

October 23, 2025

IMPERIAL COMMUNITY COLLEGE DISTRICT
IMPERIAL VALLEY COLLEGE
WATER AND WASTEWATER PLANT IMPROVEMENTS

ADDENDUM #02

THE FOLLOWING ITEMS ARE LISTED AS CORRECTIONS OR CLARIFICATIONS TO THE CONSTRUCTION DOCUMENTS.

PROJECT MANUAL

1. GAC SPECIFICATIONS
 - a. Imperial Valley College TTHM Specifications are to be provided on this addendum. Specifications provided in addendum 02 are only applicable to GAC tank scope of work.

DRAWINGS

ARCHITECTURAL SITE

1. AS3 - SITE SURVEY AND DEMOLITION PLAN, DEMOLITION UTILITY PLAN
 - a. Sheet AS3 shall be replaced by Sheet AD-02_AS3 attached to this addendum.
2. AS – HARDSCAPE
 - a. Sheet AS5 shall be replaced by Sheet AD-02_AS5 attached to this addendum.

ELECTRICAL

1. E001 – SYMBOLS LIST
 - a. Sheet E001 was omitted from Bid Set in error, Sheet E001 shall be included in Bid Set Drawings and is attached to this addendum.
2. E101 – ENLARGED WATER TREATMENT DEMOLITION ELECTRICAL PLAN
 - a. Sheet E101 was omitted from Bid Set in error, Sheet E101 shall be included in Bid Set Drawings and is attached to this addendum.
3. E102 – SITE ELECTRICAL PLAN
 - a. Sheet E102 was omitted from Bid Set in error, Sheet E102 shall be included in Bid Set Drawings and is attached to this addendum.
4. E201 – SINGLE LINE DIAGRAM
 - a. Sheet E201 was omitted from Bid Set in error, Sheet E201 shall be included in Bid Set Drawings and is attached to this addendum.

END OF ADDENDUM #02

Edgar A. Barajas

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Attachments:	TTHM GAC	01620	Installation Of Equipment
	Tank	01655	Starting And Placing Equipment In Operation
	Specifications	01660	Field Tests Of Equipment
		01710	Cleaning
		01715	Cleaning And Testing Of Piping And Appurtenances
		01720	Record Documents
		01730	Operation And Maintenance Data
		01731	Instruction Of Operations And Maintenance Personnel
		01760	Post Final Inspection
		01810	Commissioning
		01656	Pipe Testing And Disinfection
		05051	Anchor Bolts And Adhesive Anchors
		09900	Painting
		11001	Installing Owner Furnished Equipment
		11555	Granular Activated Carbon Absorption System
		15052	Exposed Piping Installation
		15067	Thermoplastic Pipe
		15113	Thermoplastic Valves, Operators And Appurtenances
		15125	Ball Valves, Operators And Appurtenances
		15150	Specialty Valves And Appurtenances
		15220	Pipe Hangers And Supports
	Drawings	AD-02_AS3, AD-02_AS5,	
	(full sheet)	E001, E101, E102, E201	

SECTION 01620

INSTALLATION OF EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section describes Work necessary to install equipment and materials to be incorporated into this Project and supplements the Specification requirements in Division 2, Sitework, through Division 16, Electrical.
- B. Shop Drawings, installation drawings and instructions finished by the manufacturers shall be used by CONTRACTOR in the installation of the equipment and materials.

1.2 ANCHOR BOLTS AND GROUT

- A. Anchor and expansion bolts shall be furnished by CONTRACTOR, as specified and required. Use expansion bolts only where shown or approved by OWNER or required by the manufacturer. Anchor and expansion bolts shall be of specified materials with heavy hexhead nuts. Anchorage items shall conform to the applicable requirements of Section 05051, Anchor Bolts, Expansion Anchors, Toggle Bolts and Concrete Inserts.
- B. Grouting shall be in accordance with Section 03600, Grout.

1.3 TRANSPORTING, HANDLING AND INSTALLING EQUIPMENT AND MATERIALS

- A. CONTRACTOR shall conform to requirements of Section 01600, General Equipment Provisions and Division 1 requirements.
- B. CONTRACTOR shall employ competent mechanics experienced in the installation of the types of equipment and materials to be furnished, and shall ensure that all equipment and materials are installed in accordance with the recommendations of the manufacturers.

1.4 EQUIPMENT ERECTION

- A. General: Conform to the following as a minimum:
 - 1. Use only mechanics, machinists or mill wrights skilled in the handling, setting, aligning, leveling and adjusting of the type of equipment and materials furnished.
 - 2. Use only an oil bath heater to expand couplings, gears, etc. Do not force or drive them on equipment shafts, nor subject them to an open flame or torch.
 - 3. Wedging shall not be permitted. Use the least number of flat shims possible in leveling equipment. Shims shall be clean and free of slags. Provide all shims, filling pieces, keys, packing, red or white lead grout, or other materials necessary to properly align, level and secure apparatus in place. When requested by OWNER, CONTRACTOR shall demonstrate that all elements so required are level and plumb. Grind as necessary to bring parts to proper bearing after erection.
 - 4. Use proper tools in the assembly of equipment and materials to prevent deforming or marring the surface of shafts, nuts or other parts.

5. Tighten connections requiring gaskets evenly all around to ensure uniform stress over the entire gasket area.
6. Equipment and materials shall not be altered or repaired, and no burning or welding shall be permitted on any parts having machined surfaces, except by written permission of OWNER.
7. No rigging shall be done from any structure without the permission of OWNER, and CONTRACTOR shall be completely responsible for damage to the structure resulting from his operations.
8. Use tools, equipment and materials that shall not damage the structure or equipment.
9. CONTRACTOR shall finish and install plugs in lubrication holes to prevent entry of foreign material.
10. Electrical work, testing, lubricating and painting shall all comply with requirements of the applicable Section.

B. Setting and Erection:

1. All units shall be carefully set and aligned on their foundations, by qualified millwrights, after their sole plates have been shimmed to true alignment at the anchor bolts. Anchor bolts shall be set in place and the nuts tightened against the shims. Bedplates or wing feet of the equipment shall be further checked after securing to the foundations and, after confirmation of all alignments, the sole plates shall be finally grouted in place. CONTRACTOR shall be responsible for the correct alignment of equipment with its associated piping. "Pipe springing" shall not be allowed.
2. Misaligned holes shall be reamed. "Driving" of bolts or keys shall not be permitted.

C. Jacking Screws and Anchor Bolts:

1. All equipment shall be anchored to supporting members by bolts or other connections to accommodate all operating forces and satisfy the seismic restraint requirements of the Uniform Building Code for Zone I Seismic Area. Anchors shall provide resistance to a lateral force of at least 0.30 times the weight of the equipment, including its contents.
2. Jacking screws shall be provided in the heavy equipment bases and bedplates, and where required elsewhere, to aid in leveling during installation.
3. Anchor bolt setting drawings shall be delivered sufficiently early to permit setting the anchor bolts when the structural steel support frame is fabricated by others.
4. All anchor bolts and anchoring hardware shall be of Type 316 stainless steel. Expansion bolts shall only be used where permitted by the OWNER and shall be Type 316 stainless steel. Alternate methods of anchoring to those shown on the Contract Documents shall meet the requirements of this Section and shall be submitted to the OWNER for review. Submittal on alternate anchoring methods shall be done in accordance with Section 01630, Substitutions.

D. Alignment and Leveling:

1. Field check all shafts, couplings and sheaves for alignment and adjust to manufacturer's specifications where necessary.
2. Couplings shall be aligned while the equipment is free from all external loads.
3. Angular and parallel alignment shall be checked, and the actual alignment shall be recorded and submitted to OWNER. Alignment shall be within manufacturer's recommended tolerance.
4. Dial indicators shall be used for the checking of angular and parallel alignment. During rotation of the half couplings in performance of this test, they shall be maintained in the same relative position, and the dial indicator readings shall be taken at the same place on the circumference of the coupling.

- E. Threaded Connections:
 - 1. Apply a molybdenum disulfide, anti-seize compound to all threads in mechanical connections such as bolts, studs, cap screws, tubing, etc., unless otherwise specified.
- F. Equipment Drive Guards:
 - 1. Unless shown or specified otherwise, provide all equipment driven by open shafts, belts, chains, pulleys, sheaves, or gears with all-metal guards conforming to the requirements of Section 01600, General Equipment Provisions.

1.5 EQUIPMENT INSTALLATION

- A. CONTRACTOR shall obtain installation instruction booklets or other recommendations from the equipment manufacturers as to procedures for, sequence of, and tolerances allowed in equipment installation. In particular, the manufacturer's recommendations as to grout spaces required, type of grout to be used, and tolerances for level and alignment, both vertical and horizontal, shall be obtained and followed. One (1) copy of this material shall be given to the OWNER prior to the installation of the equipment.
- B. Whenever applicable, CONTRACTOR shall obtain the services of a manufacturer's representative specifically trained in erection of his equipment to supervise the installation. CONTRACTOR shall be responsible for the proper alignment of all installed driven equipment and drives in accordance with the tolerance recommendation of the manufacturers for both OWNER furnished and CONTRACTOR furnished equipment. Within fourteen (14) calendar days after installation, CONTRACTOR shall submit to the OWNER a letter from the manufacturer, on the manufacturer's letterhead, stating all equipment and components are installed in accordance with the manufacturer's requirements and installation instructions as described in these Specifications.
- C. Skilled craftsmen experienced in installation of the equipment or similar equipment shall be used. Applicable specialized tools and equipment, such as precision machinist levels, dial indicators, and gauges shall be utilized as required in the installations. The Work shall be accomplished in a workmanlike manner to produce satisfactory equipment installation free of vibration or other defects.
- D. CONTRACTOR shall install all OWNER furnished equipment in accordance with the installation instructions, Shop Drawings and submittal provided by the equipment manufacturers and available at the OWNER offices for CONTRACTOR'S use.
- E. Prior to installation of equipment, all sacking and concrete preparation shall be completed and the Work area shall be maintained in a broom-clean condition during the equipment installation.
- F. No equipment and materials shall be altered or repaired, and no burning or welding shall be permitted on any parts having machined surfaces, except by written permission of the OWNER.
- G. No rigging shall be done from any structure without the permission of the OWNER, and CONTRACTOR shall be completely responsible for any damage to the structure due to his operations.

- H. Only such equipment and materials as will not damage the structure or equipment and materials shall be used on the Work.

1.6 SPECIAL TOOLS

- A. All special tools that are required to assemble, disassemble, repair, and maintain any item of equipment furnished under the terms of this Contract shall be furnished with the equipment. When special tools are provided, they shall be marked or tagged, and a list of such tools shall be included with the maintenance and operation instructions for the equipment.

1.7 COORDINATION

- A. CONTRACTOR shall take all measurements for Work at the installation sites, verify all subcontractor's and manufacturer's drawings, shall be responsible for the proper installation within the available space of the apparatus specified and shown on the Drawings and shall inform the OWNER of any variations and shall submit all proposed changes for review before making any changes.

1.8 SERVICES OF MANUFACTURERS' REPRESENTATIVE

- A. Equipment furnished under Divisions 11 and 15 shall include the cost of competent, qualified representatives of manufacturers of all equipment to supervise the installation, adjustment and testing of the equipment and to instruct the OWNER'S operating personnel on operation and maintenance. The training time and additional requirements for furnishing services of manufacturers' representatives are specified in the appropriate Sections. If no time is specified, the training time shall be at least one (1) day. Supervision may be divided into two (2) or more time periods as required by CONTRACTOR'S schedule or as directed by OWNER.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01655

STARTING AND PLACING EQUIPMENT IN OPERATION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall initially start-up and place all equipment installed by him into successful operation according to manufacturer's written instructions and as instructed by manufacturer's field representative. CONTRACTOR shall provide all material, labor, tools, equipment, chemicals, lubricants, and expendables required to complete the start-up.
- B. No system or subsystem shall be started up for continuous operation unless all components of that system or subsystem, including instrumentation, have been tested and proven to be operable as intended by the Contract Documents.
- C. General Activities Include:
 - 1. Cleaning.
 - 2. Removing temporary protective coatings.
 - 3. Flushing and replacing greases and lubricants, where required by manufacturer.
 - 4. Lubrication.
 - 5. Check shaft and coupling alignments and reset where needed.
 - 6. Check and set motor, pump and other equipment rotation, safety interlocks, and belt tensions.
 - 7. Check and correct if necessary leveling plates, grout, bearing plates, anchor bolts, fasteners, and alignment of piping which may put stress on pumping equipment connected to it.
 - 8. All adjustments required.
- D. Provide chemicals and lubricants and all other required operating fluids.
- E. Provide fuel, electricity, water, filters, and other expendables required for start-up of equipment, unless otherwise specified.
- F. OWNER shall provide sufficient personnel to assist CONTRACTOR in the start-up, but the prime responsibility for proper mechanical operation shall belong to CONTRACTOR. Manufacturer's representatives shall be present during initial startup and operation, unless otherwise acceptable to OWNER.
- G. Start-up of either the heating or air conditioning systems is dependent upon the time of year that the plant start-up is initiated. CONTRACTOR shall be required to return at the beginning of the next heating or air conditioning season (whichever is applicable) to start the appropriate system.
- H. No system, unit process or any piece of equipment shall be started up for continuous operation without the approved Operation and Maintenance Manuals being turned over to the OWNER.

- I. Training shall be provided prior to turning the operation of a system, unit process or piece of equipment over to the OWNER. Training shall be scheduled for each plant staff work shift accordingly.
- J. Completion of start-up shall be when the OWNER assumes responsibility for operation of the equipment. If the OWNER does not assume operational responsibility and in the opinion of the OWNER start-up tasks are completed, the OWNER will notify CONTRACTOR, in writing, of the completion of the startup period.

1.2 MINIMUM START-UP REQUIREMENTS

- A. Bearings and Shafting:
 - 1. Inspect for cleanliness, and clean and remove all foreign materials.
 - 2. Verify alignment.
 - 3. Replace defective bearings and those which run rough or noisy.
 - 4. Grease as necessary and in accord with manufacturer's recommendations.
- B. Drives:
 - 1. Adjust tension in V-belt drives, sheaves and drives for proper equipment speed.
 - 2. Adjust drives for alignment of sheaves and V-belts.
 - 3. Clean and remove foreign materials before starting operation.
- C. Motors:
 - 1. Check each motor for comparison to amperage nameplate value.
 - 2. Correct conditions which produce excessive current flow and exist due to equipment malfunction.
- D. Pumps:
 - 1. Check glands and seals for cleanliness and adjustment before running pump.
 - 2. Inspect shaft sleeves for scoring.
 - 3. Inspect mechanical faces, chambers, and seal rings, and replace if defective.
 - 4. Verify that piping system is free of dirt and scale before circulating liquid through the pump.
- E. Valves:
 - 1. Inspect both hand and automatic control valves, and clean bonnets and stems.
 - 2. Tighten packing glands to assure no leakage, but permit valve stems to operate without galling.
 - 3. Replace packing in valves to retain maximum adjustment after system is determined to be complete.
 - 4. Replace packing on any valve that continues to leak.
 - 5. Remove and repair bonnets that leak.
 - 6. Coat packing gland threads and valve stems with a surface preparation of "Moly-Cote" or "Fel-Pro" after cleaning.
- F. Verify that control valve seats are free from foreign material and are properly positioned for intended service.
- G. Tighten flanges and all other pipe joints after system has been placed in operation.
 - 1. Replace gaskets showing any sign of leakage after tightening.

- H. Inspect all joints for leakage.
 - 1. Promptly remake each joint that appears to be faulty; do not wait for rust to form.
 - 2. Clean threads on both parts, and apply compound and remake joints.
- I. After system has been placed in operation, clean strainers, drives, pockets, orifices, valve seats and headers in fluid system to assure freedom from foreign materials.
- J. Open steam traps and air vents, where used, and remove operating elements.
 - 1. Clean thoroughly, replace internal parts and put back into operation.
- K. Remove rust, scale and foreign materials from equipment and renew defaced surfaces.
- L. Set and calibrate draft gages of air filters and other equipment.
- M. Inspect fan wheels for clearance and balance.
 - 1. Provide factory-authorized personnel for adjustment when needed.
- N. Check each electrical control circuit to assure that operation complies with Specifications and requirements and to provide desired performance.
- O. Inspect each pressure gage and thermometer for calibration.
 - 1. Replace items which are defaced, broken, or which read incorrectly.
- P. Repair damaged insulation.
- Q. Vent gasses trapped in any part of systems.
 - 1. Verify that liquids are drained from all parts of gas or air systems.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01660

FIELD TESTS OF EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. In addition to testing required by this Section, CONTRACTOR shall perform all other tests required by detailed equipment Specifications.
- B. No system or subsystem shall be started-up for continuous operation unless all components, including instrumentation and monitoring systems, of that system or subsystem has been tested and proven to be operable as intended by the Contract Documents.

1.2 PRELIMINARY TESTS

- A. CONTRACTOR shall make preliminary field tests of all equipment as soon as conditions permit.
- B. Purpose of tests is to determine if equipment is:
 - 1. Properly installed.
 - 2. In compliance with operating cycles.
 - 3. Operational and free from overheating, overloading, vibration or other operating problems.
- C. CONTRACTOR shall finish all labor, chemicals, materials, instruments, fuel, incidentals, and expendables required, unless otherwise provided.
- D. CONTRACTOR shall make all changes, adjustments and replacements required to place equipment in service and test it.
- E. OWNER shall be given sufficient notice prior to witness tests. A minimum 48 hour notice shall be given.

1.3 FINAL TESTS

- A. To the maximum extent possible, CONTRACTOR shall perform final field tests of equipment prior to initial start-up and operation of the Project. Where this is not practicable, final field tests shall be performed during initial start-up and operation of the Project.
- B. CONTRACTOR shall request, in writing, approval of the OWNER, to perform final testing simultaneously with start-up. CONTRACTOR shall define procedures necessary to comply with the requirements of this Section and Section 01655, Starting and Placing Equipment in Operation.
- C. Purpose of the tests is to demonstrate that equipment is:
 - 1. Properly installed.
 - 2. Completely ready for operation by the OWNER.

3. In compliance with design conditions, material specifications and all other requirements of the Contract Documents.
- D. CONTRACTOR shall finish all fuel and energy, labor, materials, instruments, chemicals, lubricants and expendables required for the tests, except where otherwise specified.
- E. Until final field tests are completed and approved, CONTRACTOR shall make all necessary changes, adjustments and replacements.
- F. Systems or unit process or any piece of equipment shall not be started-up without the approved Operation and Maintenance Manuals being turned over to the OWNER.
- G. CONTRACTOR shall notify OWNER at least 48 hours prior to beginning of tests. CONTRACTOR shall keep notes and data on tests and submit copy to the OWNER. OWNER'S operating personnel shall witness all tests.

1.4 MANUFACTURERS AND SUPPLIERS FIELD AND TEST DATA

- A. An experienced, competent and authorized representative of the manufacturer or supplier of each item of equipment as required in these Specifications shall visit the site of the Work and inspect, check, and approve the equipment installation. In each case, the equipment supplier's representative shall be present when the equipment is placed in operation. The equipment supplier's representative shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation is satisfactory to the OWNER.
- B. Six (6) copies of all test and field data, collected by the manufacturers/suppliers of equipment during installation supervision and start-up services, shall be submitted to the OWNER within fourteen (14) calendar days after the start-up services are complete. The test and field data shall be submitted, whether specified or not in the detailed equipment Specifications, and shall include, but are not limited to, the motor amperage readings to verify drives are properly sized; tolerance and alignment measurements, where applicable to verify equipment has been satisfactorily installed; and all other information collected by the manufacturers/suppliers to satisfy themselves that equipment has been properly installed. The manufacturer shall submit to the OWNER, a certification on the manufacturer's letterhead stating that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and it operated satisfactorily. In cases where the manufacturer/suppliers representative believes equipment is not properly installed, he shall include with this submittal a punch list detailing the problems noted which require correction. The information required under this Section shall be furnished for all equipment and devices requiring installation and start-up services, as specified in these Specifications, including the detailed mechanical, electrical and instrumentation specifications.
- C. The costs for this Work shall be included in the prices quoted by equipment suppliers. CONTRACTOR shall perform all Work required to install and place into operation the equipment in accordance with the manufacturer's recommendations.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01710

CLEANING

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Execute cleaning, during progress of the Work, at completion of the Work, and as required by General Conditions. If CONTRACTOR fails to clean areas as specified in this Section, the OWNER will have the areas cleaned and the effort will be back-charged against the CONTRACTORS Contract Price.

Some materials of construction are to be installed for use in a drinking water, storage and distribution system. The CONTRACTOR shall provide all means possible to protect the materials from contamination of any kind at no additional cost to the OWNER.

- B. Requirements of Regulatory Agencies:

1. In addition to the requirements herein, maintain the cleanliness of the Work and surrounding premises within the Work limits so as to comply with federal, state, and local fire and safety laws, ordinances, codes and regulations.
2. Comply with all federal, state and local anti-pollution laws, ordinances, codes and regulations when disposing of waste materials, debris and rubbish.

- C. Scheduling of Cleaning and Disposal Operations:

1. So that dust, wash water or other contaminants generated during such operations do not damage or mar painted or finished surfaces.
2. To prevent accumulation of dust, dirt, debris, rubbish and waste materials on or within the Work or on the premises surrounding the Work.

- D. Waste Disposal:

1. Dispose of all waste materials, surplus materials, debris and rubbish off the project site.
2. Do not burn or bury rubbish and waste materials on the project site.
3. Do not dispose of volatile or hazardous wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
4. Do not discharge wastes into streams or waterways.
5. CONTRACTOR shall be solely responsible for complying with any federal, state, and local environmental and regulations in disposing of waste.

- E. Cleaning Materials:

1. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
2. Use each type of cleaning material on only those surfaces recommended by the cleaning material manufacturer.
3. Use only materials which will not create hazards to health or property.

- F. During Construction:

1. Keep the Work and surrounding premises within Work limits free of accumulations of dirt, dust, waste materials, debris and rubbish.
2. Keep dust generating areas wetted down.

3. Provide suitable containers for storage of waste materials, debris and rubbish until time of disposal.
4. Dispose of waste, debris and rubbish off site to legal disposal areas.

G. When Project is Completed:

1. Remove and dispose of all excess or waste materials, debris, rubbish, and temporary facilities from the site, structures and all facilities.
2. Repair pavement, roads, sod, and all other areas affected by construction operations and restore them to original condition or to minimum condition specified.
3. Remove spatter, grease, stains, fingerprints, dirt, dust, labels, tags, packing materials and other foreign items or substances from interior and exterior surfaces, equipment, signs and lettering.
4. Repair, patch and touch up chipped, scratched, dented or otherwise marred surfaces to match specified finish.
5. Remove paint, clean and restore all equipment and material nameplates, labels and other identification markings.
6. Wash and shine mirrors, glazing and polished surfaces.
7. Clean all floors, slabs, pavements, and ground surfaces.
8. Maintain cleaning until acceptance and occupation by OWNER.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01715

CLEANING AND TESTING OF PIPING AND APPURTENANCES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall provide all labor, materials, equipment, appurtenances, and services required to clean, flush and test the following piping and appurtenances:
 - a. All interior surfaces of piping, valves and appurtenances provided for the Work.
- B. All structures, piping, valves, appurtenances, and all items identified in Paragraph 1.1.A.1 above shall be cleaned in accordance with Subsection 3. Cleaning shall be performed prior to coating applications in accordance with Section 09900 and the coating manufacturer's recommendations. Cleaning shall be performed after the final coatings have been applied and cured, and the coating manufacturer has approved in writing the cleaning method and timing. Cleaning operations causing harm to or jeopardizing the coating system shall require the CONTRACTOR to replace the coating system at no additional cost to the OWNER.
- C. Water for initial testing shall be furnished by the OWNER. CONTRACTOR shall provide all temporary piping, hose, valves, appurtenances, and services required. Cost of water for re-testing will be paid by CONTRACTOR to OWNER at OWNER'S standard rates. Contractor is responsible for removing the water from the reservoir (s), pipelines, etc. to a location and at a rate acceptable to the OWNER.
- D. Related Sections:
 - 1. Section 09900, Painting
 - 2. Section 15052, Exposed Piping Installation

1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following:
 - 1. AWWA C651, Disinfecting Water Mains

1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval the following:
 - 1. Testing procedures, methods, coordination and schedules.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 CLEANING

- A. All scaffolding, planks, tools, rags, dirt, debris, and any other material not part of the structural or operating facilities shall be removed prior to hydraulic testing. The surfaces of

the walls, floors, operating facilities, liners, etc shall then be thoroughly cleaned by sweeping, a high-pressure water hose, scrubbing, or another equally effective and appropriate method. All water, dirt, or foreign material accumulated shall be removed from the structure, piping, pump, valve and appurtenances.

3.2 HYDROSTATIC TESTING OF PIPELINES

- A. Prior to hydrostatic testing, all pipelines shall be flushed or blown out as appropriate. Test all pipelines either in sections or as a unit. No section of the pipeline shall be tested until all field-placed concrete or mortar has attained an age of 14 days. The test shall be made by closing valves when available, or by placing temporary bulkheads in the pipe and filling the line slowly with water. The CONTRACTOR shall be responsible for ascertaining that all test bulkheads are suitably restrained to resist the thrust of the test pressure without damage to or movement of the adjacent pipe. Any unharnessed sleeve-type couplings, expansion joints, or other sliding joints shall be restrained or suitably anchored prior to the test, to avoid movement and damage to piping and equipment. Provide sufficient temporary air tappings in the pipelines to allow for evacuation of all entrapped air in each pipe segment to be tested. After completion of the tests, such taps shall be permanently plugged. Care shall be taken to see that all air vents are open during filling.
- B. The hydrostatic test water shall be highly chlorinated, 50 mg/l free chlorine. The pipeline shall be filled at a rate which will not cause any surges or exceed the rate at which the air can be released through the air valves at a reasonable velocity and all the air within the pipeline shall be properly purged. After the pipeline or section thereof has been filled, it shall be allowed to stand under a slight pressure for at least 24 hours to allow the concrete or mortar lining, as applicable, to absorb what water it will and to allow the escape of air from any air pockets. During this period, bulkheads, valves, and connections shall be examined for leaks. If leaks are found, corrective measures satisfactory to the OWNER shall be taken.
- C. The hydrostatic test shall consist of holding the test pressure on the pipeline for a period of 4 hours. The test pressure for distribution and transmission pipelines shall be as indicated in the following schedule measured at the lowest point of the pipeline section.

Pipeline Size	Working Pressure (psi)	Test Pressure (psi)
4, 6 and 8-inch	See 15051 and 15052	See 15051 and 15052

All visible leaks shall be repaired in a manner acceptable to the OWNER. Pipes with welded joints shall have no leakage.

- D. The maximum allowable leakage for distribution and transmission pipelines shall be 10 U.S. gallons per inch of diameter per mile of pipe per 24 hours for pipe with 40-foot or greater lengths between joints and with rubber-gasketed joints and 20 U.S. gallons per inch of diameter per mile of pipe per 24 hours for pipe with 20-foot or less lengths between joints and with rubber-gasketed joints. The maximum leakage for yard piping shall be as shown on the Piping Schedule. Pipe with welded joints shall have no leakage. In the case of pipelines that fail to pass the prescribed leakage test, determine the cause of the leakage, take corrective measures necessary to repair the leaks, and again test the pipelines.
- E. The pipeline shall be drained after successful completion of the hydrostatic test.

3.3 CONNECTIONS TO EXISTING SYSTEM

- A. Where connections are to be made to an existing potable water system, the interior surfaces of all pipe and fittings used in making the connections shall be swabbed or sprayed with a

one percent hypochlorite solution before they are installed. Thorough flushing shall be started as soon as the connection is completed and shall be continued until discolored water is eliminated.

++ END OF SECTION ++

SECTION 01720

RECORD DOCUMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall maintain and provide the OWNER with Record Documents as specified below, except where otherwise specified or modified in Division 2, Site Work, through Division 16, Electrical.
- B. Maintenance of Documents:
 - 1. One (1) set of black line sets of plans, including Addenda, of the Contract Drawings will be finished to CONTRACTOR by the OWNER.
 - 2. Maintain in CONTRACTOR'S field office in clean, dry, legible condition complete sets of the following: Drawings, Specifications, Addenda, approved Shop Drawings, Samples, photographs, Change Orders, other modifications of Contract Documents, test records, survey data, Field Orders, and all other documents pertinent to CONTRACTOR'S Work.
 - 3. Provide files and racks for proper storage and easy access. File in accordance with filing format of Construction Specification Institute (CSI), unless otherwise approved by OWNER.
 - 4. Make documents available at all times for inspection by OWNER.
 - 5. Record Documents shall not be used for any other purpose and shall not be removed from CONTRACTOR'S office without OWNER'S approval.
- C. Marking System: Changes, revisions, additions and deletions, to the record set of Drawings shall be marked in Red.
- D. Recording:
 - 1. Label the Cover Sheet, Index and each supplemental sheets of each document "PROJECT RECORD" in 2-inch high printed letters.
 - 2. Keep record documents current. CONTRACTOR'S refusal, failure or neglect to maintain current Record Documents shall constitute sufficient basis for the OWNER to recommend the withholding of some or all of any payment due.
 - 3. Do not permanently conceal any Work until required information has been recorded.
 - 4. Drawings: Legibly mark to record actual construction including:
 - a. Depths of various elements of foundation in relation to datum.
 - b. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
 - c. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
 - d. Field changes of dimensions and details.
 - e. Changes made by Change Order or Field Order.
 - f. Details not on original Drawings.
 - 5. Specifications and Addenda: Legibly mark up each Section to record:
 - a. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.

