

Davis Water Treatment Plant Chemical Feed Improvements

Bid Package 2: Lime Slaker/Lime Slurry Feed System Improvements

IFB No. 6100 CLMC447

C.I.P. 2015.047

ADDENDUM #2

ADDENDUM #2 IS TOO LARGE TO POST IN ITS ENTIRETY TO THIS WEB SITE

SECTION 00900 ADDENDUM AND ATTACHED PAGES ARE POSTED TO THIS WEBSITE

THE APPENDICES ARE NOT POSTED TO THIS WEBSITE

THE COMPLETE ADDENDUM #2 INCLUDING THE APPENDICES WILL BE MAILED TO ALL PLAN HOLDERS

THE COMPLETE ADDENDUM MAY ALSO BE OBTAINED AT THE 7TH FLOOR FILE ROOM, SUITE 760, ONE TEXAS CENTER, 505 BARTON SPRINGS ROAD, AUSTIN, TEXAS 78704

Bidding Requirements, Contract Forms and Conditions of the Contract
ADDENDUM
Section 00900

ADDENDUM No. 2

Date July 30, 2013

City of Austin

Project Name Davis Water Treatment Plant Chemical Feed System Improvements Bid Package 2:
Lime Slaker / Lime Slurry Feed System Improvements C.I.P. No. 2015.047

This Addendum forms a part of Contract and clarifies, corrects or modifies original Bid Documents, dated June 24, 2013. Acknowledge receipt of this addendum in space provided on bid form. Failure to do so may subject bidder to disqualification.

A. Project Manual Revisions:

- 1) Delete "Table of Contents" in its entirety, and replace with the attached "Table of Contents".
- 2) Delete Section 00020, "Invitation for Bids" in its entirety, and replace with the attached Section 00020, "Invitation for Bids".
- 3) Add Section 00631, Title VI Assurances Appendix A
- 4) Delete Section 00810, "Supplemental General Conditions" in its entirety, and replace with the attached Section 00810, "Supplemental General Conditions".
- 5) Delete Section 01030, "Alternate Bid Items" in its entirety, and replace with the attached Section 01030, "Alternate Bid Items".
- 6) Delete Section 01310, "Schedules and Reports" in its entirety, and replace with the attached Section 01310, "Schedules and Reports".
- 7) Delete Section 01650, "Facility Start-Up" in its entirety, and replace with the attached Section 01650, "Facility Start-Up/Commissioning".
- 8) Delete Section 01670, "Training" in its entirety, and replace with the attached Section 01670, "Training".
- 9) Delete Section 10400, "Identifying Devices" in its entirety, and replace with the attached Section 10400, "Identifying Devices".
- 10) Delete Section 11252, "Slakers, Belt Feeders, and Appurtenances" in its entirety, and replace with the attached Section 11252, "Slakers, Belt Feeders, and Appurtenances".
- 11) Delete Appendix A1 in its entirety, and replace with "Appendix A1: PLC Interface Documentation" to Section 17000 included in enclosed CD.
- 12) Delete Appendix A2 in its entirety, and replace with "Appendix A2: Davis WTP Top End Standards" to Section 17000 included in enclosed CD.
- 13) Delete Appendix A3 in its entirety, and replace with "Appendix A3: Packaged System PLC Programming Criteria" to Section 17000 included in enclosed CD.
- 14) Delete Appendix A4 in its entirety.

- 15) Delete Section 17100, "Process Control and Instrumentation Systems" in its entirety, and replace with the attached Section 17100, "Process Control and Instrumentation Systems".
- 16) Delete Section 17201, "Control Panel Instrumentation" in its entirety, and replace with the attached Section 17201, "Control Panel Instrumentation".
- 17) Add Section 17300, "Overall System Integrator Requirements"
- 18) Delete Section 17510, "PLC-Based Control Systems Hardware" in its entirety, and replace with the attached Section 17510, "Manufacturer's PLC-Based Control Systems Hardware".
- 19) Delete Section 17520, "PLC-Based Control Systems Software" in its entirety, and replace with the attached Section 17520, "Manufacturer's PLC-Based Control Systems Software".

B. Drawing Revisions:

- 20) Delete Sheet L-M-1, "Lime Slaker System Replacement Plan" in its entirety, and replace with the attached Sheet L-M-1, "Lime Slaker System Replacement Plan".
- 21) Delete Sheet L-M-3, "Lime Slurry Piping System Replacement Plan" in its entirety, and replace with the attached Sheet L-M-3, "Lime Slurry Piping System Replacement Plan".

This addendum consists of 99 page(s)/sheet(s) not including the pages of the Appendices on one (1) CD.



Approved by OWNER



Approved by ENGINEER/ARCHITECT

END

**Document
Number**

Title

VOLUME 1

00900 07/12/13 Addendum 1
00900 07/30/13 Addendum 2

INTRODUCTORY INFORMATION

05/06/11 Title Page
06/21/13 Table of Contents

BIDDING REQUIREMENTS, CONTRACT FORMS, & CONDITIONS OF THE CONTRACT

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Instructions to Bidders

00100 04/22/13 Instructions to Bidders

Bid Forms

00300L 05/06/11 Bid Form (Lump Sum)

Supplements to Bid Forms

00400 04/22/13 Statement of Bidder's Experience
00405 09/25/05 Certificate of Non-Suspension or Debarment
00410 05/06/11 Statement of Bidder's Safety Experience
00440 05/06/11 Affidavit - Prohibited Activities
00475 05/06/11 Nonresident Bidder Provisions

Agreement Form

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Bonds and Certificates

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00620 02/23/10 Payment Bond
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00680 06/05/06 Non-Use of Asbestos Affidavit (Prior to Construction)
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00819 06/10/05 Security Requirements
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00830 03/12/12 Wage Rates and Payroll Reporting
00830BC 06/21/13 Wage Rates Building Construction Trades

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722S	09/26/12	Protective Coatings

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Special Provisions to City Standard Technical Specifications

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VOL. 2	10/09/00	MBE/WBE Procurement Program Package

END

Bidding Requirements, Contract Forms and Conditions of the Contract
INVITATION FOR BIDS
Section 00020

Following is a summary of information for this Project. Bidder is cautioned to refer to other sections of the Project Manual, Drawings and Addenda (Bid Documents) for further details.

The City of Austin, hereafter called OWNER, is requesting sealed written Bids for furnishing all labor, materials, equipment, supervision, and incidentals, and for performing all Work required for the following Project:

Davis Water Treatment Plant Chemical Feed System Improvements Bid Package 2: Lime Slaker / Lime Slurry Feed System Improvements

Located at: 3500 West 35th Street, Austin, Texas 78703

CIP ID# 2015.047 IFB# 6100 CLMC447

The Work consists of demolition and replacement of existing lime slaker systems and appurtenances including slakers, volumetric feeders, slurry piping and valves, and flooring improvements. The project also includes electrical, instrumentation and controls, and miscellaneous appurtenances associated with the operation of these systems.

Bid Documents may be obtained at One Texas Center, 505 Barton Springs Road, Ste. 760, Austin, TX 78704. Copies will be available in CD format at no cost.

At the time Bid Documents are obtained, Bidder must provide a working e-mail address, so that they will receive any addenda or clarification issued by the Owner.

Sealed Bids will be received at the Contract Management Department, 105 W. Riverside Dr., Suite 210, Austin, Texas 78704 and then publicly opened and read aloud in the **SUITE 210 Conference Room**.

ALL BIDS ARE DUE PRIOR TO (Austin time) August 8, 2013, 11:00 a.m.

ALL COMPLIANCE PLANS ARE DUE PRIOR TO (Austin time) August 8, 2013, 3:00 p.m.

BIDS WILL BE OPENED AT (Austin time) August 8, 2013, 3:00 p.m.

ALL BIDS AND COMPLIANCE PLANS NOT RECEIVED PRIOR TO THE DATE AND TIME SET FORTH ABOVE WILL NOT BE ACCEPTED FOR CONSIDERATION. The time stamp clock in **SUITE 210** is the time of record and is verified with www.time.gov, the official U.S. time.

All CONTRACTORS must be registered to do business with OWNER prior to submission of a Bid. All Subcontractors must be registered with the OWNER prior to execution of a contract. Prime Contractors are responsible for ensuring that their Subcontractors are registered as vendors with the City of Austin. Registration can be done through the OWNER's on-line Vendor Registration system. Log onto <https://www.ci.austin.tx.us/vss/Advantage> and follow the directions.

All City procurements are subject to the City's Minority-Owned and Women-Owned Business Enterprise Procurement Program found at Chapter 2-9-A of the City Code, as amended. The Program provides Minority-Owned and Women-Owned Business Enterprises (MBEs/WBEs) or Disadvantaged Business Enterprises (DBEs) full opportunity to participate in all City contracts. Goals for MBE/WBE or DBE participation are stated for each solicitation. Information on achieving the goals or documenting good faith efforts to achieve the goals are contained in the MBE/WBE Procurement Program Package or DBE Procurement Program Package attached to the solicitation. When goals are established, Bidders are required to complete and return the MBE/WBE or DBE Compliance Plan with their Bid. If a Compliance Plan is not submitted prior to the date and time set forth in the solicitation, the Bid will not be accepted for consideration. (See Section 00820 for MBE/WBE requirements on "no goal" solicitations.)

All Bids shall be accompanied by an acceptable Bid guaranty in an amount of not less than five percent (5%) of the total Bid, as specified in Section 00100, Instructions To Bidders.

Performance and payment bonds when required shall be executed on forms furnished by OWNER. Each bond shall be issued in an amount of one hundred percent (100%) of the Contract Amount by a solvent corporate surety company authorized to do business in the State of Texas, and shall meet any other requirements established by law or by OWNER pursuant to applicable law.

Minimum insurance requirements are specified in Section 00810, Supplemental General Conditions.

Minimum wage rates have been established and are specified in Section 00830, Wage Rates and Payroll Reporting.

Contract Time is of the essence and all Work shall be substantially completed within 220 Calendar Days after date specified in the Notice to Proceed, in accordance with the Bid Form, Section 00300. Final completion shall be achieved within 30 Calendar Days after substantial completion. Liquidated damages are \$800 per Calendar Day for failure to substantially complete the work and \$540 per Calendar Day for failure to achieve final completion within 30 Calendar Days after substantial completion, in accordance with the Bid Form, Section 00300.

OWNER reserves the right to reject any or all Bids and to waive any minor informality in any Bid or solicitation procedure (a minor informality is one that does not affect the competitiveness of the Bid).

A mandatory Pre-Bid Conference will be held on July 2, 2013 at 9:00 a.m.
(date) (time)

(Austin time) at Davis Water Treatment Plant, 3500 West 35th, Austin, Texas 78703.
(location)

Attendance is mandatory unless otherwise stated. Bidders must attend any mandatory Pre-Bid Conference and are encouraged to attend any non-mandatory Pre-Bid Conference to ensure their understanding of Owner's bidding and contracting requirements, particularly MBE/WBE Procurement Program requirements. If the Pre-Bid Conference is mandatory the Bidder must arrive and sign-in within fifteen (15) minutes of the scheduled start time of the meeting, otherwise the Bidder will not be allowed to submit a Bid for the project.

The persons listed below may be contacted for information regarding the Invitation for Bid. If the Bidder contacts any other City employee, including Council Members and members of Boards and Commissions, the Bidder may be found in violation of Ordinance No. 20111110-052, dated November 10, 2011, regarding Anti-Lobbying and Procurement. The text of that Ordinance may be viewed at <http://www.cityofaustin.org/edims/document.cfm?id=161145>.

AUTHORIZED CONTACT PERSONS

PROJECT MANAGER: Paulinda Mackie, PMP, telephone (512)974-7974,

email paulinda.mackie@austintexas.gov

CONTRACT COMPLIANCE REP.: Mary Lou Ochoa, telephone (512)974-7215,

email marylou.ochoa@austintexas.gov

END

Bidding Requirements, Contract Forms and Conditions of the Contract
TITLE VI ASSURANCES APPENDIX A
Section 00631

During the performance of this contract, the contractor, for itself, its assignees and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. Compliance with Regulations: The contractor shall comply with the Regulations relative to nondiscrimination in Federally-assisted programs of the Department of Transportation (hereinafter, "DOT") Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.
2. Nondiscrimination: The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate either directly or indirectly in the discrimination prohibited by section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.
3. Solicitations for Subcontracts, Including Procurements of Materials and Equipment: In all solicitations either by competitive bidding or negotiation made by the contract for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, or national origin.
4. Information and Reports: The contractor shall provide all information and reports required by the Regulations or directives issued pursuant thereto, and shall permit access to its book, records, accounts, other sources of information, and its facilities as may be determined by the Recipient or the Texas Department of Transportation to be pertinent to ascertain compliance with such Regulations, orders and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information the contractor shall so certify to the Recipient, or the Texas Department of Transportation as appropriate, and shall set forth what efforts it has made to obtain the information.
5. Sanctions for Noncompliance: In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the Recipient shall impose such contract sanctions as it or the Texas Department of Transportation may determine to be appropriate, including, but not limited to:
 - (a) withholding of payments to the contractor under the contract until the contractor complies, and or
 - (b) cancellation, termination or suspension of the contract, in whole or in part.
6. Incorporation of Provisions: The contractor shall include the provisions of paragraphs (1) through (6) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto. The contractor shall take such action with respect to any subcontract or procurement as the Recipient or the Texas Department of Transportation may direct as a means of enforcing such provisions including sanctions for non-compliance: Provided, however, that, in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the Recipient to enter into such litigation to protect the

interests of the Recipient, and, in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

(DOT 1050.2, 08/24/71)

Signature: _____

Printed Name: _____

Title: _____

Date: _____

END

Bidding Requirements, Contract Forms and Conditions of the Contract
SUPPLEMENTAL GENERAL CONDITIONS
Section 00810

The Supplemental General Conditions contained herein amend or supplement the General Conditions, Section 00700.

ARTICLE 1 - DEFINITIONS

Add the following definition:

"1.20 Engineer/Architect (E/A): Add the following:

Name: Thomas W. Rohlack, P.E., 86365

Engineering Firm: URS Corporation (Texas Firm #3162)

Address: 9400 Amberglen Boulevard, Austin, TX 78729"

ARTICLE 2 - PRELIMINARY MATTERS

2.4 Before Starting Construction:

Delete 2.4.2.6 and replace with the following (changes to the original text are identified by underlining):

- ".6** a preliminary schedule of values for all of the Work, subdivided into component parts in sufficient detail to serve as the basis for progress payments during construction. At a minimum, the schedule of values shall be broken out by trade and split between materials and labor. Prices will include an appropriate amount of overhead and profit applicable to each item of Work;"

ARTICLE 5 - BONDS AND INSURANCE

"5.3 Insurance:

5.3.1 CONTRACTOR Provided Insurance

5.3.1.1 General Requirements.

- .1** CONTRACTOR shall carry insurance in the types and amounts indicated below for the duration of the Contract, which shall include items owned by OWNER in the care, custody and control of CONTRACTOR prior to and during construction and warranty period.
- .2** CONTRACTOR must complete and forward the Certificate of Insurance, Section 00650, to OWNER before the Contract is executed as verification of coverage required below. CONTRACTOR shall not commence Work until the required insurance is obtained and until such insurance has been reviewed by OWNER. Approval of insurance by OWNER shall not relieve or decrease the liability of CONTRACTOR hereunder and shall not be construed to be a limitation of liability on the part of CONTRACTOR. CONTRACTOR must also complete and forward the Certificate of Insurance, Section 00650, to OWNER whenever a previously identified policy period has expired as verification of continuing coverage.
- .3** CONTRACTOR's insurance coverage is to be written by companies licensed to do business in the State of Texas at the time the policies are issued and shall

be written by companies with A.M. Best ratings of B+VII or better, except for hazardous material insurance which shall be written by companies with A.M. Best ratings of A- or better.

- .4 All endorsements naming the OWNER as additional insured, waivers, and notices of cancellation endorsements as well as the Certificate of Insurance shall indicate: City of Austin, Contract Management Department, P.O. Box 1088, Austin, Texas 78767.
- .5 The "other" insurance clause shall not apply to the OWNER where the OWNER is an additional insured shown on any policy. It is intended that policies required in the Contract, covering both OWNER and CONTRACTOR, shall be considered primary coverage as applicable.
- .6 If insurance policies are not written for amounts specified below, CONTRACTOR shall carry Umbrella or Excess Liability Insurance for any differences in amounts specified. If Excess Liability Insurance is provided, it shall follow the form of the primary coverage.
- .7 OWNER shall be entitled, upon request and without expense, to receive certified copies of policies and endorsements thereto and may make any reasonable requests for deletion or revision or modification of particular policy terms, conditions, limitations, or exclusions except where policy provisions are established by law or regulations binding upon either of the parties hereto or the underwriter on any such policies.
- .8 OWNER reserves the right to review the insurance requirements set forth during the effective period of this Contract and to make reasonable adjustments to insurance coverage, limits, and exclusions when deemed necessary and prudent by OWNER based upon changes in statutory law, court decisions, the claims history of the industry or financial condition of the insurance company as well as CONTRACTOR.
- .9 CONTRACTOR shall not cause any insurance to be canceled nor permit any insurance to lapse during the term of the Contract or as required in the Contract.
- .10 CONTRACTOR shall be responsible for premiums, deductibles and self-insured retentions, if any, stated in policies. All deductibles or self-insured retentions shall be disclosed on the Certificate of Insurance.
- .11 CONTRACTOR shall provide OWNER thirty (30) days written notice of erosion of the aggregate limits below occurrence limits for all applicable coverages indicated within the Contract.
- .12 If OWNER owned property is being transported or stored off-site by CONTRACTOR, then the appropriate property policy will be endorsed for transit and storage in an amount sufficient to protect OWNER's property.
- .13 The insurance coverages required under this contract are required minimums and are not intended to limit the responsibility or liability of CONTRACTOR.

5.3.1.2 Business Automobile Liability Insurance. Provide coverage for all owned, non-owned and hired vehicles. The policy shall contain the following endorsements in favor of OWNER:

- a) Waiver of Subrogation endorsement CA 0444;
- b) 30 day Notice of Cancellation endorsement CA 0244; and
- c) Additional Insured endorsement CA 2048.

Provide coverage in the following types and amounts:

- .1 A minimum combined single limit of \$500,000 per occurrence for bodily injury and property damage. Alternate acceptable limits are \$250,000 bodily injury per person, \$500,000 bodily injury per occurrence and at least \$100,000 property damage liability each accident.

