the bottom of the pump and the pump discharge head outlet shall be considered in the pump design, pump performance and the maximum brake horsepower, including coupling losses, internal losses in the pump and such losses expressed in feet of water shall be added to the specified total pumping heads in the selection of the pump offered from the pump bowl performance curves. Pump bowl settings shall be set by the manufacturer.

All anchor bolts, discharge head, and discharge support framing required to support the pump and adapt to the conditions shown on the drawings shall be furnished by the Contractor.

3.07.05 Electric Motor
The pump manufacturer shall be responsible for the proper selection of a premium efficiency motor (no less than 94.1% efficient) for the given application, torque, and thrust developed by the pump under the operating conditions. The horsepower rating shall be sufficient to drive the pump at all points on the head discharge curve. Motor material, workmanship, and tests shall conform with the requirements of NEMA, IEEE, and ANSI. Motor shall be specifically designed for operation of a submersible well water pump with a variable frequency drive control unit.

The motor shall be suitable for variable frequency drive starting providing standard starting torque with a minimum inrush current. The motor shall drive the pumps continuously under the specified operating conditions without exceeding allowable temperature for the class of insulation used. Efficiency and power factor at the rated load, speed, and frequency shall be as high as possible for the motor size. Guarantee values of efficiency and power factor at full, 3/4 and 1/2 load shall be supplied.

3.07.05 Installation
The pump shall be installed in accordance with the approved procedures shown on the shop and assembly drawings. The equipment shall be tested in the presence of the Owner by an authorized pump manufacture representative who shall certify, in writing, that the pump is operating in compliance with these specifications and free of binding, scraping, vibration, or other defects.

3.07.06 Pump Test
The pump shall be run and monitored for a minimum duration of 4 continuous hours during a test period. The pump test shall be performed by a PG&E certified tester and shall measure and record the following information:

1. Inlet Pressure
2. Standing Water Level
3. Draw Down
4. Recovered Water Level
5. Discharge Pressure
6. Total Lift
7. Flow Velocity  
8. Flow Rate  
9. Specific Capacity  
10. Acre Feet per 24 hr  
11. Horsepower input to motor  
12. Percent of Rated Motor Load  
13. Kilowatt Input to Motor  
14. Overall Pumping Efficiency

Five copies of the efficiency test results shall be supplied.

3.07.07 Supplies  
The Contractor shall furnish any necessary oil and grease as recommended by the manufacturer for initial operation.

3.07.08 Disinfection  
The Contractor shall completely disinfect the pump, well, and pipeline in accordance with applicable requirements of the DOHS and AWWA A100 prior to the acceptance of the work by the Owner. The Contractor shall submit the proposed method of disinfection to the Owner no later than 20 days after award of the contract. Sampling and bacteriological analysis will be completed and paid for by the Contractor.

The pump and column pipe shall be steam cleaned to assure that no residue of oils or solvents remain which could contaminate samples being tested for volatile organic chemicals. The Contractor shall supply written verification that cleaning has been accomplished.

3.08 Chain Link Fencing  
The Contractor shall furnish all labor, materials, equipment and incidentals necessary for construction of 6 foot high black vinyl clad chain link fencing and gates as shown on the drawings and specified. Same color vinyl slats shall be installed in the fabric. Owner shall select the color.

Submittals will be required for all materials in this Section.

Fencing and gates shall be heavy gauge (9 gauge). Fencing and gates shall have a top rail. Fencing and gates shall conform to Section 80-4 of the State Specifications.

Fencing and gates shall be constructed in accordance with Section 80-4 of the State Specifications.

3.09 ELECTRICAL AND CONTROL SYSTEM  
3.09.01 General  
The Contractor shall construct a completely integrated, electrical, control, and telemetry system all in strict accordance with the National Electrical Code and local revisions.

The drawings are generally diagrammatic and the location of outlets and equipment terminals are approximate unless detailed for dimensions. The exact locations and routing of cables and conduits shall be governed by structural conditions, physical interferences, and the locations of electrical terminations on equipment.

The Contractor shall examine the plans and shop drawings for the various pieces of equipment in order to determine exact routing and final terminations for all conduits and cables. Conduits shall be stubbed up as near as possible to equipment terminals.