- b. Changes made by Change Order or Field Order.
- c. Other matters not originally specified.

E. Record Drawings:

1. Record Drawings shall be prepared for all the Work included in the Contract. At the completion of the installation of the major Work area and the Work CONTRACTOR shall furnish to the OWNER redlined Drawings showing the actual in-place installation of the items installed under this Contract. The Drawings shall show the Work in plan and sections as required for clarity with reference dimensions and elevations for complete Record Drawings. The Drawings shall be furnished prior to Substantial Completion of the Work.
2. At the completion of all Instrumentation and Control and Electrical Work under the Contract, CONTRACTOR shall furnish to the OWNER, redlined Drawings showing one line diagrams with all conduit and wire sizes shown of the distribution systems and the actual in-place grounding system, lighting arrangement, motor control centers, corrected wiring diagrams, equipment and conduit and cable plans. The Drawings shall be furnished prior to the Substantial Completion of the Work.
 - a. The Contract Drawings may be used as a starting point in developing the record drawings. Subcontractor and manufacturer drawings may be included in this drawing package. The drawing package must be fully integrated and include the necessary cross references between drawings. The drawing package shall include interconnection and termination details to equipment furnished under this Contract.
 - b. All drawings must be submitted for approval of the OWNER. This shall include the following composite drawings for the system being furnished:
 - 1) Schematic (Elementary) Diagrams: This shall include, but not be limited to, complete schematics including items furnished by others for the following:
 - a) Motor Control Circuits for Starters furnished under this Contract.
 - b) Substation Controls.
 - c) HVAC Control Panels furnished under this Contract.
 - 2) Wiring (Connection) Diagrams: These shall be included for all prewired equipment furnished under this Contract.
 - 3) Interconnection Diagrams: These shall include all interconnections to be furnished under this Contract.
 - 4) Conduit and Cable Schedules: These shall include all conduit and cable furnished under this Contract.
 - 5) Dimension of Outline Drawings: These shall include all equipment furnished under this Contract.
 - 6) Power and Lighting Layout Drawings: These shall include all conduits and wiring furnished under this Contract.
3. In addition to the redlined Record Drawings, CONTRACTOR shall prepare and submit CADD files (AutoCad Rel. 2007) for all supplemental drawings used to complete the Record Drawings.

F. Submittal:

1. Acceptance of CONTRACTOR'S monthly application for payment shall be dependent on the OWNER'S acceptance and agreement that CONTRACTOR'S

Record Documents are complete, thorough and acceptable in showing all work up through and including such work as CONTRACTOR is claiming for completion and payment on CONTRACTOR'S application for payment. Any items which do not appear on the Record Documents in complete and acceptable form shall not be paid for in the CONTRACTOR'S monthly payment.

2. Examination by the OWNER of CONTRACTOR'S Record Documents will be made on a monthly basis to determine completion for consideration of monthly pay application. CONTRACTOR shall, however, make available all Record Documents at all times to the OWNER for examination.
3. Prior to Completion of the Work, deliver Record Documents to OWNER. Final payment will not be made until satisfactory Record Documents are received by OWNER.
4. Accompany submittal with transmittal letter containing:
 - a. Date.
 - b. Project title and number.
 - c. CONTRACTOR'S name and address.
 - d. Title and number of each Record Document.
 - e. Certification that each document as submitted is complete and accurate.
 - f. Signature of CONTRACTOR, or his authorized representative.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01730

OPERATION AND MAINTENANCE DATA

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Provide Operation and Maintenance Data in the form of instructional manuals for use by the OWNER'S personnel for all items specified in paragraph 1.2, Operation and Maintenance.
- B. Training or start-up on any system, process, or piece of equipment shall not be allowed until Operation and Maintenance Manuals and Lesson Training Plans are approved by the OWNER and the approved Operation and Maintenance Manuals have been turned over to the OWNER.
- C. Definitions:
 - 1. Operation and Maintenance Data:
 - a. The term "Operation and Maintenance Data" includes all product related information and documents which are required for preparation of the plant operation and maintenance manual. It also includes all data which shall accompany said manual as directed by current regulations of any participating government agency.
 - b. Required Operation and Maintenance Data includes, but is not limited to, the following:
 - 1) Complete, detailed written operating instructions for each product or piece of equipment including equipment function; operating characteristics; limiting conditions; operating instructions for startup, normal and emergency conditions; regulation and control; and shutdown.
 - 2) Complete, detailed written preventive maintenance instructions as defined below.
 - 3) Recommended spare parts lists, by generic title and identification number, and local sources of supply for parts.
 - 4) Written explanations of all safety considerations relating to operation and maintenance procedures.
 - 5) Name, address and phone number of manufacturer, manufacturer's local service representative, and Subcontractor or installer.
 - 6) Copy of all approved Shop Drawings, and copy of warranty bond and service contract as applicable, including circuit diagrams, schematics and functional drawings.
 - 7) Final test data, where applicable, shall be submitted as an appendix when completed.
 - 8) Disassembly, re-assembly, installation, alignment, adjustment, and checking instructions.
 - 9) Provide installation data in accordance with Section 01342, Installation Data.
 - 10) Written reference to equipment tag number, as specified under Section 01660, Field Tests of Equipment.

2. Preventive Maintenance Instructions:
 - a. The term "Preventive maintenance instructions" includes all information and instructions required to keep a product or piece of equipment properly lubricated, adjusted and maintained so that the item functions economically throughout its full design life.
 - b. Preventive maintenance instructions include, but are not limited to, the following:
 - 1) A written explanation with illustrations for each preventive maintenance task.
 - 2) Recommended schedule for execution of preventive maintenance tasks.
 - 3) Lubrication charts.
 - 4) Table of alternative lubricants.
 - 5) Trouble shooting instructions.
 - 6) List of required maintenance tools and equipment.

D. Submittal:

1. General: Submit operations and maintenance data to the OWNER within 90 days after approval of Shop Drawings, unless noted otherwise.
2. Number of Copies: Four (4) hard copies and one (1) soft copy of each item.
 - a. One (1) preliminary hard copy of each O&M Manual shall be submitted to the OWNER for approval within sixty (60) days of the approval of the Shop Drawing, which indicated further submittal are not required. The O&M Manual shall conform to the requirements as specified herein.
 - b. Sixty (60) days prior to placing the equipment into service submit four (4) hard copies and one (1) soft copy of the approved O&M Manual (except for field test data) to the OWNER.
 - c. Soft copy shall be in CD format and shall include all information provided in hard copy. Text shall be in electronic .pdf format. Drawings and figures shall be in both AutoCAD ".dwg" and .tif format.
3. Format Requirements:
 - a. Use 8-1/2-inch by 11-inch paper of high rag content and quality. Larger drawings or illustrations are acceptable if neatly folded to the specified size in a manner which will permit easy unfolding without removal from the binder. Provide reinforced punched binder tab or provide fly-leaf for each product.
 - b. All text must be legible and typewritten or machine printed originals, or high quality copies of same.
 - c. Each page shall have a binding margin of approximately 1- 1/2-inches and be punched for placement in a three ring loose leaf binder. Provide three ring binders that are uniform in color and size for all submittals. Non-uniform binders will not be acceptable. Identify each binder with the following:
 - 1) Title "OPERATING AND MAINTENANCE INSTRUCTIONS".
 - 2) Title of Project.
 - 3) Identity of building or structure as applicable.
 - 4) Identity of general subject matter covered.
 - d. CONTRACTOR shall coordinate with the OWNER to develop a comprehensive, practical, and consistent indexing system for the Operations and Maintenance Manuals. The OWNER shall review the indexing system before any manuals are submitted in draft form.
 - e. Use dividers and indexed tabs between major categories of information such as operating instructions, preventive maintenance instructions, or other. When necessary, place each major category in a separate binder.
 - f. Provide a table of contents for each binder.

- g. Identify products by their functional names in the table of contents and at least once in each chapter or Section. Thereafter, abbreviations and acronyms may be used if their meaning is explained in a table in the back of each binder. Use of model or catalog numbers or letters for identification is not acceptable.
- h. Indicate all components of the equipment on catalog pages by highlighting or some other clearly definable medium for ease of identification.
- i. Final test data determined after installations of the equipment shall be submitted as an appendix to the Operations and Maintenance Manuals.

1.2 OPERATION AND MAINTENANCE

Operation and Maintenance data shall be provided for the following equipment.

EQUIPMENT	SPECIFICATION SECTION
CXT Restrooms	13340

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01731

INSTRUCTION OF OPERATIONS AND MAINTENANCE PERSONNEL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall provide the services of factory-trained maintenance specialists to instruct OWNER'S operations and maintenance personnel in the recommended operation and the preventive maintenance procedures for equipment specified in the equipment Sections.
- B. The qualifications of specialists shall be subject to approval by OWNER.
- C. CONTRACTOR shall coordinate these services at times acceptable to OWNER, with a minimum of seven (7) days prior notice.
- D. Manufacturer shall provide a combination of classroom and field training. All training shall be conducted at the Facility, unless otherwise stated in the equipment Sections. Class size shall be limited to no more than 15 trainees. Manufacturer shall provide training for all plant shifts, or as approved by OWNER.
- E. Manufacturer shall allow all training sessions to be videotaped by OWNER.

1.2 TRAINING SCHEDULE

- A. Each manufacturer shall provide as a minimum the following hours of training. Travel time and expenses are responsibility of manufacturer and are not included in training schedule time.

1.3 SUBMITTAL

- A. Manufacturer shall submit for approval the following:
 - 1. Proposed Lesson Plan for each scheduled instruction thirty (30) days prior to commencement of training. Lesson plans shall be approved a minimum of seven (7) days prior to scheduled instruction.
 - 2. Credentials of their designated operations and maintenance instructor. Credentials shall include a brief resume and specific details of the instructor's experience pertaining to operation of, maintenance of, and training for the equipment specified.
 - 3. Training Request Form. CONTRACTOR shall submit the Training Request Form to the OWNER fourteen (14) days prior to the requested training date.
 - 4. There shall be separate "Operations" and "Maintenance" staff training.

1.4 INSTRUCTION LESSON PLAN

- A. Manufacturer's proposed Lesson Plan shall include the elements presented in the outline of Instruction Lesson Plan in Paragraph 1.4.D of this Section. Specific components and procedures shall be identified in the proposed Lesson Plan.

- B. Manufacturer's proposed Lesson Plan shall detail specific instruction topics. Training aids to be utilized in the instruction shall be referenced and attached where applicable to the proposed Lesson Plan. "Hands-On" demonstrations planned for the instruction shall be described in the Lesson Plan.
- C. The manufacturer shall indicate the estimated duration of "each segment of the training Lesson Plan.
- D. Instruction Lesson Plan shall include the following as a minimum:
 - 1. Equipment Operation:
 - a. Describe equipment's operating (process) function.
 - b. Describe equipment's fundamental operating principals and dynamics.
 - c. Identify equipment's mechanical, electrical and electronic components and features.
 - d. Identify all support equipment associated with the operation of subject equipment (e.g., valve actuators, motors, etc.).
 - e. Recommend standard operating procedures to cover start-up, routine monitoring and shutdown of the equipment.
 - 2. Detailed Component Description:
 - a. Identify and describe in detail each component's function.
 - b. Where applicable, group related components into subsystems. Describe subsystem functions and their interaction with other subsystems.
 - c. Identify and describe in detail equipment safeties and control interlocks.
 - 3. Equipment Preventive Maintenance (PM):
 - a. Describe PM inspection procedures required to:
 - 1) Perform an inspection of the equipment in operation.
 - 2) Spot potential trouble symptoms and anticipate breakdowns.
 - 3) Forecast maintenance requirements (predictive maintenance).
 - b. Define the recommended PM intervals for each component.
 - c. Provide lubricant and replacement part recommendations and limitations.
 - d. Describe appropriate cleaning practices and recommend intervals.
 - e. Identify and describe the use of special tools required for maintenance of the equipment.
 - d. Describe component removal/installation and disassembly/assembly procedures.
 - g. Perform at least two "hands-on" demonstrations of preventive maintenance procedures.
 - h. Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate.
 - i. Define recommended torqueing, mounting, calibration and/or alignment procedures and settings, as appropriate.
 - j. Describe recommended procedures to check/test equipment following a corrective repair.
 - 4. Equipment Troubleshooting:
 - a. Define recommended systematic troubleshooting procedures.
 - b. Provide component specific troubleshooting checklists.
 - c. Describe applicable equipment testing and diagnostic procedures to facilitate troubleshooting.

1.5 TRAINING AIDS

- A. The manufacturer's instructor shall incorporate training aids as appropriate to assist in the instruction. As a minimum, the training aids shall include text and figure handouts. Other appropriate training aids are:
 - 1. Audio-Visual Aids (e.g., films, slides, videotapes, overhead transparencies, posters, blueprints, diagrams, catalogue sheets).
 - 2. Equipment cutaways and samples (e.g., spare parts and damaged equipment).
 - 3. Tools (e.g., repair tools, customized tools, measuring and calibrating instruments).
- B. The manufacturer's instructor shall utilize descriptive class handouts during the instruction. Photocopied class handouts shall be good quality reproductions. Class handouts should accompany the instruction with frequent reference made to them. Customized handouts developed especially for the instruction are encouraged. Handouts planned for the instruction shall be attached with the manufacturer's proposed Lesson Plan.

1.6 "HANDS-ON" DEMONSTRATIONS

- A. The manufacturer's instructor shall present "hands-on" demonstrations of operations and maintenance of the equipment for each scheduled group. The proposed "hands-on" demonstrations should be described in the manufacturer's proposed Lesson Plan.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

TRAINING REQUEST FORM
SPECIFICATION SECTION 01731
INSTRUCTION OF OPERATIONS AND MAINTENANCE PERSONNEL

Equipment Name: _____

Equipment Tag Number: _____

Equipment Description: _____

Specification Section: _____

Operations and Maintenance Data Submitted/Approved: _____

Start-up and Testing Complete/Date: _____

Lesson Plan Submitted/Approved: _____

Training Aids Submitted/Approved: _____

Hands-on Demonstration: _____

Training Schedule (Dates, Time, No. of Sessions): _____

++END OF SECTION++

SECTION 01760

POST FINAL INSPECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Approximately 30 days or less after substantial completion, OWNER will make arrangements with CONTRACTOR for a Post Final Inspection and will send a written notice to said parties informing them of the date and time of the inspection.
- B. After the inspection, OWNER will inform CONTRACTOR of any corrections required prior to release of the balance of payment due and forward a certificate for final payment.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01810
COMMISSIONING

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section Includes: Responsibility of the OWNER and CONTRACTOR during the Commissioning Phase of the Project.
- B. Start-up and commissioning of the Work, or a specified part of the Work, under this Project shall be coordinated with OWNER'S Operations. Work under this Section shall not start until the Work under Section 01655, Section 01660, Section 01720, Section 01730, Section 01731, and as defined under the individual technical specifications. Spare parts shall also be on-site and accepted prior to commissioning.

1.2 REFERENCES

- A. Related Sections:
 - 1. Division 1, General Requirements.
 - 2. Division 11, Equipment.
 - 3. Division 15, Mechanical.

1.3 DEFINITIONS

- A. Commissioning: The sequential process in which newly constructed components are integrated into the existing system and put into successful operation.
- B. Successful Operation: The resultant operation of all the processes and related controls in a manner that is consistent with the Contract Documents.
- C. Manual Operational Mode: This operational mode represents the lowest level of control philosophy utilized in the plant instrumentation and control system. For all practical purposes, it means that an operational control decision requiring equipment or process monitoring and/or control will require an individual to physically go to the local control for the associated task in order to operate the facility. In the manual operational mode, the focus will be on verifying that the equipment and processes function correctly, independent of the instrumentation system and control system. The maximum duration of the manual commissioning period shall be twenty-five (25) percent of the total Work area commissioning duration.
- D. Semi-Automatic Operational Mode: The highest level of control philosophy utilized in the instrumentation and control system.

1.4 SUBMITTAL

- A. Preventive and Unscheduled Maintenance Plan: Submit detailed plan prior to start of commissioning for providing all preventive and unscheduled maintenance of all equipment and facilities throughout the entire commissioning phase of the project.
- B. OWNER'S Personnel Training Schedule and Plan: Submit detailed plan and schedule for training OWNER'S personnel in accordance with Section 01731, Instruction of Operations and Maintenance Personnel.

1.5 REQUIREMENTS

- A. The Commissioning Process for the Project will consist of the following:

COMMISSIONING PHASES		
Work/Work Area	Commissioning Requirements	Commissioning Duration (Calendar Days)
Treatment vessels	Manual Mode	5

- B. Commissioning process will commence after completion and start-up of the Work and at a mutually agreeable schedule between the CONTRACTOR and the OWNER.
- C. CONTRACTOR shall be responsible for all commissioning of components associated with this Work. The OWNER shall be responsible for start-up of existing components within the facility that are not associated with this Work. CONTRACTOR shall coordinate with the OWNER to ensure commissioning activities are completed to the satisfaction of the OWNER.
- D. During the course of the Commissioning Process, the OWNER will evaluate design related issues and recommend design modifications which shall be implemented by CONTRACTOR through the Change Order process.
- D. No system or subsystem shall be started up for continuous operation unless all components of that system or subsystem, including instrumentation, have been tested and proven to be operable as intended by the Contract Documents.

1.6 RESPONSIBILITIES

- A. Responsibilities listed do not relieve CONTRACTOR from all other responsibilities and duties associated with project closeout as defined in Division 0 and Division 1, General Requirements of the Specifications.
- B. CONTRACTOR'S Responsibilities During the Commission Process:
 - 1. CONTRACTOR shall provide all staff, labor, equipment and appurtenances required for the commissioning of the facilities associated with this Work.
 - 2. All Change Order work resulting from the evaluation of design-related issues by the OWNER.
 - 3. All preventive and unscheduled maintenance of all equipment and facilities associated with this Work. This shall include, but not be limited to the following:
 - a. Providing all lubricants.
 - b. Lubrication of all equipment in accordance with manufacturer's recommendations.
 - c. Perform all manufacturer recommended preventive maintenance.

- d. Exercise all equipment not in use during Commissioning phase.
 - e. Repair all failed equipment.
 - f. Periodic check of all equipment alignment, vibration, and noise levels in accordance with Specifications.
 - g. Provide all parts required for equipment repair.
 - h. Provide all tools and miscellaneous equipment required for equipment repair.
 - i. Administration/logging/documentation of all preventive maintenance and repair work.
 - j. Cleanup associated with equipment failure and repair.
 - k. Daily cleanup of buildings.
 - l. Landscaping maintenance.
 - m. Roadway cleanup and maintenance.
 - n. Replacement of all HVAC filters.
 - 4. Warranty related issues/items.
 - 5. Other contractual requirements including, but not limited to, incomplete Work list.
- C. OWNER'S Responsibilities During the Commissioning Process:
- 1. Provide all chemicals required for plant operations, including scheduling and securing of chemical deliveries to the plant and respective storage tanks.
 - 2. Perform all laboratory analysis required for plant operations.
 - 3. Review training schedules and plans, and schedule personnel training.
 - 4. Assisting ENGINEER in the evaluation of design related issues and recommendations of modifications to be implemented by CONTRACTOR through the change order process.
 - 5. Operation and maintenance of all existing treatment processes not included as a part of this Work.
 - 6. Start-up and seeding operation of the existing treatment processes not included as a part of this Work.
- D. ENGINEER'S Responsibilities during Commissioning Process:
- 1. Assist OWNER with technical data and information.
- E. Based upon the data compiled during the commissioning period modifications may be required. The OWNER may issue a request for proposal to modify the Work, to change design or process related issues. CONTRACTOR shall respond to the request. Appropriate cost and time adjustment will be made to address the proposed change.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01656

PIPE TESTING AND DISINFECTION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Scope: CONTRACTOR shall provide all labor, materials, equipment, appurtenances, and services required to clean, flush, disinfect and test the complete pump station piping and appurtenances.
- B. All piping, valves, appurtenances and all items identified in Paragraph 1.1.A. above shall be cleaned and disinfected in accordance with Subsection 3. Cleaning shall be performed prior to coating applications in accordance the coating manufacturer's recommendations. Disinfection and cleaning shall be performed after the final coatings have been applied and cured, and the coating manufacturer has approved in writing the disinfection and cleaning method and timing. Cleaning and disinfection operations causing harm to or jeopardizing the coating system shall require the CONTRACTOR to replace the coating system at no additional cost to the OWNER.
- C. Water for initial testing shall be furnished by the OWNER. CONTRACTOR shall provide all temporary piping, hose, valves, appurtenances, and services required. Cost of water for re-testing will be paid by CONTRACTOR to the OWNER at the OWNER's standard rates. Contractor is responsible for removing all the water from the pipelines being tested, etc. to a location and at a rate acceptable to the OWNER and the City.
- D. Related Sections:
 - 1. Section 01710, Cleaning
 - 2. Section 03300, Cast-In-Place Concrete
 - 3. Section 09900, Painting
 - 4. Section 15051, Buried Piping Installation
 - 5. Section 15061, Ductile Iron Pipe

1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following:
 - 1. AWWA C651, Disinfecting Water Mains
 - 2. AWWA C652, Disinfection of Water Storage Facilities
 - 3. AWWA C653, Disinfection of Water Treatment Plants
- B. Schedule disinfection operation as late as possible during contract time period to assure maximum degree of sterility of facilities when the Work is accepted by the OWNER.
- C. Bacteriological Laboratory: Certified by State of California.

1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval the following:
 - 1. Disinfection, and testing procedures, methods, coordination and schedules including proposed plans for water conveyance, control, disposal, and disinfection shall be submitted in writing for approval a minimum of ten (10) working days before testing is to start.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Protect against damage and contamination.
- B. Maintain caution labels on hazardous materials.
- C. Maintain storage room dry and with temperatures as uniform as possible between 60 degrees Fahrenheit and 80 degrees Fahrenheit.

1.5 PROTECTION

- A. Provide necessary signs, barricades, and notices to prevent persons from accidentally consuming water or disturbing system being treated.

PART 2 – PRODUCTS

2.1 MATERIALS REQUIREMENTS

- A. All test equipment, chemicals for chlorination, temporary valves, bulkheads, or other water control equipment and materials shall be determined and furnished by the CONTRACTOR subject to the OWNER review. No materials shall be used which would be injurious to the construction or its future function.
- B. Chlorine for disinfection shall be in the form of liquid chlorine, sodium hypochlorite solution, or calcium hypochlorite granules or tablets.
- C. Liquid chlorine shall be in accordance with the requirements of ANSI/AWWA B301. Liquid chlorine shall be used only:
 - 1. In combination with appropriate gas flow chlorinators and ejectors;
 - 2. Under the direct supervision of an experienced technician;
 - 3. When appropriate safety practices are observed.
- D. Sodium hypochlorite and calcium hypochlorite shall be in accordance with the requirements of ANSI/AWWA B300 - Hypochlorite.

PART 3 – EXECUTION

3.1 GENERAL

- A. Waterline Disinfection and Hydrostatic Testing shall be performed on each individual pressure pipeline in total lengths not exceed one-mile segments. CONTRACTOR is responsible for providing all valves, gages, etc to facilitate the Disinfection and Hydrostatic testing procedures. Unless otherwise indicated herein, water for testing and disinfecting water pipelines will be furnished by the CONTRACTOR. The CONTRACTOR shall make all necessary provisions for conveying the water from the OWNER designated or approved source to the points of use, and disposal of the water (and dechlorinating - where applicable).
- B. All pressure pipelines shall be tested. Disinfection shall be accomplished by chlorination. All chlorinating and testing operations shall be performed in the presence of the OWNER.

- C. Disinfection operations shall be scheduled as late as possible during the contract time period so as to assure the maximum degree of sterility of the facilities at the time the Work is accepted by the OWNER. Bacteriological testing shall be performed by a certified testing laboratory approved by the OWNER and at the expense of the CONTRACTOR. Results of the bacteriological testing shall be satisfactory with the State Department of Health or other appropriate regulatory agency.
- D. Release of water from piping, after testing and disinfecting have been completed, shall be acceptable to the OWNER. The CONTRACTOR shall conduct the discharges in accordance with the Temporary Discharge Permit. The OWNER shall conduct the water quality sampling required under the permit. The CONTRACTOR shall notify local agencies, secure appropriate permits and approvals, and provide erosion control measures as appropriate.

3.2 HYDROSTATIC TESTING OF PIPELINES

- A. Prior to hydrostatic testing, all pipelines shall be flushed or blown out as appropriate. Test all pipelines either in sections or as a unit. No section of the pipeline shall be tested until all field-placed concrete or mortar has attained an age of 14 days. The test shall be made by closing valves when available, or by placing temporary bulkheads in the pipe and filling the line slowly with water. The CONTRACTOR shall be responsible for ascertaining that all test bulkheads are suitably restrained to resist the thrust of the test pressure without damage to or movement of the adjacent pipe. Any unharnessed sleeve-type couplings, expansion joints, or other sliding joints shall be restrained or suitably anchored prior to the test, to avoid movement and damage to piping and equipment. Provide sufficient temporary air tapplings in the pipelines to allow for evacuation of all entrapped air in each pipe segment to be tested. After completion of the tests, such taps shall be permanently plugged. Care shall be taken to see that all air vents are open during filling.
- B. The hydrostatic test water shall be highly chlorinated, containing 50 mg/l free chlorine. The pipeline shall be filled at a rate which will not cause any surges or exceed the rate at which the air can be released through the air valves at a reasonable velocity and all the air within the pipeline shall be properly purged. After the pipeline or section thereof has been filled, it shall be allowed to stand under a slight pressure for at least 24 hours to allow the concrete or mortar lining, as applicable, to absorb what water it will and to allow the escape of air from any air pockets. During this period, bulkheads, valves, and connections shall be examined for leaks. If leaks are found, corrective measures satisfactory to the OWNER shall be taken. Ductile Iron Pipe leakage shall not exceed 0.050 gallons per hour- per inch diameter.
- C. The hydrostatic test shall consist of holding the test pressure on the pipeline for a period of 4 hours. The test pressure for the Potable Waterline shall be as indicated in Section 15051. All visible leaks shall be repaired in a manner acceptable to the OWNER. Pipes with welded joints shall have no leakage.
- D. The pipeline shall be drained after successful completion of the hydrostatic test, as directed by the OWNER. The pipe interior shall be kept completely moist at all times, as directed by the OWNER.

3.3 DISINFECTING PIPELINES

- A. General: All Potable Waterline piping shall be disinfected in one of the following methods and accordance with the requirements of ANSI/AWWA C651 - Disinfecting Water Mains as modified herein. Disinfection method shall be approved by the OWNER.

- B. Continuous Feed Method: Disinfect in accordance with ANSI/AWWA C651 except that:
 - 1. The water in the pipe shall contain 50 mg/l free chlorine.
 - 2. After 24 hours of disinfection, the residual free chlorine shall be at least 25 mg/l at the pipeline extremities.
- C. Slug Feed Method: Disinfect in accordance with ANSI/AWWA C651.
- D. Chlorinating Valves: During the process of chlorinating the pipelines, all valves and other appurtenances shall be operated while the pipeline is filled with the heavily chlorinated water.
- E. Final Flushing: After the applicable retention period, the heavily chlorinated water shall be flushed from the pipeline until chlorine measurements show that the concentration in the water leaving the pipeline is no higher than that generally prevailing in the system or is acceptable for domestic use. If there is any question that the chlorinated discharge will cause damage to the environment, a reducing agent shall be applied to the water to neutralize thoroughly the chlorine residual remaining in the water.
- F. Sampling Ports: The CONTRACTOR shall provide sampling ports along the pipeline as defined in AWWA C651. Taps may be made at manways and air valves to help facilitate the spacing requirement.
- G. Bacteriological Testing: After final flushing and before the pipeline is placed in service, a sample, or samples shall be collected from the end of the line, and shall be tested for bacteriological quality in accordance with the requirements of the State Department of Health or other appropriate regulatory agency. For this purpose the pipe shall be refilled with fresh potable water and left for a period of 24 hours before any sample is collected. Should the initial disinfection treatment fail to produce satisfactory bacteriological test results, the disinfection procedure shall be repeated until acceptable results are obtained.
- H. Disinfection work shall be completed and the facilities, piping, valves, etc satisfactorily tested for bacteria, etc. in accordance with "Standard Methods for Examination of Water and Wastewater" before they are accepted and placed in service.
- I. Samples for bacteriological tests will be taken by the OWNER. These samples shall indicate microbiologically-satisfactory water before the facilities will be accepted.
- J. CONTRACTOR shall repeat the disinfection procedure until the test results indicate microbiologically-satisfactory water, at no additional cost to the OWNER.

3.4 CONNECTIONS TO EXISTING SYSTEM

- A. Where connections are to be made to an existing potable water system, the interior surfaces of all pipe and fittings used in making the connections shall be swabbed or sprayed with a one percent hypochlorite solution before they are installed. Thorough flushing shall be started as soon as the connection is completed and shall be continued until discolored water is eliminated.