5.3.1.3 Workers' Compensation And Employers' Liability Insurance. Coverage shall be consistent with statutory benefits outlined in the Texas Workers' Compensation Act (Section 401). CONTRACTOR shall assure compliance with this Statute by submitting two (2) copies of a standard certificate of coverage (e.g. ACCORD form) to Owner's Representative for every person providing services on the Project as acceptable proof of coverage. The Certificate of Insurance, Section 00650, must be presented as evidence of coverage for CONTRACTOR. Workers' Compensation Insurance coverage written by the Texas Workers Compensation Fund is acceptable to OWNER. CONTRACTOR's policy shall apply to the State of Texas and include these endorsements in favor of OWNER:

- a) Waiver of Subrogation, form WC 420304; and
- b) 30 day Notice of Cancellation, form WC 420601.

The minimum policy limits for Employers' Liability Insurance coverage shall be as follows:

- .1 \$100,000 bodily injury per accident, \$500,000 bodily injury by disease policy limit and \$100,000 bodily injury by disease each employee.

5.3.1.4 Commercial General Liability Insurance. The Policy shall contain the following provisions:

- a) Contractual liability coverage for liability assumed under the Contract and all contracts relative to this Project.
- b) Completed Operations/Products Liability for the duration of the warranty period.
- c) Explosion, Collapse and Underground (X, C & U) coverage.
- d) Independent Contractors coverage (Contractors/ Subcontractors work).
- e) Aggregate limits of insurance per project, endorsement CG 2503.
- f) OWNER listed as an additional insured, endorsement CG 2010.
- g) 30 day notice of cancellation in favor of OWNER, endorsement CG 0205.
- h) Waiver of Transfer of Recovery Against Others in favor of OWNER, endorsement CG 2404.

Provide coverages A&B with minimum limits as follows:

- .1 A combined bodily injury and property damage limit of \$500,000 per occurrence.

5.3.1.5 Builders' Risk Insurance. CONTRACTOR shall maintain Builders' Risk Insurance or Installation Insurance on an all risk physical loss form in the Contract Amount. Coverage shall continue until the Work is accepted by OWNER. OWNER shall be a loss payee on the policy. If off-site storage is permitted, coverage shall include transit and storage in an amount sufficient to protect property being transported or stored.

5.3.1.6 Professional Liability Insurance. For Work which requires professional engineering or professional survey services to meet the requirements of the Contract, including but

not limited to excavation safety systems, traffic control plans, and construction surveying, the CONTRACTOR or Subcontractors, responsible for performing the professional services shall provide Professional Liability Insurance with a minimum limit of \$500,000 per claim and in the aggregate to pay on behalf of the assured all sums which the assured shall become legally obligated to pay as damages by reason of any negligent act, error, or omission committed with respect to all professional services provided in due course of the Work of this Contract.

5.4 Bonds:

In Sections 5.4.2 Performance Bond, Paragraphs .2, .3, and .4 and Section 5.4.4 Maintenance Bond, replace any references to a one (1) warranty period with a two (2) year warranty period.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.6 Permits, Fees: Add the following:

"No building permits or fees will be required."

6.11 Safety and Protection: Add the following to paragraph 6.11.3:

"6.11.3 At the minimum, the safety representative will be certified in personal protective equipment, hazard communication, demolition and blasting, trench/excavation, hand and power tools, welding/cutting, cranes/derricks/hoists/conveyors/, scaffolding, confined space, CPR and first aid."

ARTICLE 11 - CHANGE OF CONTRACT AMOUNT

11.4 Determination of Value of Work: Add the following to paragraph 11.4.1.2:

"11.4.1.2 In the case of a Change Order determined by a mutually agreed lump sum properly itemized and supported by sufficient substantiating data, including documentation by subcontractors performing the work, to permit evaluation, use the following method:

COMPONENT ONE - The cost of labor, material and equipment to be incorporated in the Work and the cost of tools, equipment and facilities necessary to accomplish the Work described in the change should be submitted for review:

1a - the cost of labor (base rate, including fringe benefits),

1b - the cost of material and equipment to be incorporated in the Work, and

1c - the cost of tools, equipment and facilities necessary to accomplish the Work described in the change.

COMPONENT TWO - The costs of payroll taxes and insurance, Liability and Builder's Risk Insurance, shall be calculated as follows:

2a - Payroll taxes and Workers' Compensation Insurance 25% of payroll (Item 1a).

2b - Liability and Builder's Risk Insurance 2% of "total costs" (Items 1a, 1b, 1c, and 2a).

COMPONENT THREE - Overhead and profit shall be calculated as follows:

3a - For Subcontractors and for those portions of the Work performed by CONTRACTOR'S own forces:

Up to 15% of the first \$10,000.00 of costs and up to 10% of the balance over \$10,000.00.

("costs" = Items 1a, 1b, and 1c, above, broken down into Contractor and Subcontractor costs).

3b - For the CONTRACTOR for that portion of the Work performed by Subcontractors:

Up to 10% of the first \$10,000.00 of the Subcontractor costs and up to 7.5% of the balance over \$10,000.00.

("costs" = Items 1a, 1b, and 1c, above, broken down into Subcontractor costs)

COMPONENT FOUR - Bonds

Performance and Payment Bond according to the following table ("TOTAL COST" = Items 1a, 1b, 1c, 2a, 2b, 3a and 3b.):

<u>DOLLAR VALUE OF CONTRACT</u>	<u>% OF TOTAL COST OF CHANGE ORDER ADDED FOR BOND EXPENSE</u>
100,000 or less	2.5
100,001 thru 500,000	1.5
500,001 thru 2,500,000	1.0
2,500,001 thru 5,000,000	0.75
5,000,001 thru 7,500,000	0.70
OVER 7,500,000	0.65

- The total costs for the change, whether additive or deductive, shall be the sum total of COMPONENTS ONE - FOUR.

ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.3 Tests and Inspections: Delete 13.3.1 thru 13.3.5 and replace with the following:

13.3.1 "CONTRACTOR shall give timely notice of readiness of the Work for all required inspections, tests or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

13.3.2 OWNER shall employ and pay for services of an independent testing laboratory to perform all inspections, tests or approvals required by the Contract Documents except:

- .1 for inspections, tests or approvals covered by paragraphs 13.3.3 and 13.3.4 below;
- .2 that costs incurred for tests or inspections conducted pursuant to paragraph 13.4.3 shall be paid as provided in paragraph 13.4.3;

- .3 for reinspecting or retesting defective Work, including any associated costs incurred by the testing laboratory for cancelled tests or standby time; and
- .4 as otherwise specifically provided in the Contract Documents.

13.3.3 If laws or regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests or approvals, pay all costs in connection therewith and furnish Owner's Representative the required certificates of inspection or approval.

13.3.4 CONTRACTOR shall also be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests or approvals required for OWNER's and E/A's review of submittals covering materials, equipment, and mix designs to be incorporated in the Work.

13.3.5 All testing laboratories shall meet the requirements of ASTM E-329."

13.7 Warranty Period:

Delete the first paragraph of 13.7.1 and replace with the following:

"If within two years after the date of Substantial Completion of all the Work, irrespective of individual portions of the Work deemed Substantially Complete as permitted under paragraph 14.8.1, or such longer period of time as may be prescribed by laws or regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents (e.g., paragraph 14.11.2), any Work, including work performed after the Substantial Completion date, is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions: "

Add the following:

"**13.7.5** OWNER will utilize a "Warranty Item Form" (attached at the end of this Section) for the purpose of providing Written Notice of warranty defects to CONTRACTOR. CONTRACTOR shall date, sign, complete and return the form to OWNER when the defect is corrected, including such information on or attached to the form to describe the nature of the repairs or corrections that were made. If the defect cannot be corrected in seven (7) Calendar Days, CONTRACTOR shall provide a written explanation to the Owner's Representative describing the repairs needed and the time required to complete the repairs."

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

Application for Progress Payment: Delete 14.1.6 and replace with the following:

"**14.1.6** The Contractor shall include the following documentation, in addition to any requirements Stipulated elsewhere in this section or in section 00700 General Conditions, as part of his Monthly application for payment.

1. Updated Progress Schedule (Microsoft Project and PDF);
2. Monthly subcontractor report;
3. Updated submittal schedule and log (Microsoft Excel and PDF);
4. Construction photos documenting the work included in the payment application (PDF and hard copy)
5. Any other documentation required under the Supplemental General

Add the following:

14.7.3 All Lime Slaker Systems included in the contract, including new slakers, feeders, grit removers, rotary valves, vibrators, slurry piping replacements and electrical control panels, shall be fully functional, commissioned, successful performance testing completed, and all required training conducted before the project is deemed Substantially Complete.

14.8 Partial Utilization: Delete 14.8.1 and replace with the following (changes to the original text are identified by underlining):

14.8.1 OWNER at any time may request CONTRACTOR to permit OWNER to use any such part of the Work which OWNER believes to be ready for its intended use and substantially complete. If CONTRACTOR agrees that such part of the Work is substantially complete, CONTRACTOR will certify to Owner's Representative that such part of the Work is substantially complete and request Owner's Representative to issue a notice specifying what portion of the Work is substantially complete for the purpose of payment and what Work remains to be done on the portion being accepted. CONTRACTOR at any time may notify Owner's Representative that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request Owner's Representative to issue a notice specifying what portion of the Work is partially completed for the purpose of payment and what Work remains to be done on the portion being accepted. The provisions of paragraphs 14.7.1 and 14.7.2 will apply with respect to the notice specifying what portion of the Work is partially completed for the purpose of payment and what Work remains to be done on the portion being accepted."

14.11 Final Payment and Acceptance:

In Section 14.11.2 delete the reference to a one-year warranty period and replace with a two (2) year warranty period.

WARRANTY ITEM NO. _____ (PROJECT NAME)

The General Conditions of the Contract require that Warranty Defects be corrected within 7 days after written notice is received.

TO: _____
contractor name address / telephone / fax / email

ATTENTION OF: _____

FROM: _____
project manager name / address / telephone / fax / email

PROJECT: _____
name / location / CIP ID number

END OF TWO-YEAR WARRANTY: _____

SUBJECT: _____

- If checked, the damage requires immediate attention. The Contractor has been called.
- If checked, the Consultant has been asked to consult with the Contractor on the problem.

PLEASE CORRECT OR REPAIR THE FOLLOWING ITEM(S):

DATE OF REQUEST _____ **SIGNATURE** _____
Project Manager

- XC:
- _____ Phone No. _____
 - _____ Phone No. _____
 - _____ Phone No. _____
 - _____ Phone No. _____

RESPONSE FROM CONTRACTOR: DATE CORRECTION WAS MADE: _____

The Contractor must endeavor to correct the defect within 7 calendar days after written notice is given. If the defect cannot be corrected in that time, Contractor shall provide a written explanation to the Owner's Representative describing the repairs needed and the time required to complete the repairs.

Description of corrections made:

DATE OF REPLY _____ **SIGNATURE** _____

When the repair is complete, the contractor should return a copy to each of the following:

- _____ Phone No. _____

END

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This Section includes administrative and procedural requirements governing Alternate Bids for the replacement of slaker systems 3 and/or 4 and all materials and equipment associated with these two units that are not otherwise included in the Base Bid.
- B. Alternate Bid Item Nos. 1 and 2 are for the demolition and replacement of slaker systems 3 and 4, respectively.
- C. The demolition and replacement of all six (6) rotary valves, vibrators, cleaning of troughs and replacement of fixed piping and valves indicated on sheet L-M-3, and the trench cover replacement plan shown on L-M-4 are to be included in the base bid. The replacement of individual slaker hoses and fittings detailed on Typical Section A and identified on the corresponding piping chart on sheet L-M-3 shall also be included in the base bid.
- D. OWNER has established a priority order (Alternate No. 1 has the highest priority) for acceptance of Bid Alternates based on the Project needs and budget. See Section 00820.

1.02 RELATED SECTIONS

- A. 00300L Bid Form (Lump Sum)

1.03 SELECTION AND PURCHASE

- A. The Contractor shall purchase products and systems selected by the Owner from the designated supplier. For this project, the additional slaker systems involve equipment identical to those units included in the Base Bid. Only the quantities will be modified, and therefore, the sequence of construction.

1.04 SUBMITTALS

- A. Contractor shall submit a sequence of demolition and a replacement plan for approval by the Engineer and Owner for the Scope of Work selected by the Owner (with none or both Alternate Bid Items accepted and included in the contract).

PART 2 - PRODUCTS

The products to be utilized for Alternate Bid Items 1 and 2 are the same as those in the Base Bid and the only difference will be quantity. The construction sequencing associated with the addition of one or both of the additional slaker systems will need to be accounted for in the schedule and plant coordination.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. The Contractor shall examine products covered by the Alternates promptly on delivery for damage or defects. The Contractor shall return damaged or defective products to the manufacturer for replacement.

3.02 PREPARATION

- A. The Contractor shall coordinate materials and their installation for each Alternate with related materials and installations to ensure that each Alternate is completely integrated and interfaced with related Work.

PART 4 - MEASUREMENT AND PAYMENT

- A. Each Alternate Item shall be measured and paid as follows:
 - 1. Alternate No. 1 per bid item.
 - 2. Alternate No. 2 per bid item
- B. The total cost of the Alternates selected shall not exceed the amount indicated by the Contractor on the bid form and shall include the total cost for the construction of the additional slaker systems associated with each bid item for a complete and operational system.

END

PART 1 - GENERAL

1.01 GENERAL

- A. The Contractor shall schedule the Work in accordance with this Section.
- B. Development of the schedule, the cost loading of the schedule, monthly payment requisitions and project status reporting requirements of the Contract shall employ computerized Critical Path Method (CPM) scheduling. The CPM schedule shall be used to control the work of this Contract and to provide a definitive basis for determining job progress. The CPM Schedule shall be cost loaded based on the schedule of values as approved by the Owner in accordance with Section 00700 – General Conditions and Section 01300 - Submittals. The CPM schedule shall be prepared by the Contractor. Work shall be performed in compliance with the established CPM schedule and the Contractor and his subcontractors shall be responsible for cooperating fully with the Owner in effectively utilizing the CPM schedule.
- C. The CPM schedule and related reports should be prepared with the current version of Microsoft Project software. The CPM schedule shall be prepared and submitted by the Contractor and shall consist of a CPM network (diagram of activities) and a computer-generated schedule as specified submitted digitally and via a printed hard copy.

1.02 DEFINITIONS

- A. CPM Scheduling: The term shall be interpreted to be generally as outlined in the Association of General Contractors (AGC) publication, "The Use of CPM in Construction." except that either "i-j" arrow diagrams or precedence diagramming format may be utilized. In the case of conflicts between this Section and the AGC document, this Section shall govern.
- B. Float: Total float is the period of time measured by the number of Days each non-critical path activity may be delayed before it and its succeeding activities become part of the critical path. If a non-critical path activity is delayed beyond its float period, then that activity becomes part of the critical path and controls the end date of the Work. Thus, delay of a non-critical path activity beyond its float period will cause delay to the project itself.

1.03 INITIAL SCHEDULE SUBMITTALS

- A. Where submittals are required hereunder, the Contractor shall submit 4 copies of each submittal item.
- B. Following Notice of Award and prior to the Preconstruction Conference, the Contractor shall meet with the Owner to discuss and agree on the proposed standards for the CPM schedule. At this conference the Contractor shall submit to the Owner a preliminary network defining the planned operations during the first 60 calendar days after Notice to Proceed. The Contractor's general approach for the

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balance of the project shall be indicated. Cost of activities expected to be completed or partially completed before submission and approval of the complete network shall be included.

- C. The Contractor shall submit the 60-Day Plan of Operation schedule within 5 working days following written Notice to Proceed, which serves as the Contractor's plan of operation for the initial 60-Day period of the Contract Time and identifies the manner in which the Contractor intends to complete the Work within the Contract Times. The proposed Baseline Schedule shall be submitted within 10 working days following written Notice to Proceed.
1. 60-Day Plan of Operation: During the initial 60 Days of the Contract Times, the Contractor shall conduct operations in accordance with a 60-Day bar chart type schedule. The chart so prepared shall show accomplishment of the Contractor's early activities (mobilization, permit acquisition, submittals necessary for early material and equipment procurement, submittals necessary for long lead equipment procurement, CPM submittals, initial site work and other submittals and activities required in the first 60 Days).
 2. Baseline Schedule: The Baseline Schedule shall indicate the major components of the Work and the sequence relations between major components and subdivisions of major components as specified in Section 00700 – General Conditions and Section 01300 - Submittals. The Baseline Schedule shall indicate the relationships and time frames in which the various components of the Work will be made substantially complete and placed into service in order to meet the required milestones. Sufficient detail shall be included to subdivide major components in such activities as (1) equipment acquisition, (2) slaker unit demolition and replacement, (3) piping demolition and replacement, (4) electrical work, (5) instrumentation, (6) testing, and (7) other important Work for each major item within the overall project scope. Planned durations and start dates shall be indicated for each Work item subdivision.
- D. The Owner and the Contractor shall meet to review and discuss the 60 Day Plan of Operation within 5 working days after submittal to the Owner. The Owner's review and comment on the schedules will be limited to conformance with the sequencing and milestone requirements in the Contract Documents. The Contractor shall make corrections to the schedules necessary to comply with the requirements and shall adjust the schedules to incorporate any missing information requested by the Owner.

1.04 CPM SCHEDULE SUBMITTALS

- A. Baseline CPM Schedule Submittal: Within 10 working days after the commencement date stated in the Notice to Proceed, the Contractor shall submit for review by the Owner a hard copy of the CPM schedule and the computerized schedule report tabulations. The Contractor shall also submit a CD that contains the schedule submittal information. The data shall be compatible with Microsoft Project – latest version to generate network diagrams and schedule reports identical to the hard copies submitted. This submittal shall have already been reviewed and approved by

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- the Contractor's Project Manager, superintendent, and estimator prior to submission. The CPM schedule shall be a time-scaled network diagram of the "i-j" activity-on-arrow or precedence type. The network diagram shall describe the activities to be accomplished and their logical relationships and shall show the critical path.
- B. The computerized schedule report tabulations shall include the following:
1. Report of activities sorted by activity number: Activity numbers, where practical, shall correlate to the area numbers designated on the Contract Drawings.
 2. Report of activities sorted by early start date.
 3. Report of activities sorted by total float.
 4. Report of activities sorted by responsibility code. Responsibility codes shall be established for the Contractor, Owner, Subcontractors, Suppliers, etc. These codes shall be identified in the Network Diagram.
 5. A successor-predecessor report which shall identify the successor and predecessor activities for each activity and ties between schedule activities.
- C. Float Ownership: Neither the Owner nor the Contractor owns the float time. Float time is not for the exclusive use or benefit of either the Contractor or Owner. The Contractor's Work shall proceed according to early start dates, and the Contractor acknowledges and agrees that actual delays, affecting paths of activities containing float times, will not have any effect upon contract completion times, providing that the actual delay does not exceed the float time associated with those activities.
- D. Baseline CPM Schedule Review Meeting: The Contractor shall, within 15 working days from the commencement date stated in the Notice to Proceed, meet with the Owner to review the Baseline CPM schedule submittal. The Contractor shall have the Project Manager, superintendent, and the scheduler in attendance. The Owner's review will be limited to conformance with the Contract Documents. However, the review may also include:
1. Clarifications of the design intent.
 2. Directions to include activities and information missing from the submittal.
 3. Requests to the Contractor to clarify and revise the schedule.
- E. Revisions to the Baseline CPM Schedule: Within 20 working days after the commencement date stated in the Notice to Proceed, the Contractor shall revise the Baseline CPM schedule submittal to address review comments from the Baseline CPM schedule review meeting and resubmit the network diagrams and reports for the Owner's review. The Owner, within 14 working days from the date that the Contractor submitted the revised schedule will either (1) accept the schedule and cost loaded activities as submitted, or (2) advise the Contractor in writing to review any part or parts of the schedule which either do not meet the requirements or are

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unsatisfactory for the Owner to monitor the progress and status of Work or evaluate monthly payment requests by the Contractor. The Owner may accept the schedule conditional upon the first monthly CPM schedule update correcting deficiencies identified. When the schedule is accepted, it shall be considered as the "Baseline CPM Construction Schedule" until an updated schedule has been submitted. The Owner reserves the right to require that the Contractor adjust, add to, or clarify any portion of the schedule which may later be discovered to be insufficient for the monitoring of Work or approval of partial payment requests. No additional compensation will be provided for such adjustments, additions, or clarifications.