All equipment shall be located and installed so that it will be readily accessible for operating and maintenance. The Engineer reserves the right to require minor changes in location of outlets or equipment, prior to roughing in, without incurring any additional costs or charges.

Electrical work shall be performed in cooperation with all other trades in order to secure the best arrangements of the work as a whole. No changes in the work shall be made without the written approval of the Engineer.
Allowance has been made in the design for the number of conduits, cables, and conductors which the Engineer considers adequate for feeding the various drives and equipment. These circuits are based on available data pertaining to a particular design of equipment. If the Contractor provides equipment which differs in connection requirements from the unit shown, the Engineer's acceptance of his substitution does not relieve the Contractor of his obligation to provide the necessary diagrams, services, and connections to the equipment at no additional cost to the College.

The Contractor shall not install any electrical equipment or devices in any newly constructed areas without permission by the Engineer. All operations involving grinding of concrete, sweeping, and similar activities shall have been completed prior to installation of the electrical equipment or the installation shall be made under controlled conditions of ventilation and other protection as may be required to protect the equipment from contamination by cement dust and any other particles.

3.09.02. Permits and Fees
The Contractor shall apply for and pay for all permits, inspections and other costs to provide electrical service for the pump station. The Contractor shall comply with all requirements of PG&E regarding temporary and permanent power service.

3.09.03 Materials and Installation
All electrical work shall be furnished and installed in accordance with the latest provisions of the National Electrical Code and/or codes of the agencies having jurisdiction.

All conduit shall be Schedule 80 PVC.

Wire shall be code Grade THW, THHN or as noted on the plans. All wiring materials, devices, apparatus, and parts shall be a standard catalog product of reputable manufacture. No spliced leads shall be made in the conduit.

3.09.04 Existing Motor Control Center Enclosure
The existing motor control center enclosure shall be utilized by the Contractor.

The existing busway section shall be modified as shown on the drawings. A 80 amp, 3 pole, 3 phase 480 volt quick trip motor circuit protector shall be installed as a main disconnect switch. A service ground shall be installed.

The motor control center shall be modified with the addition of a combination starter with variable frequency drive unit for the well pump; a Subtrol Pump Protector unit, # KVA 480 v to 120/240 volt transformer, an 8 circuit distribution panel; and the control panel. All equipment shall be for operation at 480 volts, 3 phase, 60 cycle. Starter shall be equipped with "Hand-Off-Automatic" selector switch and quick-trip overload relays in each phase. Pump required lights, pump running lights, and elapsed time hour meters shall be provided on each starter.

A Subtrol Plus motor protector manufactured by Franklin Electric Company shall be installed to protect the new well pump.

Each device or piece of equipment shall be identified with a permanent name plate.

The well pump starter shall be equipped with a Variable Frequency Drive (VFD). The VFD shall be of sufficient capacity and provide a quality of output waveform so as to achieve full rated output of the pump motors at full rating. In addition, the VFD will include the following ratings and parameters:

1. Minimum VFD efficiency - 96% at 100% speed and 96% at 60% speed.
2. Rated input voltage - 480 volts plus/minus 10%.
3. Ambient temperature range -10 1/2 C to +40 1/2 C.
4. Elevation - Less than 3000 feet above MSL.
5. Service Factor - 1.0.
6. Power Unit rating basis - 100% rated current continuous.
The VFD shall incorporate an input motor circuit protector such that:

1. The protector shall be sized to provide a short circuit interrupting capacity of at least 14,000 symmetrical amps or as determined by the short circuit calculations.

2. The input protector shall be mechanically interlocked with the power unit enclosure door.

The VFD shall be solid state design utilizing transistorized power electronics and microprocessor-based control circuits. The operating system of the VFD shall employ sine wave pulse-width modulation producing adjustable voltage and frequency through a two step process.

1. AC power shall be converted to a fixed DC voltage utilizing a full-wave diode bridge. This shall be done to provide an input displacement power factor of 0.95 or greater throughout the entire speed range. VFD's employing a phase-controlled front end will not be acceptable due to the inherent reduction of power factor with speed change (with possible utility power factor penalty) as well as power line notching considerations.