+ + END OF SECTION + +

SECTION 05051

ANCHOR BOLTS AND ADHESIVE ANCHORS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Scope:
 - 1. Provide all labor, materials, equipment and incidentals as shown on the Drawings, specified, and required to furnish and install anchor bolts (cast-in place) and adhesive anchors.
- B. Coordination:
 - 1. Review installation procedures under this and other Sections and coordinate installation of items that must be installed with or before anchor bolt or adhesive anchor work.
- C. This Section includes all anchor bolts (cast-in-place) and adhesive anchors required for the Work, but not specified under other Sections.
- D. The types of Work using anchor bolts (cast-in-place) and adhesive anchors include, but are not limited to the following:
 - 1. Hangers and brackets.
 - 2. Equipment.
 - 3. Piping.
 - 4. Tanks.
 - 5. Grating and floor plate.
 - 6. Electrical, Plumbing and HVAC Work.
 - 7. Metal, wood, and plastic fabrications.
 - 8. Partitions and ceilings.
 - 9. Shelf angles and masonry lintels.
 - 10. Structural members and accessories.

1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with the applicable provisions and recommendations of the following, except as shown on the Drawings or specified otherwise.
 - 1. ASTM F 593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - 2. ASTM F 594, Specification for Stainless Steel Nuts.
 - 3. 2012 International Building Code.

1.3 SUBMITTALS

- A. Samples: Representative samples of anchor bolts (cast-in-place) and adhesive anchors as may be requested by ENGINEER. Review will be for type and finish only. Compliance with all other requirements is exclusive responsibility of CONTRACTOR.
- B. Shop Drawings: Submit for approval the following:
 - 1. Setting drawings and templates for location and installation of anchorage devices.
 - 2. Copies of manufacturer's specifications, load tables, dimension diagrams, and installation instructions for the devices.
 - 3. Copies of ICC, UL, or FM Reports certifying load carrying capacities and installation requirements for the anchorage devices.

PART 2 – PRODUCTS

2.1 DESIGN CRITERIA

- A. When the size, length or load carrying capacity of an anchor bolt or adhesive anchor is not shown on the Drawings, provide the following:
 - 1. For anchor bolts (cast-in-place), provide the size, length, and capacity required to carry the design load based on the values and requirements for concrete given in the 2012 International Building Code.
 - 2. For adhesive anchors, provide the size, length, type, and capacity required to carry the design load based on the values and requirements given in the ICC Evaluation Report, or similar certifications by UL or FM, for the anchor to be used. Alternately, the capacity may be based on independent testing lab capacities for tension and shear strength using a minimum safety factor of four. Consideration of reduced capacity due to spacing and edge distance shall be made.
- B. Determine design loads as follows:
 - 1. For equipment anchors, use the design load recommended by the equipment manufacturer and approved by ENGINEER.
 - 2. For pipe hangers and supports, use one half of the total weight of: pipe, fittings, and water contained in pipe, plus the full weight of valves and accessories located between the hanger or support in question, and the next adjacent pipe hanger or support, in both directions along the pipe.
 - 3. Allowances for vibration are included in the safety factor specified above.
 - 4. Anchor bolts (cast-in-place) and adhesive anchors shall develop ultimate shear and pull out loads of not less than the following values in 4,000 psi concrete:

Bolt Diameter (Inches)	Min. Shear (Pounds)	Min. Pull-Out Load (Pounds)
1/2	5,000	7,600
5/8	8,000	12,000
3/4	11,500	17,000
7/8	15,700	20,400
1	20,500	28,400

2.2 APPLICATION

- A. Where a concrete anchor is shown on the Drawings, either install an adhesive anchor or anchor bolt (cast-in-place).
- B. Anchor Bolts (Cast-in-Place):
 - 1. Use in concrete or grout filled masonry.
 - 2. Where an anchor bolt is indicated, only a cast-in-place anchor bolt shall be used, unless another anchor type is accepted by the ENGINEER.
 - 3. Provide anchor bolts as shown on the Drawings or as required to secure structural steel to concrete or masonry.
- C. Adhesive Anchors:
 - 1. Use in concrete or masonry.
 - 2. Use where subject to vibration or where buried or submerged.
 - 3. Use for pipe supports.
 - 4. Shall not be used for vertical overhead installations.

2.3 MATERIALS

- A. Anchor Bolts:
 - 1. Unless otherwise indicated, provide stainless steel bolts complete with washers and nuts, complying with ASTM F 593 and ASTM F 594, AISI Type 316.
 - 2. For equipment, provide anchor bolts which meet the equipment manufacturer's requirements for size, material, strength, embedment length, and projection.
 - 3. Locate and accurately set the anchor bolts using templates or other devices as required.
- B. Adhesive Anchors in Concrete or Grout Filled Masonry:
 - 1. Provide stainless steel adhesive anchors complete with washers and nuts, complying with ASTM F 593 and ASTM F 594, AISI Type 316.
 - 2. Anchors shall be of the size required for the concrete strength specified.
 - 3. Adhesive anchors shall consist of threaded rods anchored with an adhesive system into hardened concrete or grout-filled masonry. The adhesive system shall use a two-component adhesive mix. Adhesive shall be injected with a static mixing nozzle following manufacturer's instructions. The embedment depth of the threaded rod shall provide a

minimum allowable bond strength that is equal to the allowable steel tensile capacity of the threaded rod, unless noted otherwise on the Drawings.

4. Adhesive Anchors in concrete:
 - a. Product and Manufacturer: Provide one of the following:
 - 1) HIT-RE 500-SD Epoxy Adhesive Anchor System, by Hilti, Inc.
 - 2) SET-XP Epoxy Adhesive Anchor System, by Simpson Strong-Tie Company, Inc.
 - 3) Or equal.
5. Adhesive Anchors in grout filled masonry:
 - a. Product and Manufacturer: Provide one of the following:
 - 1) HIT-HY 200 MAX Adhesive Anchor System, by Hilti, Inc.
 - 2) SET Adhesive Anchor System, by Simpson Strong-Tie Company, Inc.
 - 3) Or equal.

C. Powder activated fasteners and other types of bolts and fasteners not specified herein shall not be used, unless approved by ENGINEER.

D. Expansion anchors will not be allowed.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which anchor bolt (cast-in-place) and adhesive anchor Work is to be installed, and notify ENGINEER, in writing, of conditions detrimental to proper and timely completion of Work. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 INSTALLATION

- A. Protect anchor bolt (cast-in-place) and adhesive anchor threads and shank from damage during installation of equipment and metal framing.
- B. Adhesive Anchors in Concrete or Grout Filled Masonry:
 1. Holes shall be drilled in hardened concrete or grout to the adhesive anchor system manufacturer's recommended diameter and depth to develop the required pullout resistance but shall not be greater in diameter than 1/4-inch more than the anchor diameter nor less than 12 times the anchor diameter in depth, unless shown otherwise on the Drawings.
 2. Holes shall be drilled by methods which do not interfere with the proper bonding of the adhesive. Use rotary percussion drilling with carbide bit to avoid cutting reinforcing steel embedded in the concrete.
 3. Existing reinforcing steel in the vicinity of proposed holes shall be located prior to drilling. The location of holes to be drilled shall be adjusted to avoid drilling through or nicking any existing reinforcing bars. Holes in adjusted locations may be drilled only after approval by the ENGINEER.

4. Holes shall be brushed and blown clean with clean, dry compressed air to remove all dust and loose particles. Conform to the adhesive system manufacturer's written instructions.
5. Adhesive shall be injected into the hole through the injection system-mixing nozzle (and any necessary extension tubes) placed to the bottom of the hole. The discharge end shall be withdrawn as resin is placed but kept immersed to prevent formation of air pockets. The hole shall be filled to a depth that ensures that excess material is expelled from the hole during dowel placement.
6. Anchor rods shall be twisted during insertion into the partially filled hole so as to guarantee full wetting of the bar surface with adhesive. Anchor rods shall be inserted slowly to avoid developing air pockets.
7. Adhesive anchor manufacturer's representative shall observe and demonstrate the proper installation procedures for the adhesive anchors and adhesive material at no additional expense to OWNER. Each installer shall be certified in writing by the manufacturer to be qualified to install the adhesive anchors.

3.3 CLEANING

- A. After embedding concrete is placed, remove protection and clean anchor bolts.

3.4 FIELD QUALITY CONTROL

- A. Testing of Adhesive Anchors:
 1. Employ the services of an independent testing laboratory to perform field quality testing of adhesive anchors. A minimum of 10 percent (but no less than 15 anchors) shall be chosen at random by the testing laboratory and confirmed by the ENGINEER. Unless otherwise directed by the ENGINEER, adhesive anchors shall be tensioned to 60 percent of the specified yield strength. Where adhesive anchors are located less than eight dowel diameters from the edge of concrete the ENGINEER will determine the tensile load required for the test.
 2. Provide access for the testing agency to places where Work is being produced so that required inspection and testing can be accomplished.
 3. CONTRACTOR shall be responsible for the failure of any adhesive anchor. If any anchor fails, the testing shall be increased to 20 percent (but no less than 30 anchors), and may be increased further after review by the ENGINEER.
 4. Correct improper workmanship, remove and replace, or correct as directed by the ENGINEER, all adhesive anchors found unacceptable or deficient, at no additional cost to the OWNER.
 5. Pay for all corrections and subsequent tests required to confirm the integrity of the adhesive anchors.
 6. The independent testing and inspection agency shall complete a report for each area. The report shall summarize the observations made by the Inspector and be submitted to the ENGINEER.

++ END OF SECTION ++

SECTION 09900

PAINTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install all painting Work.
2. Extent of painting Work is specified herein.
3. Types of painting Work include, but is not necessarily limited to, the following:
 - a. Painting and finishing of all items and surfaces throughout the project included in this Section and other Sections.
 - b. Surface preparation, priming and coats of paint specified are in addition to shop priming and surface treatment specified under other sections of the Work.
4. The term "paint" as used herein means all coating systems materials, which includes pretreatment, primers, emulsions, enamels, organic or inorganic polymer coatings, stain, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
5. Paint all exposed surfaces whether or not colors are designated in any schedule, except where the natural finish of the material is specifically noted as a surface not to be painted. The term "exposed" as used herein means all items not covered with cement plaster or concrete. Ducts, conduits and other materials with corrosion resistant surfaces which are in chases, above finished ceilings, or other inaccessible areas shall not require field painting. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas.
6. Structural and miscellaneous metals covered with concrete, shall only receive a primer compatible with the covering material unless otherwise indicated.
7. Pre-applied coatings to all items delivered to the job site and not requiring field sand blasting shall be done in accordance with the approved painting submittal under this Section. All items delivered to the job site with pre-applied coatings shall be inspected by the OWNER and shall be repaired by the CONTRACTOR if in the judgement of the OWNER, coating is damaged. The CONTRACTOR shall then apply a final coat of the approved protective coating to the equipment in the field.
8. Where required in these specifications, ferrous metal surfaces to be painted including above ground and below ground piping, fittings, valves, etc. supplied under Division 15, Mechanical, shall be prepared by field sand blast cleaning as specified herein.
9. Pipe markers, as specified.

B. Coordination:

1. Review installation procedures under other Sections and coordinate the installation of items that must be field painted in this Section.
2. Coordinate the painting of areas that are inaccessible once equipment has been installed.
3. Ensure pre-approved prime coats not to be sand blasted are done in accordance with the approved painting submittals under this Section. CONTRACTOR shall be responsible to ensure all coating systems are provided in accordance with the approved painting and protective coating submittals under this Section.
4. Provide finish coats which are compatible with the prime paints used. Review other Sections of these Specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. CONTRACTOR shall be responsible for the compatibility of all shop primed and field painted items. Furnish information on the characteristics of the finish materials proposed to use, to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify OWNER, in writing, of anticipated problems using the coating systems as specified with substrates primed by others.

C. Related Work Specified Elsewhere:

1. Section 01300, Submittals.
2. Section 01600, General Equipment Provisions
3. Section 01610, Transportation, Handling, and Storage of Materials and Equipment.
4. Division 4, Masonry.
5. Division 5, Metals.
6. Section 10400, Identification Devices.
7. Division 11, Equipment.
8. Division 14, Conveying Systems.
9. Division 15, Mechanical.
10. Division 16, Electrical.

D. Painting Not Included: The following categories of Work are not included as part of the field-applied finish Work, or are included in other Sections of these Specifications.

1. Shop Priming: Unless otherwise specified, shop priming of structural metal, miscellaneous metal fabrications, other metal items and such fabricated components as shop-fabricated or factory-built heating and ventilating, instrumentation and electrical equipment or accessories shall conform to applicable requirements of Section 09900, Painting, but is included under the appropriate Sections of this Specification.
2. Pre-Finished Items: Unless otherwise shown or specified, do not include painting when factory finishing such as baked-on enamel, porcelain, anodizing or other similar finish is specified for such items as, but not limited to, finished mechanical and electrical equipment such as light fixtures and distribution cabinets and other equipment. CONTRACTOR shall be required to touch up factory finished items with paint supplied by the item manufacturer. CONTRACTOR shall field paint all damaged pre-finished items.
3. Metal surfaces of anodized aluminum, stainless steel chromium plate, bronze, copper, and similar finished materials will not require finish painting, unless shown or specified.
4. Operating Parts and Labels:
 - a. Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts do not require finish painting unless otherwise specified.
 - b. Do not paint over any code-required labeling, such as UL and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.
 - c. Remove all paint, coating or splatter inadvertently placed on these surfaces.

1.2 QUALITY ASSURANCE

A. Applicator Qualifications:

1. CONTRACTOR shall submit to the OWNER the name and experience record of the painting subcontractor. Include a list of utility or industrial installations painted, responsible officials, architects, or engineers concerned with the project and the approximate contract price.
2. Painting subcontractors whose submissions indicate that they have not had the experience required to perform the Work shall not be approved. Qualifying experience shall include at least three (3) previous projects of similar magnitude and complexity to this project that have been completed not less than eighteen (18) months prior to submission of qualifications to OWNER.

B. All materials specified by name, brand or manufacturer shall be delivered unopened to the job in their original containers. The paint shall be applied in strict accordance with the recommendations of the manufacturer using equipment approved for the duty.

C. Source Quality Control:

1. Certify long term compatibility of all coatings with all substrates.
2. Provide the services of a qualified manufacturer's representative at the Project site for a minimum of one (1) trip and one 8 hour work day at completion of the work to inspect the Work. Within seven (7) calendar days after inspection by the manufacturer, the CONTRACTOR shall provide a written report from the manufacturer certifying the coatings have been applied properly and in accordance with the manufacturer's recommendations and requirements. Deficiencies in the coatings system, if any, noted by the manufacturer during final inspection shall be defined in the manufacturer's report including corrective names to be implemented by the CONTRACTOR at the CONTRACTOR'S expense. Following corrective measures by the CONTRACTOR, the qualified manufacturer's representative shall re-inspect the Work, at the CONTRACTOR'S sole expense and the CONTRACTOR shall, within seven (7) days after re-inspection, provide a written report from the manufacturer certifying the coatings have been applied properly and in accordance with the manufacturer's recommendations and requirements.

E. Reference Standards: Comply with applicable provisions and recommendations of the following, except where otherwise shown or specified:

1. ANSI A13. 1, Scheme for the Identification of Piping Systems.
2. Great Lakes - Upper Mississippi River Board of State Sanitary Engineers (Ten States Standards), Recommended Standards for Waste Treatment Works Latest Edition, Recommended Color Scheme for Piping.
3. Great Lakes - Upper Mississippi River Board of State Sanitary Engineers (Ten States Standards), Recommended Standards for Water Works - 1968 Edition, Addendum No. 6, Painting of Water Works Piping for Public Water Supplies.
4. OSHA 1910.144, Safety Color Code for Marking Physical Hazards.
5. SSPC Volume 2, Systems and Specifications, Surface Preparation Guide and Paint Application Specifications.
6. National Sanitation Foundation NSF 60 and 61.

F. Requirements of regulatory Agencies: Coatings for surfaces in contact with potable water or water being treated for potable use shall not impart any taste or odor to the water or result in any organic or inorganic content in excess of the maximum contaminant level established by

applicable laws or regulations. All such coatings shall be approved by NSF and any other applicable regulatory agency. Revise painting systems specified herein to provide manufacturer's regulatory agency approved coating systems at no additional cost to OWNER.

1.3 SUBMITTALS

- A. Samples: Submit for approval the following:
 - 1. Pipe Markers: Each type of marker specified.
 - 2. Sample of all color options available from specified manufacturers.
- B. Shop Drawings: Submit for approval the following:
 - 1. Copies of manufacturer's technical information, including paint label analysis and application instructions for each material proposed for use.
 - 2. Copies of CONTRACTOR'S proposed protection procedures in each area of the Work.
 - 3. List each material and cross-reference to the specific paint and finish system and application. Identify by manufacturer's catalog number and general classification. State number of gallons of each component of each painting and coating system which will be brought to the project site and be incorporated into the Work. State the square foot area calculated to be covered by each painting and coating system component specified.
 - 4. Specification for spray equipment with cross-referenced to paint manufacturer's recommended equipment requirements.
 - 5. Pipe Markers: Copies of manufacturer's technical brochure, including color chart and set of standard markers.
 - 6. Maintenance Manual: Upon Final Acceptance, furnish copies of a detailed maintenance manual including the following information:
 - a. Product name and number.
 - b. Name, address and telephone number of manufacturer and local distributor.
 - c. Detailed procedures for routine maintenance and cleaning.
 - d. Detailed procedures for light repairs such as dents, scratches and staining.
 - e. Approved Shop Drawings.
- C. Certificates:
 - 1. Provide notarized statement that all coatings are compatible with substrates specified and that each component is recommended by the paint manufacturer for inclusion within each painting system as submitted for Shop Drawing review.
 - 2. Certification by the manufacturer that products supplied comply with applicable regulations controlling the use of volatile organic compounds (VOC).
- D. Test Reports: Submit for approval certified laboratory test reports for required performance tests.

1.4 PRODUCT DELIVERY- STORAGE AND HANDLING

- A. Delivery of Materials: Deliver all materials to the job site in original, new and unopened packages and containers bearing manufacturer's name and label, and the following information.
 - 1. Name or title of material.
 - 2. Manufacturer's stock number and date of manufacture.
 - 3. Manufacturer's name.
 - 4. Contents by volume, for major pigment and vehicle constituents.
 - 5. Thinning instructions where recommended.
 - 6. Application instructions.
 - 7. Color name and number.

B. Storage of Materials:

1. Store only acceptable project materials on project site.
2. Store in a suitable location approved by OWNER. Keep area clean and accessible.
3. Restrict storage to paint materials and related equipment.
4. Comply with health and fire regulations including the Occupational Safety and Health Act of 1970.

C. Handling of Materials:

1. Handle materials carefully to prevent inclusion of foreign materials.
2. Do not open containers or mix components until necessary preparatory Work has been completed and application Work will start immediately.

1.5 JOB CONDITIONS

A. Existing Conditions:

1. Before painting is started in any area, it shall be broom cleaned and excessive dust shall be removed.
2. After painting operations begin in a given area, broom cleaning will not be allowed; cleaning shall then be done only with commercial vacuum cleaning equipment.

B. Environmental Requirements:

1. Apply water-base paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 55 degrees F and 90 degrees F unless otherwise permitted by the paint manufacturer's printed instructions.
2. Apply other paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 65 degrees F and 95 degrees F and the temperature is 5 degrees F above the dewpoint, unless otherwise permitted by the paint manufacturer's printed instructions and approved by the OWNER.
3. Do not apply paint in rain, fog, or mist; or when the relative humidity exceeds 80 percent; or to damp or wet surfaces.
4. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.
5. Adequate illumination and ventilation shall be provided in all areas where painting operations are in progress.
6. Surface preparation and application of coatings shall be performed by the CONTRACTOR in compliance with all applicable federal, state and local occupational safety, health and air pollution control regulations. The CONTRACTOR shall obtain and comply with all safety precautions recommended by the paint manufacturer in printed instructions or special bulletins.
7. Install piping markers only after all painting and finish work has been completed.
8. Moisture content of substrates shall be verified to OWNER as acceptable to permit the commencement of the Work of this Section using methods recommended by the specified manufacturer.

C. Protection:

1. Cover or otherwise protect finished Work of other trades and surfaces not being painted concurrently or not to be painted.
2. Comply with governing code requirements for air quality and material disposal regulations.

3. Provide fire extinguishers and post caution signs warning against smoking and open flame when working with flammable materials.
 4. Submit protection procedures to be employed by CONTRACTOR to OWNER.
- D. Spent abrasive containing lead and/or chromate paint resulting from the blasting of the "affected surfaces" may be classified as a hazardous waste. "Spent abrasive" shall be understood to mean the abrasive generated during the blasting operation, including the spent water imposed over the abrasive flow, paint residue and any other debris.
- E. Care shall be exercised to prevent spent abrasive, water or dust from falling on surrounding buildings, unprotected vegetation, walkways, soils, structures and equipment by covering these areas with non-tearing tarps. Spent abrasive collecting on the ground shall be vacuumed regularly to prevent it from becoming wind blown. The site shall at all times be kept as clean as possible. At the end of the work day, all spent abrasive shall be thoroughly vacuumed and the site left with a neat appearance.
- F. Spent abrasive resulting from the blasting of the "affected surfaces" shall be captured. Non-tearing tarps or plastic sheathing, platforms, partial or total enclosures, temporary barriers or structures, or similar containment methods may be employed for this purpose. These methods must be reviewed by the OWNER prior to start of Work. A detailed procedure describing the proposed blast cleaning operation, abrasive capture and containment techniques, and safety measures to avoid the contamination of the natural environment or surrounding structures.
- G. Spent abrasive resulting from the blasting of the "affected surfaces" shall be collected and legally disposed of by the CONTRACTOR in a legal and responsible manner. Such disposal shall also be in conformance with all applicable codes, ordinances and regulations for hazardous waste disposal. All other waste, including spent abrasive generated by the blasting of non-affected surfaces, shall be disposed by the CONTRACTOR.
- H. All materials including painting equipment, shall be stored in accordance with local, state and federal requirements for paints, toxic materials and hazardous materials. All rags shall be removed from the premises. All possible precautions shall be taken to prevent spontaneous fires.
- I. All reasonable care shall be taken to protect against paint splatter and overspray. CONTRACTOR shall be responsible for any damage incurred to surrounding property resulting from his work.
- J. Signs shall be posted, as required, to alert the public of any risks associated with sandblasting debris, painting overspray, etc. All efforts shall be made to prevent debris from becoming wind blown.
- K. CONTRACTOR shall be responsible for obtaining any and all permits required to perform the Work.
- L. Spent water, resulting from the cleaning operation of "affected surfaces" due to wet sandblasting, may contain hazardous particulates.

PART 2 - PRODUCTS

2.1 MATERIAL QUALITY

- A. Provide the best grade of the various types of coatings, suitable for use in industrial projects, as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable.
- B. Provide primers produced by the same manufacturer as the finish coats. Use only thinners recommended by the paint manufacturer, and use only to recommended limits.
- C. Provide paints of durable and washable quality. Use materials which will withstand normal washing as required to remove grease, oil, chemicals, etc., without showing discoloration, loss of gloss, staining, or other damage.
- D. Manufacturer: Provide products as manufactured by one of the following:
 - 1. Tnemec Company, Incorporated.
 - 2. Kop-Coat, Inc.
 - 3. Or equal.

2.2 SUBMITTALS

- A. No products that decrease the film thickness, the surface preparation, VOC'S, solids by volume or the generic type of coating specified shall be considered. Approved manufacturers shall furnish the same color selection as the manufacturers Specified, including accent colors and custom colors in all coating systems, and shall document satisfactory performance of their coating system for at least two (2) water treatment plants that have been in service at least three (3) years each.

2.3 COLORS AND FINISHES

- A. Surface treatments, and finishes, are shown under "Painting Systems" below. All substrates scheduled under 'Painting Systems" shall be painted whether or not shown on the Drawings, or in Schedules, unless an item is specifically scheduled as not requiring the painting system scheduled below.
- B. Color Selection:
 - 1. A minimum of 20 different colors shall be selected for the Work, in addition to color coding of all piping and ducts. At least one accent color may be selected for one wall in each room.
 - 2. OWNER reserves the right to select non-standard colors for all paint systems specified within the ability of the manufacturer to produce such non-standard colors. Selection of non-standard colors, shall not be cause of CONTRACTOR rejecting OWNER'S color selections and CONTRACTOR shall supply such colors at no additional expense to OWNER. All colors and materials shall be approved by the OWNER prior to procurement.
- C. After approval of submittals and prior to beginning Work, OWNER will furnish color schedules for surfaces to be painted listed in the painting systems below.
- D. Color Coding: In general and unless otherwise specified, all color coding of piping, ducts and equipment shall comply with applicable standards of ANSI A13.1 and OSHA 1910.144.
- E. Use representative colors when preparing samples for OWNER'S review.
- F. Color Pigments: Pure, non-fading, applicable types to suit the substrates and service indicated.

1. Lead: Lead content shall not exceed amount permitted by federal, state and local government laws and regulations.
- G. Submit proposed application techniques to OWNER. Submit proof of acceptability, of technique, by the paint manufacturer selected.
- H. Exterior and interior building colors, perimeter wall colors, reservoir exterior wall color and reservoir roof gravel color shall be as approved by the OWNER.

2.4 PAINTING SYSTEMS

- A. Ferrous Metals including all Structural Steel, Miscellaneous Ferrous Metals, and all Ferrous Piping; Interior Non-submerged:
 1. Surface Preparation: SSPC-SP6 Commercial Blast Cleaning as specified in Paragraph 3.2.
 2. Interior non-submerged applies to areas that are housed within a building and/or within a non-process, enclosed structure.
 3. Product and Manufacturer: Provide one of the following:
 - a. Tnemec:
 - 1) Shop Primer: 66 H.B. Epoxoline - 2 coats, 2-3 dry mils per coat.
 - 2) Field Primer or Field Touchup: 66 H.B. Epoxoline - 1 coat, 2-3 dry mils per coat.
 - 3) Finish: 69 H.B. Epoxoline II - 2 coats, 4-5 dry mils per coat.
 - 4) Or equal.
- B. Ferrous Metals including all Ferrous Piping and the service entrance section; Exterior, Non-submerged:
 1. Surface Preparation: SSPC-SP6 Commercial Blast Cleaning as specified in Paragraph 3.2.
 2. Exterior non-submerged applies to areas that are not housed within a building or structure, and that are not located within process and/or water carrying structures or tanks.
 3. Product and Manufacturer: Provide one of the following:
 - a. Tnemec:
 - 1) Primer: 66 H.B. Epoxoline - 2 coats, 2-3 dry mils per coat.
 - 2) Intermediate: 69 RB. Epoxoline II - 1 coat, 4-5 dry mils.
 - 3) Finish: 75 Endura-Shield - 2 coats, 1.5-2 dry mils per coat.
 - b. Or equal.
- C. Galvanized Metal and Non-Ferrous Metal:
 1. Interior Non-Submerged: Surface Preparation: SSPC-SP 1 Solvent Cleaning, as specified in Paragraph 3.2.
 2. Interior non-submerged applies to areas that are housed within a building and/or within a non-process, enclosed structure.
 3. Product and Manufacturer: Provide one of the following:
 - a. Tnemec:
 - 1) Primer: 66 H.B. Epoxoline - 1 coat, 3-4 dry mils.
 - 2) Finish: 69 H.B. Epoxoline II - 1 coat, 4-5 dry mils.
 - b. Or equal.
- D. PVC, CPVC Pipe, Non-Ferrous Metal:
 1. Surfaces in industrial exposure, surface preparation:
 3. Product and Manufacturer: Provide one of the following:
 - a. Tnemec
 - 1) Primer: Series 115 Unibond – 1 coat, 2-4 dry mils.

- 2) Finish: Tnemec Series 1029 for Semi-Gloss finish – 1 coat, 2-4 dry mils.
 - b. Or equal.
- E. All Aluminum in Contact with Dissimilar Materials:
 - 1. Surface Preparation: Remove all foreign matter.
 - 2. Product and Manufacturer: Provide one of the following:
 - a. Tnemec:
 - 1) 66 H.B. Epoxoline - 2 coats, 2.0-3.0 dry mils per coat.
 - b. Or equal.
- F. Special Requirements for Aluminum:
 - 1. Aluminum surfaces bearing in or embedded in concrete and other surfaces of bolted aluminum joints, except anchor bolts, shall be given two (2) coats of 66 H.B. Epoxoline Primer, or equal. The primer shall be allowed to dry between coats and before concrete is poured against it.
 - 2. Where aluminum metals are placed in contact with or fastened to ferrous or stainless steel metals, the contact surfaces of each shall receive the protective coating specified for that metal and a gasket shall be placed between the two contact surfaces. The gasket material shall be non-conductive commercial grade neoprene, 60 durometer, 0.03-inch in thickness unless otherwise specified. Bolts shall be isolated using one piece non-conductive sleeves and washers as by PSI Products, Inc., Burbank, California; Parker Seal Col, Culvert City, California, or equal.
- G. New and Existing Ferrous Metals, Galvanized (Zinc-Coated) Metals and Non-Ferrous Metals and Exterior Surfaces of Piping; Submerged or Intermittently Submerged, Interior and Exterior:
 - 1. Surface Preparation: SSPC-SP6 Commercial Blast Cleaning as specified in Paragraph 3.2.
 - 2. Product and Manufacturer: Provide one of the following:
 - a. Tnemec:
 - 1) Shop Primer: Series 69N Hi-Build Epoxoline, Two coats, 1.5 to 2.5 dry mils per coat, 280 to 475 square feet per gallon per coat.
 - 2) Field Primer or Field Touchup: Series 69N Hi-Build Epoxoline, One coat, 1.5 to 2.5 dry mils, 280 to 475 square feet per gallon.
 - 3) Finish: Series 46H High Build Tnemec-Tar, Two coats, 6.0 to 8.0 dry mils per coat, 130 to 175 square feet.