F. Acceptance

1. Acceptance of the Contractor's schedule by the Owner will be based solely upon compliance with the requirements. By way of the Contractor assigning activity durations and proposing the sequence of the Work, the Contractor agrees to utilize sufficient and necessary management and other resources to perform Work in accordance with the schedule. Upon submittal of a schedule update, the updated schedule shall be considered the "current" project schedule.
2. Submission of the Contractor's progress schedule to the Owner shall not relieve the Contractor of total responsibility for scheduling, sequencing, and pursuing the Work to comply with the requirements of the Contract Documents, including adverse effects such as delays resulting from ill-timed Work.

G. Monthly Updates and Periodic CPM Schedule Submittals

1. Following acceptance of the Contractor's baseline CPM schedule, the Contractor shall monitor the progress of the Work and adjust the schedule each month to reflect actual progress and any changes in planned future activities. Each schedule update submittal shall be complete including information requested in the Baseline schedule submittal and be in the schedule report format indicated below. Each update shall continue to show Work activities including those already completed. Completed activities shall accurately depict "as built" information by indicating when the Work was actually started and completed.
2. Neither the submission nor the updating of the Contractor's Baseline schedule submittal nor the submission, updating, change, or revision of any other report, curve, schedule, or narrative submitted by the Contractor, nor the Owner's review or acceptance of any such report, curve, schedule, or narrative shall have the effect of amending or modifying in any way the Contract Times or milestone dates or of modifying or limiting in any way the Contractor's obligations under the Contract. Only a signed, fully executed Change Order can modify contractual obligations.
3. The monthly schedule update submittal will be reviewed with the Contractor during construction progress meetings. The goal of these meetings is to enable the Contractor and the Owner to initiate appropriate remedial action to minimize any known or foreseen delay in completion of the Work and to determine the amount of Work completed since the last schedule update. The status of the

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Work will be determined by the percent complete of each activity in the updated CPM schedule. These meetings are considered a critical component of the overall monthly schedule update submittal, and the Contractor shall have appropriate personnel attend. As a minimum, the Contractor's Project Manager and superintendent shall attend these meetings. The Contractor shall submit the revised CPM schedule (on a date as defined by the Owner) the revised CPM computerized tabulations, the revised successor/predecessor report, the project status reports as defined below and the Contractor's Application for Payment. Within 5 working days of receipt of the revised submittals, the Owner will either accept or reject the monthly schedule update submittal. If accepted, the percent complete in the monthly update shall be the basis for the Application for Payment to be submitted by the Contractor. If rejected, the update shall be corrected and resubmitted by the Contractor before the Application for Payment for the update period will be processed.

- H. Schedule Revisions: The Contractor shall highlight or otherwise identify changes to the schedule logic or activity durations made from the previous schedule. The Contractor shall modify any portions of the CPM schedule which become infeasible because activities are behind schedule or for any other valid reason.

1.05 CHANGE ORDERS

- A. Upon approval of a Change Order or upon receipt by the Contractor of authorization to proceed with additional Work, the change shall be reflected in the next submittal of the CPM Schedule. The Contractor shall utilize a sub-network in the schedule depicting the changed Work and its effect on other activities. This sub-network shall be tied to the main network with appropriate logic so that a true analysis of the critical path can be made. Whenever the Contractor believes that a Change Order will extend the Contract Times, the sub-network analysis herein shall be submitted with the price proposal for the change. If the Contractor does not submit the sub-network demonstrating that the change affects the Contract Times, then no subsequent claim for additional time due to the change will be accepted.

1.06 CPM STANDARDS

- A. Construction Schedules: Construction schedules shall include a graphic network diagram and computerized schedule reports as required below for status reporting.
- B. Networks: The CPM network shall be in a form of a time scaled "i-j" activity-on-arrow or precedence type diagram and may be divided into a number of separate sheets with suitable match lines relating the interface points among the sheets. Individual sheets shall not exceed 22 inches by 34 inches.
- C. Construction and procurement activities shall be presented in a time-scaled format with a calendar time line along the entire sheet length. Each activity arrow or node shall be plotted so that the beginning and completion dates of each activity are accurately represented along the calendar time line. Every activity shall use symbols that clearly distinguish between critical path activities, non-critical activities, and free float for each non-critical activity. Activity items shall be identified by their activity

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number, responsibility code, duration, and dollar value. Non-critical path activities shall show total float time in scale form by utilizing a dotted line or some other graphical means.

- D. Duration Estimates: The duration estimate for each activity shall be computed in Days and shall represent the single best estimate considering the scope of the Work and resources planned for the activity. Except for certain non-labor activities such as curing of concrete or delivery of materials, activity duration shall not exceed 10 Days nor be less than one Day, unless otherwise accepted by the Owner. Advise the Owner of the calendar used for the schedule. The calendar should be based on the actual working days and hours as defined in Section 00700 – General Conditions.

1.07 SCHEDULE REPORT FORMAT

- A. Schedule Reports: Schedule reports shall be prepared based on the CPM schedule, shall be submitted on paper and digitally via CD (in pdf and MS Project), depending on file size, and shall include the following minimum data for each activity:

1. Activity numbers and responsibility codes.
 2. Estimated activity duration.
 3. Activity description.
 4. Activity percent completion.
 5. Early start date (calendar dated).
 6. Early finish date (calendar dated).
 7. Late start date (calendar dated).
 8. Late finish date (calendar dated).
 9. Status (whether critical).
 10. Total float for each activity.
 11. Free float for each activity.
 12. Cost value for each activity.
- B. Project Information: Each Schedule Report shall be prefaced with the following summary data:
1. Contract name and number.
 2. Contractor name.
 3. Type of tabulation.

4. Project duration.
5. Contract Times (as revised by Change Orders).
6. The commencement date stated in the Notice to Proceed.
7. The data date and plot date of the CPM Schedule.
8. If an update, cite the new schedule completion date.

1.08 PROJECT STATUS REPORTING

- A. The Contractor shall furnish monthly project status reports (Baseline Schedule and a written narrative report) in conjunction with the revised CPM schedules as indicated above. Status reporting shall be in the form below.
- B. The Contractor shall prepare and submit monthly a Baseline Schedule of the major project components. The Baseline Schedule shall be a summary of the current CPM schedule (Baseline and as updated and adjusted throughout the entire construction period). The major project components shall be represented as time bars which shall be subdivided into various types of Work including demolition, excavation and earthwork, yard piping, concrete construction, and mechanical, electrical, testing and instrumentation installations. Major components shall include each new structure by area designation, site work, modifications to existing structures, tie-ins to existing facilities, and equipment/plant startups.
- C. Each major component and subdivision shall be accurately plotted consistent with the project Baseline Schedule above. It shall represent the same status indicated by early start and finish activity information contained in the latest update of the CPM schedule. In addition, a percent completion shall be indicated for each major component and subdivision. The initial submittal of the Baseline Schedule shall be made at the time that the revised Baseline CPM schedule is submitted to the Owner. The Contractor shall amend the overview schedule to include any additional detail required by the Owner. The Contractor shall include any additional information requested by the Owner at any time during the construction of the Work.
- D. The Contractor shall prepare monthly written narrative reports of the status of the project for submission to the Owner. Status reports shall include:
 1. The status of major project components (percent complete, amount of time ahead or behind schedule) and an explanation of how the project will be brought back on schedule if delays have occurred.
 2. The progress made on critical activities indicated on the CPM schedule.
 3. Explanations for any lack of Work on critical path activities planned for the last month.
 4. Explanations for any schedule changes, including changes to the logic and to activity durations.

**PROGRESS SCHEDULES AND REPORTS
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5. A list of the critical activities scheduled to be performed in the next 2 months.
 6. The status of major material and equipment procurement.
 7. The value of materials and equipment properly stored at the Site but not yet incorporated into the Work.
 8. Any delays encountered during the reporting period.
 9. An assessment of inclement weather delays and impacts to the progress of the Work.
- E. The Contractor may include any other information pertinent to the status of the Work. The Contractor shall include additional status information requested by the Owner.

PART 2 - PART 2 -- PRODUCTS (NOT USED)

PART 3 - PART 3 -- EXECUTION (NOT USED)

END

PART 1 - GENERAL

1.01 GENERAL

- A. Plant startup is prerequisite to satisfactory completion of the contract requirements and shall be completed within the Contract Times.
- B. Conduct all testing, check out, startup, and related requirements indicated in the Contract Documents and provide documentation of same to the Owner prior to requesting Substantial Completion from the Owner. Where manufacturer on-site inspections are required before startup, the manufacturer shall furnish a written statement that the installation and check out is complete and proper and that the item(s) are ready for startup.
- C. Startup of equipment requires the combined expertise of the Contractor, Subcontractors, the Engineer, and the Owner. The Contractor shall be responsible for coordinating all parties for a successful startup: the Engineer and Owner may be available for technical and operational advice prior to and during startup.
- D. General requirements for startup activities are included in this Section. More specific requirements may also be included in other portions of the Contract Documents.
- E. Temporary facilities may be necessary. If so, Contractor shall design, provide, operate, and later decommission them.

1.02 DEFINITIONS

- A. Startup is defined as testing, demonstrations, and other activities as required to achieve Substantial Completion. Startup includes commissioning activities, manufacturer's services, certifications of readiness for testing, and troubleshooting, checkout, and shakedown activities.
- B. Commissioning is the verification that the complete Work functions on an extended basis in full conformance with the Contract requirements. For the project, the required demonstration period is 72 continuous hours as defined herein.

1.03 SUBMITTALS

- A. Schedule: The schedule for startup shall be submitted under Section 01300 - Submittals.
- B. Startup Plan: Not less than 30 Days prior to startup, submit for review a detailed Startup Plan. The Contractor shall revise the Plan as necessary based on review comments. The Plan shall include:
 - 1. Schedules for manufacturers' equipment certifications.
 - 2. Schedules for submitting final Operating and Maintenance Data and Technical Manuals.

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3. Schedule for training the Owner's personnel.
 4. Description of temporary facilities and schedule for installing and decommissioning them.
 5. List of Owner and Contractor-furnished supplies.
 6. Detailed schedule of operations to achieve successful commissioning.
 7. Checklists and data forms for each item of equipment.
 8. Address coordination with the Owner's staff.
 9. Designate a representative of the Contractor who has the authority to act in matters relating to startup and has experience in testing large pump stations and pipelines. The Plan shall also designate the roles and responsibilities of any Subcontractors that may be involved in startup activities.
 10. Safety, startup, and testing procedures and proposed inspection and certification forms and records.
 11. Interconnection of new to existing facilities.
 - a. Date and time frame of proposed shutdown or interconnection, including sequence of events and activities to be conducted.
 - b. A detailed description of sequences and activities for the planned shutdown and interconnection.
 - c. Staff, equipment, and materials that will be at the Site before commencing the shutdown.
 - d. Other provisions so that interconnection, testing, and startup will be completed within the planned time.
 12. Hydrostatic testing of water-holding structures and pipelines and other potable water equipment. Schedule and plan shall indicate source of water, testing and disinfection sequence, disinfection procedures, and the disposal of the water following disinfection.
- C. System Outage Requests: Request for shutdown of existing systems as necessary to test or start up new facilities. Connections to existing facilities and outages for slaker system installations shall be minimized with activities requiring outages to be combined whenever possible, outages for any two (2) slaker systems simultaneously and for any one (1) slaker system in accordance with the restrictions provided in Section 01040, Project Coordination and Sequencing, 3.01 A., shall be limited to increments of no more than two (2) weeks at a time unless approved by Owner. All outages shall be coordinated with the Owner. Outage requests will be approved based on System capabilities.

D. Records and Documentation

1. Where required by the specifications, submit equipment installation certifications under those sections.
2. Records of startup as indicated below.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 MALFUNCTIONS

- A. During the extended operational demonstrations, all components, subsystems, systems, and equipment must properly run continuously 24 hours per day at rates indicated by the Owner throughout the test period. Unless indicated otherwise, if any item fails or malfunctions during the test, the item shall be repaired and the test restarted at time zero with no credit given for the operating time before the failure or malfunction. Malfunctions satisfying all three of the following conditions will allow the demonstration period to resume at the elapsed time when the malfunction started:
1. Malfunction did not cause any interruption of the continuous operation of any other components, subsystems, systems, and equipment.
 2. Malfunction was corrected without causing or requiring any components, subsystems, systems, and equipment to cease operations.
 3. Malfunction was corrected within 1 hour of the time the malfunction was detected (the 1-hour period includes the time required to locate the cause of the malfunction, beginning upon Contractor's notification from the Owner that a malfunction has occurred and ending when the item is corrected and the system is successfully placed back into operation).
- B. The Contractor shall arrange for manufacturer's representatives to visit the Site as often as necessary to correct malfunctions. The Manufacturer's representative shall be available within four (4) hours of any malfunction during this time.

3.02 PREREQUISITES

- A. Commissioning activities shall be scheduled according to Section 01300. The 72-hour demonstrations period shall start prior to midday on a Monday or Tuesday. Any testing that lasts beyond 5:00 pm on a Friday will require prior approval of the Owner. Testing periods shall also not include holidays, based on the Owner's calendar unless prior approval is provided by the Owner.
- B. The following shall be completed before commissioning begins.
1. All Operating and maintenance data information required by the Contract Documents have been submitted.

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2. Safety equipment, emergency shower and eyewash units, fire extinguishers, gas detectors, protective guards and shields, emergency repair kits, safety chains, handrails, gratings, safety signs, and valve and piping identification required by the Contract Documents are provided. Devices and equipment shall be fully functional, adjusted, and tested.
3. Manufacturer's certifications of proper installation have been accepted.
4. Leakage tests, electrical tests, and adjustments have been completed.
5. The Owner has approved the Startup Plan.
6. Temporary facilities are functional, adjusted, and ready for use.
7. Individual instrumentation loops (analog, status, alarm, and control) have been verified functionally.
8. Individual interlocks between the field-mounted control devices and the motor control circuits, control circuits of variable-speed controllers, and packaged system controls have been verified.

3.03 GENERAL

A. Supplies.

1. The Contractor shall furnish:
 - a. Chemicals.
 - b. Oil and grease.
 - c. Other necessary materials not listed for the Owner to furnish.
2. The Owner will furnish:
 - a. Lime.
 - b. Water.
 - c. Power.

B. Startup Records: The Contractor shall maintain the following during testing and startup and submit originals to Owner:

1. Lubrication and service records for each mechanical and electrical equipment item.
2. Hours of daily operation for each mechanical and electrical equipment item.
3. Equipment alignment and vibration measurement records.

4. Logs of electrical measurements and tests.
5. Instrumentation calibration and testing logs.
6. Testing and validation of SCADA inputs, outputs, logic functions, status indications, and alarms.
7. Factory and field equipment settings.
8. Log of problems encountered and remedial action taken.
9. Other records, logs, and checklists as required by the Contract Documents.

3.04 COMMISSIONING

- A. The Contractor shall start up the equipment and operate it without malfunction for a continuous 72hour period. The Owner will determine the operational parameters.
- B. Defects that appear shall be promptly corrected. Time lost for wiring corrections, control point settings, or other reasons that interrupt the test may, at the judgment of the Owner, be cause for extending the demonstration an equal amount of time.
- C. Commissioning shall not begin until leakage tests, instrumentation tests and adjustments, electrical tests and adjustments, equipment field tests, disinfection, and system tests have been completed to the satisfaction of the Owner.
- D. During commissioning, the Contractor shall:
 1. Lubricate and maintain equipment in accordance with the manufacturers' recommendations.

END

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This Section specifies the training requirements associated with equipment and systems installed by the CONTRACTOR.
- B. Minimum onsite requirements for the various plant components are described in various sections of the specifications.
- C. Except as noted otherwise, all costs for training, testing, startup, installation, supervision, etc., shall be the responsibility of the CONTRACTOR.
- D. Refer to Specification 11252, Slakers, Belt Feeders, and Appurtenances, and the 17000 Series Specification sections for specific training notification and durations.