2. The second step shall convert the fixed DC bus voltage to a three-phase adjustable voltage, adjustable frequency output utilizing power transistors in the inverter circuit for high reliability.

The VFD shall be capable of operating at 460 volts, 60 Hz.

The VFD shall automatically compensate for power line fluctuations from -15% to +10% of nominal. The drive shall be capable of rated operation in an ambient temperature of -10 degrees C to +50 degrees C; with a relative humidity of 0 to 95% (non-condensing) and at an altitude of 3300 ft. elevation. Altitude derating shall be no more than 3% per thousand feet altitude above 3300 ft. The VFD shall be capable of attaining efficiencies of greater than 96% throughout 10% to 100% of the rated motor load range. The VFD shall be capable of providing an over current capacity of 150% for one minute. The VFD shall offer regeneration braking torque of approximately 20% of rated motor torque and be capable of operating in an environment of 0.5 G vibration.

The VFD shall contain the following features:

1. Control functions shall be capable of:
   a. Receiving input reference analog control signals of 0-5 VDC, 0-10 VDC of 4-20mA signals.
   b. Variable timed linear acceleration/deceleration adjustable from 1 to 150 seconds.
   c. Dynamic braking
   d. Start/Stop and speed-setting available on inverter chassis.
   e. Reduced voltage/frequency pattern selectable for energy savings.
   f. "Soft-Torque" operation on variable torque loads.
   g. Forward/Reverse operation
   h. Control via a surface mounted dial from 0% to 100%.

2. Stall prevention. The VFD shall have stall prevention circuitry which utilizes current foldback in the following sequence:
   In an operations mode, whenever the output current exceeds 150% of the rated VFD current, the VFD microprocessor stops increasing the output frequency and decreases it according to the set acceleration ramp until the output current is reduced below 150%. The inverter then resumes normal operation and the output frequency increases to set frequency.

3. Diagnostics. The VFD shall have the following built-in fault indicators:
   a. Electronic thermal overload relay to protect the motor at reduced speeds.
   b. Electronic over current trip for instantaneous overload protection.
   c. Over-temperature protection.
   d. Surge protection from input line voltage.
e. Electrical isolation between power and logic circuits.
f. Ability to withstand output line-to-line short circuit without VFD component failure.
g. Each variable speed shall be protected by a separate disconnect circuit breaker.

Each FVNR line voltage bypass starter and each transfer contactor shall be protected by a separate Westinghouse MCP Motor Protector disconnect. The combination Variable speed/Full speed system for each pump shall be compartmentalized with two disconnects interlocked through the door for operator safety and redundant backup.

4. Input surge isolation shall be through the use of isolation transformers specifically designed for this application or a suppression module specifically designed for protecting drive inverters. These units shall be standard catalog items of the inverter supplier which are tested and guaranteed to be matched and compatible with the inverter.

The A-C power units shall be enclosed in a sheet metal housing of NEMA 3R construction. The door of each power unit shall include:

1. Input circuit breaker handle.
2. One Manual speed control potentiometer.
3. One three-position mode selector switch, marked as follows: MANUAL -OFF-AUTOMATIC.
4. A "POWER ON" light.
5. A speed indicating meter.

The following conditions will cause an orderly drive shutdown and restart after time delay:

1. Loss of input power.
2. Undervoltage.
3. Sustained gradual overload.
4. Underload amperage.
5. Instantaneous severe overload.
6. Overvoltage.
8. Logic power supply failure.

For each occurrence condition 1 through 5, the VFD will automatically attempt to restart. Two unsuccessful restarts will result in permanent shutdown and alarm.

The VFD will be tested with the systems logic and given complete factory tests including simulated operation. After operational tests are complete, the complete VFD system will be heat tested with "Power On" in a heat room maintained at 50 1/2C. Length of the heat test will be 50 hours. The VFD unit will contain certification that the heat tests have been completed.

Complete shop drawings shall be submitted for all equipment and wiring included in the motor control center. All equipment shall be identified with the name, model number, and manufacturer.