2.5 PIPING MARKERS

- A. Manufacturer: Provide products produced by one of the following:
 - 1. W. H. Brady Company..
 - 2. Seton Name Plate Corporation.
 - 3. Or equal.
- B. General:
 - 1. Piping markers shall be formed from laminated plastic. All printing shall be sealed with a formed butyrate plastic film. Markers for piping up to 6-inch diameter shall be preformed to completely wrap around the pipe requiring no adhesive. Markers for pipes over 6-inch diameter shall be preformed to the contour of the pipe and attached with stainless steel spring fasteners.
 - 2. For pipes under 3/4-inch outside diameter: Provide brass tags, 1-1/2-inch diameter, with depressed 1/4-inch high black filled letters above 1/2-inch high black filled numbers.

3. Each marker shall consist of at least a legend descriptive of the function of the pipe, and a directional arrow.
4. The size of lettering and marker shall conform to ANSI A13. 1.
5. Location of Markers:
 - a. Adjacent to each valve and "T" connection.
 - b. At each branch and riser takeoff.
 - c. At each pipe passage through a wall, floor and ceiling.
 - d. On all horizontal and vertical pipe runs at 25-foot intervals.

PART 3 - EXECUTION

3.1 INSPECTION

- A. CONTRACTOR and his Painting Subcontractor (applicator) and the manufacturer shall examine the areas and conditions under which painting Work is to be performed and notify OWNER, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected by the CONTRACTOR.
- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film.
- C. Quality Assurance: Surface preparation shall be based upon comparison with: "Pictorial Surface Preparation Standards for Painting Steel Surfaces," SSPC-Vis 1 ASTM Designation D220, NACE Standard TM-01-70; and as described below. Anchor profile for prepared surfaces shall be measured by using a nondestructive instrument such as a Keane-Tator Surface Profile Comparator or Testix Press-o-Film System. Temperature and dewpoint requirements noted herein shall apply to all surface preparation operations, except minimum temperature shall be 40 degrees F. To facilitate inspection, the CONTRACTOR shall on the first day of abrasive blasting operations, abrasively blast metal panels furnished by CONTRACTOR to the standard specified. These panels shall be equivalent to plates or structural stock used in facility with minimum measurements of 8- 1/2-inches by 11-inches or nearest multiple for structural shapes. After agreeing a specific panel meets the requirements of the specification, the panel shall be initialed by the CONTRACTOR and OWNER and coated with a clear non-yellowing finish. Panels shall be utilized for inspection purposes throughout the duration of abrasive blasting operations.

3.2 SURFACE PREPARATION

- A. General:
 1. Perform all preparation and cleaning procedures as specified herein and in strict accordance with the paint manufacturer's instructions for each particular substrate and atmospheric condition.
 2. When required, prepare existing substrates to be painted under this Section as specified for new substrates. Where other methods of preparing existing substrates are proposed by the CONTRACTOR they shall be submitted to the OWNER for approval. OWNER'S approval of alternate substrate preparation shall not relieve the CONTRACTOR of his required performance under this Section.
 3. Remove all hardware, hardware accessories, machined surfaces, plates, fighting fixtures, and similar items in place and not to be finish painted, or provide surface applied protection prior to surface preparation and painting operations. Remove, if necessary, for the complete

painting of the items and adjacent surfaces. Following completion of painting of each space or area, reinstall the removed items by workmen skilled in the trades involved.

4. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.
5. All surfaces which were not shop painted or which were improperly shop painted, and all corroded or rusted shop painted surfaces, which are to be painted, as determined by OWNER, shall be prepared as specified below.
6. With the exception of motors, gears, and other equipment as well as protective metal coatings (i.e. galvanized) that might be damaged by sandblasting, and unless specified otherwise, shop applied protective coatings shall be completely removed at the jobsite by sandblasting. See 1.1D for metals that do not require finish painting and therefore, do not require surface prep.
7. All equipment and materials to be painted at the jobsite shall be placed on raised supports at least two feet above the ground. The prime coat shall be applied as quickly as possible after blasting. In no case shall bare metal surfaces be left more than one (1) hour before applying the prime coat. Each coat of the paint shall be applied at proper consistency and shall be sprayed or brushed evenly and be free of brush marks, pinholes, sags, and runs with no evidence of poor workmanship. Care shall be exercised to prevent paint from being spattered on surfaces which are not to be painted, and if paint is dropped or spattered on surfaces not to be painted the paint shall be removed as directed by the OWNER. All equipment nameplates, valve stems and areas not to painted shall be masked prior to painting.
8. Multiple coats shall be applied in conformance with the paint manufacturers recommendations for minimum drying time and maximum curing time between coats. The surface preparation and each coat of a multiple-coat system shall be of different colors (as selected by the OWNER) and inspected by the OWNER before subsequent coats are applied.
9. If thinning is required for proper application of a coating, it shall be done only in accordance with the recommendations of the paint manufacturer and only to the manufacturer's recommended limits.

B. Concrete and Ferrous Surfaces:

1. Concrete and ferrous metal surfaces to be painted including above and below ground concrete, piping, fittings, etc. supplied under Division 3, Concrete and Division 15, Mechanical, shall be prepared by field blast cleaning as specified below, unless described otherwise elsewhere in the Specifications.
2. Prior to blast cleaning the CONTRACTOR shall ensure that all rough welds are ground smooth and sharp steel edges ground to approximately 118-mch radius. Weld spatter shall be removed. Paint, mill, scale, rust, flux, fume and slag from weld deposits shall be removed by blast cleaning. Any grease or oil shall be removed by steam or solvent cleaning.
3. Surfaces to be blast cleaned shall be dry blast cleaned to a commercial blast cleaned surface finish conforming to Section 310-2.5 'Blast Cleaning' of the SSPWC and SSPC-SP6. Surface profile for surface not subject to submergence shall be 1.5 to 1.9 mils. Surface profile for surfaces subject to submergence shall be 3.0 to 4.0 mils.
4. All dust shall be removed by brushing, vacuum, air blast and as approved by the OWNER. Dust removal shall be performed immediately after surface preparation is complete. The prime coat shall be applied immediately after blasting and dust removal is complete, as directed by the OWNER.
5. Sandblasting and painting shall not be performed concurrently in the same area. No sandblasting will be allowed in areas adjacent to equipment that might be damaged by

- sandblasting. Sandblasted areas required to be left until the surface preparation and painting Work proceeds shall be protected in a manner acceptable to the OWNER.
6. Heavy deposits of grease or oil shall be removed from all surfaces to be coated using the paint manufacturer's specified cleaner prior to any other surface preparation. Any chemical contamination shall be neutralized and flushed off prior to any other surface preparation.
 7. In addition to the limitations imposed in Section 310-1 of the SSPWC, no surface preparation or coating shall be performed during periods of excessive wind, that in the opinion of the OWNER, would affect the quality of the Work, or produce nuisance conditions in adjacent areas. All coatings shall be applied in strict conformance with the manufacturer's printed recommendations regarding minimum and maximum allowable air and surface temperature. No coatings shall be applied when the relative humidity is higher than 80 percent or when the temperature is less than or equal to 5 degrees F above dewpoint. No coatings shall be applied if any moisture is detectable on the surface to be coated.
 8. Sandblast all concrete surfaces to the satisfaction of the OWNER.

C. Equipment that cannot be sandblasted:

1. Equipment that could be damaged by sandblasting, typically including motors, gear reducers, switchboards and similar equipment, shall receive the shop coatings and finish coatings. Shop coating of the Division 11, 13 and 16 equipment shall be as specified in Section 01600, General Equipment Provisions. The CONTRACTOR shall be solely responsible for ensuring that shop coating is done in conformance with the specifications and the approved paint submittal, and for repair or replacement of any shop coating which is determined to be inadequate by the OWNER. AR components shall have a finish color to match the preferred color scheme. Color samples shall be submitted for review and selection by the OWNER.
2. Shop-applied coatings shall be inspected and evaluated at the jobsite and shall be evenly applied and free of brush marks, sags, nicks, scratches, runs, holidays or other evidence of poor workmanship or damage. Shop coatings of good quality shall be solvent cleaned, and lightly sanded as directed by the OWNER and finish coated as specified. AR bearings and openings shall be masked to prevent damage during sanding and painting. Color shall be as specified above. Prior to application, the CONTRACTOR shall perform spot testing to determine if the shop-applied paint is of the same manufacturer as the specified finish coats. If, in the opinion of the OWNER, the paints are not as specified, the CONTRACTOR shall apply a suitable paint to act as a barrier or "tie coat" between the shop-applied and field-applied finishes. Materials and application procedures for the "tie-coat" shall be subject to review and approval by the OWNER. "Tie coats" shall be applied at no increase in contract price. It shall be the CONTRACTOR'S sole responsibility to determine if shop applied primers and finishes are as specified and he shall be totally responsible for the entire coating system warranty.
3. Shop-applied coatings which show evidence of poor materials or workmanship, or have been damaged, shall be repaired or replaced in the field as directed by the OWNER. Nicks and scratches or other small imperfections in the finish shall be repaired by wire brushing to a bright metal, 1 with a universal primer and finish coated as specified. Universal primer shall be Amercoat 185, 37-77H Kem Prime, Koppers Pug Primer, or approved equal, to a minimum dry film thickness of 2 mils. An epoxy primer may be used as a universal primer if a test patch is applied to check adhesion, and the OWNER approves. After repair, the equipment shall be solvent cleaned, lightly sanded, and painted as specified above for equipment with a good quality shop finish. X in the opinion of the OWNER, the shop coating is of such poor quality that repair is not warranted, he may elect to either: (1) require the CONTRACTOR to return the equipment to the factory for refinishing, or (2) require the CONTRACTOR to completely remove the misting coating, prepare the surface for

repainting and repaint the equipment using the applicable paint system as specified herein. ALL Work shall be done in a manner which will prevent damage to the equipment. Costs incurred for repair or replacement of shop-applied coatings shall be the sole responsibility of the CONTRACTOR at his expense.

- D. Non-Ferrous Metal Surfaces. Clean non-ferrous metal surfaces in accordance with the coating system manufacturer's instructions for the type of service, metal substrate, and application required.
- E. PVC, CPVC Piping and Fiberglass: Lightly sand and clean all surfaces to be painted.
- F. Covering on Pipe: Clean free of oil and surface contaminants as recommended by the coating manufacturer for substrate and application required. Do not cut or damage the insulation in any way.

3.3 MATERIAL PREPARATION

- A. General:
 - 1. Mix and prepare painting materials in strict accordance with the manufacturer's directions.
 - 2. Do not mix coating materials produced by different manufacturers, unless otherwise permitted by the manufacturer's instructions.
 - 3. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.
 - 4. Stir all materials before application to produce a mixture of uniform density, and as required during the application of the materials. Do not stir any film which may form on the surface into the material. Remove the film and, if necessary, strain the material before using.
 - 5. Mixing:
 - a. Mix only in containers placed in suitably sized non-ferrous or oxide resistant metal pans to protect concrete floor from splashes or spills which could stain exposed concrete or react with subsequent finish floor material.
 - b. Mix and apply paint only in containers bearing accurate product name of material being mixed, or applied.

3.4 APPLICATION

- A. General:
 - 1. Apply paint by brush, roller, air spray, or airless spray in accordance with the manufacturers directions and recommendations of Paint Application Specifications No. 1 in SSPC Vol. 2, where applicable. Use brushes best suited for the type of material being applied. Use rollers of carpet, velvet back, or high pile sheeps' wool as recommended by the paint manufacturer for material and texture required. Use air spray and airless spray equipment recommended by the paint manufacturer for specific coating system specified. Submit a list of application methods proposed, listing paint systems and location.
 - 2. The paint film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried.
 - 3. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. This is of particular importance regarding intense primary accent colors. Insure that all surfaces, including edges, comers, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.

4. Multiple coats shall be applied in conformance with the paint manufacturer's recommendations for minimum drying time and maximum curing time between coats. The surface preparation and each coat of a multiple-coat system shall be of different colors (as selected by the OWNER) and inspected by the OWNER before subsequent coats are applied. The CONTRACTOR shall provide forced ventilation in areas where inadequate ventilation exists. If thinning is required for proper application of a coating, it shall be done only in accordance with the recommendations of the paint manufacturer and with the written approval of the OWNER.
 5. Surfaces not exposed to view do not require color coding but require the same coating system specified for exposed surfaces.
 - a. "Exposed to view surfaces" is defined as those areas visible when permanent or built-in fixtures convactor covers, covers, covers for finned tube radiation, grilles, etc. are in place in areas scheduled to be painted.
 6. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint as specified, before final installation of equipment.
 7. Paint aluminum parts in contact with dissimilar materials as specified with appropriate primer and isolation gasket material.
 8. Omit field primer on metal surfaces which have been shop primed touch-up paint shop prime coats only when approved by OWNER.
 9. Paint the backs of access panels, and removable or hinged covers to match the exposed surfaces.
- B. Electrical Work:
1. Electrical items to be painted include, but are not limited to, the following:
 - a. Conduit and fittings.
 - b. Switchgear, panels, junction boxes, motor control centers, motors and accessories.
- C. Minimum Coating Thickness:
1. Apply each material at not less than the manufacturer's recommended spreading rate, and provide total dry film thickness as specified.
 2. Apply extra coat if required to obtain specified total dry film thickness.
- D. Scheduling Painting:
1. Apply the first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 2. Allow sufficient time between successive coatings to permit proper drying. Do not re-coat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
- E. Prime Coats: Re-coat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn through or other defects caused by insufficient sealing.
- F. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage.
- G. Transparent (Clear) Finishes:

1. On exposed to view portions, use multiple coats to produce glass-smooth surface film continuity of even matte luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.
2. Provide satin finish for final coats, unless otherwise indicated.

H. Brush Application:

1. Brush-out and work all brush coats onto the surfaces in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable. Neatly draw all glass and color break lines.
2. Brush apply a primer or first coats, unless otherwise permitted to use mechanical applicators.

I. Mechanical Applicators:

1. Use mechanical methods for paint application when permitted by governing ordinances, paint manufacturer, and approved by OWNER. If permitted, limit to only those surfaces impracticable for brush applications.
2. Limit roller applications, if approved by OWNER, to interior wall finishes for second and third coats. Apply each roller coat to provide the equivalent hiding as brush-applied coats.
3. Confine spray application to metal framework, siding, decking, wire mesh and similar surfaces where hand brushwork would be inferior and to other surfaces specifically recommended by paint manufacturer.
4. Wherever spray application is used, apply each coat to provide the equivalent hiding of brush-applied coats. Do not double back with spray equipment for the purpose of building up film thickness of 2 coats in one pass.

J. Completed Work: Match approved samples for color, team and coverage. Remove, refinish or repaint Work not in compliance with specified requirements as required by OWNER.

3.5 PROTECTION

- A. Protect work of other trades, whether to be painted or not, from the Work of this Section. Leave all such work undamaged. Correct all damages by cleaning, repairing or replacing, and repainting, as directed by OWNER.
- B. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove all temporary protective wrappings provided for protection of this Contract and other contracts after completion of painting operations.
- C. All equipment and/or materials to be painted at the jobsite shall be placed on raised supports at least two feet above the ground. The prime coat shall be applied as quickly as possible after blasting. In no case shall bare metal surfaces be left overnight before applying the prime coat. Each coat of the paint shall be applied at proper consistency and shall be sprayed or brushed evenly and be free of brush marks, pin holes, sags, and runs with no evidence of poor workmanship. Care shall be exercised to prevent paint from being splattered on surfaces which are not to be painted and if paint is dropped or splattered on surfaces not to be painted, the paint shall be removed as directed by the OWNER. All equipment nameplates, valve stems and areas not to be painted shall be masked prior to painting.
- D. In addition to the limitations imposed in Section 310-1 of the SSPWC, no surface preparation or coating shall be performed during periods of excessive wind which, in the opinion of the OWNER, would affect the quality of the Work, or produce nuisance conditions in adjacent areas.

ALL coatings shall be applied in strict conformance with the manufacturer's printed recommendations regarding minimum and maximum allowable air and surface temperatures. No coatings shall be applied when the relative humidity is higher than 80 percent or when the temperature is less than or equal to 5 degrees F above dewpoint. No coatings shall be applied if any moisture is detectable on the surface to be coated.

- E. The CONTRACTOR shall be responsible for containing all overspray. Any overspray on any item of equipment, piping, structures, paving, or others including vehicles shall be removed by the CONTRACTOR- If removal is not possible, the CONTRACTOR shall be responsible at CONTRACTORS cost for repainting the entire damaged item, to the satisfaction of the OWNER.

3.6 CLEAN-UP

- A. During the progress of the Work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each work day.
- B. Upon completion of painting Work, clean all paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces as determined by OWNER.

3.7 WARRANTY

- A. Warranty inspection shall be conducted during the eleventh month following completion of the Work. All defective Work shall be repaired by the CONTRACTOR in accordance with this Specification and to the satisfaction of the OWNER and at the CONTRACTOR'S expense.
- B. Any location where paint has peeled, bubbled, or cracked and any location where rusting is evident shall be considered to be a failure of the system. The CONTRACTOR shall make repair at all points where failures are observed by removing the deteriorated paint, cleaning the surface, and recoating or repainting with the same system. If the area of failure exceeds 25 percent of the total coated or painted surface, the entire coating or paint system may be required to be removed and repainted in accordance with this specification as determined by the OWNER-
- C. All costs for CONTRACTOR'S inspection, manufacturer's inspection and all costs for repair shall be done by the CONTRACTOR.

3.8 INSPECTION

- A. Holiday Testing
 - 1. The CONTRACTOR shall employ the services of an inspector qualified to operate high-voltage pulse-type, nondestructive holiday detection equipment to inspect the coatings of the following components:
 - a. Submerged metallic piping systems
 - a. The CONTRACTOR shall furnish the following inspection equipment for use by the qualified inspector: Tinker and Rasor Model AP-W, D.E. Stearns Co. Model 14/20, or Equal.

2. The testing equipment shall be in good working order, and shall be accurately calibrated and adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the specified coating thickness. Testing results shall be furnished for each separate unit which is to be coated, to demonstrate compliance with the Contract Documents.
3. Holiday testing equipment and procedures shall be done in strict accordance with the latest edition of the NACE "Standard Recommended Practice Discontinuity (Holiday) Testing of Protective Coatings." Areas that shall contain holidays shall be marked and repaired or recoated in accordance with the coating manufacturer's printed instructions and then retested.
4. The CONTRACTOR shall notify the OWNER of scheduled inspections at least 24 hours in advance to allow the OWNER to witness inspection testing.

B. Paint Inspections

1. The OWNER shall inspect and test coatings of the balance of components painted in accordance with Section 09900 – Painting for conformance to the specifications.
2. The OWNER shall use the following inspection equipment:
 - a. A Microtest, Elcometer, or equal, magnetic dry film thickness gauge.
 - b. Wet mil paint gauge for use during application.

PIPE COLOR CODING AND IDENTIFICATION SCHEDULE

SUBSTANCE	PIPE/COLOR BAND	LABEL BACKGROUND/LETTERS
Water (Potable)	Blue/ -	Lt. Blue/Black
Water (Non Potable)	Red/ -	White/Red
Water (Hot)	Blue/Red	Yellow/Black
Water (Sample)	Color of water being sampled	Green/Black
Chlorine (liquid, gas or solution)	Yellow/ -	Yellow/Black
Carbon Addition Chemical	Yellow/-	Black/Yellow
Process Air	White (Match Existing)/ -	White/Black
Secondary Effluent	Light Brown (Match Existing)/ -	White/Black
Feed Forward or Waste Activated Sludge (WAS)	Brown (Match Existing)	White
Tertiary Effluent	Purple	White/Black
Backwash / Recycle Lines	Dark Green / -	White/Black
Raw Sewage, Screened Influent, or Drains	Lt. Gray/ -	Green/Black
Sanitary Waste	Dark Gray/ -	Green/Black
Compressed Air	Peridot Green/ -	White/Black

PAINT SCHEDULE

FLUID	MATERIAL
Raw Sewage, Screened Influent, Feed Forward, WAS, Tertiary Effluent	DIP
Non Potable Water	PVC or CPVC
Process Air	Carbon Steel
Carbon Addition Chemical Carrier Pipe	PVC or CPVC

++ END OF SECTION ++

SECTION 11001

INSTALLING OWNER FURNISHED EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section includes installation, testing, and field painting of the Owner- furnished pressure vessel and granular activated carbon media, referred to as the TTHM treatment system.
- B. A copy of the purchase order and related preliminary drawings is attached as an appendix.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. A193: Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications.
 - 2. A194: Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
 - 3. A307: Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
 - 4. F593: Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - 5. F594: Standard Specification for Stainless Steel Nuts.

1.3 OWNER FURNISHED DATA

- A. Obtain the following data from the Owner:
 - 1. Approved shop drawings for the equipment showing the layout, arrangement, dimensional drawings, and mounting details for the equipment.
 - 2. Assembly drawings for installing the complete TTHM treatment system.

PART 2 - PRODUCTS

2.1 ANCHOR BOLTS

- A. Provide concrete-embedded Type 316 stainless steel anchor bolts, nuts, and washers. Stainless bolts shall comply with ASTM A593, Type 316; nuts shall comply with ASTM F594, Type 316. Washers shall be of the same material as the nuts. Anchoring system shall comply with Division 5 and manufacturer's recommendations.

PART 3 - EXECUTION

3.1 INSTALLATION-GENERAL

- A. Install anchor bolts and mounting plates in cast-in-place concrete per the equipment
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Installing Owner Furnished Equipment

manufacturer's drawings.

- B. Follow sludge dewatering manufacturers written instructions assembling and installing all Owner Furnished equipment.
- C. Obtain from the Owner the diameter of the penetrations required through decks and floors for equipment having shafts penetrating the deck or floor.
- D. Assemble and install pieces of equipment requiring field installation.
- E. Follow all manufacturer's recommended lubricant requirements in drives and other mechanical equipment.
- F. See Specification 11555 for further installation instructions.

3.3 PAINTING AND COATING

- A. Repair any damaged painting in accordance with Section 09900.

3.4 PLACING EQUIPMENT IN SERVICE

- A. After the equipment has been installed and is ready for field testing, notify the Engineer. The Engineer will arrange a meeting with a representative of the equipment manufacturer to test the equipment's operation.
- B. The Contractor shall be present at the meeting with the Engineer and the equipment supplier's representative.

3.5 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

+ + END OF SECTION + +

SECTION 11555

GRANULAR ACTIVATED CARBON ADSORPTION SYSTEM

PART 1 - GENERAL

OWNER shall furnish the granular activated carbon adsorption system (pressure vessel and media), also referred to as the TTHM treatment system, for CONTRACTOR to install. See Section 11001, Installing Owner Furnished Equipment. Installation and Start-up Services for the TTHM treatment system are described herein.

PART 2 – PRODUCTS (NOT USED)

PART 3- EXECUTION

3.1 GENERAL

- A. The fabrication and construction of all equipment shall be completed in every detail in a professional manner.
- B. Process performance testing shall be required within the time frame of one (1) month after start-up.
- C. Install the work of this section in strict accordance with manufacturer's recommendations and Shop Drawings as approved by the engineer
- D. Adsorption System Installation: The GACAS Supplier shall make all necessary arrangements and shall provide for the installation of the adsorption system including initial fill of GACAS vessel. The GACAS Supplier shall coordinate all necessary activities with the General Contractor and site personnel, including scheduling, site safety or other procedures, authorization of construction personnel and site responsibilities (services not provided by GACAS Supplier, but necessary for the installation and start-up of the adsorption system).
- E. Operator Training and Start-up Assistance: The GACAS Supplier shall provide the services of qualified personnel who will be responsible for pre-startup inspection of the adsorption system, site operator training (formal and informal) and assistance at the site during system startup. One day of field service shall be provided for each of these activities.

3.2 QUALITY CONTROL

- A. Provide services of a competent factory trained individual representing the manufacturer supplying the equipment (Representative). The Representative shall provide installation assistance and verify the installation to manufacturer's satisfaction. The Representative shall provide, in writing, 48 hours prior to startup, a certification that the carbon units are properly installed and ready for startup.
- A. The Representative shall be present for start-up activities and provide troubleshooting services as necessary.

- B. A Representative of the manufacturer shall instruct and train the plant personnel on operation, maintenance, and servicing of each vessel of equipment during the start-up activities.
- C. Holiday Testing – The PFASTS supplier shall certify provide factory test and inspection reports regarding all factory-applied linings and coatings for adsorber vessels and piping. Reports shall indicate that the linings and coatings have been applied in accordance with these specifications on surfaces receiving the specified preparation. Records of film thickness and holiday testing shall be included. Reports shall be furnished not later than the time of delivery of the vessels.
- D. Pressure test reports and certificates of inspection for each vessel in accordance with procedures for ASME pressure rating and ASME Boiler and Pressure Vessel Code. Reports shall be furnished not later than the time of delivery of the vessels.
- E. Quality Control Submittals: Supplier's Certificate of Proper Installation for pressure vessel system and accessories. This Certificate shall contain language stating that the Supplier agrees the System has been installed in accordance with the Suppliers plans and specifications, the System is ready for commissioning, and the Supplier warrants the System in accordance with the requirements of the Agreement.

3.3 DELIVERY, STORAGE, AND HANDLING

- A. Transport, deliver, unload, and handle products in accordance with manufacturer's instructions. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- B. Provide equipment and personnel to unload and handle products by methods to prevent soiling, disfigurement, or damage.
- C. All equipment supplied shall be shipped assembled to the greatest extent possible, consistent with handling and shipping limitations.
- D. All equipment and small loose pieces, tools, gaskets, etc. shall be adequately packed to prevent damage or loss during shipment or while in storage. All crates shall be identified with the equipment piece numbers. Major equipment shall bear the appropriate identification tag.

3.4 TESTS AND INSPECTION

- A. Pressure vessels shall be disinfected in accordance with AWWA C652, Disinfection of Water Treatment Plants. The bacteriological laboratory performing the bacteriological analysis shall be certified by the State of California. Bacteriological testing shall be performed by a certified testing laboratory approved by the OWNER and at the expense of the CONTRACTOR. Results of the bacteriological testing shall be satisfactory with the State Department of Health or other appropriate regulatory agency. Disinfection operations shall be scheduled as late as possible during the contract time period so as to assure the maximum degree of sterility of the facilities at the time the Work is accepted by the OWNER. Release of water from after testing and disinfecting have been completed, shall be acceptable to the OWNER and CONTRACTOR shall assume that a vector truck shall be used to haul the spent water to a local wastewater treatment plant.

- B. All materials used in the manufacture of equipment specified herein and all work performed shall be subject to inspection. The OWNER reserves the right to perform shop inspections any time prior to shipment.
- C. The GACAS Supplier shall be responsible for the protection of all instruments and devices that may be damaged by any test. Shop testing shall be done after manufacturing and assembly is complete and prior to shipping from the manufacturing facility.

++END OF SECTION++

SECTION 15052

EXPOSED PIPING INSTALLATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install and test all exposed piping, fittings, and specials. The Work includes, but is not limited to, the following:
 - a. All types and sizes of exposed piping, except those specified under other Sections.
 - b. Piping embedded in concrete within a structure or foundation will be considered as exposed and included herein.
 - c. Supports, restraints, thrust blocks and other anchors.
 - d. Work on or affecting existing piping.
 - e. Testing.
 - f. Cleaning and disinfecting.
 - g. Installation of all jointing and gasketing materials, specials, flexible couplings, mechanical couplings, harnessed and flanged adapters, sleeves, tie rods, and all other Work required to complete the exposed piping installation.
 - h. Incorporation of valves, meters and special items shown or specified into the piping systems as required and as specified in the appropriate Division 15, Mechanical, Sections.
 - i. Unless otherwise specifically shown, specified, or included under other Sections, all exposed piping Work required, beginning at the outside face of structures or structure foundation and extending into the structure.

B. Coordination:

1. Review installation procedures under other Sections and coordinate with the Work that is related to this Section.
2. Section 15052, Exposed Piping Installation, specifies the installation of all exposed piping materials specified in Division 15, Mechanical. Coordinate with these Sections.

C. Related Sections:

1. Section 15220, Pipe Hangers and Supports.
2. Division 15, Sections on Piping, Valves and Appurtenances.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Comply with applicable requirements of NFPA Standard No. 14 for "Standpipe and Hose Systems" used for fire protection.
2. Comply with requirements of UL, FM and other jurisdictional authorities, where applicable.

B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. ANSI B 13.1, Code for Pressure Piping.
2. ANSI B 16.3, Malleable-Iron Threaded Fittings, Classes 150 and 300.

3. ANSI B 16.4, Cast Iron Threaded Fittings, Classes 125 and 250.
4. ANSI B 16.5, Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys.
5. ANSI B 16.9, Factory-Made Wrought Steel Butt Welding Fittings.
6. ANSI B 16.11, Forged Steel Fittings, Socket-Welding and Threaded.
7. ANSI B31.1, Power Piping.
8. ANSI B31.8, Gas Transmission and Distribution Piping Systems.
9. ANSI D1.1, Structural Welding Code.
10. AWWA C 111, Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
11. AWWA C206, Field Welding of Steel Water Pipe Joints.
12. AWWA C600, Installation of Ductile Iron Water Mains and Their Appurtenances.
13. AWWA C606, Grooved and Shouldered Type Joints.
14. AWWA C651, Disinfecting Water Mains.
15. AWWA M11, Steel Water Pipe Design and Installation.
16. AWWA M23, PVC Piping.
17. AWS D10.9, Standard for Qualification of Welding Procedures and Welders for Piping and Tubing.
18. ASME Boiler and Pressure Vessel Code.