1.2 TRAINING REQUIREMENTS

- A. Furnish all labor, materials, equipment, and incidentals necessary to train the OWNER staff on the equipment, products, and systems provided under the Contract.
- B. **Objective of Training:** The objective of the training shall be to convey the knowledge needed by OWNER operations, maintenance, and engineering staff to safely operate, maintain, and repair the equipment and systems provided under this Work. OWNER staff who will participate in this training have existing full-time work assignments and this training is an additional assigned work task. OWNER staff work schedules regularly shift, as water treatment plants are operated on an around-the-clock basis. Training shall be focused to the skills and job classifications of the staff attending the classes, e.g., plant manager, water treatment plant operator, maintenance technician, electrician. Supporting documentation, such as operation and maintenance manuals to assist the instruction learning process and to serve as a source of information to OWNER staff after training, shall be furnished.
- C. **Specific training objectives are as follows:**
 - 1. To instruct personnel in the removal, inspection, cleaning, and operation and maintenance of the equipment. Instruction shall include step-by-step trouble shooting procedures with all necessary test equipment.
- D. Unless specifically indicated otherwise, all training shall be conducted in accordance with the following general requirements.
 - 1. **Scheduling of Classes:**
 - a) Training shall not be scheduled until the manufacturer has verified that the equipment is installed and performs properly. Startup services and training services will be required at separate times which will involve separate trips.
 - b) Specific classes shall be scheduled a minimum of 4 weeks in advance to allow OWNER staffing arrangements to take place. Training shall be coordinated in accordance with the Progress Schedule to occur during system installation, startup, and operation. The OWNER will approve and confirm class schedules. The CONTRACTOR shall schedule training classes at the times requested by the OWNER, within the period 7 a.m. to 7 p.m. Monday through Saturday. Classes covering identical material shall be conducted on different days.
 - 2. **Number of Classes on Each Subject:** A minimum of four classes on identical subject matter shall be conducted unless otherwise indicated. The purpose of having two classes on each subject is to accommodate the attendance of as many OWNER personnel working different

- shifts as possible. The OWNER shall have the option, however, of requiring four total classes, but each class shall contain different training material.
3. A maximum of one class per day shall be held on consecutive days unless otherwise approved by the OWNER. Multiple classes may be scheduled if the class duration is shorter than 4 hours. Times shall be scheduled at the discretion of the OWNER.
 4. Each class shall be subdivided into 2- to 8-hour modules, or as appropriate for the subject matter being discussed.
 5. **Instruction Format:** The training for operations personnel and for maintenance personnel shall be provided as separate entities. The training for maintenance personnel shall be further subdivided into three trade groups: mechanical maintenance, electrical maintenance, and instrumentation and controls maintenance.
 6. **Class Agenda:** A class agenda shall be prepared by the organization conducting the training and submitted to the OWNER at least 4 weeks in advance of the date of the first corresponding class for their approval. The agenda shall include a listing of subjects to be discussed, time estimated for each subject, list of documentation to be used or furnished to support training, and instructor name. Agendas shall include an allocation of time for OWNER staff to ask questions and discuss the subject matter. The OWNER may request that particular subjects be emphasized and the agenda shall be adjusted to accommodate these requests. Copies of the agenda shall be distributed to each student at the beginning of each training class.
 7. **Number of Students:** It is estimated that 5 to 10 persons will attend each training class. The actual number of students will be determined by OWNER. The OWNER will provide an estimated "headcount" one week prior to the class, so that the instructor can furnish the correct number of training aids for participants.
 8. **Training Location:** Unless otherwise indicated, all training shall be conducted at the WTP Conference Room, for each type of class to be conducted; If necessary and appropriate as determined by the OWNER, training shall be conducted at off-Site locations or the actual installed location of the equipment, product, or system. If held off-Site, the OWNER will be responsible for making and paying for classroom arrangements.
 9. **Length of Training:** Each individual training session shall be planned to be completed within no -more than 6 hours, including one 10-minute break and a 45-minute lunch period unless otherwise indicated. Requests for longer sessions must be specifically approved by the OWNER.
 10. **Instructor Qualifications:** Instructors shall be completely knowledgeable in the products, systems, and functions for the equipment provided. Instructor name and qualifications shall be submitted 1 month prior to start of training. Sales representatives are not qualified instructors unless they possess the detailed operating and maintenance knowledge required for proper class instruction. If, in the opinion of the OWNER, the scheduled training was not provided by an appropriately knowledgeable person, such training shall be rescheduled and repeated with a suitable instructor at no additional cost to the OWNER.
 11. **Training Aids:** Each instructor is encouraged to use audio-visual devices, P&IDs, models, charts, and so forth to increase the transfer of knowledge. The organization conducting the training shall furnish all such equipment (televisions, video cassette recorder/player, projectors, screens, easels, etc.), models, and charts for each class. It shall be the responsibility of the organization conducting the training to confirm in advance that the class room will be appropriate for the types of audio visual equipment to be employed.
 12. **Classroom Documentation:** If training is being completed on equipment, systems, or products for which an operations and maintenance manual is required, this operations and maintenance manual shall be complete and used during the classroom instruction. The quantity of operations and maintenance manuals required under Section 01300 - Contractor

Submittals, shall be available for classroom use. Supplemental documentation handouts shall be furnished to support instruction.

- a) Where written materials are used, sufficient copies shall be provided for each attendee, with at least four extra copies provided to the OWNER for training documentation. All written materials shall be identified with the name of the training module, subject matter, date of training, and instructor name.
- b) All course materials shall be consolidated on a CD and submitted to the OWNER prior to training beginning for approval.

13. Testing: Test OWNER operation and maintenance personnel following the completion of operational and safety training. The purpose of this testing shall be to determine the effectiveness of the training program and to determine the ability of OWNER personnel to safely operate and maintain said processes. Testing shall be comprised of multiple choice and true/false questions.

14. OWNER videotaping, photographing, audio recording, and other documentation of training classes: OWNER reserves the right to videotape, photograph, audio record, and otherwise document any or all training classes. The organization(s) conducting the training and the CONTRACTOR shall cooperate with OWNER in making such videotapes, photographs, or audio recordings, which shall remain the exclusive property of OWNER.

- E. Additional training requirements for specific equipment and systems may also be indicated elsewhere in these Specifications.
- F. **Safety and Health Training:** Furnish safety and health training to OWNER personnel that describe the procedures required to safely and healthfully operate and maintain the equipment. Safety and health training shall also include standard procedures for emergency response and safe shutdown of equipment in emergency conditions. Incorporate appropriate OSHA regulations including personal protective equipment and its use and other means of injury and illness prevention such as precautions and engineering controls. Three 1-day safety training sessions shall be conducted.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE

- A. Provide signs, decals, tags, pipe labeling, color coding, and other identifying devices and appurtenant work, complete and in place, as indicated in accordance with the Contract Documents.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. American National Standard Specifications, ANSI A13.1, "Scheme for the Identification of Piping Systems"
- B. Section 722S
- C. Section 01300

1.03 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with the requirements of Section 01300 – Contractor Submittals.
- B. Shop Drawings
 - 1. Submit full-size or scaled layouts of signs, showing sign size, color, fasteners and mounting, and location.
 - 2. Product Data: Fully describe all items proposed for use.
 - 3. Submit identification text labeling and equipment location tag number for approval.
- C. Samples
 - 1. Submit samples of the materials and colors proposed for the Work, clearly marked to show the manufacturer's name and product identification.
 - 2. Submit the manufacturer's technical data and application instructions.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide identification devices where directed by the Engineer.
- B. Provide wording as indicated and verified before fabrication.

2.02 EQUIPMENT NAMETAGS

A. Small Equipment (Valves)

1. Material shall be 1/16-inch thick acrylic with a matte finish, with the color selected by the Engineer.
2. Provide white letters, 1/2-inch tall, embossed and fused by heat and pressure into the material.
3. Lettering shall be the equipment number in the Contract Documents.

B. Large Equipment (Slakers)

1. Material shall be 1/16-inch thick stainless steel plate, at least 4 inches by 6 inches.
2. Provide lettering embossed into the plate, at least 1 inch tall.
3. Stencil lettering directly onto the equipment, in letter size and color determined by the Engineer.
4. Furnish the proposed wording to the Engineer for approval prior to application.

C. The Engineer will determine the location for equipment nametags and the methods of attachment.

2.03 SIGNS

A. General: Signs or warnings shall be painted with enamel on semi-rigid butyrate. Signs shall conform to OSHA standards and directions. Lettering sizes shall be 3 inches in height unless indicated otherwise.

B. General

1. Paint signs and warnings using enamel on semi-rigid butyrate.
2. Signs shall conform to OSHA standards and directions.
3. Lettering size shall be 3 inches in height, unless otherwise indicated.

C. Miscellaneous

1. Provide the following signs in new and existing underground structures and manholes into which employees may enter.

**CAUTION
VENTILATE BEFORE ENTERING**

**IDENTIFYING DEVICES
SECTION 10400**

**DANGER
PERMIT REQUIRED CONFINED SPACE DO NOT ENTER!**

- D. Provide the following sign at hose bibbs where water is non-potable, in both English and Spanish:

**CAUTION
NON-POTABLE WATER
DO NOT DRINK**

- E. Automatic Startup

1. Attach the following sign to equipment which can be started either automatically or remotely:

**WARNING
THIS MACHINE
STARTS AUTOMATICALLY**

- F. Provide structure and building identification signs at each process area and building. Signs are to be attached to the outside of each area and include the name of the structure.

PART 3 - EXECUTION

3.01 GENERAL

- A. Identifying device installations shall be vandal-resistant.
- B. Provide concealed, non-corrosive fasteners as appropriate for the materials being fastened and as required.

3.02 LETTERS

- A. Install metal letters 3/4-inch projection-mounted from the concrete block wall surface, using threaded studs and space collars.
- B. Align the center of each row.
- C. Install the letters in accordance with the manufacturer's published instructions.

END

SLAKERS, BELT FEEDERS, AND APPURTENANCES
SECTION 11252

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope

1. This section specifies requirements for lime slaking systems, including requirements for system construction, components, materials, functional testing, quality and use.
2. The Manufacturer shall furnish all labor, materials, equipment and incidentals required to install paste type lime systems as shown on the drawings and specified herein.
3. The entire system (s) shall consist of the following major components:
 - a. Volumetric Belt Type Lime Feeder with SCR Controls
 - b. Paste-type Lime Slaker
 - c. PLC-Operated Electronic Water Valve
 - d. Conveyor Type Grit Conveyor
 - e. System Control Panel
 - f. Junction Box
 - g. Replacement Rotary Valves and Vibrators
 - h. Electrical Wiring, Instrumentation and Control as specified and shown in other sections for the specifications.
4. Contractor and Manufacturer shall be aware of multiple coordination requirements and responsibilities required in other specification section. Special attention shall be given to the 17000 series specification sections with regards to instrumentation provided by the slaker equipment manufacturer and for plant's overall systems integration.

B. System Description

1. The base bid includes but is not limited to the demolition and replacement of lime slaking systems 1, 2, 5, and 6, including electrical and I&C as specified, the replacement and cleaning of all lime slurry piping and/or troughs, and flooring improvements as shown on the plans or specified herein. Alternate bid items include the replacement of lime slaking systems 3 and 4, including electrical and I&C associated with those units.

**SLAKERS, BELT FEEDERS, AND APPURTENANCES
SECTION 11252**

2. The lime slaking system shall consist of a feeder inlet flexible connector, lime feeder, lime slaker, grit remover, SCR control panel, a slaker system control panel, dust and vapor arrestor and supply water piping and accessories.
3. The lime slaking system shall provide equipment to safely convert the dry pebble quicklime fed by the lime feeder into lime slurry, which is then piped by gravity to the rapid mix basins via slurry piping and troughs. A grit remover is used to separate the grit from the slaked lime.
4. The lime slaker shall use a controlled paste-slaking technique with a 2:1 water to lime ratio by weight. A PLC operated electronic water valve shall automatically maintain paste consistency of the lime being slaked. It shall maintain the desired water to lime ratio over the range of the feeder up to 20:1. A pre-wired control panel shall be remote or local and shall ensure proper control and operation of the system. The system shall be operated manually or automatically with 4-20 mA flow-proportional control of the feeder or remote start-stop signal and automatic start-stop operation of the slaker system.
5. System shall be designed for the following operating conditions:

System I.D	A-758 Plus
Slaker Maximum Capacity, lbs/hr	4,000
Quicklime (Pebble) Feed Rate, lbs/hr	4,000
Maximum Output Lime Slurry Concentration, %	18
Minimum/Maximum Supply Water Pressure, psi	40/75
Total Supply Water Requirements at Maximum Supply Water Pressure, gpm	55

C. Related Sections

1. Section 01300: Submittals
2. Section 01650: Facility Start-Up/Commissioning
3. Section 01670: Training
4. Section 01720: Record/As-Built Drawings
5. Section 01730: Operation and Maintenance Data
6. Section 02220: Demolition
7. Section 722S: Protective Coatings
8. Section 10400: Identifying Devices
9. Section 11000: Equipment General Provisions
10. Section 15050: Piping, Valves, and Accessories

**SLAKERS, BELT FEEDERS, AND APPURTENANCES
SECTION 11252**

11. Division 16: Electrical

12. Division 17: Instrumentation

D. References

1. ASTM – American Society for Testing and Materials
2. AWWA B202 – Standard for Quicklime and Hydrated Lime (refer to Section 3.04 for exceptions)
3. National Electric Code
4. OSHA – Occupational Safety and Health Administration, Code of Federal Regulations, (CFR 29)
5. SSPC – The Society for Protective Coatings

1.02 QUALITY ASSURANCE

A. Manufacturer Requirements

1. All equipment provided under this section shall be obtained from a single manufacturer, who shall:
 - a. Assume full responsibility for the completeness and proper operation of the lime paste slaking systems.
 - b. Experienced reputable and qualified in designing and manufacturing lime paste slaking system equipment.
 - c. Supply units containing all necessary appurtenances and components for a complete and operating system conforming to this specification. The entire system shall be pre-assembled, piped, wired, and factory tested prior to shipment to facilitate installation and start-up at the jobsite. System footprint as shown on the drawings shall not be exceeded.
2. To ensure quality and complete unit responsibility, the complete system must be assembled and tested by the Manufacturer at its facility and be a standard and regularly marketed product of that Manufacturer. The Manufacturer must have a physical plant, technical and design staff, and fabricating personnel to complete the work specified.
3. The owner reserves the right to be present at the Manufacturer's facility for visual inspection of equipment to be supplied and to witness factory functional testing.
4. Contractor shall submit certification of and the results of factory acceptance testing to the Owner.

**SLAKERS, BELT FEEDERS, AND APPURTENANCES
SECTION 11252**

B. Specified Manufacturers

1. Paste type lime slaking system shall be used as manufactured and supplied by W&T Chem Feed/Integrity Municipal Services (IMS), Poway, CA, (858) 486-1620 (Series A-758 PLUS). Owner and engineer are aware of no other supplier of paste type lime slaking systems that is an equal to this specified manufacturer and product.

C. Warranty

1. The Manufacturer shall warrantee that the equipment system provided shall be free of defects in material and workmanship for a period of 24 months from substantial completion and acceptance of each individual unit by the Owner. Substantial completion will be achieved when all four (4) base bid slakers are in operation and have been successfully commissioned, performance tested, and accepted by the Owner. If Alternative Bids 1 and/or 2 are accepted, the calendar days for substantial and final completion will remain the same as provided in these contract documents.

D. Submittals

1. Shop Drawings and Product Data: Submit the following as a single complete submittal in accordance with Section 01300.
 - a. Product data fully describing all items proposed for use to demonstrate that the equipment conforms to the Specifications.
 - b. Equipment and motor data as required by Sections 11000.
 - c. Scaled general arrangement layout and elevation drawings, plans and sections showing equipment dimensions and external piping connections to other equipment as described herein.
 - d. Anchorage Design, including layout and calculations conforming to the requirements of Section 11000.
 - e. Electrical and Instrumentation Drawings and submittals required by Division 16 and 17. Include panel components, wiring diagram and bill of materials including requirements for all field instruments controlled by the control panel. Provide Process and Instrumentation Diagrams (P&ID) and control narrative for the system.
2. A compact disk (CD) with all final Lime Slaking System drawings in the latest version of AutoCAD.
3. A compact disk (CD) with all final Lime Slaking PLC and OIU configuration and programming files in their native, editable format.

**SLAKERS, BELT FEEDERS, AND APPURTENANCES
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4. Performance Testing:
 - a. Submit results of the Lime Slaker Factory Test.
 - b. Submit results of the witnessed Factory Test of the control system (PLC and OIU).
 - c. Submit a copy of the favorably reviewed PLC code following factory testing.
 5. Provide the resume showing the experience of the factory-certified service technician to oversee installation of the lime slaking systems and provide training.
 6. Training: Submit course outlines, training materials, and instructor resumes. Submittal must be approved prior to scheduling of training. See Section 17100 for additional requirements.
 7. Manuals: Furnish six (6) hardcopies and two (2) electronic copies on CDs of manufacturer's installation, lubrication, operation and maintenance manuals, bulletins, and spare parts lists for the lime slaking system and ancillary equipment as specified in Section 01300.
 8. Affidavits: Submit affidavits for the lime slaker system and ancillary equipment manufacturer stating that the equipment and control panels have been properly installed, adjusted, and tested and are ready for full-time operation. Affidavits for the full Lime Slaker System scope of supply shall be included.
 9. General: Additional submittal requirements related to the Slaker system are included in Division 16 and Division 17 Specification Sections. Thoroughly review each of those sections and provide required submittals.
- E. Operation and Maintenance Manuals
1. Refer to Section 01730 "Operation and Maintenance Data."
- F. Manufacturer Services
1. Installation Services
 - a. Provide the services of a factory-certified service technician trained in the installation, startup, testing, and operation and maintenance of the slaking system and training of the Owner's personnel.
 - b. The system manufacturer shall inspect and supervise the installation and certify that the Contractor has installed the lime slaking system in the correct manner in accordance with Section 01650.
 - c. The lime slaking system manufacturer's service technician shall be on site and oversee installation of the first new lime slaking system.

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- d. The lime slaking system manufacturer's service technician shall train the Contractor's personnel in the correct installation procedures. Service technicians shall be available to assist the Contractor at any time during installation of the remaining five slaking systems. In the event of any difficulties, the service technician shall return to the site to assist the Contractor in the correction of the deficiencies within four (4) hours.
2. Startup: The service technician shall startup the equipment, make necessary adjustments and demonstrate to the Owner that all components of the lime slaking systems are in proper operating condition by continuous operation for a period of not less than 72 continuous hours for each slaker system.
3. Training
 - a. See 3.03 for Training requirements.
4. The system manufacturer shall make a field trip within one month of the end of the two-year warranty to visit the site and inspect the operation of the system. Within one week after the site visit, submit a report of the results of the trip pointing out deficiencies and offering recommendations for underperformed maintenance, if any.

PART 2 - PRODUCTS

2.01 PASTE TYPE LIME SLAKING SYSTEM UNIT

Quicklime pebble feeder and controls, paste lime slaker, grit conveyor, dust and vapor removal system, lime slaker electrical control panel, and all other required appurtenances shall be pre-assembled as complete lime slaking system package. Components of the lime slaking system shall comply with this specification. The entire system shall be pre-assembled, piped, wired, and factory tested prior to shipment.

2.02 LIME SLAKER AND APPURTENANCES

- A. The lime slaker shall include the following features:
 1. Paste type. Other types are not acceptable.
 2. Capacity of 4,000 pounds per hour of similar to AWWA B202 grade pebble lime.
 3. Constructed of 316 Stainless-steel.
 4. The slaker drive and transport mechanisms, and slaking compartment rotating equipment shall be protected to conform to OSHA section 1910.212 and 1910.219 Machine Guarding.
 5. Ability to achieve a self-sustaining slaking temperature of 170° F or above without requiring the use of a heat exchanger, heated water or any external heat source.