The electrical contractor shall determine the maximum short circuit available at all points of the system and shall provide busses, motor circuit protectors, switches, circuit breakers and fuses which have sufficient amps interrupting capacity (AIC) to protect all equipment. A copy of the short circuit calculations shall be submitted to the Engineer with the shop drawing submittals.

**3.09.05 Control and Telemetry System**

The Contractor shall provide wiring as shown on the drawings to the existing master control center.

The College will program the SCADA system to accommodate the new flowmeter and well level transmitter.
3.09.05 Electrical System Tests

After electrical installation is complete, the Contractor shall make tests to demonstrate that the entire system is in proper working order and in accordance with drawings and specifications.

The tests shall be no less than those outlined hereafter, unless requested in writing and approved. Tests are in addition to, and not a substitution for, tests of individual items at manufacturer's plant. Make insulation and ground resistance tests before operating tests. Determine proper rotation of motors before permanent connections are made.

The Contractor shall replace wiring and equipment found defective, or failing to meet specified requirements, without charge, unless written acceptance for repair is given by Owner.

The Contractor shall furnish three copies of all test results to Owner.

The College will supply electric current necessary for tests.

The Contractor shall furnish suitable electrical instruments including voltmeters, ammeters, watt meters, tachometers and all other equipment necessary to perform tests specified.

The Contractor shall make necessary openings in circuits for testing instruments and place and connect all instruments, equipment and devices, necessary for the tests. Upon completion of tests, remove instruments and instrument connections and restore all circuits to permanent condition.

The Contractor shall coordinate activities and cooperate with others on project, to ensure that systems are energized when required, loads applied and other requirements are carried out on a timely, coordinated basis.

The Contractor shall conduct tests in presence of Engineer, notify Engineer seven calendar days or more in advance when any test is to be performed and do not start tests without Engineer's permission.

The Contractor shall make up no connections at service entrance permanently until correct phase rotation of all equipment is determined. The Contractor shall install and insulate these connections temporarily, if necessary, while determining proper rotation. The Contractor shall make permanent connections after proper rotation has been established and subsequent to completion of insulation resistance and dielectric tests.

The following tests shall be performed:

1. Insulation Resistance Tests of Circuits
   a. Do not subject conductors rated 600 volts and below to high potential dielectric tests. Test each complete feeder and branch circuit of 600 volts or below with everything but power supply and power-consuming equipment, connected thereto and have an insulation resistance between conductors and between each conductor and ground of not less than 10,000,000 ohms, unless otherwise accepted by College.
   b. Determine insulation resistance values with all switchboards, panelboards, fuseholders, switches, receptacles and overcurrent devices in place.
   c. Use megohmmeter having output of at least 500 volts to determine insulation resistance value of 600 volt rated conductors.
   d. List each circuit and measured resistance as test data.
   e. Maintain record of all insulation resistance values. Identify conductor, or equipment, date that value was taken and resistance value. Arrange information in suitable neat tabular form and return to College in triplicate.
2. Insulation Resistance Tests for Motors

After installation, test windings of all 3 phase motors with megohmmeter in accordance with, and meeting the requirements of, IEEE Standard No. 43.

3. Ground Resistance

a. Test each ground rod in accordance with IEEE Standard 142, and submit tabulation of results to College. Include identification of electrode, date of reading and ground resistance value in results.

b. Test each entire grounding system for continuity of connections and for resistance. Ensure that ground resistance of conduits, equipment cases and supporting frames does not vary appreciably from that of system as a whole and does not exceed 5 Ohms.

4. Operating Tests

a. Operate each motor and associated equipment, as nearly as possible, under normal operating conditions for as long as feasible and for the length of time sufficient to demonstrate correct alignment, temperature rise, speed and satisfactory operation. Load motors to full capacity, or as near as possible.

b. Operate switches, circuit breakers and control devices to show correct and satisfactory operation.

c. Associated equipment includes instruments, meters, relays, circuit breakers, switches and other devices in substations, switchgear, motor control centers, panel boards, control and instrumentation panels, etc., related to motor being tested.

d. Where tests of any of the above-referenced equipment are included in other Sections of specifications, coordinate testing, as directed by Engineer, to avoid duplication and conflict between tests.

e. Perform above tests in addition to, and not in substitution for required manufacturer's factory tests of individual items.