1.3 SUBMITTAL

- A. Shop Drawings: Submit for approval the following:
 1. Detailed drawings, in plan and section, and laying schedules.
 2. Details of piping, valves, supports, accessories, specials, joints, harnessing, and connections to existing pipes and structures.
- B. Tests: Submit description of proposed testing methods, procedures and apparatus. Submit copies of test report for each test.
- C. Certificates: Submit certificates of compliance with referenced standards.
- D. Record Drawings:
 1. Submit Record Drawings prior to the time of Substantial Completion.

1.4 PRODUCT- DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site to ensure uninterrupted progress of the Work.
- B. Handle all pipe, fittings and accessories carefully with approved handling devices. Do not drop or roll pipe off trucks. Do not otherwise drop, roll or skid piping.
- C. Store pipes and fittings on heavy wood blocking or platforms so they are not in contact with the ground.
- D. Unload pipe, fittings and specials opposite to or as close to the place where they are to be installed as is practical to avoid unnecessary handling. Keep pipe interiors completely free from dirt and foreign matter.
- E. Inspect delivered pipe for cracked, gouged, chipped, dented or other damaged material and immediately remove damaged materials from site.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Required pipe materials are listed in the Piping Schedule. Refer to applicable Sections for material specifications.
- B. General:
 - 1. Marking Piping:
 - a. Clearly mark each piece of pipe or fitting with a designation conforming to that shown on the Shop Drawings.
 - b. Cast or paint material, type and pressure designation on each piece of pipe or fitting 4-inches in diameter and larger.
 - c. Pipe and fittings smaller than 4-inches in diameter shall be clearly marked by manufacturer as to material, type and rating.
- C. Pipe Identification Markers and Arrows: Refer to Section 09900, Painting.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Install piping as shown, specified and as recommended by the manufacturer.
 - 2. If there is a conflict between manufacturer's recommendations and the Contract Documents, request instructions from OWNER before proceeding.
- B. Manufacturer's Installation Specialist:
 - 1. Provide the services of a competent installation specialist of the pipe manufacturer when pipe installation begins for the following:
 - a. Thermoplastic pipe.
 - 2. Retain installation specialist at the site for a minimum of two days or until competency of the pipe installation crew has been satisfactorily demonstrated.
- C. Piping Installation:
 - 1. Install straight runs true to line and elevation.
 - 2. Install vertical pipe truly plumb in all directions.
 - 3. Install piping parallel or perpendicular to building walls. Piping at angles and 45 degree runs across comers will not be accepted unless specifically shown or approved.
 - 4. Install small diameter piping generally as shown when specific locations and elevations are not indicated. Locate such piping as required to avoid ducts, equipment, beams, and other obstructions.
 - 5. Install piping so as to leave all corridors, walkways, work areas, and like spaces unobstructed. Unless otherwise approved, provide a minimum headroom clearance under all piping of 7-feet 6-inches.
 - 6. Protect and keep clean water pipe interiors, fittings and valves.
 - 7. Provide temporary caps or plugs over all pipe openings at the end of each day's work, and when otherwise required or directed by OWNER.
 - 8. Cutting: Cut pipe from measurements taken at site, not from Drawings.
 - 9. Install dielectric unions or dielectric flange kits with sleeves and washers wherever dissimilar metals are connected, except for bronze or brass valves in ferrous piping.

10. Provide a union downstream of each valve with screwed connections.
11. Provide screwed or flanged unions at each piece of equipment, where shown, and where necessary to install or dismantle piping.
12. Additional requirements for thermoplastic piping:
 - a. Support all valves independently of the piping system.
 - b. Utilize wide band supports, as recommended by manufacturer and approved by OWNER, to minimize localized stresses.
 - c. Provide piping passing through walls with a sleeve of wearing material to prevent abrasion damage to piping.
 - d. When anchors are required at locations other than equipment or tanks, they shall be placed at elbows, valve locations and at bends in pipeline.
 - e. Spacing of supports shall be in accordance with the manufacturer's published recommendations at the maximum design operating temperature of the pipe and requirements of Section 15220, Pipe Hangers and Supports.
 - f. Use "U" clamps with wide band circumferential contact.
 - g. Use guides on long runs of piping to maintain alignment and reduce chance of elastic failure of pipe. Space guides as recommended by manufacturer or 18 to 24-inches on center and 12 to 18-inches from expansion joints.
 - h. Expansion compensation shall comply with the requirements of Section 15220, Pipe Hangers and Supports.
 - i. Do not install pipe when ambient temperature is less than 60 degrees F.

D. Joints:

1. General:
 - a. Make joints in accordance with the pipe manufacturer's recommendations and the requirements below.
 - b. Cut piping accurately and squarely and install without forcing or springing.
 - c. Ream out all pipes and tubing to full inside diameter after cutting. Remove all sharp edges on end cuts.
 - d. Remove all cuttings and foreign matter from the inside of pipe and tubing before installation. Thoroughly clean all pipe, fittings, valves, specials, and accessories before installing.
2. Flanged Joints:
 - a. Assemble flanged joints using 1/8-inch ring-type gaskets for raised face flanges. Use full face gaskets for flat face flanges, unless otherwise approved by OWNER. Gaskets shall be suitable for the service intended in accordance with the manufacturer's ratings and instructions. Gaskets shall be properly centered.
 - b. Bolts shall be tightened in a sequence ensuring equal distribution of bolt loads.
 - c. The length of bolts shall be uniform, and they shall not project beyond the nut more than 1/4-inch or fall short of the nut when fully taken up. The ends of bolts shall be machine cut so as to be neatly rounded. No washers shall be used.
 - d. Bolt threads and gasket faces for flanged joints shall be lubricated prior to assembly.
 - e. Alternately tighten bolts 180 degrees apart to compress the gasket evenly.
3. Steel Pipe Joints:
 - a. Joints in steel pipe shall be butt welded, flanged, or threaded joints, except that flexible couplings, mechanical couplings, or Ranged connections shall be provided where shown on the Drawings.
 - b. Welding shall conform to the requirements of AWWA C206. Pipe 36-inches in diameter and larger shall be welded both inside and outside of the pipe.
 - c. After welding, the joint and the surrounding damaged or uncoated area shall be coated with the same material and to the same thickness as the shop applied coating.

- d. For threaded joints, use standard, right hand tapered full depth threads on steel piping and apply an approved joint compound, to the male threads only, before installation. Remove all cuttings and foreign matter from the inside of the pipe. Thoroughly clean all pipe, fittings, valves, specials, and accessories before installing.
 - 4. Thermoplastic Pipe Joints:
 - a. Solvent Cement Joints:
 - 1) Bevel pipe ends and remove all burrs before making joints. Clean both pipe and fittings thoroughly. Do not attempt to make solvent cement joints if temperature is below 40 degrees F or above 90 degrees F when exposed to direct sunlight nor in wet conditions.
 - 2) Use solvent cement supplied or recommended by the pipe manufacturer.
 - 3) Apply joint primer and solvent cement and assemble joints in strict accordance with the recommendations and instructions of the manufacturer of the joint materials and the pipe manufacturer.
 - 4) Observe safety precautions with the use of joint primers and solvent cements. Allow air to circulate freely through pipelines to permit solvent vapors to escape. Slowly admit water when flushing or filling pipelines to prevent compression of gases within pipes.
 - 5. Copper Tubing Joints:
 - a. Assemble copper tubing with soldered joints. Solder shall be 95-5 tin-antimony conforming to ASTM B32.
 - b. Ream or file pipe to remove burrs.
 - c. Clean and polish contact surfaces of joints.
 - d. Apply flux to both male and female ends.
 - e. Insert end of tube into full depth of fitting socket.
 - f. Heat joint evenly.
 - g. Form continuous solder bead around entire circumference of joint. Runs shall contain unions at connections to equipment and at reasonable distances along the lengths of runs to permit convenient disassembly of piping and removal of equipment.
- E. Installing Valves and Accessories:
- 1. Provide supports for large valves, flow meters and other heavy items as shown or required.
 - 2. Install floor stands as shown and as recommended by the manufacturer.
 - 3. Provide lateral restraints for extension bonnets and extension stems as shown and as recommended by the manufacturer.
 - 4. Provide steel sleeves where operating stems pass through floor. Extend sleeves 2 inches above floor.
 - 5. Position valve operators as shown. When the position is not shown, install the valve so that it can be conveniently operated and as approved by OWNER. Avoid placing operators at angles to the floors or walls.
 - 6. Position flow measuring devices in pipe lines so that they have the amount of straight upstream and downstream runs as recommended by the manufacturer, unless specific location dimensions are shown. Position swing check valves so that they do not conflict with the discs of butterfly valves.
- F. Unions:
- 1. Install dielectric unions wherever dissimilar metals are connected, except for bronze or brass valves, in ferrous piping.
 - 2. Provide a union downstream of each valve with screwed connections.
 - 3. Provide screwed or flanged unions at each piece of equipment, where shown, and where necessary to install or dismantle piping.

- G. Eccentric Reducers: Use eccentric reducers where shown and where air or water pockets would otherwise occur in mains because of a reduction in pipe size.
- H. Transitions from One Type of Pipe to Another:
 - 1. Do not take pipelines out of service unless specifically named below, or approved by OWNER.
 - 2. Provide all necessary adapters, specials and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.
- I. Taking Existing Pipelines Out of Service:
 - 1. Notify OWNER at least forty-eight (48) hours prior to taking pipeline out of service.
- J. Work on Existing Pipelines:
 - 1. Cut or tap pipes as shown or required with machines specifically designed for this work.
 - 2. Install temporary plugs to keep out all dirt, water and debris.
 - 3. Provide all necessary adapters, fittings, pipe and appurtenances required.

3.2 THRUST RESTRAINT

- A. Provide thrust restraint on all pressure piping systems and where otherwise shown or specified.
- B. Thrust restraint may be accomplished by means of restrained pipe joints. Thrust restraint shall be designed for the axial thrust exerted by the test pressure specified in the Exposed Piping Schedule.
- C. Restrained Pipe Joints:
 - 1. Pipe joints shall be restrained by means suitable for the type of pipe being installed. Provide restraint in accordance with MAG Standard detail No. 302 as directed by the OWNER.
 - a. Restrain concrete pipe joints utilizing welded joints.
 - b. Restrain ductile-iron mechanical joint pipe utilizing tie rods and clamps or proprietary restrained joint system such as American Lok-Fast, Fast-Tite, U.S. Trim-Tite or equal.
 - c. Restrain ductile iron pipe connected by flexible couplings or flanged coupling adapters by harnessing across the coupling or adapter using tie rods or extended bolts connecting between flanges.
 - d. Steel pipe shall have butt-welded joints, flanged joints, or flexible or mechanical coupling connectors. Provide tie rods connected to ears welded to the steel pipe for restraint at all flexible coupling connectors.

3.3 PAINTING

- A. Field painting shall conform to the requirements of Section 09900, Painting.

3.4 TESTING OF PIPING

- A. General:
 - 1. Test all piping as specified below, unless otherwise authorized by OWNER.
 - 2. Notify OWNER forty-eight (48) hours in advance of testing.
 - 3. Provide all testing apparatus including pumps, hoses, gages, and fittings.
 - 4. Pipelines shall hold the specified test pressure for two (2) hours.

5. Repair and retest pipelines which fail to hold specified test pressures or which exceed the allowable leakage rate.
6. Test pressures required are at the lowest elevation of the pipeline section being tested, unless otherwise specified.
7. Follow special test procedures below for gaseous chemical and liquid chlorine lines.
8. Conduct all tests in the presence of the OWNER. Repeat tests in the presence of local authorities having jurisdiction, if required.

B. Schedule of Pipeline Tests:

1. Test piping at the test pressure listed in the Exposed Piping Schedule.
2. For piping not included in the Schedule, the OWNER will notify CONTRACTOR in writing of the test pressure to be utilized.

C. Pressure Test Procedure:

1. Ensure that all supports and restraint protection are securely in place.
2. Fill section to be tested slowly with water and expel all air. Install cocks, as directed by the Owner, to ensure removal of air.
3. Test only one section of pipe at a time.
4. Apply specified test pressure required for two (2) hours and observe pressure gage. Check carefully for leaks while test pressure is being maintained.

3.5 TESTING OF DRAINAGE PIPING

A. General:

1. Test all drainage piping installed under this Section.
2. Provide all testing apparatus required.
3. Notify OWNER forty-eight (48) hours in advance of test.
4. Conduct all tests in presence of OWNER.

B. Procedures:

1. Perform test on entire system or on individual sections as approved by OWNER.
2. Completely seal all openings except highest opening in system or section to be tested.
3. Fill with water completely and test with at least ten (10) feet of water above highest point.
4. Allow water to stand in system for at least fifteen (15) minutes. Inspect for leaks and repair all leaks found. Retest repaired sections.

3.6 CLEANING AND DISINFECTION

A. Cleaning:

1. Thoroughly clean all piping and flush prior to placing in service in a manner approved by OWNER.
2. Piping 24-inches in diameter and larger shall be inspected from inside and all debris, dirt and foreign matter removed.
3. If piping that requires disinfection has not been kept clean during storage or installation, CONTRACTOR shall swab each section individually with a five percent hypochlorite solution, to ensure clean piping.

B. Disinfection:

1. Disinfect all potable water piping. Disinfection shall conform to the requirements 02643, Waterline Testing and ADEQ requirements noted on the general notes on the Drawings.

3.7 IDENTIFICATION OF PIPING

A. Piping markers shall conform to the requirements of Section 09900, Painting.

3.8 PIPING SCHEDULE

The following abbreviations are used in the Exposed Piping Schedule at the end of this Section.

A. Material Abbreviations

Cast Iron	CI	Double Containment	
Copper	C	Fiberglass Reinforce	
Carbon Steel	CS	Plastic	DCFRP
Chlorinated Polyvinyl Chloride	CPVC	Ductile-Iron	DI
Double Contained		Fiberglass Reinforced	
Fiberglass Reinforced Plastic	DCFRP	Plastic	FRP
Prestressed Concrete	PCCP	Polyvinyl Chloride	PVC
		Polyethylene	PE
		Stainless Steel	SS

B. Lining and Coating Abbreviations

Cement Mortar Coated	CC	Tape Wrap	TW
Cement Mortar Lined	CL	Galvanized	Galv
Glass Lined	GL	Plastic Lined	PL
Bituminous Coated	BC	Painted	P
Reinforced Synthetic Veil	RSV	Teflon	T
		Epoxy Lined	EL

C. Joint Abbreviations

Bell and Spigot	BS	Screwed Fittings	S
Flanged	Flg	Compression Sleeve	
Mechanical Joint	MJ	Coupling	CSC
Butt Welded	BW	Compression Flange	
Solvent Welded	SW	Adaptor	CFA
Soldered	Sd		

IMPERIAL VALLEY COLLEGE TTHM REDUCTION PROJECT EXPOSED PIPING
SCHEDULE

Service	Material	Interior Lining	Exterior Coating	Thickness / Class	Joint	Pressure Test (psig)
3-inch Backwash Supply Piping	CPVC	-	P	SCH 80	SW	160
4-inch Rinse to Waste Piping	CPVC	-	P	SCH 80	SW	160
4-inch Vessel Treated Effluent Piping	CPVC	-	P	SCH 80	SW	160
4-inch GAC Inlet/Backwash to Waste Piping	CPVC	-	P	SCH 80	SW	160

+ + END OF SECTION + +

SECTION 15067

THERMOPLASTIC PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install and place in satisfactory service chlorinated polyvinyl chloride (CPVC) piping, fittings and specials.
2. The extent of piping is shown on the Drawings and in schedules in Section 15051, Buried Piping Installation, and Section 15052, Exposed Piping Installations.

B. Coordination:

1. Review installation procedures under other Sections and coordinate with the Work that is related to this Section.

C. Related Sections:

1. Section 02220, Excavation and Backfill.
2. Section 09900, Painting.
3. Section 15051, Buried Piping Installation.
4. Section 15052, Exposed Piping Installation.
5. Section 15112, Thermoplastic Valves, Operators and Appurtenances.
6. Section 15220, Pipe Hangers and Supports.

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Manufacturer shall have a minimum of five (5) years of experience in the production of thermoplastic pipe and fittings, and shall show evidence of satisfactory service in at least five (5) installations.
2. Thermoplastic pipe and fittings shall be the product of one (1) manufacturer.

B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. ASTM D1598, Test for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure.
2. ASTM D1599, Test for Short-Time Rupture Strength of Plastic Pipe, Tubing and Fittings.
3. ASTM D2122, Determining Dimensions of Thermoplastic Pipe and Fittings.
4. ASTM D1784, Rigid Poly (Vinyl Chloride) PVC Compounds and Chlorinated Poly (Vinyl Chloride) CPVC Compounds.
5. ASTM D1785, Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.
6. ASTM D2467, Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings.
7. ASTM D2564, Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
8. ASTM D2774, Underground Installation of Thermoplastic Pressure Piping.
9. ASTM D2846, Chlorinated Poly (Vinyl Chloride) Plastic Hot Water Distribution Systems.

10. ASTM D3034, Type PSM Poly (Vinyl Chloride)(PVC) Sewer Pipe and Fittings.
11. ASTM F 437, Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
12. ASTM F439, Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
13. ASTM F441, Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
14. ASTM F477, Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
15. ASTM F493, Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
16. Standard No. 14, National Sanitation Foundation.
17. American National Standards Institute.

C. Shop Tests:

1. Piping manufacturer shall maintain a continuous quality control program. All CPVC plastic molding materials used to manufacture pipe and fittings under this Section shall be tested for conformance to the requirements of ASTM D 1784 and ASTM D 1785.

1.3 SUBMITTAL

A. Shop Drawings: Submit for approval the following:

1. Detailed procedures to be used in jointing and installing piping system including manufacturer's recommendations.
2. Interfacing of piping system to equipment and appurtenances.
3. Detail requirements for burial, supports, anchors, guides, expansion joints, and all accessories required for a satisfactory piping system.
4. Bill of materials, indicating material composition of pipe and solvent, pressure rating, nominal size and its location on the piping installation drawings.
5. Certifications letter from pipe manufacturer confirming that the materials to be used are suitable for the intended service.

B. Certificates: Submit certificates of compliance with above referenced standards.

1.4 PRODUCT DELIVERY. HANDLING AND STORAGE

- A. Delivery: All necessary precautions shall be taken to prevent damage to pipe fittings and other materials during shipment and delivery. All materials shall be securely fastened to truck or rail car to prevent movement or damage during shipment. An inspector shall examine all materials before unloading.
- B. Handling: All pipe materials shall be handled to prevent damage. Pipe and fittings shall not be dropped, rolled, or pushed off from any height on delivery, storage or installation. Any pipe that has been dropped shall be removed from the site.
- C. Storage: All pipe materials shall be stored off the ground. Pipe ends shall be secured by caps or plugs. Do not store pipe or fittings in sunlight. Pipe shall be stored to prevent sagging or bending. Store off the ground, under cover, and in a dry location.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. CPVC Pipe:
 - 1. CPVC pipe shall be Schedule 80, Class 24554B, conforming to ASTM DI 784 and ASTM F 441.
 - 2. Fittings shall be Schedule 80, solvent welded, socket type, conforming to ASTM F439. Provide flanged fittings at all valves and equipment with teflon filled gaskets, unless shown otherwise on Drawings. Solvent cement shall conform to requirements of ASTM F493.
- B. Provide expansion compensation in accordance with Section 15220, Pipe Hangers and Supports.
- C. CONTRACTOR shall supply type, grade and strength of pipe required to meet the specified service conditions. Submit to OWNER for approval.
- D. Painting shall conform to requirements of Section 09900, Painting.

2.2 DETAILED REQUIREMENTS

- A. Workmanship: The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions or other defects. The pipe shall be uniform in color, opacity, density, and other physical properties.
- B. Dimensions and Tolerances: Dimensions and tolerances shall be measured in accordance with ASTM D 2122. The eccentricity of the inside and outside circumferences of the pipe walls shall not exceed 12 percent.
- C. Sustained Pressure: The pipe shall not fail, balloon, burst, or weep as defined in ASTM D 1598.
- D. Burst Pressure: The minimum burst pressure shall be determined in accordance with ASTM D 1599.
- E. Marking: Marking on the pipe shall include the following, spaced at intervals of not more than 5-feet.
 - 1. Pipe nominal size.
 - 2. Pipe schedule.
 - 3. Specification of plastic material.
 - 4. Type and grade of plastic.
 - 5. Date and place of manufacture.
- F. Piping and fittings shall be manufactured with a minimum of 2 percent of titanium oxide for ultraviolet protection.

2.3 ADAPTERS

- A. Where required to join piping of different materials, CONTRACTOR shall provide the necessary adapters, as recommended by the thermoplastic pipe manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Refer to Section 15051, Buried Piping Installation, and Section 15052, Exposed Piping Installation, for piping installation, testing, cleaning and acceptance.
 - 2. Request instructions from OWNER before proceeding if there is a conflict between Contract Documents and manufacturer's recommendations.
 - 3. Pipe, fittings and accessories that are cracked, damaged, not identified or in poor condition will be rejected.

+ + END OF SECTION + +

SECTION 15113

THERMOPLASTIC VALVES, OPERATORS AND APPURTENANCES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals required to furnish and install all thermoplastic valves, operators and appurtenances.
2. The Work includes, but is not necessarily limited to, all types of valves required for buried, exposed, submerged and other types of piping, except where otherwise specifically included in other Sections.

B. Coordination:

1. Review installation procedures under other Sections and coordinate with the Work which is related to this Section including buried piping installation, exposed piping installation, site utilities, insulation, heating, ventilating and air conditioning and plumbing.

C. Related Sections

1. Section 01600, General Equipment Provisions.
2. Section 01730, Operation and Maintenance Data.
3. Section 09900, Painting.
4. Section 15051, Buried Piping Installation.
5. Section 15052, Exposed Piping Installation.
6. Section 15061, Ductile-Iron Pipe.
7. Section 15065, Copper Pipe
8. Section 15067, Thermoplastic Pipe.
9. Section 15212, Piping Specialties and Accessories.
10. Section 15220, Pipe Hangers and Supports.

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Manufacturer shall have a minimum of five (5) years of experience in the production of substantially similar equipment, and shall show evidence of satisfactory service in at least five (5) installations.
2. Each type of valve shall be the product of one (1) manufacturer.

B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. ANSI B16.1, Cast Iron Pipe Flanges and Flanged Fittings.
2. ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
3. ASTM A354, Specification for Quenched and Tempered Alloy Steel Bolts, Studs and Other Externally Threaded Fasteners.
4. ASTM F439, Specification for Socket-type, Chlorinated Poly (Vinyl Chloride)(CPVC) Plastic Pipe Fittings, Schedule 40.
5. ASTM F441, Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.

6. ASTM F493, Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
7. ASTM D 1784, Rigid Poly (Vinyl Chloride) PVC Compounds and Chlorinated Poly (Vinyl Chloride) CPVC compounds.
8. ASTM D1785, Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.
9. NEMA, National Electrical Manufacturer's Association.

1.3 SUBMITTAL

- A. Shop Drawings: Submit for approval the following:
 1. Manufacturer's literature, illustrations, paint certifications, specifications, detailed drawings, data and descriptive literature on all valves and appurtenances.
 2. Deviations from the Contract Documents.
 3. Engineering data including dimensions, materials, size and weight.
 4. Fabrication, assembly, installation and wiring diagrams.
- B. Operation and Maintenance Data: Submit complete manuals including:
 1. Copies of all approved Shop Drawings, test reports, maintenance data and schedules, description of operation, and spare parts information.
 2. Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01730, Operation and Maintenance Data.
- C. Shop Tests:
 1. Test motor operated valves before shipment to ensure that the mechanisms can close the valves in the specified time limit, and for proper seating.
 2. Hydrostatic tests shall be performed, when required by the valve specifications included herein.
- D. Certificates: Where specified or otherwise required by OWNER, submit test certificates.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site to ensure uninterrupted progress of the Work.
 1. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to not delay the Work.
- B. Handle all valves and appurtenances very carefully. Valves which are cracked, dented or otherwise damaged or dropped will not be acceptable.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms or other supports. Protect steel members and packaged materials from corrosion and deterioration.
- D. Store all mechanical equipment in covered storage off the ground and prevent condensation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General:

1. Valves shall have manufacturer's name and working pressure cast in raised letters on valve body.
2. Manual valve operators shall turn clockwise to close, unless otherwise specified. Valves shall indicate the direction of operation.
3. All other bolts, nuts and studs shall, unless otherwise approved, conform to ASTM A307, Grade B; or ASTM A354.
9. Bolts and nuts shall have hexagon heads and nuts.
10. Gasket material and installation shall conform to manufacturer's recommendations.
11. Identification: Identify each valve 4-inches and larger with a stainless steel nameplate stamped with the approved designation. Nameplate shall be permanently fastened to valve body at the factory. Stenciled designations are acceptable for buried valves.
12. CONTRACTOR shall be responsible to coordinate compatible materials of construction for all wettable parts of all valves for each process application.

B. CPVC Check Valves:

1. Check valves on CPVC piping shall be manufactured of chlorinated polyvinyl chloride (CPVC) material with seats and seals which are compatible with the process fluid.
2. CPVC shall be Type 4, Grade 1, in accordance with the requirements of ASTM D 1784.
3. Valves shall be true union type or flanged, rated for 100 psi service minimum, and shall be suitable for installation in either the horizontal or vertical plane.
4. Product and Manufacturer: Provide one of the following:
 - a. Nibco Incorporated.
 - b. Hayward Manufacturing Company.
 - c. ASAHI/America.
 - d. Or equal.

C. PVC and CPVC Ball Valves:

1. Ball valves shall not be used on the chlorination system. Ball valves on PVC piping shall be manufactured of polyvinyl chloride (PVC) material with seats and seals which are compatible with the process fluid.
2. Ball valves on CPVC piping shall be manufactured of chlorinated polyvinyl chloride (CPVC) material with seats and seals which are compatible with the process fluid.
3. PVC shall be Type 1, Grade I in accordance with ASTM D 1784, and shall be dark grey in color.
4. CPVC shall be Type 4, Grade 1, in accordance with ASTM D 1784.
5. Valve shall be true union type and rated for 200 psi service.
6. Product and Manufacturer: Provide PVC and CPVC Ball Valves of one of the following:
 - a. Nibco Incorporated.
 - b. Hayward Manufacturing Company.
 - c. ASAHI/America.
 - d. Or equal.

2.2 PAINTING

- A. Clean and prime coat ferrous metal surfaces of equipment in the shop in accordance with the requirements of Section 09900, Painting.

- B. Coat machined, polished and non-ferrous surfaces including gears, bearing surfaces and similar unpainted surfaces with corrosion prevention compound which shall be maintained during storage and until equipment begins operation.
- C. Field painting shall conform to the requirements under Section 09900, Painting.
- D. CONTRACTOR shall certify, in writing, that the shop primer and coating system is compatible with the finish coating system in accordance with Section 09900, Painting.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install all valves and appurtenances in accordance with manufacturer's instructions.
- B. Install all valves so that operating handwheels or wrenches may be conveniently turned from operating floor but without interfering with access, and as approved by OWNER.
- C. Unless otherwise approved, install all valves plumb and level. Install valves free from distortion and strain caused by misaligned piping, equipment or other causes.
- D. Set valve boxes plumb, and centered with the bodies directly over the valves. Carefully tamp earth fill around each valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face, if less than 4 feet.

3.2 FIELD TESTS AND ADJUSTMENTS

- A. Adjust all parts and components as required to provide correct operation.
- B. Conduct functional field test of each valve in presence of OWNER to demonstrate that each part and all components together function correctly.

+ + END OF SECTION + +

SECTION 15125

BALL VALVES, OPERATORS AND APPURTENANCES

PART 1 – GENERAL

DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals required to furnish and install all ball valves, operators and appurtenances.
2. The Work includes, but is not necessarily limited to, all types of valves required for buried, exposed, submerged and other types of piping, except where otherwise specifically included in other Sections.

B. Coordination:

1. Review installation procedures under other Sections and coordinate with the Work which is related to this Section including buried piping installation, exposed piping installation, site utilities, insulation, heating, ventilating and air conditioning and plumbing.

C. Related Sections:

1. Section 09900, Painting.
2. Section 15052, Exposed Piping Installation.
3. Section 15220, Pipe Hangers and Supports.
4. Section 15292, PVC Pressure Pipe.

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Manufacturer shall have a minimum of five (5) years of experience in the production of substantially similar equipment, and shall show evidence of satisfactory service in at least five (5) installations.
2. Each type of valve shall be the product of one (1) manufacturer.

B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. AGMA Standards.
2. ANSI B 16.1, Cast Iron Pipe Flanges and Flanged Fittings.
3. ANSI B 16.4, Cast Iron Fittings.
4. ANSI B 16.5, Steel Pipe Flanges and Flanged Fittings.
5. API 6D, American Petroleum Institute, Specifications for Pipeline Valves.
6. ASTM A48, Standard Specification for Gray Iron Castings.
7. ASTM A105, Standard Specification for Carbon Steel Forgings for Piping Applications.
8. ASTM A126, Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
9. ASTM A216 Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.
10. ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

11. ASTM A354, Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs and Other Externally Threaded Fasteners.
12. ASTM A436, Standard Specification for Austenitic Gray Iron Castings.
13. ASTM A536, Standard Specification for Ductile Iron Castings.
14. ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
15. AWWA C 111, Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
16. AWWA C507, Ball Valves, 6-Inch Through 48-Inch.
17. NEC, National Electric Code.
18. NEMA, National Electrical Manufacturer's Association.