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6. Automatically control the slaking water flow rate to provide a 2:1 water-to-lime ratio by weight and compensate for vapor loss, changes in lime reactivity, and feed rate.
7. Complete with two counter-rotating, pug mill type paddle mixers. Mixers shall have a maximum rotational speed not to exceed 40 rpm. The use of high-speed mixers and replaceable wear plates is unacceptable.
8. Paddle shaft motion detector mounted on the slurry discharge side of the slaker.
9. The slaking chamber shall be designed to complete the slaking reaction in 5 minutes or less.
10. A 20:1 belt feeder operating range.
11. PLC-operated electronic water control valve to maintain a 2:1 water-to-lime ratio and a 5-minute retention time in the slaking compartment.
12. Integral dust and vapor arrestor.
13. Water pressure reducing valve.
14. Supply water strainer and pressure gauge.
15. Supply water low pressure switch.
16. Integral lime paste temperature sensor.
17. Supply water flow meter.
18. 1.5 HP, 230/460V, 3 Ph, 60Hz mixer motor.
19. Paste cut-off jet spray nozzles and slurry mixing rakes in the dilution chamber.
20. Normally opened bypass solenoid valve to flush slaking compartment on system shutdown.
21. Slaker outlet and overflow connections.
22. Grease lubricated shaft seals.

2.03 GRIT REMOVER

- A. The grit remover shall be a flight-scraper conveyor-type grit conveyor with the ability to remove virtually all grit down to 10 mesh in size and a portion of finer grit down to 40 mesh. Grit particles are separated from the lime slurry based on their specific gravity. Lime slurry concentrations up to 18% are achievable.

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- B. The conveyor type grit remover will be complete with:
1. 316SS construction.
 2. Clean-out hatch.
 3. ¼ horsepower, 480 volt, 3 phase, 60Hz TENV gear motor.
 4. Individually replaceable flight scrapers.
 5. Water control valve and flow meter to regulate the grit-wash water flow.
 6. Grit Remover Alarm Sensor shall be mounted at the top of the conveyor for optimum accessibility by operations personnel and shall be mounted to sense the non-tension side of the conveyor for quicker response and failure sensing.

2.04 VOLUMETRIC BELT TYPE FEEDER

- A. The slaking system will include a belt type volumetric feeder to control the feed rate of pebble lime into the slaker.
- B. To facilitate on-site assembly of the slaking system and assure proper fit and function of all system components the feeder shall be supplied by the same manufacturer as the slaker.
- C. The feeder shall be Model 32-215 Volumetric belt-type feeder having a volumetric capacity of 840 cubic feet per hour of pebble lime, and complete with BUNA N belt, manually positioned vertical gate and 6-inch insert for reduced feeder capacity requirements, belt speed contactor and SCR speed control.
- D. The feeder shall be constructed of heavy gauge steel with corrosion resistant epoxy paint. The housing shall be dust tight with gasketed side, top and feed end covers. An SCR control enclosure shall be provided and remote-mounted and wired to current NEC requirements, within a water and dust tight enclosure. Power supply to the SCR control panel will be 120 VAC/ 1 phase / 60 Hz from the slaker control panel.
- E. The belt transport system shall be torsion free and cantilevered for easy belt removal without tools. Drive and driven rollers shall have permanently lubricated and sealed roller bearings. The drive roll shall be neoprene coated to prevent belt slippage. A tensioning weight connected to the driven roller bearing shall be provided to automatically maintain constant belt tension, while a self-adjusting tracking device maintains proper belt operating position. Scrapers shall be spaced on both sides of the belt and on the rollers to maintain the transport system free of product build up.
- F. The belt shall be driven by a ½ HP, 0-90VDC, permanent magnet, TENV motor coupled to a helical worm-drive speed reducer. A tachometer mounted on the drive motor shall provide motor speed feedback to the SCR speed controller. The belt drive roller is to be driven via chain and sprocket coupled to the gear reducer.

**SLAKERS, BELT FEEDERS, AND APPURTENANCES
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2.05 ROTARY INLET VALVES AND VIBRATORS

- A. Rotary Inlet Valve – Contractor shall remove and replace the six (6) existing 8" x 10" hand-operated, cast iron, precision machined bore and rotor, cast lever and hub, flanged inlet and outlet, rotary shut-off valves and replace in-kind. Valves shall be manufactured by FLSmith conforming to Drawing 116-72-4-1024-00 or approved equal. Drawing 116-72-4-1024-00 is included as Attachment A at the end of this specification for ease of reference.
- B. Vibrators and Controller – Contractor shall remove and replace six (6) existing Syntron V51.B1 electromagnetic vibrators and replace with identical units by FMC Technologies or approved equal. Mount the new vibrators to the proposed replacement rotary valves. The vibrators are 115 V, 60 Hz, 4.5 amps and are pulsed via a Syntron Power Pulse controller which shall be integrated into the proposed local control panels.

2.06 MECHANICAL SPARE PARTS

- A. 12 each paddle shaft collars with bolts
- B. 12 each top weir plates with fasteners
- C. 12 each bottom weir plates with fasteners
- D. 60 each left hand paddles with bolts
- E. 60 each right hand paddles with bolts
- F. 144 each grit paddles with fasteners
- G. 2 each grit conveyor chains
- H. 18 each weir plate spray nozzles with fasteners
- I. 6 each dust arrestor nozzles
- J. 1 set of paddle shafts
- K. 4 each of paddle shaft mechanical seal assemblies
- L. 12 each feeder belts
- M. 2 each water control valve / solenoid assembly
- N. 12 each flexible connection assembly's with fasteners, high temperature model
- O. 2 sets of the lower and upper grit shaft assemblies including the bushings and fasteners
- P. 4 each of the grit shafts bearings

**SLAKERS, BELT FEEDERS, AND APPURTENANCES
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- Q. 1 each grit conveyor drive motor
- R. 1 each paddle shafts drive motor
- S. 1 each feeder drive motor
- T. 2 each complete paddle shaft gear boxes (gear reducers)
- U. 2 each gear boxes for the grit conveyor (gear reducers)
- V. 1 Twin Electric Drum Top Vacuum with std dual filtration and A HEPA Final Filter by Vactagon (Unit #DT255H) with accessories:
 - 1. 1 DT Hose Package (10 ft) 2-inch rubber hose, one 2-inch steel wand, one 14-inch floor brush, one hose cuff
 - 2. 1 DTH2002 Connector for 2-inch hose
 - 3. 1 6-inch Utility Nozzle for 1-1/2-inch hose
 - 4. 1 55-Gallon Drum Dolly
- W. 1 each Spillrite Drum Top Vac, unit number #1145-1755.00, 211 cfm

2.07 SLAKER ELECTRICAL CONTROL PANEL

- A. The lime slaker electrical control panel shall provide electrical control for the entire system.
- B. The control panels shall comply with the following OWNER's specifications and standards.

Note: The Manufacturer shall provide Control Panel drawings for Engineer's review and approval prior to construction. The Manufacturer shall program the PLC to the Owner's programming standards. The Manufacturer shall configure the OIU to the Owner's standards.

- 1. 16200 – General Wiring Methods
- 2. 16202 – Wire Tagging
- 3. 17100 - Process Control and Instrumentation Systems
- 4. 17200 – Control Panels
- 5. 17201 – Control Panel Instrumentation
- 6. 17510 – Manufacturer's PLC-Based Control Systems Hardware
- 7. 17520 – Manufacturer's PLC-Based Control Systems Software

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8. 17000 Appendix A1 – PLC Interface Documentation
9. 17000 Appendix A3 – Packaged System PLC Programming Criteria
- C. The control panel enclosure shall be a NEMA 4X wall-mount aluminum enclosure with continuous hinge door and clamps. The control panel shall be remote-mounted next to the slaker system by the contractor. A NEMA 4X aluminum junction box shall be mounted on the slaker system and factory pre-wired to system components.
- D. The control panel shall include a Modicon M340 series PLC with a Magelis XBT-GT 7340 color 5.7-inch OIU (Operator Interface Unit) graphical display (touch screen) to provide system automation and operator monitoring of the lime slaker system. See Section 17510 2.03 for specific PLC and OIU hardware part numbers.
- E. The OIU shall allow local access to the following slaker functionality. All local functionality shall be available to the OWNER's Top End SCADA system:
 1. Pebble lime feed-rate control.
 2. Pebble lime feed rate display.
 3. Manual and automatic operation of the lime feeder.
 4. On/off indication of the lime feeder status.
 5. Manual and automatic operation of the paddle-shaft mixer motor.
 6. On/off indication of the paddle-shaft mixer motor status.
 7. Manual and automatic operation of the grit remover.
 8. On/off indication of the grit remover status.
 9. Manual and automatic operation of the water flow control valve.
 10. Open/closed indication of the water flow control valve status.
 11. Slaking water flow rate display.
 12. Lime slaking temperature display.
 13. Graphical display of historical slaking temperature.
 14. Alarm Indication for the following:
 - a. Water inlet valve fault.
 - b. Paddle shaft mixer fault.
 - c. Lime feeder fault.

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- d. Grit remover fault.
 - e. Emergency stop active.
 - f. Inlet water low pressure.
 - g. Inlet water low flow.
 - h. Grit Remover fault.
 - i. Paddle shaft mixer over-current.
- F. Each existing slaker includes a Syntron V51.B1 electromagnetic vibrator by FMC Technologies mounted to the existing rotary valves between the slaker systems and the lime silo discharges. The vibrators are 115 V, 60 Hz, 4.5 amps and are pulsed via a Syntron Power Pulse controller in each of the existing local control panels. The Contractor/Manufacturer shall replace the vibrators in-kind and integrate the equipment into the new control panels as required to provide for complete and operational pulsed vibratory function as is currently provided.
- G. A single source of power shall be required (480v, 3 Ph, 60Hz, 25 amps) for the control panel. A physical barrier shall separate 480v power from the controls component area in the panel.
- H. An emergency stop button shall be incorporated into each control panel.
- I. Control panel shall be provided with terminal strip for easy wiring connections for input and output.
- J. The panel shall provide for the following types of operation and control:
- 1. Manual speed control of the feeder.
 - 2. Automatic control of feeder rate via a 4-20 mA input signal based on flow or process conditions.
 - 3. Automatic batching.
 - 4. Automatic system shutdown.
 - 5. Programmable flush cycle after each shutdown.
 - 6. Adjustable paste thickness control via programmable set-point.
 - 7. On/off control of the Owner's silo vibrator.
- K. Control Panel Spare Parts:
- 1. As noted in Section 17100.

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- L. The Manufacturer shall provide the OWNER with an unrestricted copy of the PLC and OIU programs for maintenance purposes.

PART 3 - EXECUTION

3.01 FACTORY ASSEMBLY AND TESTING

- A. Each system shall be pre-assembled at the manufacturing location.
- B. System(s) shall be tested at the location of assembly to assure they are in full operational and working order per the requirements of the specific design(s) for the project and this specification.
- C. Engineer and/or Owner reserve the right to be present at the Manufacturer's testing facility to witness the factory functional testing. Engineer and/or Owner shall provide intent to witness functional testing at the time of the design submittal review and approval, and Manufacturer shall provide notice to Engineer and/or Owner regarding the scheduled time of the functional testing at least fifteen (15) business days in advance of the proposed functional testing.
- D. Factory testing shall include visual inspection of all equipment, complete assembly and functional operating testing of components including piping and instrumentation check, and verification of control panel wiring and operation. Reference section 17510 for PLC/OIU Factory Acceptance requirements.

3.02 DELIVERY AND INSTALLATION

- A. System(s) shall be packaged and shipped so as not to incur damage to any portion of the unit through handling and installation of the unit itself.
- B. Feeder and grit remover mountings, supply water line, overflow, vent and electrical connections shall be pre-determined and clearly indicated on system.
- C. System(s) shall be installed per the manufacturer's guidelines and recommendations. Installation shall include the re-assembly of any items separately packaged for protection during shipment.
- D. It is the Contractor's responsibility to provide:
 - 1. Piping for water, vent from vapor and dust arrestor, overflow/drain and lime slurry discharge lines to/from lime slaker.
 - 2. Wiring to/from system control panel for power, control and alarm interfaces with feeder's control modules, junction box, plant SCADA, etc.
 - 3. Anchor bolts, mounting to existing concrete pedestals, and other incidentals as necessary to complete the installation.

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3.03 FIELD START-UP AND TRAINING

- A. A factory representative from Manufacturer shall be present at the jobsite for initial system start-up and commissioning of equipment as specified in Section 1.02.F. Factory representative will ensure that system is properly installed, will start-up the system and train owner's personnel.
- B. General: The CONTRACTOR shall train the OWNER'S personnel on the maintenance, calibration, and repair of instruments and equipment provided under this Contract.
 - 1. The CONTRACTOR shall provide the following training:
 - a. Operator and Mechanical Training – Duration: up to 20 hours (five days of 4 hour classes each)
 - b. Instrument and Electrical Technicians Training – Duration: 8 hours (two 4 hour classes)
 - c. SCADA Personnel Training – Duration: 4 hours (one, 4 hour class)
- C. Schedule: Training shall be performed during the commissioning phase of the project. The training sessions shall be scheduled a minimum of 3 weeks in advance of when the courses are to be initiated. The ENGINEER will review the course outline for suitability and provide comments that shall be incorporated.
- D. Agenda: The training shall include operation and maintenance procedures, troubleshooting with necessary test equipment, and changing set points, and calibration for that specific piece of equipment.
- E. Documentation: Within 10 Days after the completion of each session the CONTRACTOR shall submit the following:
 - 1. A list of OWNER personnel who attended the session.

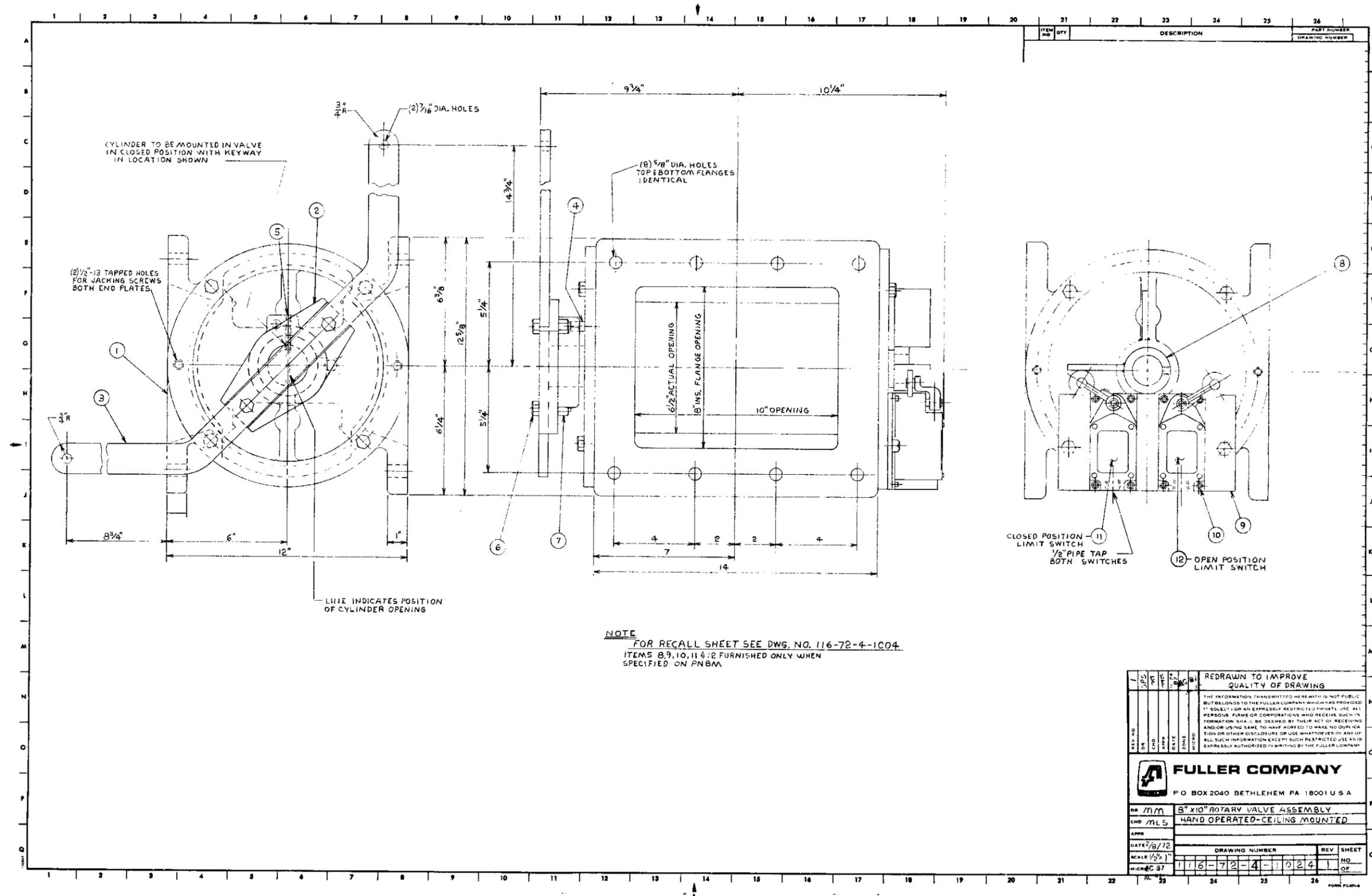
3.04 QUICKLIME

- A. Pebble quicklime meeting AWWA B202 guidelines approximately 90% of the time is provided by the OWNER. The Manufacturer is aware that the 2.5% limit on insoluble material is periodically exceeded and has a slight variation from the AWWA specification.

3.05 IDENTIFICATION AND MARKING

- A. Refer to Section 10400 "Identifying Devices."

**Attachment A
Drawing 116-72-4-1024-00**



END

**PROCESS CONTROL AND INSTRUMENTATION SYSTEMS
SECTION 17100**

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. The CONTRACTOR shall provide a Process Control and Instrumentation System (PCIS) complete and operable, in accordance with the Contract Documents.
- B. The requirements of this Section apply to every component of the PCIS unless indicated otherwise.
- C. Responsibilities
 - 1. The CONTRACTOR, through the use of a qualified Manufacturer System Integrator, Overall System Integrator and electrical and mechanical installers, shall be responsible to the OWNER for the implementation of the PCIS and the integration of the PCIS with other required instrumentation and control devices.
 - 2. As a minimum, the CONTRACTOR shall perform the following Work:
 - a. Manufacturer System Integrator Work:
 - i) Provide four (4) or six (6) new Slaker Control Panels depending on applicability of Alternate bids, per Division 16 and Division 17.
 - b. Overall System Integrator Work:
 - i) Integrate Top-End SCADA system to interface with the new Slaker PLC's provided by the Manufacturer per Section 17300.
 - ii) Provide View Node in Chemical Building Electrical Room.
 - iii) Modify existing code in existing Chemical Building PLC – MCPC to accommodate changes to field I/O, including removal of code and variables associated with demolished signals.
 - iv) Test existing hardwired signals between the new Slaker PLC's and existing Chemical Building PLC – MCPC.
 - c. Electrical Installers Work:
 - i) Demolish four (4) or six (6) existing Slaker Control Panels and associated wiring and conduit per Drawings.
 - ii) Install four (4) or six (6) new Slaker Control Panels and associated wiring and conduit per Drawings.
 - iii) Install conduit and cable for View Node

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D. Implementation of the PCIS (as applicable to the Manufacturer System Integrator and Overall System Integrator):

1. Prepare hardware equipment submittals.
2. Design, develop, and electronically draft loop drawings and control panel designs.
3. Prepare the test plan, the training plan, and the spare parts submittals.
4. Procure hardware.
5. Fabricate panels.
6. Configure and program PLCS and operator interface units.
7. Perform factory tests on panels.
8. Perform bench calibration and verify calibration after installation.
9. Oversee and certify installation.
10. Oversee, document, and certify loop testing.
11. Oversee, document, and certify system commissioning.
12. Conduct the performance test.
13. Prepare technical manuals.
14. Conduct training classes.
15. Prepare record drawings.

E. Integration of the PCIS with instrumentation and control devices provided under other sections:

1. Resolve signal, power, or functional incompatibilities between the PCIS and interfacing devices.

1.02 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Section 01300 - Contractor Submittals and the following:

1. The CONTRACTOR shall coordinate the instrumentation Work so that the complete instrumentation and control system will be provided and will be supported by accurate Shop Drawings and record drawings.

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2. Exchange of Technical Information: During the period of preparation of these submittals, the CONTRACTOR shall authorize a direct, informal liaison with the ENGINEER for exchange of technical information. As a result of this liaison, certain minor refinements and revisions in the systems as indicated may be authorized informally by the ENGINEER, but will not alter the scope of work or cause increase or decrease in the Contract Price. During this informal exchange, no oral statement by the ENGINEER shall be construed to give approval of any component or method, nor shall any statement be construed to grant exception to or variation from these Contract Documents.
3. Symbology and Nomenclature: In these Contract Documents, systems, meters, instruments, and other elements are represented schematically, and are designated by symbology as derived from Instrument Society of America Standard ISA S5.1 - Instrumentation Symbols and Identification. The nomenclature and numbers designated herein and on the Drawings shall be employed exclusively throughout Shop Drawings, and similar materials. No other symbols, designations, or nomenclature unique to the manufacturer's standard methods shall replace those prescribed above, used herein, or on the Drawings.
4. In addition to the submittal requirements in Section 01300, the CONTRACTOR shall provide a PDF format scan of each submittal on two CDs. CDs shall be included with all hardcopy submittals.

B. Presubmittal Conference

1. The CONTRACTOR shall arrange and conduct a Presubmittal Conference within 30 Days after award of the Contract. The purpose of the Presubmittal Conference is to review and approve the manner in which the CONTRACTOR intends to carry out its responsibilities for all submittals on the Work to be provided under this Section. The CONTRACTOR, Manufacturer System Integrator, Overall System Integrator, and the ENGINEER shall attend. Both the CONTRACTOR and the ENGINEER may invite additional parties at their discretion.
2. The CONTRACTOR shall allot one 4-hour meeting for the Conference.
3. The CONTRACTOR shall present the following for discussion at the Conference:
 - a. A list of equipment and materials required for the PCIS and the manufacturer's name and model number for each proposed item.
 - b. A list of proposed clarifications to the Contract Documents along with a brief explanation of each. Resolution shall be subject to a separate formal submittal and review by the ENGINEER.
 - c. An exact one-to-one sample of each type of submittal herein.
 - d. A flow chart showing the steps to be taken in preparing and coordinating each submittal to the ENGINEER.

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- e. A bar-chart type schedule for system-related activities from the Presubmittal Conference through start-up and training. Dates of submittals, design, fabrication, programming, factory testing, deliveries, installation, field testing, and training shall be shown. The schedule shall be subdivided to show activities relative to each major item or group of items when everything in a given group is on the same schedule.
- f. An overview of the proposed training plan. The OWNER's staff and ENGINEER will review the overview and may request changes. Changes to the proposed training shall be resolved at the pre-submittal conference. The overview shall include the following for each proposed course.
 - i) Course title and objectives.
 - ii) Prerequisite training and experience of attendees.
 - iii) Course content - a topical outline.
 - iv) Course duration.
 - v) Course format - lecture, laboratory demonstration, etc.
- 4. The CONTRACTOR shall furnish 3 copies of the items above to the ENGINEER.
- 5. The CONTRACTOR shall take minutes of the Conference, including events, questions, and resolutions. Prior to adjournment, attendees must concur with the accuracy of the minutes and sign accordingly.
- C. Hardware Equipment Submittal: shall be submitted in accordance with the requirements of Section 17300 – Top End SCADA System and Section 17510 - PLC-Based Control System Hardware.
 - 1. The CONTRACTOR shall include a Spare Parts and Special Tools Section including part numbers and quantities. Manufacturer technical brochures or bulletins shall be submitted for all special tools.
- D. Software Submittal: Software shall be submitted in accordance with the requirements of Section 17520 – PLC-Based Control System Software.
- E. Shop Drawing Submittal
 - 1. General
 - a. Preparation of Shop Drawings shall not commence until adjournment of the Presubmittal Conference.
 - b. Shop Drawings shall include the letter head or title block of the Manufacturer. The title block shall include, as a minimum, the Manufacturer's registered business name and address, project name, drawing name, revision level, and

**PROCESS CONTROL AND INSTRUMENTATION SYSTEMS
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personnel responsible for the content of the drawing. The quantity of submittal sets shall be as indicated in Section 01300 - Contractor Submittals.

- c. Shop Drawings shall be submitted on 11"X17" sheets, bound in a flexible cover. Binder depth shall not exceed 3-inches.
 - d. Interfaces between instruments, motor starters, control valves, variable speed drives, flow meters, chemical feeders and other equipment related to the PCIS shall be included in the Shop Drawing submittal.
2. Manufacturer Control Panel Submittal: Control Panel Submittal shall be submitted in accordance with Section 17200 – Control Panels.
 3. Project-Wide Loop Drawing Submittal: The CONTRACTOR shall furnish a Loop Drawing Submittal (PLDS) which completely defines and documents the contents of each monitoring, alarming, interlock, and control loop associated with equipment provided under Division 17 sections, equipment provided under sections in other Divisions, existing, and OWNER-furnished equipment which is to be incorporated into the PCIS. The PLDS shall be a singular complete bound package electronically drafted in AutoCAD, submitted within 120 Days after Notice to Proceed, and shall include the following:
 - a. A complete index in the front of each bound volume. The loop drawings shall be indexed by systems or process areas. Loops shall be tagged in a manner consistent with the Contract Documents. Loop drawings shall be submitted for every analog and discrete monitoring and control loop.
 - b. Drawings showing definitive diagrams for every analog and discrete instrumentation loop system. These diagrams shall show and identify each component of each loop or system using legend and symbols from ISA S5.4 - Instrument Loop Drawings, extending the format as shown on Drawing I-1 and as defined by the most recent revision in ISA. Loop drawings shall be developed for loops in equipment vendor-supplied packages, equipment provided under Division 17, and OWNER furnished equipment. In addition to the expanded ISA S5.4 requirements, the loop diagrams shall also show the following details:
 - i) Functional name of each loop
 - ii) Reference name, drawing, and loop diagram numbers for any signal continuing off the loop diagram sheet.
 - iii) Panel, circuit, and breaker numbers for power feeds to the loops and instrumentation.
 - iv) Designation, and if appropriate, terminal assignments associated with every manhole, pullbox, junction box, conduit, and panel through which the loop circuits pass.

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- v) Vendor panel, instrument panel, conduit, junction boxes, equipment and PLC terminations, termination identification wire numbers and colors, power circuits, and ground identifications.
4. Operator Interface Unit Graphics Submittal: Custom Operator Interface Unit Graphics shall be submitted in accordance with the requirements of Section 17520 – PLC-Based Control System Software.
 5. Factory Acceptance Test Procedure Submittal: The Factory Acceptance Test Procedure shall be submitted in accordance with the requirements of Section 17510 – PLC-Based Control System Hardware.
 6. Field Instrument Calibration Sheet Submittal: Field Instrument Calibration Sheets shall be submitted in a single, bound, indexed volume on 8 ½" X 11" sheets 30 days prior to installation and start up for ENGINEERS review and approval. Reference Part 3 Section 3.4 for Field Instrument Calibration Sheet format. Along with the CONTRACTOR-prepared Field Instrument Calibration Sheets, the CONTRACTOR shall also submit all instrument calibration documentation prepared by the original instrument manufacturer. Reference individual instrument specification sections for additional calibration and calibration documentation requirements.
 7. Loop Test Validation Sheet Submittal: Loop Test Validation Sheets shall be submitted in a single, bound, indexed volume on 8 ½"X11" sheets 30 days prior to startup testing for ENGINEERS review and approval. Completed Loop Test Validation Sheets shall be provided no later than 30 days after loop testing is completed. Reference Part 3 Section 3.5 for Loop Test Validation Sheet format. Sheets shall be divided by PLC and ordered alphanumerically by tag number.
 8. Commissioning Validation Sheet Submittal: Commissioning Validation Sheets shall be submitted in a single, bound, indexed volume on 8 ½"X11" sheets 30 days prior to start-up testing for ENGINEERS review and approval. Completed Commissioning Validation Sheets shall be provided no later than 30 days after Commissioning is completed. The Commissioning Validation Sheets shall include the Top-End SCADA interface points. Reference Part 3 Section 3.6 for Commissioning Validation Sheet format and requirements.
 9. Training Submittal: Subsequent to the receipt of the OWNER's and ENGINEER's inputs made at the Presubmittal Conference, the CONTRACTOR shall submit a training plan which includes:
 - a. Resubmittal of the training plan overview from the Presubmittal Conference with incorporation of modifications agreed upon at that meeting.
 - b. Schedule of training courses including dates, durations, and locations of each class.
 - c. Resumes of the instructors who will actually implement the plan.

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10. Operation and Maintenance Manual

- a. General: Information in the Operation and Maintenance (O&M) Manual shall be based upon the approved submittals as modified for conditions encountered in the field during the Work.
- b. The O&M Manual shall have the following organization:
 - i) Section A – Equipment List
 - ii) Section B – Original Manufacturer Operation and Maintenance Manuals, User Manuals, and Installation Manuals
 - iii) Section C – Original Manufacturer Drawings
 - iv) Section D – CONTRACTOR As-Built Shop Drawings
 - v) Section E – Final Instrument Calibration Documentation
 - vi) Section F – Final, Signed Loop Test Validation Sheets
 - vii) Section G – Final, Signed Precommissioning Validation Sheets

11. Record Drawings

- a. The CONTRACTOR shall keep current a set of complete loop and schematic diagrams which shall include field and panel wiring, piping and tubing runs, routing, mounting details, point-to-point diagrams with cable, wire, tube and termination numbers. These drawings shall include every instrument and instrument element. One set of drawings electronically formatted in AutoCAD and 2 hard copies shall be submitted after completion of commissioning tasks but prior to Performance Testing. Such drawings shall be submitted for review prior to acceptance of the completed Work by the OWNER.

1.03 SPECIAL CORRECTION OF DEFECTS REQUIREMENTS

- A. Extended Period for Correction of Defects: The CONTRACTOR shall correct defects in the PCIS upon notification from the OWNER within 2 years from the date of Substantial Completion. Corrections shall be completed within 5 days after notification.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Code and Regulatory Compliance: PCIS Work shall conform to or exceed the applicable requirements of the National Electrical Code.

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- B. Current Technology: Meters, instruments, and other components shall be the most recent field-proven models marketed by their manufacturers at the time of submittal of the Shop Drawings unless otherwise required to match existing equipment.
- C. Hardware Commonality: Instruments which utilize a common measurement principle (for example, d/p cells, pressure transmitters, level transmitters that monitor hydrostatic head) shall be furnished by a single manufacturer. Panel mounted instruments shall have matching style and general appearance. Instruments performing similar functions shall be of the same type, model, or class, and shall be from a single manufacturer.
- D. Loop Accuracy: The accuracy of each instrumentation system or loop shall be determined as a probable maximum error; this shall be the square root of the sum of the squares of certified "accuracies" of the designated components in each system, expressed as a percentage of the actual span or value of the measured variable. Each individual instrument shall have a minimum accuracy of plus and minus 0.5 percent of full scale and a minimum repeatability of plus and minus 0.25 percent of full scale unless otherwise indicated. Instruments that do not conform to or improve upon these criteria are not acceptable.
- E. Instrument and Loop Power: Power requirements and input/output connections for components shall be verified. Power for transmitted signals shall, in general, originate in and be supplied by the control panel devices. The use of "2 wire" transmitters is preferred, and use of "4 wire" transmitters shall be minimized. Individual loop or redundant power supplies shall be provided as required by the manufacturer's instrument load characteristics to ensure sufficient power to each loop component. Power supplies shall be mounted within control panels or in the field at the point of application.
- F. Instrument Air: Dry, filtered control air at 30 psig nominal pressure shall be piped to field instruments and instrument panels requiring air. Each field instrument shall be provided with an integral, non-adjustable filter/regulator assembly to provide regulated air. Each instrument panel requiring air shall be provided with an adjustable filter/regulator assembly with gauge and an air manifold to provide air to pneumatic instruments. Air shall be filtered to 5-micron maximum particle size. Pressure reducers and regulators shall be furnished with additional instrumentation as required.
- G. Loop Isolators and Converters: Signal isolators shall be provided as required to ensure adjacent component impedance match where feedback paths may be generated, or to maintain loop integrity during the removal of a loop component. Dropping precision wirewound resistors shall be installed at field side terminations in the control panels to ensure loop integrity. Signal conditioners and converters shall be provided where required to resolve any signal level incompatibilities or provide required functions.
- H. Environmental Suitability: Indoor and outdoor control panels and instrument enclosures shall be suitable for operation in the ambient conditions associated with the locations designated in the Contract Documents. Heating, cooling, and

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dehumidifying devices shall be provided in order to maintain instrumentation devices 20 percent within the minimums and maximums of their rated environmental operating ranges. The CONTRACTOR shall provide power wiring for these devices. Enclosures suitable for the environment shall be furnished. Instrumentation in hazardous areas shall be suitable for use in the particular hazardous or classified location in which it is to be installed.

- I. Signal Levels: Analog measurements and control signals shall be as indicated herein, and unless otherwise indicated, shall vary in direct linear proportion to the measured variable. Electrical signals outside control panels shall be 4 to 20 milliampers dc except as indicated. Signals within enclosures may be 1 to 5 volts dc. Electric signals shall be electrically or optically isolated from other signals. Pneumatic signals shall be 3 to 15 psig with 3 psig equal to 0 percent and 15 psig equal to 100 percent.
- J. Control Panel Power Supplies: Control panels shall be provided with redundant power supplies which are configured in a fault-tolerant manner to prevent interruption of service upon failure and interruption of service necessitated by the replacement of a power supply. Power supplies shall have an excess rated capacity of 40 percent.
- K. Alternative Equipment and Methods: Equipment or methods requiring redesign of any project details are not acceptable without prior written approval of the ENGINEER through the "or equal" process of Section 01600 - Products, Materials, Equipment, and Substitutions. Any proposal for approval of alternative equipment or methods shall include evidence of improved performance, operational advantage, and maintenance enhancement over the equipment or method indicated, or shall include evidence that an indicated component is not available.
- L. The PCIS shall be designed and constructed for satisfactory operation and long, low maintenance service under the following conditions:
 - 1. Environment water distribution facility, Temperature Range 32 through 104 degrees F, Thermal Shock 1 degree F per minute, max Relative Humidity 20 through 90 percent, non-condensing

2.02 SPARE PARTS AND SPECIAL TOOLS

- A. The CONTRACTOR shall furnish the following:
 - 1. Provide six (6) SD cards for M340 CPU.
 - 2. Provide 20% spare parts for each control panel component, minimum of (1) one of each, including PLC CPU, power supply, I/O module types, communication modules, switch, memory card, OIU, etc.
 - 3. Per Section 11252, a compact disk (CD) with all final Lime Slaking PLC and OIU configuration and programming files in their native, editable format.

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2.03 FACTORY TESTING

- A. The CONTRACTOR shall arrange for the Manufacturers of the equipment and fabricators of panels and cabinets supplied under this Section to allow the ENGINEER and OWNER to inspect and witness the testing of the equipment at the site of fabrication. Equipment shall include the control cabinets, control system network communication systems, special control systems, and other pertinent systems and devices. Reference section 17510-3.2 for Factory Test scheduling, setup, execution and documentation requirements. A minimum of fifteen working days notification shall be provided to the OWNER and ENGINEER prior to testing. No shipments to the work site shall be made prior to the Factory Test without the ENGINEER'S written approval.

PART 3 - EXECUTION

3.01 PRODUCT HANDLING

- A. Shipping Precautions: After completion of shop assembly, factory test, and approval, equipment, cabinets, panels, and consoles shall be packed in protective crates and enclosed in heavy duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust, and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weight shall be shown on shipping tags together with instructions for unloading, transporting, storing, and handling at the Site.
- B. Special Instructions: Special instructions for proper field handling, storage, and installation required by the manufacturer shall be securely attached to each piece of equipment prior to packaging and shipment.
- C. Tagging: Each component shall be tagged to identify its location, instrument tag number, and function in the system. A permanent stainless steel or other noncorrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number, as given in the tabulation, shall be provided on each piece of equipment in the PCIS. Identification shall be prominently displayed on the outside of the package.
- D. Storage: Equipment shall not be stored outdoors. Equipment shall be stored in dry permanent shelters, including in-line equipment, and shall be adequately protected against mechanical injury. If any apparatus has been damaged, such damage shall be repaired by the CONTRACTOR. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through tests as directed by the ENGINEER. If such tests reveal defects, the equipment shall be replaced.