1.3 SUBMITTAL

- A. Shop Drawings: Submit for approval the following:
 1. Manufacturer's literature, illustrations, paint certifications, specifications, detailed drawings, data and descriptive literature on all valves and appurtenances.
 2. Deviations from Contract Documents.
 3. Engineering data including dimensions, materials, size and weight.
 4. Fabrication, assembly, installation and wiring diagrams.
- B. Operation and Maintenance Data: Submit complete manuals including:
 1. Copies of all approved Shop Drawings, test reports, maintenance data and schedules, description of operation, and spare parts information.
 2. Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01730, Operation and Maintenance Data.
- C. Shop Tests:
 1. Test motor operated valves before shipment to ensure that the mechanisms can close the valves in the specified time limit, and for proper seating.
 2. Hydrostatic tests shall be performed, when required by the valve specifications included herein.
- D. Certificates: Where specified or otherwise required by OWNER, submit test certificates.

1.4 PRODUCT DELIVERY. STORAGE AND HANDLING

- A. Deliver materials to the site to ensure uninterrupted progress of the Work.
 1. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to not delay the Work.
- B. Handle all valves and appurtenances very carefully. Valves which are cracked, dented or otherwise damaged or dropped will not be acceptable.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms or other supports. Protect steel members and packaged materials from corrosion and deterioration.
- D. Store all mechanical equipment in covered storage off the ground and prevent condensation.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General:

1. Valves shall have manufacturer's name and working pressure cast in raised letters on valve body.
2. Manual valve operators shall turn clockwise to close, unless otherwise specified. Valves shall indicate the direction of operation.
3. Unless otherwise specified, all flanged valves shall have ends conforming to ANSI B 16.1, Class 250.
4. Buried valves shall have flanged ends with mechanical joint adapters and installed with a flanged adapter or have grooved mechanical couplings. All bolts shall be Type 316 stainless steel.
5. Buried valves shall be provided with adjustable two piece valve boxes and provided with extension stems, operating nuts and covers unless otherwise shown or specified. Extension stems shall terminate 12-inches below finished grade.
6. All bolts, nuts and studs on or required to connect buried or submerged valves shall be Type 316 stainless steel.
7. All bolts and studs embedded in concrete and studs required for wall pipe shall be of Type 316 stainless steel.
8. All other bolts, nuts and studs shall, unless otherwise approved, conform to ASTM A 307, Grade B; or ASTM A 354.
9. Bolts and nuts shall have hexagon heads and nuts.
10. Gasket material and installation shall conform to manufacturer's recommendations.
11. Identification: Identify each valve 4-inches and larger with a stainless steel nameplate stamped with the approved designation. Nameplate shall be permanently fastened to valve body at the factory. Stenciled designations are acceptable for buried valves.

B. Rubber Seat Ball Valves:

1. Valve shall have a cast iron body suitable for 150 psi pressure. Body shall have stainless steel conical seating surfaces to provide abrasion-free, corrosion free surfaces for mating with the resilient seat on the rotor.
2. Ends shall be ranged, conforming to ANSI B 16.1, Class 250.
3. Shaft seal shall be of bronze, provided with "O" ring seals.
4. Shaft bearings shall be of bronze, permanently lubricated, sealed with "O"-ring seals.
5. Seats shall be of rubber suitable for wastewater service, secured to the rotor by means of ductile Ni-Resist adjusting segments.
6. Rotor shall be of cast iron, secured to stub shafts with stainless steel taper pins.
7. Stub shafts shall be of stainless steel.
8. Provide adjustable thrust bearings for alignment of the rotor in the body.
9. Product and Manufacturer: Provide one of the following:
 - a. Henry Pratt Company.
 - b. Or equal.
10. Valve Operator - Manual:
 - a. Valves shall be equipped with an enclosed worm gear drive and nut, handwheel or chain wheel operator.
 - b. Enclosed worm gear operators shall have a gear ratio designed not to exceed 80 pounds pull to meet the required operator torque.
 - c. Gears shall be permanently lubricated and totally enclosed.
 - d. Operators shall be designed to hold the valve disc in any intermediate position without creeping or fluttering.

- e. Provide adjustable stops to prevent over travel in either position, to withstand a pull of 200 pounds.
 - f. Stops shall be enclosed within the operator housing and shall be capable of absorbing the full operator torque with minimum safety factor of 5.
 - g. Operators shall be equipped with a direct coupled indicator.
 - h. Valves regardless of size, if installed with the operating wheel more than five feet above the operating floor, shall be provided with a chainwheel, sprocket and aluminum chain. Chain shall extend to three feet above the operating floor.
 - i. Valve operator shall be designed to fully close or fully open the valve in a minimum of 30 turns. Valves shall open counter-clockwise, and shall have a position indicator.
 - j. Product and Manufacturer: Provide manual operators by one of the following:
 - 1. Philadelphia Gear Corporation.
 - 2. Or equal.
11. Shop Painting:
- a. Interior ferrous metal surfaces of the valve except finished or bearing surfaces shall be shop painted with two (2) coats of an approved two (2) component coal tar epoxy coating applied in accordance with the manufacturers recommendations and Section 09900.
 - b. Exterior surfaces of the valve and operator shall be shop painted as specified hereinafter under Paragraph 2.3, below.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Installation shall be as specified herein. Valve operators shall be located so that they are readily accessible for operation and maintenance. Valve operators shall be mounted for unobstructed access, but mounting shall not obstruct walkways. Valve operators shall not be mounted where shock or vibration will impair their operation. Support systems shall not be attached to handrails, process piping or mechanical equipment.
- B. Identification tags shall be securely attached to the operator in a readily visible location using stainless steel screws or wire.
- C. Install all valves and appurtenances in accordance with manufacturer's instructions.
- D. Install all valves so that operating handwheels or wrenches may be conveniently turned from operating floor but without interfering with access, and as approved by OWNER.
- E. Unless otherwise approved, install all valves plumb and level. Install valves free from distortion and strain caused by misaligned piping, equipment or other causes.
- F. Set valve boxes plumb, and centered with the bodies directly over the valves. Carefully tamp earthfill around each valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face, if less than 4 feet.

3.2 FIELD TESTS AND ADJUSTMENTS

- A. Adjust all parts and components as required to provide correct operation.
- B. Conduct functional field test of each valve in presence of OWNER to demonstrate that each part and all components together function correctly.

++ END OF SECTION ++

SECTION 15150

SPECIALTY VALVES AND APPURTENANCES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals required to furnish and install all specialty valves and appurtenances.
2. The Work includes, but is not necessarily limited to, all types of valves required for buried, exposed, submerged and other types of piping, except where otherwise specifically included in other Sections.

B. Coordination:

1. Review installation procedures under other Sections and coordinate with the Work which is related to this Section including buried piping installation, exposed piping installation, site utilities, insulation, heating, ventilating and air conditioning and plumbing.

C. Related Sections:

1. Section 09900, Painting.
2. Section 15052, Exposed Piping Installation.

1.2 QUALITY ASSURANCE

A. Manufacture's Qualifications:

1. Manufacturer shall have a minimum of five (5) years of experience in the production of substantially similar equipment, and shall show evidence of satisfactory service in at least five (5) installations.
2. Each type of specialty valve shall be the product of one (1) manufacturer.

B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. ANSI B 16.1, Cast Iron Pipe Flanges and Flanged Fittings.
2. ANSI B 16.4, Cast Iron Fittings.
3. ASTM A 48, Standard Specification for Gray Iron Castings.
4. ASTM B 62, Standard Specification for Composition Bronze or Ounce Metal Castings.
5. ASTM A 126, Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
6. ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
7. ASTM A 354, Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs and Other Externally Threaded Fasteners.
8. ASTM A 436, Standard Specification for Austenitic Gray Iron Castings.
9. ASTM A 536, Standard Specification for Ductile Iron Castings.
10. ASTM D 1784, Rigid Poly (Vinyl Chloride) PVC Compounds and Chlorinated Poly (Vinyl Chloride) CPVC compounds.
11. ASTM D 1785, Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.

12. AWWA C111, Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
13. AWWA C500, Gate Valves for Water and Sewerage Systems.
14. AWWA C502, Dry-Barrel Fire Hydrants.
15. AWWA C503, Wet-Barrel Fire Hydrants.
16. AWWA C504, Rubber-Seated Butterfly Valves.
17. AWWA C506, Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types.
18. AWWA C507, Ball Valves, 6-Inch Through 48-Inch.
19. AWWA C508, Swing Check Valves for Waterworks Service, 2-inch through 24-inch NPS.
20. AWWA C509, Resilient-Seated Gate Valves, 3 through 12 NPS, for Water and Sewerage Systems.
21. AGMA Standards.
22. NEMA, National Electrical Manufacturer's Association.

1.3 SUBMITTAL

- A. Shop Drawings: Submit for approval the following:
 1. Manufacturer's literature, illustrations, paint certifications, specifications, detailed drawings, data and descriptive literature on all valves and appurtenances.
 2. Deviations from Contract Documents.
 3. Engineering data including dimensions, materials, size and weight.
 4. Fabrication, assembly, installation and wiring diagrams.
- B. Shop Tests:
 1. Test motor operated valves before shipment to ensure that the mechanisms can close the valves in the specified time limit, and for proper seating.
 2. Hydrostatic tests shall be performed, when required by the valve specifications included herein.
- C. Certificates: Where specified or otherwise required by OWNER, submit test certificates.

1.4 PRODUCT DELIVERY. STORAGE AND HANDLING

- A. Deliver materials to the site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to not delay the Work.
- B. Handle all valves and appurtenances very carefully. Valves which are cracked, dented or otherwise damaged or dropped will not be accepted.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms or other supports. Protect steel members and packaged materials from corrosion and deterioration.
- D. Store all mechanical equipment in covered storage off the ground and prevent condensation.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General:

1. Valves shall have manufacturer's name and working pressure cast in raised letters on valve body.
2. Manual valve operators shall turn clockwise to close, unless otherwise specified. Valves shall indicate the direction of operation.
3. Unless otherwise specified, all flanged valves shall have ends conforming to ANSI B16.1, Class 125.
4. All other bolts, nuts and studs shall, unless otherwise approved, conform to ASTM A 307, Grade B; or ASTM A 354.
5. Bolts and nuts shall have hexagon heads and nuts.
6. Gasket material and installation shall conform to manufacturer's recommendations.
7. Identification: Identify each valve 4-inches and larger with a stainless steel nameplate stamped with the approved designations Nameplate shall be permanently fastened to valve body at the factory. Stenciled designations are acceptable for buried valves.

B. Pressure Regulators:

1. Pressure regulators for seal water connections, and elsewhere, where shown or required shall be of cast bronze construction with stainless steel seat rings, and shall have adjustable downstream pressure suitable for the service intended.
2. Install a strainer with bronze body and stainless steel mesh screen ahead of the valve.
3. Strainer may be separated from or integral with the pressure regulator.
4. Product and Manufacturer: Provide one of the following:
 - a. Watts.
 - b. Mueller Company.
 - c. Or equal.

C. Pressure Gages:

1. Type: Direct mounted, dial type pressure gage.
 - a. Construction:
 - 1) Case: 6-inch diameter cast aluminum, flangeless with black finish and bottom 1/4-inch N.P.T.
 - 2) Ring: Chrome plated close type.
 - 3) Dial: White face, black numbers and graduations.
 - 4) Window: Glass or clear acrylic plastic.
 - 5) Pointer: Micrometer type, black finish, red tip.
 - 6) Movement: Stainless steel, rotary type, delrin sector and bushings.
 - 7) Bourdon Tube: Seamless phosphor bronze, Grade A over-pressured and stress relieved.
 - 8) Socket and Tip: Forged brass, alloy steel and Type 316 stainless steel.
 - b. Accuracy: 1 percent minimum.
2. Gage Cocks: Provide brass tee handle cock before each gage.
3. Reference ANSI B40.1 for Grade AA gages.
4. All pressure gauges shall be provided with an approved pressure snubber.
5. Product and Manufacturer: Provide one of the following:
 - a. Weksler Instrument Company.
 - b. H.O. Trerice Company.
 - c. Or equal.

D. Pipe Labels:

1. Type: Self-adhering, temperature resistant, waterproof, corrosion resistant.
2. Marker size, marker color, legend size, and legend color shall conform to ANSI

A13.1.

2.2 PAINTING

- A. Clean and prime coat ferrous metal surfaces of equipment in the shop in accordance with the requirements of Section 09900, Painting.
- B. Coat machined, polished and nonferrous surfaces including gears, bearing surfaces and similar unpainted surfaces with corrosion prevention compound which shall be maintained during storage and until equipment begins operation. Field painting shall conform to the requirements under Section 09900, Painting.
- C. CONTRACTOR shall certify, in writing, that the shop primer and coating system is compatible with the finish coating system in accordance with Section 09900, Painting.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install all valves and appurtenances in accordance with manufacturer's instructions.
- B. Install all valves so that operating handwheels or wrenches may be conveniently turned from operating floor but without interfering with access, and as approved by OWNER.
- C. Unless otherwise approved, install all valves plumb and level. Install valves free from distortion and strain caused by misaligned piping, equipment or other causes.

3.2 FIELD TESTS AND ADJUSTMENTS

- A. Adjust all parts and components as required to provide correct operation.
- B. Conduct functional field test of each valve in presence of OWNER to demonstrate that each part and all components together function correctly.

3.3 MANUFACTURER'S SERVICE

- A. CONTRACTOR shall provide the services of a qualified factory-trained serviceman to check and approve the installation of the following types of valves:
- B. Serviceman shall instruct OWNER'S personnel in operation, care and maintenance and supervise initial operation.

++ END OF SECTION ++

SECTION 15220

PIPE HANGERS AND SUPPORTS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified and required to design, furnish and install all hangers, supports and appurtenances necessary to complete the Work.
- B. Related Sections:
 - 1. Section 09900, Painting.
 - 2. Division 15, Sections on Piping, Valves and Appurtenances.

1.2 QUALITY ASSURANCE

- A. Each type of pipe hanger or support shall be the product of one (1) manufacturer.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
 - 1. The Manufacturers Standardization Society of the Valve and Fittings Industry:
 - a. MSS SP-58, Pipe Hangers and Supports - Materials and Design.
 - b. MSS SP-69, Pipe Hangers and Supports - Selection and Application.
 - 2. Federal Specification, FS W-H-171, Hangers and Support, Pipe.
 - 3. ASTM A 575, Merchant Quality Hot-Rolled Carbon Steel Bars.
 - 4. Underwriters' Laboratories, Inc., Standard UL-203-Pipe Hanger Equipment.

1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval the following:
 - 1. Detailed drawings showing all hangers and supports for each piping system specified. Shop Drawings shall show location, installation, material, loads or forces, and deflection of all hangers and supports.
 - 2. Submit and coordinate these Shop Drawings with Shop Drawings required for all piping systems, valves and appurtenances.
- B. Product Information: Submit manufacturer's catalogs, literature, and engineering data on all hangers and supports. Load ratings, materials and installation shall be consistent with the recommendations of the MSS SP-58, MSS SP-69 and Federal Specification WW-H-171.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment to the site to ensure uninterrupted progress of the Work.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off the ground using pallets, platforms or other supports. Protect steel members and packaged materials from corrosion and deterioration.

- C. Store materials in covered storage off the ground and prevent condensation.

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Hangers and supports shall meet with the following requirements:
1. Standard and fabricated hangers and supports shall be finished complete with necessary inserts, bolts, nuts, rods, washers, and other accessories.
 2. Run piping in groups where practicable and parallel to building wall generally. Provide minimum clearance of 1-inch between pipe and other work.
 3. Install hangers or supports at all locations where pipe changes direction.
 4. All hangers and supports shall be capable of adjustment after placement of piping.
 5. Different types of hangers or supports shall be kept to a minimum.
 6. All suspended or supported cast iron pipe shall have a hanger or support adjacent to each hub.
 7. Support vertical piping at each floor and between floors by stays or braces to prevent rattling and vibration.
 8. Hanger rods shall be straight and vertical. Chain, wire, strap or perforated bar hangers shall not be used. Hangers shall not be suspended from piping, unless shown on the Drawings.
 9. Maximum support spacing, unless otherwise shown or approved for standard weight steel pipe shall be as follows:

<u>Steel Pipe Size</u>	<u>Steel Pipe Spacing</u>
Up to 1"	6'-0"
1-1/4" through 4"	10'-0"
4" and greater	12'-0"

10. Maximum support spacing, unless otherwise shown or approved for copper pipe shall be as follows:

<u>Copper Pipe Size</u>	<u>Pipe Spacing</u>
3/4" through 1-1/2"	6'-0"
2" and greater	10'-0"

11. Maximum support spacing, unless otherwise shown or approved for plastic pipe shall be as follows:

<u>Plastic Pipe Size</u>	<u>Pipe Spacing</u>
Up to 1-1/2"	4'-6"
2" and greater	6'-0"

12. Where proper hanger or support spacing does not correspond with joist or rib spacing, structural steel channels may be attached to joists or ribs and pipes suspended therefrom.
13. Prevent contact between dissimilar metals when supporting copper tubing by use of copper plated, rubber or vinyl coated, or stainless steel hangers or supports.
14. Isolate thin walled stainless steel piping from carbon steel by use of plastic coated hangers or supports or by taping at points of contact with PVC or vinyl.
15. Supports and hangers shall be of a material approved by the OWNER.
16. Anchors for pipe support systems shall be compatible or protected by a coating system approved by the OWNER.

2.2 HANGERS AND SUPPORTS

- A. Hangers and supports where shown shall be in accordance with the Drawings. Hangers and supports not shown shall be in accordance with MSS SP-58.
- B. Product and Manufacturer: Provide one of the following:
 - 1. ITT Grinnell Co.
 - 2. Elcen.
 - 3. Unistrut.
 - 4. Ackinstrut, by RobRoy Industries.
 - 5. Or equal.

2.3 ACCESSORIES

- A. Hanger rods shall be made according to ASTM A 575, with square head nut on top and running thread on bottom end.
- B. Concrete Inserts:
 - 1. Concrete inserts shall be MSS SP-58 malleable Type 18.
 - 2. Concrete inserts shall be of the continuous type, capable of supporting 2,000 pounds per foot of insert.
 - 3. Product and Manufacturer: Provide concrete inserts of one of the following:
 - a. Unistrut Corporation, Wayne, Michigan.
 - b. Elcen Metal Products, Company, Franklin Park, Illinois.
 - c. Or equal.
- C. Steel Beam Clamps:
 - 1. Steel beam clamps shall be of malleable iron and conform to MSS SP-58.
- D. Inserts for Pipe Insulation:
 - 1. Insulated pipe, larger than 1-1/2 inches in diameter, shall be supported by a rigid insert to protect the insulation. A steel metal saddle of sufficient gage to carry the weight of the pipe and its fluid, without deforming, shall extend 2-inches minimum on each side of the rigid insert. The joints between insert and insulation shall be sealed before saddle is installed. Sizes up to 6-inches Internal Pipe Size (IPS) shall be MSS SP-58 Type 40 and for sizes over 10-inches shall be MSS SP-58 Type 39.
- E. Brackets:
 - 1. Brackets for wall mounting shall be MSS SP-58 Type 32 or 34.
- F. Pipe Roll:
 - 1. To provide for pipe expansion, pipe shall be supported on adjustable malleable or steel pipe rolls, Grinnell Figure 175, or equal.
- G. Fabricated Pipe Rack:
 - 1. Pipes shall be supported and anchored to the fabricated pipe rack as shown on the Drawings. Clamps, rollers, and supports for piping shall conform to the general requirements of MSS SP-69.

2.4 PAINTING

- A. Clean and prime ferrous metal surfaces in the shop in accordance with the requirements of Section 09900, Painting.
- B. Field painting shall conform to the requirements under Section 09900, Painting.

PART 3 – EXECUTION

3.1 INSTALLATION

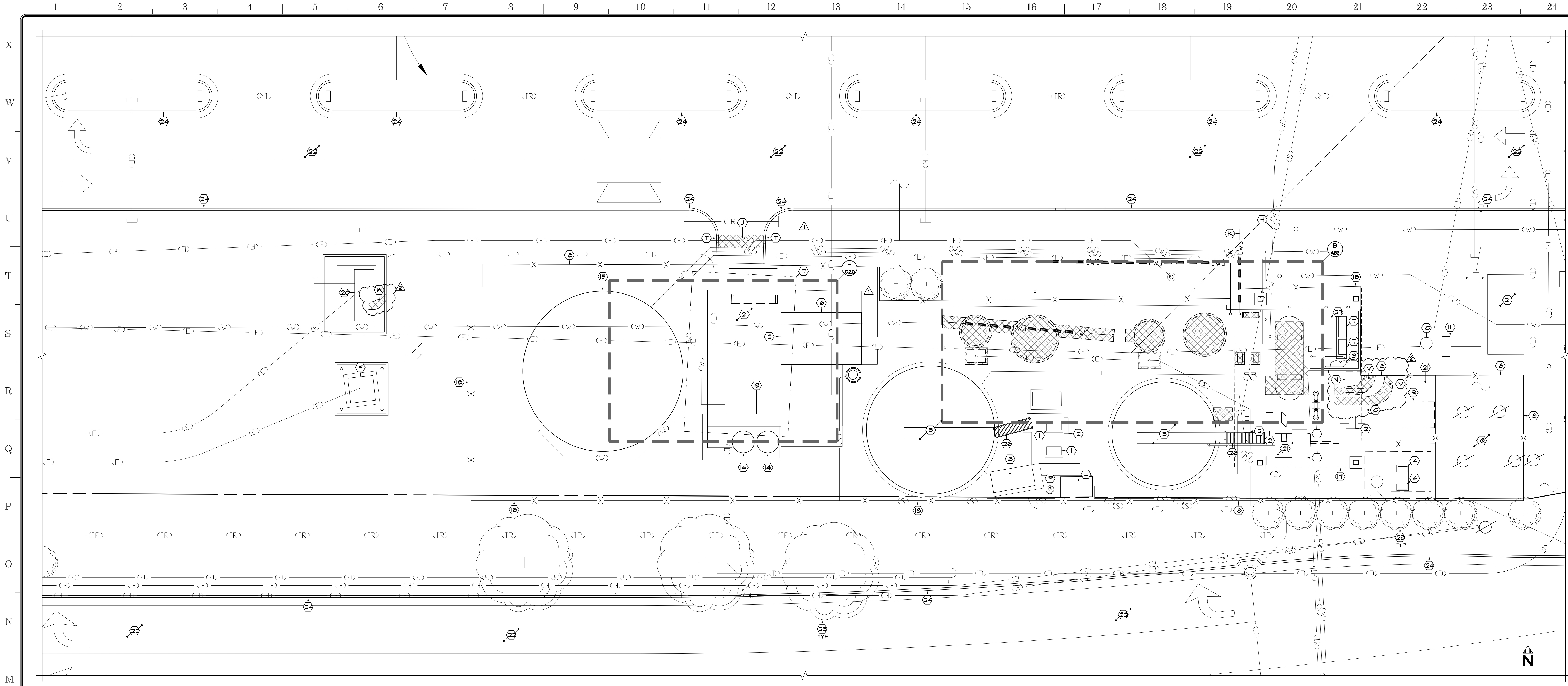
- A. Locate hangers, supports, and accessories to support piping, valves, and fittings at all concentrated loads.
- B. Locate hangers, supports, and accessories within maximum span lengths specified to support continuous pipeline runs unaffected by concentrated loadings.
- C. Locate hanger and supports to prevent vibration or swaying and to provide for expansion and contraction.
 - 1. Support piping independently so that equipment is not stressed by piping weight or expansion.
 - 2. For Non-insulated Copper Pipe or Tubing: Clamps and supports shall be electroplated copper finish. Instrumentation tubing shall be supported in steel or aluminum troughs with covers. All tubing layout and connections shall be as approved by the manufacturer of the equipment.
 - 3. Uncoated Hangers, Rods and Supports: Dip in zinc chromate primer before installation.
 - 4. Provide additional supports in addition to those shown and specified at:
 - a. Change in pipe direction.
 - b. Branch piping and runouts over 5 feet.
 - c. Concentrated loads due to valves, strainers and other similar items. Maximum support spacing for plastic pipe at ambient temperature shall be 1/2 the above values.
 - 5. Hanger types for horizontal piping, except as noted and shown on Drawings:
 - a. Forged steel adjustable clevis type, rod support for all service.
 - b. Slide Bases:
 - 1) Pipe stand, brackets, trapeze or other equivalent structural support.
 - 2) For piping 2-inches or larger.
 - c. For pipe and covering provide:
 - 1) Saddles for roller or slide bases.
 - 2) Protective shields or saddles for all other types of supports.
 - d. Threaded Steel Rods:
 - 1) 2-inch vertical adjustment with two (2) nuts each end for positioning and locking.
 - 2) Size hanger rods according to the schedule below, unless otherwise noted on the Drawings:

Nominal Pipe (inches)	Rod Diameter (inches)
2 and less	3/8
2-1/2 to 3-1/2	1/2
4	5/8
6	3/4
8 through 12	7/8
14 through 18	1

- 3) For Double Rod Hangers: One size smaller than above.
 - 4) Connection to Structural for Piping up to 2-Inches: Concrete inserts, or expansion shields in shear into sides of beams.
 - 5) Connection to Structural for Piping 2-1/2 Inches or Larger: Concrete inserts, beam clamps or suitable bridging.
 6. Vertical Piping:
 - a. Base Support: Base elbow or welded equivalent.
 - 1) Bearing plate on structural support.
 - b. Guides not to exceed:
 - 1) 25 feet for piping up to 2-inches.
 - 2) 36 feet for piping 2-1/2-inches or larger.
 - 3) 4 feet for chlorination system piping.
 - c. Top Support:
 - 1) Special hanger or saddle in horizontal connection.
 - 2) Provisions for expansion.
 - d. Intermediate Supports: Steel pipe clamp at floor.
 - 1) Bolted and welded to pipe.
 - 2) Extension ends bearing on structural steel or bearing plates.
 - e. For Multiple Pipes: Coordinate guides, bearing plates and accessory steel.
 7. Insulated Piping:
 - a. Horizontal Pipe Shields at Supports:
 - 1) Minimum 120 degree arc.
 - 2) Length equal to diameter of insulation, 12-inch minimum.
 - 3) To 6-Inch Pipe Size: No. 18 USSG galvanized steel.
 - b. Vertical Pipe Shields at Guides:
 - 1) Full 360 degree arc, securely banded.
 - 2) Length equal to diameter of insulation, 12-inch minimum.
 - 3) To 6-Inch Pipe Size: No. 18 USSG galvanized steel.
 8. Chlorination and Sampling Piping System:
 - a. All pipe supports and fasteners shall be glass fiber-reinforced plastic with a flame spread rating of 25, in accordance with ASTM E-84.
 - b. Materials shall be manufactured by either the pultrusion or extrusion process.
 - c. All pipe supports shall have a surface veil over 100 percent of the surface which, along with a filler system, shall protect against degradation from ultra-violet light.
 - d. All fasteners shall be manufactured from long glass fiber-reinforced polyurethane to ensure strength and corrosion resistance.
 - e. All-thread rods shall be made from vinylester resin.
 - f. Product and Manufacturer: Provide one of the following:
 - 1) Ackinstrut, RobRoy Industries.
 - 2) Or equal.
- D. Install items to be embedded before concrete placement.
- E. Fasten embedded items securely to prevent movement during concrete placement.
- F. Install hangers and support units on piping systems in accordance with manufacturer's recommendations.

- G. Adjust hangers and supports and place grout for concrete supports to bring pipelines to specified elevations.
- H. Bring all pipe systems up to operating pressures and temperatures. Cycle systems to duplicate operating conditions. Correct all support malfunctions.