3.02 MANUFACTURER'S SERVICES

- A. The CONTRACTOR shall furnish the following manufacturer's services for the instrumentation listed below:

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1. Perform bench calibration.
2. Oversee installation.
3. Verify installation of installed instrument.
4. Certificate of Proper Installation and reconfirm manufacturer's accuracy statement.
5. Oversee loop testing, prepare loop validation sheets, and certify loop testing.
6. Prepare Commissioning validation sheets, oversee commissioning, and certify when commissioning is completed.
7. Verify Top End SCADA interface points with Overall System Integrator.
8. Train the OWNER's personnel (refer to 3.09 and references to other sections)

3.03 INSTALLATION

A. General

1. Instrumentation, including instrumentation furnished under other Divisions, shall be installed under Division 17 and the manufacturers' instructions.
2. Equipment Locations: The monitoring and control system configurations indicated are diagrammatic. The locations of equipment are approximate. The exact locations and routing of wiring and cables shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment. Equipment shall be located and installed so that it will be readily accessible for operation and maintenance.
3. Where job conditions require reasonable changes in approximated locations and arrangements, or when the OWNER exercises the right to require changes in location of equipment which do not impact material quantities or cause material rework, the CONTRACTOR shall make such changes without additional cost to the OWNER.

B. Conduit, Cables, and Field Wiring

1. Conduit shall be furnished and installed under Division 16 without delay to the Work of Division 17.
2. Process equipment control wiring, 4 to 20 mA signal circuits, signal wiring to field instruments, PLC input and output wiring, and other field wiring and cables shall be furnished and installed under Division 16.
3. Network cables shown on the System Architecture Diagram shall be furnished under Division 17 and installed under Division 16.

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- C. Instrumentation Tie-Downs: Instruments, control panels, and equipment shall be anchored by methods that comply with seismic requirements applicable to the Site.
- D. Ancillary Devices: The Contract Documents show necessary conduit and instruments required to make a complete instrumentation system. The CONTRACTOR shall be responsible for providing any additional or different type connections as required by the instruments and specific installation requirements. Such additions and such changes, including the proposed method of installation, shall be submitted to the ENGINEER for approval prior to commencing that Work. Such changes shall not be a basis of claims for extra Work or delay.
- E. Installation Criteria and Validation: Field-mounted components and assemblies shall be installed and connected according to the requirements below:
 - 1. Installation personnel have been instructed on installation requirements of the Contract Documents.
 - 2. Technical assistance is available to installation personnel at least by telephone.
 - 3. Installation personnel have at least one copy of the approved Shop Drawings and data.
 - 4. Instrument process sensing lines shall be installed in conduit under Section 16150 – Raceways, Fittings and Supports. Individual tubes shall run parallel and near the surfaces from which they are supported. Supports shall be used at intervals of not more than 3-feet of rigid tubing.
 - 5. Bends shall be formed to uniform radii with the proper tool without deforming or thinning the walls of the tubing. Plastic clips shall be used to hold individual plastic tubes parallel. Ends of tubing shall be square cut and cleaned before being inserted in the fittings. Bulkhead fittings shall be provided at panels requiring pipe or tubing entries.
 - 6. Flexible cables and capillary tubing shall be installed in flexible conduits. The lengths shall be sufficient to withdraw the element for periodic maintenance.
 - 7. Power and signal wires shall be terminated with crimped type lugs.
 - 8. Connectors shall be, as a minimum, water tight.
 - 9. Wires shall be mounted clearly with an identification tag that is of a permanent and reusable nature.
 - 10. Wire and cable shall be arranged in a neat manner and securely supported in cable groups and connected from terminal to terminal without splices unless specifically approved by the ENGINEER. Wiring shall be protected from sharp edges and corners.
 - 11. Mounting stands and bracket materials and workmanship shall comply with requirements of the Contract Documents.

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12. Verify the correctness of each installation, including polarity of electric power and signal connections, and make sure process connections are free of leaks. The CONTRACTOR shall certify in writing that discrepancies have been corrected for each loop or system checked out.
13. The OWNER will not be responsible for any additional cost of rework attributable to actions of the CONTRACTOR or the Instrumentation Supplier.

3.04 CALIBRATION

- A. General: Devices provided under Division 17 shall be calibrated according to the manufacturer's recommended procedures to verify operational readiness and ability to meet the indicated functional and tolerance requirements.
- B. Calibration Points: Each instrument shall be calibrated at 0, 25, 50, 75, and 100 percent of span using test instruments to simulate inputs. The test instruments shall have accuracies traceable to National Institute of Standards and Testing.
- C. Bench Calibration: Instruments that have been bench-calibrated shall be examined in the field to determine whether any of the calibrations are in need of adjustment. Such adjustments, if required, shall be made only after consultation with the ENGINEER.
- D. Field Calibration: Instruments which were not bench-calibrated shall be calibrated in the field to insure proper operation in accordance with the instrument loop diagrams or specification data sheets.
- E. Analyzer Calibration: Each analyzer system shall be calibrated and tested as a workable system after installation. Testing procedures shall be directed by the manufacturers' technical representatives. Samples and sample gases shall be furnished by the manufacturers.
- F. Calibration Sheets: Each instrument calibration sheet shall provide the following information and a space for sign-off on individual items and on the completed unit:
 1. Project name.
 2. Tag number.
 3. Manufacturer.
 4. Model number.
 5. Serial number.
 6. Calibration range.
 7. Calibration data: Input, output, and error at 0 percent, 50 percent, and 100 percent of span.

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8. Switch setting, contact action, and deadband for discrete elements.
 9. Space for comments.
 10. Space for sign-off by Instrumentation Supplier and date.
 11. Test equipment used and associated serial numbers.
- G. Calibration Tags: A calibration and testing tag shall be attached to each piece of equipment or system at a location determined by the ENGINEER. The CONTRACTOR shall have the Instrumentation Supplier sign the tag when calibration is complete. The ENGINEER will sign the tag when the calibration and testing has been accepted.

3.05 LOOP TESTING

- A. General: Individual instrument loop diagrams per ISA Standard S5.4 - Instrument Loop Diagrams, expanded format, shall be submitted to the ENGINEER for review prior to the loop tests. The CONTRACTOR shall notify the ENGINEER of scheduled tests a minimum of 30 Days prior to the estimated completion date of installation and wiring of the PCIS. After the ENGINEER's review of the submitted loop diagrams for correctness and compliance with the specifications, loop testing shall proceed. The loop check shall be witnessed by the ENGINEER.
- B. Control Valve Tests: Control valves, cylinders, drives and connecting linkages shall be stroked from the operator interface units as well as local control devices and adjusted to verify proper control action, hand switch action, limit switch settings, torque settings, remote control actions, and remote feedback of valve status and position. Control valve actions and positioner settings shall be checked with the valves in place to insure that no changes have occurred since the bench calibration.
- C. Interlocks: Hardware and software interlocks between the instrumentation and the motor control circuits, control circuits of variable-speed controllers, and packaged equipment controls shall be checked to the maximum extent possible.
- D. Instrument and Instrument Component Validation: Each instrument shall be field tested, inspected, and adjusted to its indicated performance requirement in accordance with its manufacturer's specifications and instructions. Any instrument which fails to meet any Contract requirement, or, in the absence of a Contract requirement, any published manufacturer performance specification for functional and operational parameters, shall be repaired or replaced, at the discretion of the ENGINEER.
- E. Loop Validation: Controllers and electronic function modules shall be field tested and exercised to demonstrate correct operation. Control loops shall be checked under simulated operating conditions by impressing input signals at the primary control elements and observing appropriate responses of the respective control and monitoring elements, final control elements, and the MCP Operator Interface Unit. Actual signals shall be used wherever available. Following any necessary corrections, the loops shall be retested. Accuracy tolerances for each analog network are defined

**PROCESS CONTROL AND INSTRUMENTATION SYSTEMS
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as the root-mean-square (RMS) summation of individual component accuracy requirements. Individual component accuracy requirements shall be as indicated by Contract requirements or by published manufacturer accuracy specifications, whenever Contract accuracy requirements are not indicated. Each analog network shall be tested by applying simulated analog or discrete inputs to the first element of an analog network. For networks which incorporate analog elements, simulated sensor inputs corresponding to 0, 25, 50, 75, and 100 percent of span shall be applied, and the resulting element outputs monitored to verify compliance to calculated RMS summation accuracy tolerance requirements. Continuously variable analog inputs shall be applied to verify the proper operation and setting of discrete devices. Provisional settings shall be made on controllers and alarms during analog loop tests. Analog loop test data shall be recorded on test forms attached at the end of this Section which include calculated RMS summation system accuracy tolerance requirements for each output.

- F. Loop Validation Sheets: The CONTRACTOR shall prepare loop confirmation sheets for each loop covering each active instrumentation and control device except simple hand switches and lights. Loop confirmation sheets shall form the basis for operational tests and documentation. Each loop confirmation sheet shall cite the following information and shall provide spaces for sign-off on individual items and on the complete loop by the Instrumentation Supplier:
1. Project Name.
 2. Tag Number, Description, Manufacturer, and Model Number.
 3. Installation Detail Number.
 4. Specification Section Number.
 5. Space for Comments.
 6. Space for Loop Sign-Off by CONTRACTOR and Date.
 7. Space for ENGINEER Witness Signature and Date.
 8. Loop Certifications: When installation tests have been successfully completed for individual instruments and separate analog control networks, a certified copy of each test form signed by the ENGINEER or the ENGINEER's representative as a witness, with test data entered, shall be submitted to the ENGINEER together with a clear and unequivocal statement that the instrumentation has been successfully calibrated, inspected, and tested.

3.06 COMMISSIONING

- A. General: Commissioning shall commence after acceptance of wire test, calibration tests and loop tests, and inspections have demonstrated that the instrumentation and control system complies with Contract requirements. Precommissioning shall demonstrate proper operation of every system with process equipment operating

**PROCESS CONTROL AND INSTRUMENTATION SYSTEMS
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over full operating ranges under conditions as closely resembling actual operating conditions as possible.

- B. Commissioning Procedures and Documentation: Commissioning and test activities shall follow detailed test procedures and check lists accepted by the ENGINEER. Test data shall be acquired using equipment as required and shall be recorded on test forms accepted by the ENGINEER, which include calculated tolerance limits for each step. Completion of system precommissioning and test activities shall be documented by a certified report, including test forms with test data entered, delivered to the ENGINEER with a clear and unequivocal statement that system Commissioning and test requirements have been satisfied.

- C. System Testing: When the PLC installation has been certified and Loop Testing has been completed, system testing shall be performed in accordance with the approved test procedures. System testing shall operate the various systems of the facility to verify compliance with all functional requirements specified, including the automatic control modes and PLC interlocks described in the control strategies contained in the Manufacturer's Operations & Maintenance Manuals. Tests which fail to demonstrate the required operation shall be repeated in their entirety or continued after corrective action has been completed at the discretion of the ENGINEER. Where feasible, System Testing shall include the use of water to establish service conditions that simulate, to the greatest extent possible, normal final control element operating conditions in terms of applied process loads, operating ranges, and environmental conditions. Final control elements, control panels, and ancillary equipment shall be tested under startup and steady state operating conditions to verify that proper and stable control is achieved using motor control center and local field mounted control circuits. Hardwired and software control circuit interlocks and alarms shall be operational. The control of final control elements and ancillary equipment shall be tested using both manual and automatic (where provided) control circuits. The stable steady state operation of final control elements running under the control of field mounted automatic analog controllers or software based controllers shall be assured by adjusting the controllers as required to eliminate oscillatory final control element operation. The transient stability of final control elements operating under the control of field mounted, and software-based automatic analog controllers shall be verified by applying control signal disturbances, monitoring the amplitude and decay rate of control parameter oscillations (if any), and making necessary controller adjustments as required to eliminate excessive oscillatory amplitudes and decay rates.

- D. Loop Tuning: Electronic control stations incorporating proportional, integral or differential control circuits shall be optimally tuned, experimentally, by applying control signal disturbances and adjusting the gain, reset, or rate settings as required to achieve a proper response. Measured final control element variable position/speed setpoint settings shall be compared to measured final control element position/speed values at 0, 25, 50, 75, and 100 percent of span and the results checked against indicated accuracy tolerances.

- E. Commissioning Validation Sheets: The CONTRACTOR through the use of the Manufacturers System Integrator and the Overall System Integrator shall construct

**PROCESS CONTROL AND INSTRUMENTATION SYSTEMS
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the Commissioning Validation Sheets that can be tested by the CONTRACTOR and witnessed by the ENGINEER. The validation sheets shall include a sign-off at the end of the section for the CONTRACTOR and ENGINEER's signatures and dates.

3.07 ON-SITE SUPERVISION

- A. The CONTRACTOR shall furnish the services of an on-site resident engineer to supervise and coordinate installation, adjustment, testing, and start-up of the PCIS. The resident engineer shall be present during the total period required to effect a complete operating system. A team of engineering personnel shall be at the Site for 80 hours, in addition to on site time required in other specifications, to check equipment, perform the tests indicated in this Section, and furnish startup services.

3.08 PERFORMANCE TESTING

- A. The entire Work shall operate for 72-hours longer than the commissioning period in Section 01650 without failure.
- B. In addition to the commissioning requirements of Section 01650, the CONTRACTOR shall furnish support staff as required to operate the system and to satisfy the repair or replacement requirements.
- C. If any component fails during the performance test, it shall be repaired or replaced and the performance test shall be restarted at time zero for another 72 hour period.
- D. Reference Section 17510-3.3 B for additional PLCS Performance Testing requirements.

3.09 TRAINING

- A. General: The CONTRACTOR shall train the OWNER'S personnel on the maintenance, calibration, and repair of instruments and equipment provided under this Contract.
 - 1. See specification 11252 for Control System training details from the Slaker vendor and the Manufacturer System Integrator.
 - 2. See specification 17300 for Control System training details from the Overall System Integrator.

3.10 SUBSTANTIAL COMPLETION

Refer to Section 00810, Supplemental General Conditions, for a definition of Work project substantial completion. For the purpose of this Section and all of Division 17 the following conditions shall be fulfilled before the work is considered substantially complete:

- A.
 - 1. Submittals have been completed and approved.

**PROCESS CONTROL AND INSTRUMENTATION SYSTEMS
SECTION 17100**

2. The PCIS has been successfully calibrated, loop tested, and Commissioned.
3. The OWNER training has been performed.
4. Spare parts, special tools, expendable supplies and test equipment have been delivered to the OWNER.
5. Performance testing has been successfully completed.
6. Punch-list items have been corrected.
7. Record drawings in both hard copy and electronic format have been submitted.
8. Revisions to the O&M Manuals that may have resulted from the field tests have been made and reviewed.
9. Debris associated with installation of instrumentation has been removed.
10. Probes, elements, sample lines, transmitters, tubing, and enclosures have been cleaned and are in like-new condition.

END

APPENDIX A - DIVISION 17000 SUBMITTAL REQUIREMENTS LISTING

CLIENT NAME: **CITY OF AUSTIN**
 PLANT NAME: **DAVIS WATER TREATMENT PLANT**
 PROJECT NAME: **CHEMICAL FEED SYSTEM IMPROVEMENT**

PACKAGE TITLE: **BID PACKAGE 2 - LIME SLAKER SYSTEM**
 PACKAGE NO.:
 REVISION NO.: **0**

ITEM NO.	Package NO.	ITEM DESCRIPTION	REFERENCE PARAGRAPH	QUANTITIES AND DUE DATES							LIQUIDATED DAMAGES	REMARKS	
				WITH BID	2 WEEKS ARO	4 WEEKS PRIOR TO MANUFACTURING	4 WEEKS PRIOR TO FACTORY ACCEPTANCE TEST	UPON DELIVERY/RECEIPT	4 WEEKS PRIOR TO COMMISSIONING	UPON COMPLETION OF PERFORMANCE TESTING			IN ACCORDANCE WITH VENDOR'S APPROVED SCHEDULE
		Manufacturer's - System Integrator	SS-17100										
1	2	Hardware Submittal	1.02			E							Submit for Review and ENGINEER'S Approval prior to control panel manufacturing
2	2	Software Submittal	1.02			E							Submit for Review and ENGINEER'S Approval prior to control panel manufacturing
3	2	Control Panel Submittal	1.02			E		E					Submit for Review and ENGINEER'S Approval prior to control panel manufacturing
4	2	Loop Drawing Submittal	1.02				E			E*			Submit for Review and ENGINEER'S Approval prior to Factory Acceptance Test.
5	2	PLC & Graphics Criteria Document	SS-17520 2.07 - B.2			E							30 days after Graphics/PLC Meeting 1
6	2	Operator Interface Unit Submittal	SS-17520 2.07 - C.2				E			E*			30 days after Graphics/PLC Meeting 2
7	2	PLC Program Submittal	SS-17520 2.07 - C.2				E			E*			30 days after Graphics/PLC Meeting 2
8	2	Factory Acceptance Test Submittal	SS-17510 3.02				E						Submit for Review and ENGINEER'S Approval
9	2	Field Instrument Calibration Sheet Submittal	1.02						E	E*			Submit for Review and ENGINEER'S Approval
10	2	Loop Test Validation Sheet Submittal	1.02						E	E*			Submit for Review and ENGINEER'S Approval
11	2	Commissioning Validation Sheet Submittal	1.02						E	E*			Submit for Review and ENGINEER'S Approval
12	2	Training Submittal	1.02						E				Submit for Review and ENGINEER'S Approval
13	2	Operations and Maintenance Manual	1.02						E	E			Submit for Review and ENGINEER'S Approval * Include as part of final O&M Manual
14	2	As-Built Drawings	1.02							E*			Submit for review and ENGINEER'S approval
		Overall System Integrator	SS-17300										
1	2	Hardware Submittal	2.03			E							Submit for Review and ENGINEER'S Approval
2	2	Software Submittal	2.04			E							Submit for Review and ENGINEER'S Approval
3	2	PLC Program Modifications Submittal	2.05				E						Submit for Review and ENGINEER'S Approval
4	2	Graphics Criteria Document	2.06 C.3.b				E						Submit for Review and ENGINEER'S Approval
5	2	Top-End Graphics Submittal	2.06 C.4.a				E						Submit for Review and ENGINEER'S Approval
6	2	Davis WTP Top-End Administration Manual Modification	2.06 C.4.b						E	E			Submit for Review and ENGINEER'S Approval
7	2	Davis WTP Operators Manual Modifications	2.06 C.4.b						E	E			Submit for Review and ENGINEER'S Approval
8	2	Commissioning Validation Sheet Submittal	3.01						E	E			Submit for Review and ENGINEER'S Approval
9	2	Training Submittal	3.03						E				Submit for Review and ENGINEER'S Approval

NOTE: CONTRACTOR to sign this form and return with bid.

Company Name:
Rep. Name:

**CONTROL PANEL INSTRUMENTATION
SECTION 17201**

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. General: The CONTRACTOR shall provide control panel instrumentation, complete and operable, in accordance with the Contract Documents.
- B. The requirements of Section 17100 - Process Control and Instrumentation Systems apply to the Work of this Section.
- C. The requirements of Section 17200 - Control Panels apply to the Work of this Section.

1.02 CONTRACTOR SUBMITTALS

- A. General: Submittals shall be included within the submittals of Section 17200 – Control Panels.