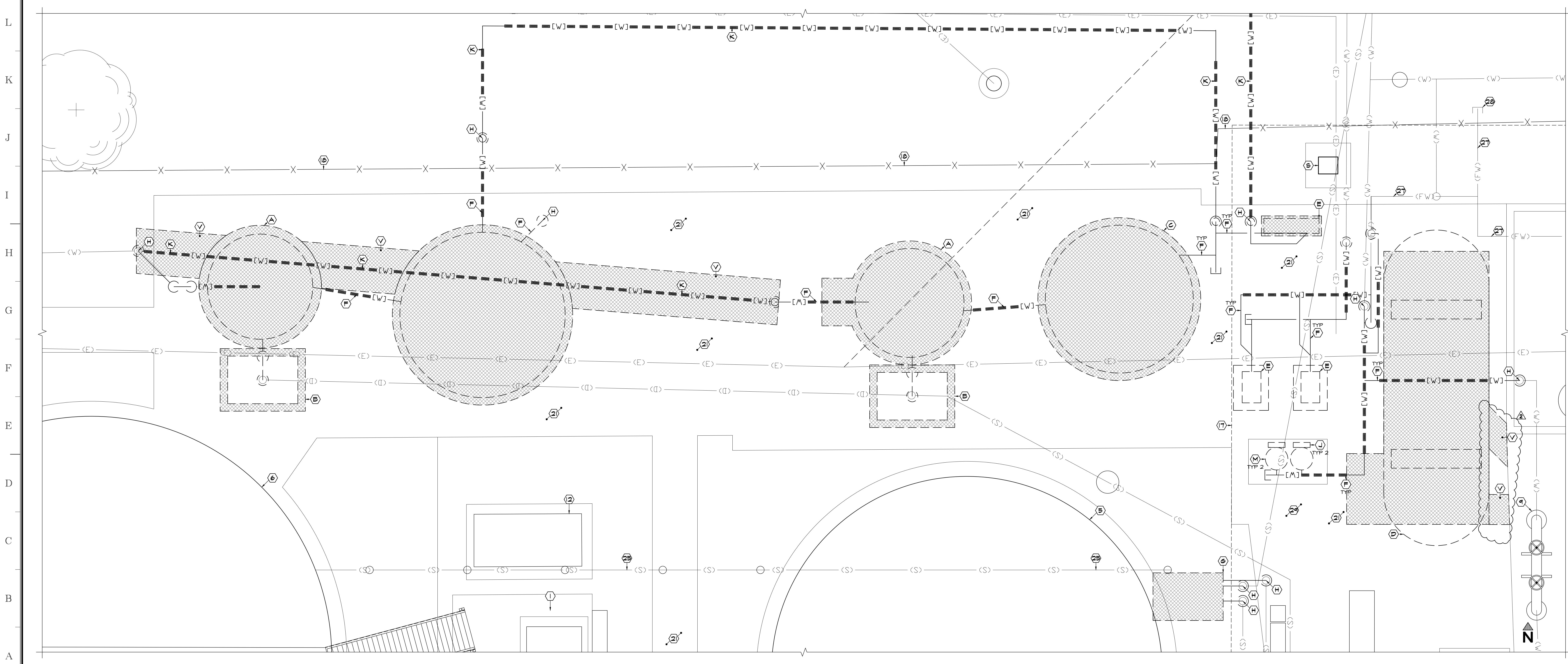
+ + END OF SECTION + +



SITE SURVEY AND DEMOLITION PLAN

SCALE: 1" = 10'-0"

A



ENLARGED SITE SURVEY AND DEMOLITION UTILITY PLAN

SCALE: 3/8" = 1'-0"

B

APPROVALS

KEYNOTES:

- EXISTING SEWER PLANT BLOWER TO REMAIN - PROTECT
- EXISTING ELECTRICAL DISTRIBUTION PANEL TO REMAIN - PROTECT
- EXISTING FIRE PUMP OIL TANK TO REMAIN - PROTECT
- EXISTING EFFLUENT WATER PUMP TO REMAIN - PROTECT
- EXISTING 50K GALLON PACKAGE SEWER PLANT TANK TO REMAIN - PROTECT
- EXISTING 100K GALLON PACKAGE SEWER PLANT TANK TO REMAIN - PROTECT
- EXISTING FIRE PUMP AND FIRE PUMP CONTROL PANEL TO REMAIN - PROTECT
- EXISTING STORAGE CONTAINER TO REMAIN - PROTECT
- EXISTING BACKFLOW PREVENTER SERVING MUSEUM TO REMAIN - PROTECT
- EXISTING ELECTRICAL UTILITY VAULT - PROTECT
- EXISTING SECTOR BOX TO REMAIN - PROTECT
- EXISTING BACK-UP GENERATOR TO REMAIN - PROTECT
- EXISTING PACKAGE WATER TREATMENT PLANT TO REMAIN - PROTECT
- EXISTING FILTERED WATER STORAGE TANK TO REMAIN - PROTECT
- EXISTING 220K GALLON TREATED WATER STORAGE TANK TO REMAIN - PROTECT
- EXISTING WATER TREATMENT BUILDING TO REMAIN - PROTECT
- EXISTING METAL SHADE STRUCTURE TO REMAIN - PROTECT
- EXISTING CHAIN-LINK FENCE TO REMAIN - PROTECT
- EXISTING ID TRANSFORMER TO REMAIN - PROTECT
- EXISTING SWITCHBOARD TO REMAIN - PROTECT
- EXISTING SITE CONCRETE TO REMAIN - PROTECT
- EXISTING AC PAVING TO REMAIN - PROTECT
- EXISTING TREE / SHRUB TO REMAIN - PROTECT
- EXISTING CURB / CURB 4 GUTTER TO REMAIN - PROTECT
- EXISTING OVERHEAD SEWER PIPING AND SUPPORTS TO REMAIN - PROTECT
- EXISTING METAL STAIRS AND CATHALKS TO REMAIN - PROTECT
- EXISTING FIRE WATER EXPOSED PIPING INCLUDING VALVES AND FITTINGS TO REMAIN - PROTECT
- EXISTING FIRE DEPARTMENT CONNECTION TO REMAIN - PROTECT
- EXISTING UNISUIT SUPPORTS FOR ELECTRICAL CONDUIT TO REMAIN - PROTECT

DEMOLITION KEYNOTES:

- REMOVE EXISTING ABANDONED GRAVITY FILTER TANK. REMOVE CONCRETE PAD INCLUDING ALL ASSOCIATED EXPOSED PIPING. CAP AND SEAL PIPING FLUSH TO GRADE.
- REMOVE EXISTING WASH WATER SUMP. REMOVE CONCRETE HALLS. DRAIN TO REMAIN.
- REMOVE EXISTING ABANDONED DOMESTIC WATER GRAVITY STORAGE TANK. REMOVE CONCRETE PAD INCLUDING ALL ASSOCIATED EXPOSED PIPING. CAP AND SEAL PIPING FLUSH TO GRADE.
- REMOVE EXISTING ABANDONED HYDRO-PNEUMATIC TANK. REMOVE CONCRETE FOOTING INCLUDING ALL ASSOCIATED EXPOSED PIPING. CAP AND SEAL PIPING FLUSH TO GRADE.
- REMOVE EXISTING DOMESTIC WATER PUMP INCLUDING CONCRETE PAD.
- REMOVE EXISTING EXPOSED DOMESTIC WATER PIPING INCLUDING ALL ASSOCIATED APPURTENANCES (I.E. VALVES, FITTINGS, SWITCHES). CAP AND SEAL PIPING AT FLUSH GRADE.
- REMOVE EXISTING 50K GALLON SEWER PACKAGED PLANT DIVERSION BOX. REMOVE PIPING RISERS. CAP AND SEAL PIPING FLUSH TO GRADE FOR FUTURE POC.
- POINT OF DISCONNECT. CAP LINE FOR FUTURE POINT OF CONNECTION.
- REMOVE EXISTING DOMESTIC WATER PUMP VPD.
- REMOVE EXISTING UNDERGROUND PIPING.
- REMOVE EXISTING DISINFECTANT UV LIGHT SYSTEM. ENCLOSURE TO REMAIN.
- REMOVE EXISTING DOMESTIC WATER EXPANSION TANK.
- REMOVE EXISTING ELECTRICAL OIL FUSED SWITCHBOARD. CONTRACTOR IS RESPONSIBLE FOR ABATEMENT / HAZARDOUS MATERIAL REMOVAL.
- REMOVE EXISTING PRIVATE ELECTRICAL TRANSFORMER.
- REMOVE EXISTING CHLORINE FILTER TANK.
- REMOVE EXISTING ELECTRICAL SUB-STATION. COORDINATE W/ IID.
- REMOVE EXISTING ELECTRICAL MAIN DISTRIBUTION PANEL.
- REMOVE COATINGS FROM WASTEWATER PLANT INTERIOR AND EXTERIOR SURFACE AND ASSOCIATED COMPONENTS PER SPC-SP10 PACE 2 STANDARD.
- REMOVE PORTION OF EXISTING CONCRETE CURBS.
- REMOVE PORTION OF EXISTING ASPHALT. FIELD VERIFY EXACT LOCATION.
- REMOVE PORTION OF EXISTING SITE CONCRETE.
- REMOVE PORTION OF EXISTING SWITCHGEAR CONCRETE PAD.

LEGEND:

- CONCRETE / ASPHALT TO BE REMOVED
- BENCH MARK: TOP OF NORTHEAST CORNER OF TRANSFORMER PAD LOCATED NORTH OF THE MAINTENANCE BUILDING. EXISTING ELEVATION (SITE CONCRETE (ND))
- FIRE HYDRANT
- IRRIGATION HYDRANT
- POWER POLE
- NS NATURAL SOIL
- TC TOP OF CURB
- FL FLOW LINE
- (S) SEWER LINE
- (W) WATER LINE
- (FW) FIREWATER LINE
- (G) GAS LINE
- (E) ELECTRICAL LINE
- (C) COMMUNICATIONS LINE
- (I) IRRIGATION LINE
- (SD) STORM DRAIN LINE
- (TD) TILE DRAIN LINE

NOTES:

- DEMOLITION KEYNOTES ARE NOT INTENDED TO SHOW ALL DEMOLITION REQUIRED FOR PROPOSED IMPROVEMENTS. CONTRACTOR IS RESPONSIBLE FOR REMOVING ALL EXISTING UTILITIES AND CONDITIONS REQUIRED TO COMPLETE WORK FOR PROPOSED IMPROVEMENTS.
- CONTRACTOR SHALL ENCOUNTER EXISTING IRRIGATION LINES DURING DEMOLITION. CONTRACTOR SHALL CAP LINE AWAY FROM PROPOSED IMPROVEMENTS, AND NOTIFY ARCHITECT/SCHOOL DISTRICT.
- CONTRACTOR SHALL REMOVE UTILITY PIPING AS INDICATED ON PLANS. ALL UNDERGROUND PIPING SHALL REMAIN IN PLACE. DISCONNECT AND CAP PIPING TO BE CONNECTED FOR FUTURE POINT OF CONNECTION.
- CONTRACTOR SHALL REPAIR OR REPLACE ANY LINE BROKEN OR DAMAGED DURING COURSE OF NEW LINES. CONSTRUCTION OF TRENCHING, OR HEAVY EQUIPMENT ON SITE AT NO COST TO OWNER.
- PRIOR TO ANY EXCAVATION THE SITE SHALL BE VISITED BY A "DIG ALERT" COMPANY FOR THE PURPOSE OF LOCATING ALL UNDERGROUND UTILITY LINES.
- CAP ALL STUBBED OUT CONDUIT FOR FUTURE.
- PROVIDE FULL STRING FOR ALL CONDUIT.
- ALL UTILITY LINES ARE EXISTING UNLESS NOTED OTHERWISE - PROTECT.
- SAW CUT EXISTING SITE CONCRETE TO NEAREST CONTROL JOINT FOR PROPOSED UTILITIES REPLACEMENT CONCRETE TO BE FLUSH.
- THE EXISTENCE AND LOCATION OF EXISTING UNDERGROUND FACILITIES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE, THERE ARE NO OTHER EXISTING FACILITIES, EXCEPT AS SHOWN ON THESE PLANS. HOWEVER, THE CONTRACTOR IS REQUIRED TO TAKE PRECAUTIONARY MEASURES TO PROTECT ANY EXISTING FACILITY SHOWN HEREON AND ANY OTHER WHICH IS NOT OF RECORD OR NOT SHOWN ON THESE PLANS.
- CONTRACTOR IS REQUIRED TO TAKE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN HEREON AND ANY OTHER EXISTING LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.
- CONTRACTOR IS REQUIRED TO HIRE SITE UTILITY IDENTIFIER CONTRACTOR PRIOR TO ANY EXCAVATION.

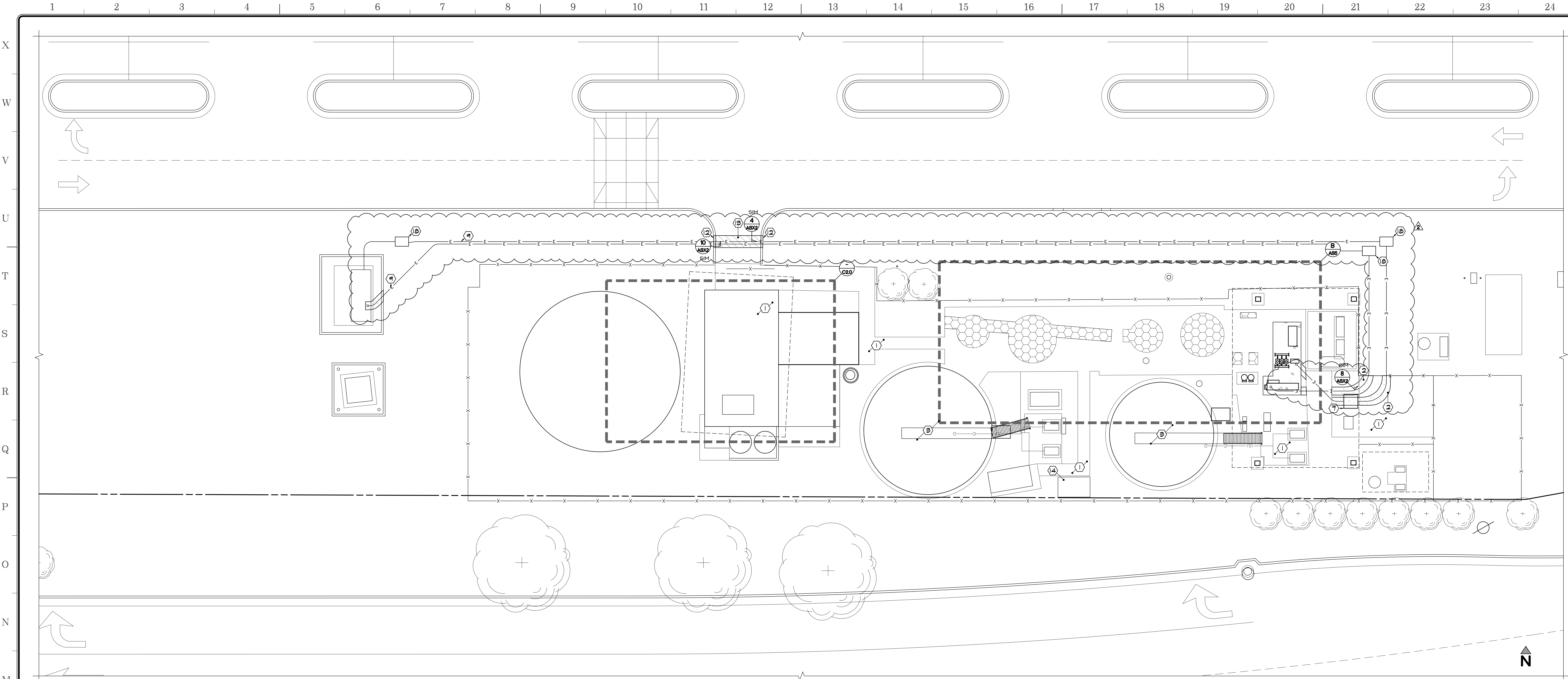
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Project Title
IMPERIAL VALLEY COLLEGE
WATER & WASTEWATER PLANT IMPROVEMENTS

Sheet Title
SITE SURVEY AND DEMOLITION PLAN
DEMOLITION UTILITY PLAN

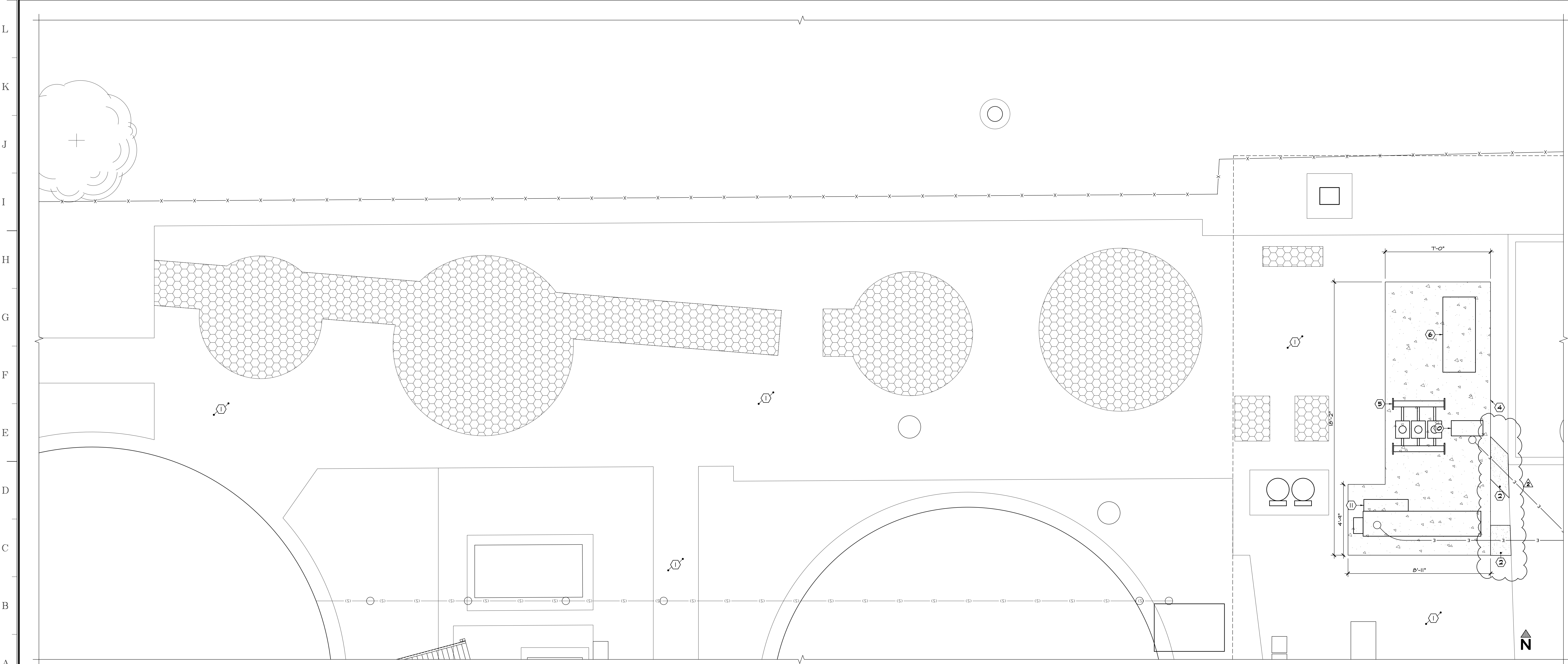
	Document Date 2025-10-17	Project Number 25-28IV
	Date Last Revised 2025-10-23	Sheet Number AD-02_AS3



HARDSCAPE

SCALE: 1" = 10'-0"

A



ENLARGEMENT

SCALE: 3/8" = 1'-0"

B

APPROVALS

KEYNOTES:

- EXISTING CONCRETE WALK - PROTECT
- 6" THICK CONCRETE WALK
- PROVIDE SHERWIN WILLIAMS DURA-PLATE 6000 HIGH PERFORMANCE EPOXY IV HIGH BUILD HARDENER ENCASMENTS. APPLY 1 DRY FILM THICKNESS OF 275 MILS PER MANIF. REQUIREMENTS TO SOIL AND 100% GALLON PACKAGED WASTEWATER PLANT FOR INTERIOR AND EXTERIOR SURFACE AND ASSOCIATED COMPONENTS
- PROVIDE NEW CONCRETE PAD PER
- NEW DOMESTIC WATER PUMPS. REFER TO PLUMBING DRAWINGS
- NEW FIRE WATER PUMP. REFER TO PLUMBING DRAWINGS
- NEW PRIVATE ELECTRICAL TRANSFORMER. REFER TO ELECTRICAL DRAWINGS
- PROVIDE CONCRETE UTILITY VAULT PER
- NEW ELECTRICAL LINE. SEE ELECTRICAL DRAWINGS
- NEW DOMESTIC WATER PUMP CONTROLLER. REFER TO PLUMBING DRAWINGS
- NEW FIRE WATER PUMP CONTROLLER. REFER TO PLUMBING DRAWINGS
- PROVIDE NEW CONCRETE CURB PER
- PROVIDE NEW ASPHALT PAVING PER
- NEW DISINFECTANT UV LIGHT SYSTEM. REFER TO PLUMBING DRAWINGS

LEGEND:

- NEW SITE CONCRETE PER
- NEW CONCRETE PAD PER
- NEW CONCRETE CURB PER
- NEW AC PAVING PER
- NEW CLASS II BASE PER
- BENCH MARK: TOP OF NORTHEAST CORNER OF TRANSFORMER PAD LOCATED NORTH OF THE MAINTENANCE BUILDING
- EXISTING ELEVATION FROM AERIAL SURVEY
- EXISTING ELEVATION (SITE CONCRETE UNQ.)
- PROPOSED ELEVATION (SITE CONCRETE UNQ.)
- DIRECTION OF SLOPE W/ SLOPE NOTED
- RADIUS - NOTED IN DECIMAL FEET
- GRADE BREAK
- STORM DRAIN
- FIRE HYDRANT
- IRRIGATION HYDRANT
- UTILITY CLEAN OUT
- POWER POLE
- LIGHT STANDARDS - SEE ELECTRICAL DRAWINGS
- MANHOLE
- STORM DRAIN CATCH BASIN
- EXISTING CHAIN LINK FENCE
- NATURAL SOIL
- TOP OF CURB
- FLOW LINE
- TOP OF BENCH
- TOP OF PLANTER
- POLE BASE
- DRAIN
- NEW SEWER LINE - SEE PLUMBING DRAWINGS
- NEW WATER LINE - SEE PLUMBING DRAWINGS
- NEW GAS LINE - SEE PLUMBING DRAWINGS
- NEW ELECTRICAL LINE - SEE ELECTRICAL DRAWINGS
- NEW COMMUNICATIONS LINE - SEE COMMUNICATION DRAWINGS
- NEW STORM DRAIN LINE - SEE HARDSCAPE
- NEW COMPRESS AIR LINE - SEE PLUMBING DRAWINGS
- NEW GREASE WASTE LINE - SEE PLUMBING DRAWINGS
- NEW FIRE WATER LINE - SEE FIRE PROTECTION DRAWINGS

NOTES:

- ALL DIMENSIONS ARE TO FACE OF CURB AND FACE OF STUD/CHU (UNQ.).
- CONTRACTOR SHALL BE RESPONSIBLE TO VERIFY DRAINAGE OF SITE. CONTRACTOR SHALL NOTIFY ARCHITECT PRIOR TO CONSTRUCTION. ANY SITE CONCRETE WHICH WILL NOT PROPERLY DRAIN.
- ALL CONTROL JOINTS TO BE SAW CUT.
- ALL NATIVE SOIL REMOVED FOR CONSTRUCTION HARDSCAPE SHALL REMAIN ON SITE. CONTRACTOR SHALL USE NATIVE SOIL FOR FINISH GRADING.
- MAXIMUM GROSS SLOPE AT ALL ACCESSIBLE PATHS OF TRAVEL IS 28%.
- PROVIDE 1'-0" MIN. TOP SOIL AT ALL PLANTING AREAS.
- THE EXISTENCE AND LOCATION OF EXISTING UNDERGROUND FACILITIES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE, THERE ARE NO OTHER EXISTING FACILITIES EXCEPT AS SHOWN ON THESE PLANS. HOWEVER, THE CONTRACTOR IS REQUIRED TO TAKE PRECAUTIONARY MEASURES TO PROTECT ANY EXISTING FACILITY SHOWN HEREON AND ANY OTHER WHICH IS NOT OF RECORD OR NOT SHOWN ON THESE PLANS.
- BEFORE EXCAVATING FOR THIS CONTRACT, VERIFY LOCATION OF UNDERGROUND UTILITIES. THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS HAS BEEN OBTAINED FROM AVAILABLE RECORDS ONLY AND MAY NOT REFLECT ALL EXISTING UTILITIES. LOCATION OF ALL EXISTING UTILITIES SHALL BE CONFIRMED BY FIELD MEASUREMENTS BY CONTRACTOR PRIOR TO CONSTRUCTION OF WORK.
- CONTRACTOR IS REQUIRED TO TAKE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN HEREON AND ANY OTHER EXISTING LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.
- ACCURATE VERIFICATIONS AS TO SIZE, LOCATION AND DEPTH OF EXISTING UNDERGROUND SERVICES SHALL BE THE CONTRACTOR'S RESPONSIBILITY. THE CONTRACTOR SHALL NOTIFY THE SOUTHERN CALIFORNIA GAS COMPANY, AT&T, INTERNAL IRRIGATION DISTRICT, GOLDEN STATE WATER COMPANY, AND ANY OTHER AFFECTED UTILITY AGENCIES PRIOR TO STARTING WORK NEAR SUCH UTILITY FACILITIES AND SHALL COORDINATE WORK WITH UTILITY REPRESENTATIVES FOR LOCATION OF UNDERGROUND UTILITIES AND APPURTENANCES. CONTACT UNDERGROUND SERVICE ALERT AT 811.
- CONTRACTOR IS REQUIRED TO HIRE SITE UTILITY IDENTIFIER CONTRACTOR PRIOR TO ANY EXCAVATION.

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Project Title
**IMPERIAL VALLEY COLLEGE
WATER & WASTEWATER PLANT IMPROVEMENTS**

Sheet Title
HARDSCAPE

Document Date 2025-10-17	Project Number 25-28IV
Date Last Revised 2025-10-23	Sheet Number AD-02_AS5

AD-02_AS5



 LIGHTING CONTROL PANEL, SEE CONTROL DETAIL AND SCHEDULES FOR MORE INFORMATION.
 PUSH BUTTON LOW VOLTAGE OVERRIDE CONTROL SWITCH
 ZONE CONTROLLED (UPPER CASE LETTER DENOTES ZONE CONTROLLED)
 SWITCH LEDS CONTROLLED (LOWER CASE LETTER DENOTES SWITCH LEDS CONTROLLED)
 SWITCH, SINGLE POLE 20A, MTD, 48" AFF TO TOP, DESIGNATION TO LEFT
 2- DOUBLE POLE K - KEYSWITCH
 3- THREE WAY T - MANUAL MOTOR STARTER WITH THERMAL OVERLOADS
 4- FOUR WAY D - LINE RATED DIMMER
 PL - PILOT LIGHT PB - PUSHBUTTON
 MALL MOUNTED MOTION CONTROLLED LIGHTING SWITCH WITH INTEGRAL BI-LEVEL SENSING, DEVICE - WHITE MTD, 48" AFF TO TOP.
 MALL MOUNTED MOTION SENSOR/MANUAL SWITCH-RAISER/LOWER ON/OFF DEVICE WHITE MTD, 48" AFF TO TOP.
 ULL MOUNTED ULTRASONIC MOTION SENSOR, DEVICE WHITE
 MALL MOUNTED DUAL-TECHNOLOGY MOTION SENSOR, DEVICE WHITE
 FIXTURE CALLOUT:
 TYPE (SEE LIGHT FIXTURE SCHEDULE)
 PACKAGE QUANTITY
 RELAY
 TIME CLOCK
 MOTION SENSOR POWER PACK
 EMERGENCY POWER OFF PUSHBUTTON, MOUNTED AT +48" WCN.
 PHOTOCELL

- ▼ DATA OUTLET WITH TRM RING, PULLSTRING TO ACCESSIBLE CEILING SPACE, 110" A.F.F. TO CENTER.
- ▼ TELEPHONE OUTLET WITH TRM RING, PULLSTRING TO ACCESSIBLE CEILING SPACE, 110" A.F.F. TO CENTER.
- ▼ TELECOMMUNICATIONS OUTLET WITH TRM RING, PULLSTRING TO ACCESSIBLE CEILING SPACE, 110" A.F.F. TO CENTER.
- ④ TELECOMMUNICATION OUTLET FLUSH FLOOR MOUNTED ON FIRE RATED FLOOR-THRU.
- ③ SPEAKER BACK BOX LOCATION
- ② INTERCOM J-BOX LOCATION
- ① ELECTROMAGNETIC DOOR HOLDER
- ② INTERCOM LOCATION
- ② CARD READER
- ② ELECTRIC DOOR STRIKE

3. 3/4" FIRE RATED PLYWOOD BACKBOARD WITH #6AWG GROUND TO FLOORING SYSTEM GROUND.

===== CABLE TRAY PER PLANS. COORDINATE ROUTING WITH OTHER DISCIPLINES.

1. ALL ELECTRICAL DEVICES AND UTILIZATION EQUIPMENT SHALL BE LISTED BY AN APPROVED TESTING AGENCY
2. ALL WORK TO COMPLY WITH THE 2022 OF THE CALIFORNIA ELECTRICAL CODE
3. USE COPPER CONDUCTORS ONLY.
4. THERMOSTATS, SWITCHES AND/OR RECEPTACLES INSTALLED IN RESTROOMS OR OTHER AREAS EXPOSED FOR PERSONS WITH DISABILITIES, SHALL BE LOCATED AT NOT TO EXCEED 48" TO TOP OF DEVICE FROM THE FLOOR.
5. CONTRACTOR IS TO VERIFY MOUNTING HEIGHTS OF ALL DEVICES PRIOR TO MOUNTING
6. VERIFY ROUTING OF ANY SURFACE MOUNTED CONDUITS PRIOR TO INSTALLATION
7. REVIEW ALL PLANS BY OTHER TRADES AND PROVIDE ADDITIONAL MARK AS REQUIRED NOT OUTLINED IN THESE DOCUMENTS
8. COORDINATE ALL DIMMING FLUORESCENT BALLASTS WITH DIMMING SYSTEM, PROVIDE NEW CONTROLS AND RELOCATE EXISTING BALLASTS
9. ELECTRICAL CONTRACTOR SHALL PROVIDE MULTI-POLE CIRCUIT BREAKERS WITH COMMON TRIP OR U.L. LISTED HANDLE TIES FOR ALL MULTI-POLE CIRCUITS WITH SHARED NEUTRAL
10. ALL 125-12W THROUGH 250-20W RECEPTACLES SUPPLIED BY SINGLE-PHASE BRANCH CIRCUITS RATED 150 AMPERES OR LESS TO GROUND, 150 AMPERES OR LESS, AND RECEPTACLES SUPPLIED BY THREE-PHASE BRANCH CIRCUITS RATED 150 AMPERES OR LESS TO GROUND, 150 AMPERES OR LESS, INSTALLED IN KITCHENS AND BATHROOMS SHALL BE PROVIDED WITH GROUND-Fault CIRCUIT INTERRUPTER (GFCI) PROTECTION.

	JUNCTION BOX																		
	WALL MOUNTED JUNCTION BOX.																		
	DUPLEX RECEPTACLE MTD 15' AFF TO CENTER COVERPLATE COLOR: WHITE																		
	<table border="1"> <thead> <tr> <th>DEVICE TYPE</th><th>DEVICE COLOR</th></tr> </thead> <tbody> <tr> <td>STANDARD</td><td>WHITE</td></tr> <tr> <td>IG</td><td>DIGATED GROUND</td></tr> <tr> <td>D</td><td>DEDICATED 20A RATED</td></tr> <tr> <td>UPS</td><td>15A OR 20A UPS</td></tr> <tr> <td>EM</td><td>EMERGENCY</td></tr> <tr> <td>T</td><td>TAMPER RESISTANT</td></tr> <tr> <td>USB</td><td>USB PORT</td></tr> <tr> <td></td><td>WHITE</td></tr> </tbody> </table>	DEVICE TYPE	DEVICE COLOR	STANDARD	WHITE	IG	DIGATED GROUND	D	DEDICATED 20A RATED	UPS	15A OR 20A UPS	EM	EMERGENCY	T	TAMPER RESISTANT	USB	USB PORT		WHITE
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	6FT DUPLEX RECEPTACLE MTD 15' AFF TO CENTER COVERPLATE COLOR: WHITE																		
	DUPLEX WEATHERPROOF RECEPTACLE MTD 15' AFF TO CENTER, USE "IN USE" TYPE COVER PLATES																		
	DOUBLE DUPLEX RECEPTACLE MTD 15' AFF TO CENTER, SCHEDULE AS NOTED ABOVE.																		
	SPLIT WIRED 15A 1/2 HOT, 1/2 SWITCHED OUTLET COLOR: WHITE																		
	DUPLEX RECEPTACLE CONTROLLED BY OCCUPANCY SENSOR, MTD 15' AFF TO CENTER, SCHEDULE AS NOTED ABOVE																		
	DOUBLE DUPLEX RECEPTACLE WITH ONE DUPLEX CONTROLLED BY OCCUPANCY SENSOR, MTD 15' AFF TO CENTER, SCHEDULE AS NOTED ABOVE																		
	208V/10 RECEPTACLE, NEMA CONFIGURATION AS NOTED.																		
	208V/30 RECEPTACLE, NEMA CONFIGURATION AS NOTED.																		
	FLUSH FLOOR MOUNTED DUPLEX RECEPTACLE.																		
	FLOOR BOX WITH DOUBLE DUPLEX RECEPTACLE AND SINGLE GANG TEL/DATA RECEPTACLE.																		
	FLOOR BOX WITH DUPLEX RECEPTACLE AND SINGLE GANG TEL/DATA RECEPTACLE.																		
	SPECIALTY FLOOR BOX PER PLANS MULTIPLE GANG BOX, SEE SPECS.																		
	PEDESTAL MOUNTED DUPLEX RECEPTACLE MANUF: HUBBELL#SA6606 N/STAINLESS STEEL COVERPLATES																		
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	WEATHERPROOF 6FT WORK OUTLET. PROVIDE CAST BOX N/STAINLESS STEEL WP																		
	EXTERNALLY OPERATED FUSED DISCONNECT SWITCH. PROVIDE PER NEMA RATINGS REQUIRED.																		
	COMBINATION PVR MAGNETIC MOTOR STARTER AND DISCONNECT RATINGS AND POLES AS INDICATED. PROVIDE WITH OVERLOAD PER HORSEPOWER REQUIREMENTS, CPT, H.O.A. WITH PILOT LIGHTS; PROVIDE WITH (1) EACH N.O. AND N.C. AUX CONTACTS.																		
	PVR MAGNETIC STARTER WITH OVERLOAD PER HORSEPOWER REQUIREMENTS, CPT, H.O.A. WITH PILOT LIGHTS; PROVIDE WITH (1) EACH N.O. AND N.C. AUX CONTACTS.																		
	MOTOR PROVIDED BY OTHERS.																		
	FLUSH MOUNTED PANELBOARD																		
	SURFACE MOUNTED PANELBOARD																		
	SURFACE MOUNTED LIGHTING CONTROL PANEL, U.O.N.																		
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	FIRE RATED DOUBLE DUPLEX POKE THROUGH																		
	FIRE RATED SYSTEMS FURNITURE FEED POKE THROUGH																		
	GLOCK HANGER OUTLET ONLY, MOUNTED AT 12\" U.O.N.																		
	TELEVISION SYSTEM OUTLET WITH JACK, WALL MOUNTED AT 12\" U.O.N.																		
	MULTI-OUTLET ASSEMBLY LENGTH AS INDICATED ON PLANS.																		
	FLEXIBLE CONDUIT																		
	WIRING OR CONDUIT CONCEALED IN WALL OR CEILING																		
	WIRING OR CONDUIT EXPOSED																		
	WIRING OR CONDUIT CONCEALED UNDERGROUND OR IN FLOOR																		
	RACEWAY OR RISERWAY ASSEMBLY DOWN																		
	RACEWAY OR RISERWAY ASSEMBLY UP																		
	HOMERUN TO PANEL, CIRCUITS AS INDICATED.																		
	UNDERGROUND HOMERUN TO PANEL, CIRCUITS AS INDICATED.																		
	CONCEALED EMT CONDUIT WITH THIN WIRE 2#12 AWG 3/4\" MINIMUM																		
	CONCEALED EMT CONDUIT WITH THIN WIRE 2#12 AWG 3/4\" MINIMUM. GHEVRONS INDICATE #10 CONDUCTORS																		
	FUSED SWITCH, SEE SINGLE LINE DIAGRAM FOR MORE INFORMATION.																		
	CIRCUIT BREAKER, SEE SINGLE LINE DIAGRAM FOR MORE INFORMATION.																		
	TRANSFORMER, SEE SINGLE LINE DIAGRAM FOR MORE INFORMATION.																		
	CURRENT TRANSFORMER																		
	AUTOMATIC TRANSFER SWITCH																		
	GROUNDING ELECTRODE																		
	SMOKE DETECTOR																		

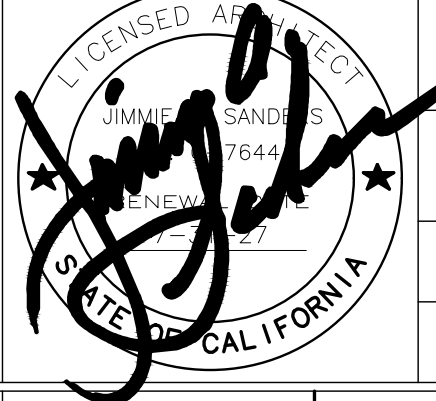
AC AMPERES
ACV ALTERNATING CURRENT
AD AMPERES INTERRUPTING CAPACITY
AF ABOVE FINISHED FLOOR
AFF ABOVE FINISHED GRADE
AFM AMP FRAME/AMP FUSE
AL ALUMINUM
AR ARCHITECT OR ARCHITECTURAL
AS AMP SWITCH
AT AMP TRIP
ATS AUTOMATIC TRANSFER SWITCH
AX AXIAL
ANG AMERICAN NINE GAUGE
BK BACKBOARD
BK-BD GROUND WITH NINE
GATV CABLE TELEVISION
GLTV GLOVED GROUND TELEVISION
GR BREAKER
GCT CURRENT LIMITING FUSE
GND GROUND ONLY WITH NYLON PULL CORD
CONTR CONTRACTOR
CT CURRENT TRANSFORMER
CW COLD WATER
CO DEDICATED OUTLET
DC DIRECT CURRENT
DT DRINKING FOUNTAIN
DIA DIAMETER
DIS DISCONNECT
DST DISTRIBUTION
DVS DRAWINGS
EA ELECTRICAL
EB 40-MINUTE BATTERY CONNECTED TO UNIT
EC ELECTRICAL CONTRACTOR
ED ELECTRICAL GENERATOR CONNECTION
EFG EXHAUST FAN
EL ELECTRICAL
ELEV ELEVATION/ELEVATOR
EMT ELECTRICAL-METALLIC TUBING
END END
FA FIRE ALARM
FG FOOT CANDLE
FI FIXTURE
FL FLOOR
FT FOOT OR FOOT
GG GENERAL CONTRACTOR
GGD GARBAGE DISPOSAL
GR GENERATOR
GRI GENERATOR FAULT INTERRUPTER
GFR GROUND FAULT RELAY
GRD GROUND
H HORIZONTAL
HD HIGH INTENSITY DISCHARGE
H-H HORIZONTAL
HPS HIGH PRESSURE SODIUM
HR HOUR
HT HEIGHT
HZ HERTZ
IS ISOLATED GROUND BUS OR CONDUIT
IMC INTERMEDIATE METAL CONDUIT
INCAD INCADESIGN
INB INJECTION BOX
KVA KILO-VOLT-AMPERE
KV KILOVOLT
KPH KILOVAAT-HOUR
LN LINEAL FEET
LT LIGHTING
LV LOW VOLTAGE
MANF MANUFACTURER
MAX MAXIMUM
MCC MECHANICAL CONTRACTOR
MCCG MOTOR CONTROL CENTER
MECH MECHANICAL
MN MINIMUM
MH METAL HALIDE
MLD MAIN LUGS ONLY
MNT MOUNTING
NTG NUTTING
N NEUTRA
NEG NEGATIVE ELECTRIC CODE
NG NOT
NL NIGHT LIGHT
NTS NOT TO SCALE
ON ON CENTER
OFI OWNER FURNISHED CONTRACTOR INSTALLED
OFI-INS OWNER INSTALLED
P PEDESTAL MOUNT
PB PULL BOX
PC PHOTOELECTRIC CONTROL
PCT PHOTOELECTRIC TIME/CLOCK CONTROL
PH PHASE
PIV POINT INDICATING VALVE
PL PILOT LIGHT
P/V POLY-VINYL CHLORIDE
POW POWER
PWR POWER POLE
PF FIXTURE WITH QUARTZ RESTRIKE
Q QUANTITY
RC RECEPTACLE
REF REFRIGERATOR
RGS REINFORCED STEEL
SD SMOKE DETECTOR
SFE SQUARE FEET
SQ FT SQUARE FOOT OR SQUARE FOOT
SW SWITCH
TDP TATCHBOARD
TMP TEMPERATURE OR TEMPORARY
TV TELEVISION
TEL, TELE TELEPHONE
TO TO CLOCK
TR TRANSFORMER
TYP TYPICAL
USPS UNDERPANEL PULL SECTION
UL UNDERWRITERS LABORATORIES
UNO UNLESS NOTED OTHERWISE
UNUSABLE POWER SUPPLY
V VOLTS
VA VOLT-AMPERE
WH WATER HEATER
XMR WEATHER PROOF
XMR TRANSFORMER



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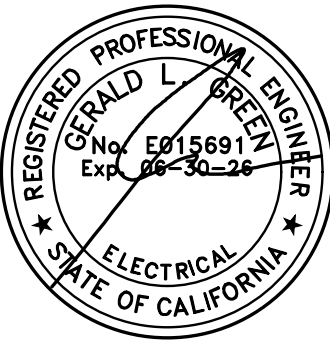
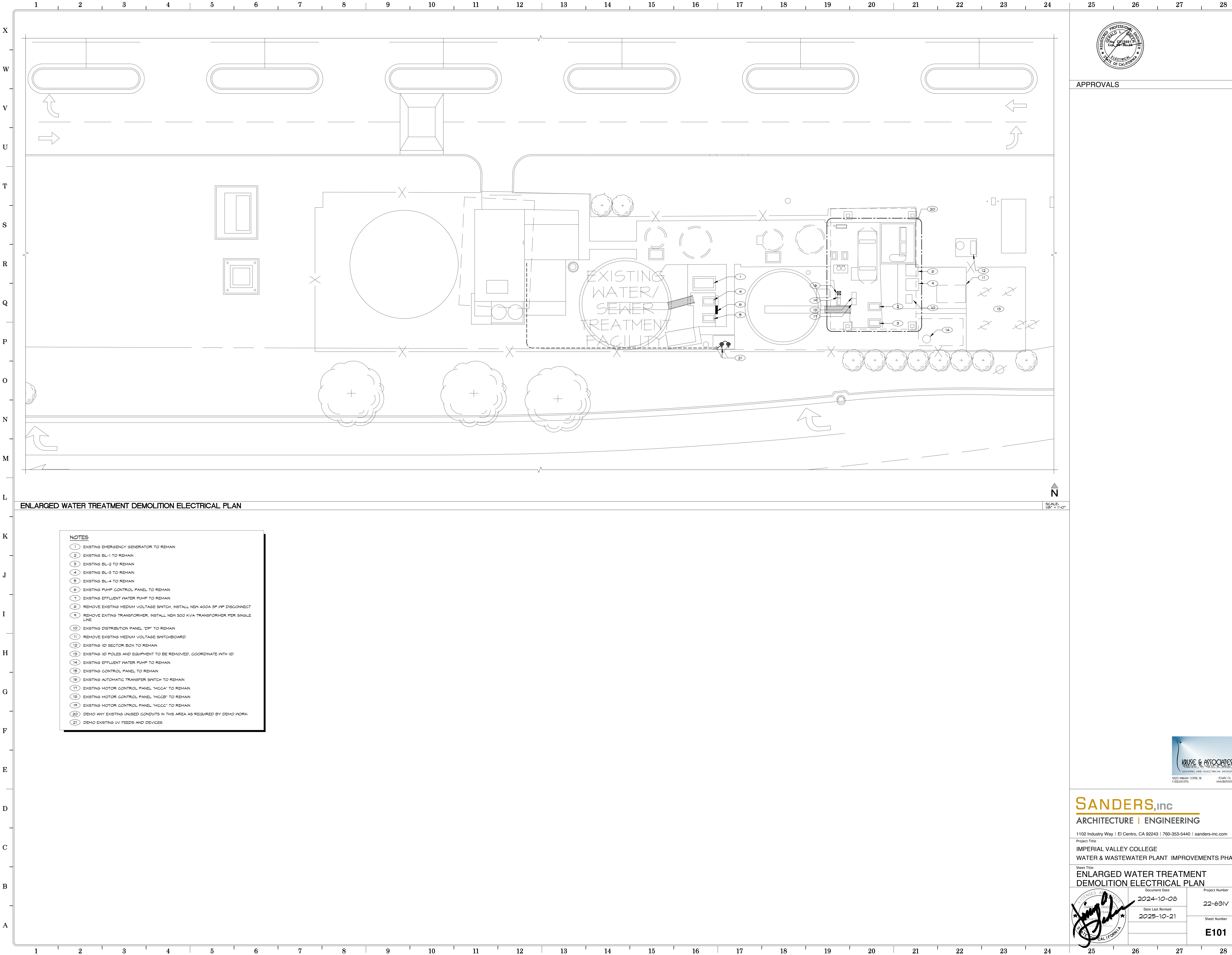


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22-63/M

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APPROVALS

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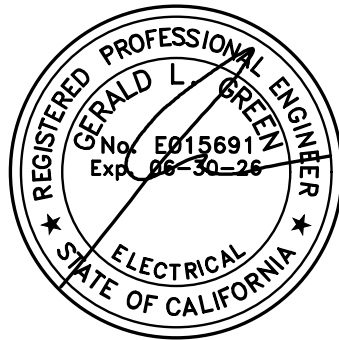
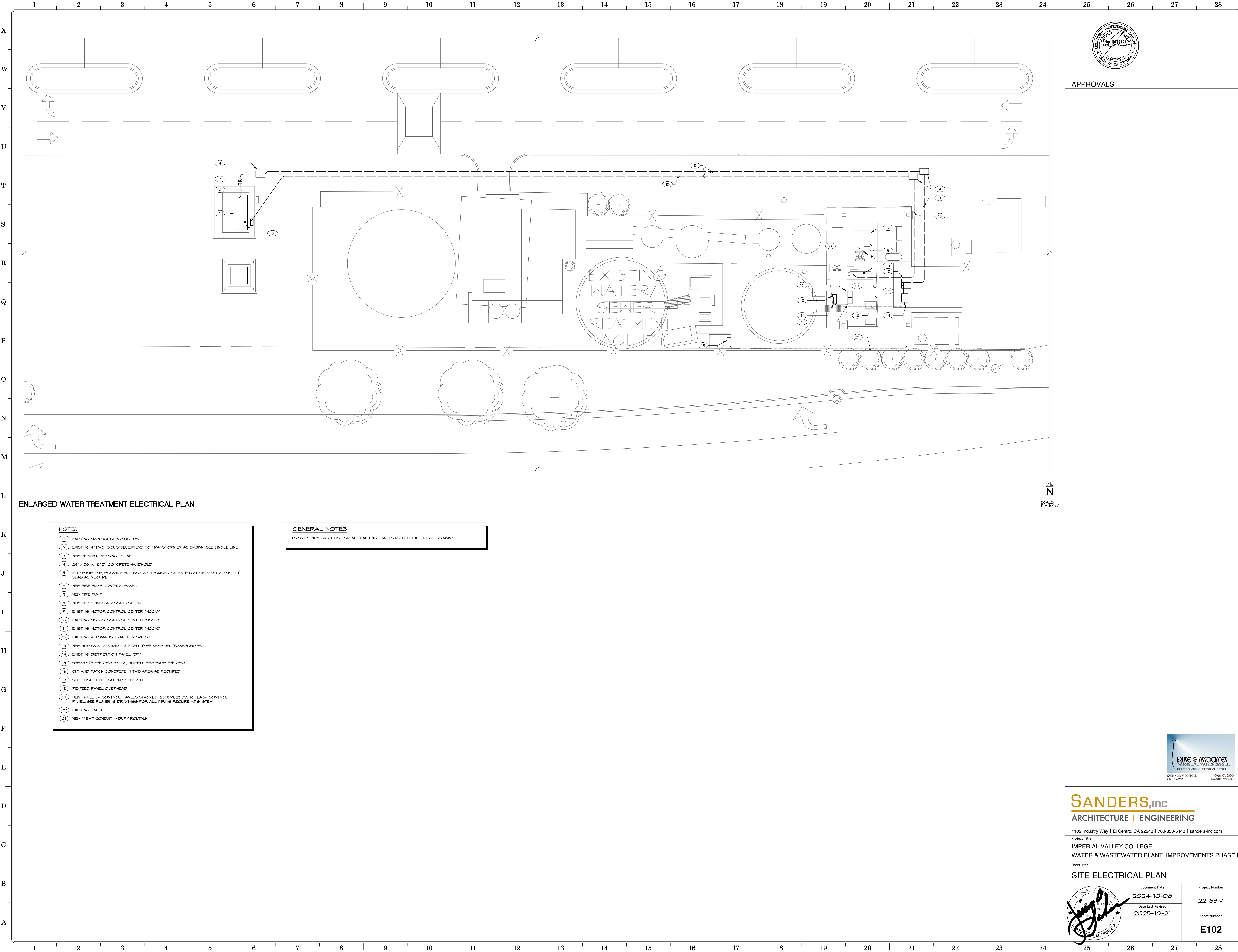
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Project Title
**IMPERIAL VALLEY COLLEGE
WATER & WASTEWATER PLANT IMPROVEMENTS PHASE I**

Sheet Title
**ENLARGED WATER TREATMENT
DEMOLITION ELECTRICAL PLAN**

	Document Date 2024-10-08	Project Number 22-631V
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APPROVALS

ENLARGED WATER TREATMENT ELECTRICAL PLAN

N
SCALE: 1" = 10'-0"

NOTES

- 1 EXISTING MAIN SWITCHBOARD "MS"
- 2 EXISTING 4" P.V.C. G.O. STUB, EXTEND TO TRANSFORMER AS SHOWN, SEE SINGLE LINE
- 3 NEW FEEDER, SEE SINGLE LINE
- 4 24" X 36" X 18" D. CONCRETE HANDHOLD
- 5 FIRE PUMP TAP, PROVIDE PULLBOX AS REQUIRED ON EXTERIOR OF BOARD, SAN CUT SLAB AS REQUIRE
- 6 NEW FIRE PUMP CONTROL PANEL
- 7 NEW FIRE PUMP
- 8 NEW PUMP SKID AND CONTROLLER
- 9 EXISTING MOTOR CONTROL CENTER "MCC-A"
- 10 EXISTING MOTOR CONTROL CENTER "MCC-B"
- 11 EXISTING MOTOR CONTROL CENTER "MCC-C"
- 12 EXISTING AUTOMATIC TRANSFER SWITCH
- 13 NEW 300 KVA, 277/480V, 3Ø DRY TYPE NEMA 3R TRANSFORMER
- 14 EXISTING DISTRIBUTION PANEL "DP"
- 15 SEPARATE FEEDERS BY 12", SLURRY FIRE PUMP FEEDERS
- 16 CUT AND PATCH CONCRETE IN THIS AREA AS REQUIRED
- 17 SEE SINGLE LINE FOR PUMP FEEDER
- 18 RE-FEED PANEL OVERHEAD
- 19 NEW THREE UV CONTROL PANELS STACKED, 2500W, 208V, 1Ø, EACH CONTROL PANEL. SEE PLUMBING DRAWINGS FOR ALL WIRING REQUIRE AT SYSTEM
- 20 EXISTING PANEL
- 21 NEW 1" EMT CONDUIT, VERIFY ROUTING

GENERAL NOTES

PROVIDE NEW LABELING FOR ALL EXISTING PANELS USED IN THIS SET OF DRAWINGS

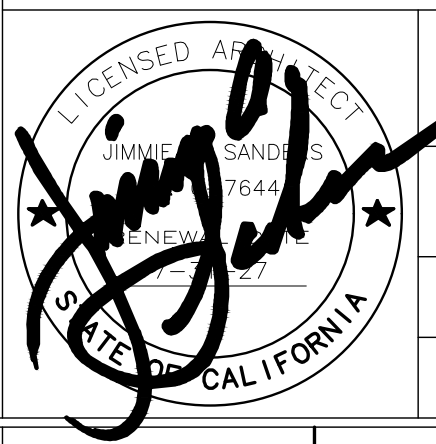


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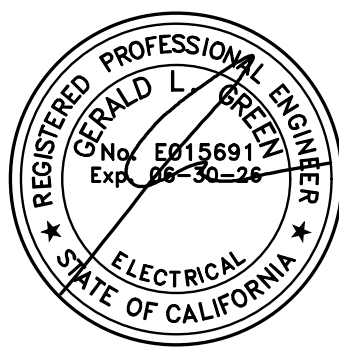
Project Title
**IMPERIAL VALLEY COLLEGE
WATER & WASTEWATER PLANT IMPROVEMENTS PHASE I**

Sheet Title
SITE ELECTRICAL PLAN

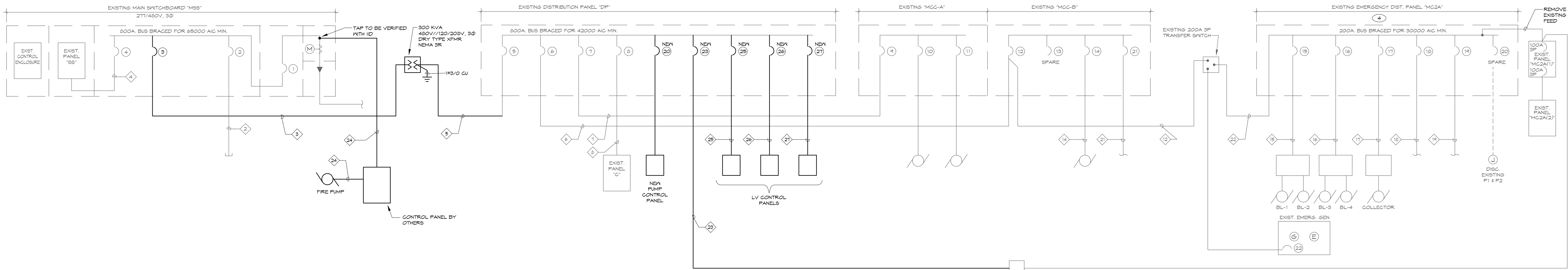


Document Date
2024-10-08
Date Last Revised
2025-10-21

Project Number
22-631V
Sheet Number
E102



APPROVALS



POWER SINGLE LINE DIAGRAM

NO SCALE

	DEVICE NUMBER	C.B. OR S.W. SIZE	FUSE SIZE	FUSE TYPE	FEEDER NUMBER	CONDUITS & CONDUCTORS						
						CONDUIT TYPE	CONDUIT SIZE	CONDUCTOR QUANTITY	CONDUCTOR SIZE	CONDUCTOR TYPE	GND CU	0/0 V.D.
EXIST	1	800A 3P	-	-	1	PVC	-	-	-	-	-	-
SPARE	2	800A 3P	-	-	2	PVC	(3) 4"	-	-	-	-	-
NBX	3	400A 3P	-	-	3	PVC	4"	3	3/0	CU	4	320'-0"
EXIST	4	100A 3P	-	-	4	-	-	4	2	CU	5	-
(BKR) EXIST	5	800A 3P	-	-	5	PVC	(3) 4"	4	300 MCM (EA)	CU	3/0 (EA)	14'-0"
EXIST	6	200A 3P	-	-	6	PVC	2"	4	3/0	CU	4	-
EXIST	7	200A 3P	-	-	7	PVC	2"	4	3/0	CU	4	-
EXIST	8	200A 3P	-	-	8	PVC	2"	4	3/0	CU	4	-
EXIST	9	250A 3P	-	-	9	-	-	-	-	-	-	-
EXIST	10	40A 3P	-	-	10	-	-	-	-	-	-	-
EXIST	11	100A 3P	-	-	11	-	-	-	-	-	-	-
EXIST	12	150A 3P	-	-	12	-	-	-	-	-	-	-
SPARE	13	100A 3P	-	-	13	-	-	-	-	-	-	-
EXIST	14	100A 3P	-	-	14	-	-	-	-	-	-	-
EXIST	15	50A 3P	-	-	15	PVC	1 1/2"	3	6	CU	5	-
EXIST	16	100A 3P	-	-	16	PVC	1 1/2"	3	2	CU	5	-
EXIST	17	15A 3P	-	-	17	EMT	1"	3	12	CU	12	-
EXIST	18	15A 3P	-	-	18	EMT	3/4"	2	12	CU	12	-
EXIST	19	15A 3P	-	-	19	EMT	3/4"	2	12	CU	12	-
NBX	20	125A 3P	-	-	20	EMT	1 1/2"	3	1/0	CU	6	-
EXIST	21	100A 3P	-	-	21	-	-	-	-	-	-	-
EXIST	22	150A 3P	-	-	22	-	-	-	-	-	-	-
EXIST/NBX	23	100A 3P	-	-	23	-	2"	4	1/0	CU	5	-
NBX	24	-	-	-	24	PVC	2"	3	3/0	CU	4	-
NBX	25	20A 2P	-	-	25	EMT	1"	6	12	CU	12	-
NBX	26	20A 2P	-	-	26	EMT	1"	6	12	CU	12	-
NBX	27	20A 2P	-	-	27	EMT	1"	6	12	CU	12	-

LOAD RECAP	
MCG2A:	
BL-1	8112 VA (NON SIMULTANEOUS)
BL-2	8112 VA (NON SIMULTANEOUS)
BL-3	16560 VA
BL-4	16560 VA
LARGEST MOTOR (25%)	4140 VA
MISC. LOADS	5000 VA
TOTAL 40280 VA 112 A @ 120/208, 3Ø	

NOTES

- FIRE PUMP TAP SHALL COMPLY WITH CEC 230.82 (5)
- PROVIDE DISCONNECTING MEANS IN COMPLIANCE WITH CEC 615.4 (3)
- PROVIDE LABELING AS REQUIRED IN 230.2
- PROVIDE RED PLACARD ON PANEL STATING THE FOLLOWING:
"BREAKER FOR BL-1 & BL-2 ARE NON-SIMULTANEOUS WITH BREAKER FOR BL-3 & BL-4. PROVIDE LOCK TO USE ON LOCK-OUT BREAKER TO ABOVE FUNCTION"

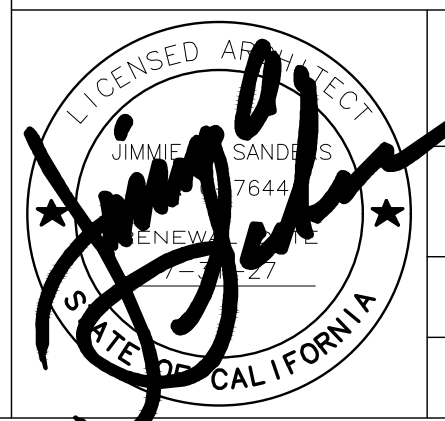


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Sheet Title
SINGLE LINE DIAGRAM



Document Date
2024-10-08
Date Last Revised
2025-10-21

Project Number
22-631V
Sheet Number
E201