PART 2 - PRODUCTS

2.01 STATION COMPONENTS

- A. Pushbuttons, selector switches, and pilot lights shall be of the heavy-duty, oil-tight type sized to 30 mm. Miniature style devices are not acceptable. Devices shall be as manufactured by Square D, or equal.
 - 1. Lens colors shall be red for "run," "open," or "on"; green for "stopped," "closed," or "off;" amber for alarm.
 - 2. Pilot lights shall be full voltage LED cluster style.
 - 3. Provide hazardous location type pilot devices in classified locations.
- B. Relays shall be 3 PDT with 10 amp contacts, plug-in type utilizing rectangular blades and provided with sockets for screw-type termination and hold-down clips. Relays shall be as manufactured by Square D, Potter Brumfield, or equal.
- C. Elapsed time meters shall be non-resettable type, read to a maximum of 99999.9 hours and shall be as manufactured by Square D, or equal.
- D. Terminal strips shall be provided for all panels and shall be of the flanged fork or ring lug type suitable for No. 12 AWG stranded wire minimum. Provide 25% spare terminals in each panel.
- E. Time delay relays shall be combination on delay and off delay (selectable) with adjustable timing ranges. Time delay relays shall be Square D JCK70. Provide socket with screw terminal connections and retaining strap. Similar shall be by ATC, or equal.

**CONTROL PANEL INSTRUMENTATION
SECTION 17201**

2.02 POWER SUPPLIES:

A. 24V DC Power Supplies

1. General: Power supplies shall conform with the requirements of Section 17100. All power supplies shall be the same manufacturer and model.
2. All power supplies shall include a dry relay fail contact.
3. 24V DC power supplies shall be as manufactured by Allen Bradley, Sola Hevi-Duty, Acopian, or approved equal.

2.03 TOTALIZERS

A. Totalizers and Integrators, Electro-Mechanical

1. Totalizers: Totalizers shall be electro-mechanical front panel mounting units with a minimum of seven non-resettable digits. Size shall be approximately 2-inches H by 2-inches W by 2-inches D. Character height shall be 0.150-inches minimum.
2. Totalizers shall be Durant Series 7-Y, Kessler-Ellis Type MK, or approved equal.

2.04 ISOLATORS

A. 4-20mA Loop Isolators (I/I Converters)

1. 24VDC, 4-20mA loop isolators shall be as Moore Industries Model ECT-DIN with TX, Phoenix Contact Model MCR or approved equal.

PART 3 - EXECUTION

3.01 GENERAL

- A. Control panel instrumentation shall be executed in accordance with Section 17100.

END

**OVERALL SYSTEM INTEGRATOR REQUIREMENTS
SECTION 17300**

PART 1 GENERAL

1.01 REQUIREMENT

- A. This section encompasses general provisions related to PLC and Top-End hardware, software and programming requirements that apply to the Overall System Integrator. The functional requirements specified in this section are intended to be minimum requirements, which must be provided.
- B. Responsibilities
 - 1. As a minimum the CONTRACTOR through the use of a qualified Overall System Integrator shall perform the following work:
 - a. Integrate the six new Slaker systems into the Top-End for remote monitoring and control.
 - b. Add a Workstation/View Node into the Chemical Building Electrical Room.
 - c. Modify existing code in existing Chemical Building PLC – MCPC to accommodate changes to field I/O, including removal of code and variables associated with demolished signals.
 - d. Test hardwired interface between existing MCPC PLC located in the Chemical Building Electrical Building, new Slaker Control Panels and Top-End.
 - e. Update Davis WTP Top-End Administration Manual and Operator Manual to include the Slaker functionality.
- C. All programming work shall adhere to the AWU programming standards. The following are OWNER's specifications and standards:
 - 1. 17000 Appendix A1 - PLC Interface Documentation.
 - 2. 17000 Appendix A2 – Davis WTP Top-End Standards.
- D. This section encompasses general provisions related to PLC and Top-End hardware, software and programming requirements that apply to the Overall System Integrator. The functional requirements specified in this section are intended to be minimum requirements, which must be provided.

PART 2 PRODUCTS

2.01 CHEMICAL BUILDING PLC - MCPC

- A. The existing PLC is a Quantum PLC programmed using Schneider Electric's Concept programming software.
- B. Contractor shall make modifications to the existing PLC programming using the same version of Concept as is currently installed.

**OVERALL SYSTEM INTEGRATOR REQUIREMENTS
SECTION 17300**

2.02 TOP-END SCADA SYSTEM

- A. The existing Top-End is the GE Proficy iFIX SCADA System.
- B. The Top-End shall communicate with the Slaker system PLC's using Ethernet connectivity.

2.03 TOP-END HARDWARE

- A. The CONTRACTOR shall provide one Workstation/View Node to be located in the Chemical Building Electrical Room. The Workstation specification is as follows:

1. WorkStation Specification:

- Processors - 3rd Gen Intel® Core™ i3-3225 Processor (Dual Core, 3.30GHz, 3MB, w/ HD4000 Graphics);
- Operating System(s) - Windows 7 Professional, No Media, 64-bit, English;
- OptiPlex 9010 DT - OptiPlex 9010 Desktop w/ up to 90% Efficient PSU;
- Memory - 4GB, NON-ECC, 1600MHZ DDR3,2DIMM;
- Removable Media Storage Device - 16X DVD+ and -RW SATA;
- Productivity Software Microsoft® Office Trial, MUI;
- Graphics Cards - Intel® Integrated Graphics DP/DP/VGA w/DP-to-DVI Adapter;
- Monitors - DELL UltraSharp™ U2212H 21.5 Inch Monitor with Adj Stand, Widescreen, VGA/ DVI/ DP;
- Boot Hard Drive - 250GB 3.5 SATA 6Gb/s with 8MB DataBurst Cache™;
- Hard Drive Mode - No RAID;
- Systems Management Mode - Intel® Standard Manageability;
- Energy Efficiency Options - No ESTAR Settings;
- Wireless - None;
- Keyboard - Dell KB212-B USB 104 Quiet Key Keyboard, English;
- Mouse - Dell MS111 USB Optical Mouse;
- Setup and Features Information Tech Sheet - No Tech Sheet;
- Power Supplies - OptiPlex 9010 Desktop w/ up to 90% Efficient PSU;
- Thermals - Heat Sink, Mainstream, Desktop;
- Speakers - Internal Dell Business Audio Speaker;
- Security Hardware - Chassis Intrusion Switch Option; and
- Documentation - OptiPlex 9010 Documentation English and French Resource DVD.

- B. The Workstation hardware requirements shall be reviewed during the Top-End Graphics Meeting.

2.04 TOP-END SOFTWARE

- A. The following application software shall be provided for Workstation computer to be located in the Chemical Building Electrical Room:

**OVERALL SYSTEM INTEGRATOR REQUIREMENTS
SECTION 17300**

- GE Proficy - iFIX iClient Runtime software – latest version
- MS Office 2010 Professional (provided by OWNER)
- Anti-Virus - latest version (provided by OWNER)

- B. In an attempt to address possible version compatibility problems, the version of each software package shall be reviewed during the Top-End Graphics Meeting.
- C. The CONTRACTOR is responsible for installing and configuration of all necessary application software to provide a full function Workstation/View Node.

2.05 CHEMICAL BUILDING PLC - MCPC PROGRAMMING

- A. The CONTRACTOR shall perform necessary PLC programming work to integrate the Slaker systems, and remove programming that is no longer required due to replacement of the Slakers.
- B. The CONTRACTOR shall follow the AWU PLC programming standards. The OWNER shall provide the existing PLC program as reference.
- C. PLC Program Modifications
1. It is the responsibility of the CONTRACTOR to design, configure, and test the PLC program modifications required for this project. All of this work shall take into account the specific needs of the end user.
 2. The CONTRACTOR shall base the PLC program modifications on the existing PLC program, the I/O modifications shown on the Drawings, and AWU PLC programming standards.
 3. The CONTRACTOR shall attend the following PLC Programming Meeting:
 - a. PLC Programming Meeting: The PLC Programming Meeting shall at a minimum review the modifications and deletions required to support the replacement of the Slakers.
 - b. The CONTRACTOR shall allow 4 hours for the PLC Programming Meeting.
 4. Submittals:
 - a. PLC program printouts in PDF format shall be submitted for ENGINEER'S review, clearly indicating modified and deleted items, subsequent to the PLC Programming Meeting specified in this section and 30 days prior to the Slaker system Commissioning. ENGINEER will provide comments in appropriate hard or soft copy format.

2.06 TOP-END PROGRAMMING

- A. The CONTRACTOR shall perform necessary device driver, database and graphics work to integrate the Slaker systems incorporating, at a minimum, all signals listed in Specification Section 11252 2.06 E.

**OVERALL SYSTEM INTEGRATOR REQUIREMENTS
SECTION 17300**

- B. The CONTRACTOR shall follow the AWU Davis WTP Top-End Standards. The OWNER shall also provide sample graphics of the existing Top-End graphics as reference.
- C. Graphics Generation
1. It is the responsibility of the CONTRACTOR to design, configure, and test the Top-End graphic displays required for this project. All of this work shall take into account the specific needs of the end user.
 2. The CONTRACTOR shall base the Top-End graphics on sample graphics provided by the Manufacturer and the AWU Davis WTP Top-End Standards.
 3. The CONTRACTOR shall attend the following graphics meeting:
 - a. Top-End - Graphics Meeting. The Top-End Graphics meeting shall at a minimum review the following:
 - (i) Workstation Hardware and Software specifications and requirements.
 - (ii) AWU graphics standards.
 - (iii) Manufacturers sample graphics.
 - b. Subsequent to the adjournment of Graphics Meeting, the CONTRACTOR shall prepare and formalize a document titled "GRAPHICS CRITERIA" that shall contain detailed meeting minutes and a definition of all graphic guidelines to be adhered to. This report shall be supplemented by graphic examples which illustrate the incorporation and application of each graphic criteria. The report shall be submitted within 30 calendar days of the meeting's adjournment.
 - c. The CONTRACTOR shall allow 8 hours for the Top-End - Graphics Meeting.
 4. Submittals
 - a. Top-End graphics in PDF format shall be submitted for ENGINEER'S review subsequent to the Graphics Meeting specified in this section and 30 days prior to the Slaker system Commissioning. ENGINEER will provide comments in appropriate hard or soft copy format.
 - b. Modifications to the Davis WTP Top-End Administration Manual and Operators Manual shall be submitted for ENGINEERS review and approval 30 days prior to commissioning.
- 2.07 SOFTWARE LICENSE AND REGISTRATION: All software provided shall be installed and used within the terms of the software contractor's license agreement. All software purchased by the CONTRACTOR shall be registered to the OWNER. Between original software purchase and substantial completion, the CONTRACTOR shall be responsible for providing and incorporating minor software package updates issued by the software contractor. For example, if Version 3.1 of a program is purchased, and Version 3.2 and 3.3 are released prior to project completion, the CONTRACTOR shall be responsible for incorporating these later versions into the final project. The

**OVERALL SYSTEM INTEGRATOR REQUIREMENTS
SECTION 17300**

CONTRACTOR would not be responsible for incorporating major software revisions such as the release of a Version 4.0 or 4.1.

PART 3 EXECUTION

3.01 COMMISSIONING

- A. The CONTRACTOR shall install the Workstation/View Node in the Chemical Building Electrical Room. The CONTRACTOR shall ensure View Node functionality.
- B. The CONTRACTOR shall coordinate commissioning of the Chemical Building PLC modifications and Top-End Graphics with the Slaker commissioning schedule.
- C. Submittals: The CONTRACTOR shall provide test procedures and forms to confirm proper functionality. Procedures and forms shall include test of modified I/O to the Chemical Building PLC, new signals from the Slakers acquired via Ethernet network, monitoring via top-end, control via top-end, top-end navigation, top-end alarming, and top-end trending. It shall also include checkout of new Chemical Building View Node. The CONTRACTOR shall submit all test procedures and forms to the ENGINEER for approval prior to commissioning.
- D. The CONTRACTOR shall provide documentation that the Chemical Building PLC and Top-Graphics and Slaker interface have been validated during commissioning.

3.02 PERFORMANCE TESTING

- A. The entire Work shall operate for 72 hours longer than the commissioning period in Section 01650 without failure.
- B. In addition to the commissioning requirements of Section 01650, the CONTRACTOR shall furnish support staff as required to operate the system and to satisfy the repair or replacement requirements.
- C. If any component fails during the performance test, it shall be repaired or replaced and the performance test shall be restarted at time zero for another 72-hour period.

3.03 TRAINING

- A. The CONTRACTOR shall train the OWNER's SCADA and maintenance personnel on the Top-End interface with the Slaker system.
- B. The CONTRACTOR shall allow for one 4-hour session for Top-End training during the commissioning.
- C. Training submittals shall be provided as defined in Specification Section 17100.

**OVERALL SYSTEM INTEGRATOR REQUIREMENTS
SECTION 17300**

3.04 SUBSTANTIAL COMPLETION

A. Refer to section 00810, Supplemental General Conditions, for the definition of project substantial completion. For the purpose of this Section, the following conditions shall be fulfilled before the work is considered substantially complete:

1. Submittals have been completed and approved.
2. The Top End and existing PLC modifications are commissioned.
3. The OWNER training has been performed.
4. Performance testing has been successfully completed.
5. Punch-list items have been corrected.

END OF SECTION

**MANUFACTURER'S PLC-BASED CONTROL SYSTEMS HARDWARE
SECTION 17510**

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. The CONTRACTOR through the use of the Manufacturer System Integrator shall furnish, supervise installation, assemble and configure, program, and place into service the PLC-based Control System (PLCS), specified under this Section and in Section 17520 - PLC-Based Control Systems-Software, all in accordance with the requirements of the Contract Documents. Reference Specification 11252 for the overall Manufacturer system details.
- B. The PLCS shall consist of PLCs, panel-mounted operator interfaces, network switches, and all required equipment and peripherals as shown on the System Architecture Diagram and as described in these specifications, and as required to meet the functional intent of the specifications. The PLCS implementation shall be integrated into the CITY's existing SCADA system.
- C. The PLCS shall be in conformance with the following key system criteria.
 - 1. All PLCs shall be of the same manufacturer, Modicon by Schneider Electric.
 - 2. Unless noted otherwise, peer to peer networks shall conform to IEEE 802.3 Ethernet protocols to preserve a nonproprietary system infrastructure.
- D. Scope of Work

The CONTRACTOR shall furnish and install the PLCS as specified within the Contract Documents. The CONTRACTOR shall be responsible for all equipment selection and supply, hardware and software submittal preparation, system integration, data traffic management, programming, graphics generation, supervision of installation, testing, training, start-up, and other implementation activities for the PLCS furnished under this Contract. The PLC hardware and software shall be standardized so as to utilize off-the-shelf, commercially available configurations of hardware and software modules. The CONTRACTOR shall provide all installation, all labor and all engineering required to assure the proper installation and operation of the entire PLCS. The CONTRACTOR shall be responsible for providing and installing a complete and functional system, fully programmed to meet all the requirements of the Contract Documents.

The work, equipment and services shall include but not be limited to:

- 1. Preparation of PLCS hardware and software shop drawing submittals for ENGINEER approval.
- 2. Procurement of all hardware and software required to conform to these specifications.
- 3. Installing a complete and operational PLCS network, as outlined in the System Architecture Diagram and specified herein.

**MANUFACTURER'S PLC-BASED CONTROL SYSTEMS HARDWARE
SECTION 17510**

4. Performing all required PLCS tests, adjustments, and calibrations.
5. Furnishing qualified labor to perform PLCS installation, programming, and start-up.
6. Furnishing qualified certified instructors to provide PLCS instruction and training.
7. Furnishing all required PLCS tools, test equipment, spare parts, supplies, operation and maintenance manuals, programming listings, and reproducible record drawings, as specified herein.
8. Conducting programming workshops to review AWU programming standards and proposed PLC and OIU programming.
9. Furnishing qualified labor to perform PLC program and database development, and PLC communications interface configuration.
10. Furnishing qualified labor to perform OIU display and database development, PLC driver interface configuration and system report generation.
11. The CONTRACTOR shall provide on-loan, any and all PLCS system equipment required for partial start-up of a facility or communication system.
12. The CONTRACTOR shall be responsible for the interface to existing systems and systems furnished by others, including the Top-End SCADA system.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. PLC-based control systems-hardware reference specifications, codes, and standards shall be provided in accordance with Section 17100 - Process Control and Instrumentation Systems.
- B. All programming work shall adhere to the latest AWU programming standards. The following are OWNER's specifications and standards:
 1. 17000 Appendix A1 - PLC Interface Documentation
 2. 17000 Appendix A3 - Packaged System - PLC Programming Criteria

1.03 CONTRACTOR SUBMITTALS

- A. PLCS submittals shall be in accordance with the requirements of Section 17100 - Process Control and Instrumentation Systems.

1.04 SERVICES OF MANUFACTURER'S REPRESENTATIVE

- A. The CONTRACTOR shall provide visits by, and services of, technical field representatives of the PLC and OIU software manufacturer for installation certification, system testing, training, and start-up. All associated costs shall be the

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responsibility of the CONTRACTOR. Reference 17100 - 3.2 for additional Manufacturer's services required.

1.05 STORAGE AND HANDLING

- A. All equipment and materials delivered to the job site shall be stored in a location which shall not interfere with the operations of the CITY's personnel or interfere with construction. Storage and handling shall be performed in a manner which shall afford maximum protection to the equipment and materials. It is the CONTRACTOR's responsibility to assure proper handling and on-site storage.

1.06 SPECIAL WARRANTY REQUIREMENTS

- A. Special warranty requirements shall be in accordance with the applicable requirements of Section 17100-1.3. The following additional warranty requirements apply specifically to the PLCS.
- B. The complete PLCS (and associated software) included herein shall be guaranteed to meet or exceed the design requirements set forth in the Contract Documents.
- C. Equipment, software, and materials which do not achieve design requirements after installation shall be replaced or modified by the CONTRACTOR to attain compliance. All associated costs shall be the responsibility of the CONTRACTOR. Following replacement or modification, the CONTRACTOR shall retest the system and perform any additional procedures needed to place the complete PLCS in satisfactory operation and attain design compliance approval from the ENGINEER.
- D. For instrumentation and equipment furnished by others but installed by the CONTRACTOR, the CONTRACTOR shall warrant the instrument/equipment installation and installation workmanship to be in compliance with the manufacturer requirements and the project requirements. Instrument/equipment failure due to improper installation and/or poor workmanship shall be the repair and/or replacement responsibility of the CONTRACTOR.
- E. The CONTRACTOR warrants/guarantees the satisfactory performance of the equipment and materials under operating conditions for a period of two years after the date of final acceptance of the entire PLCS (i.e., completion of all contractual items including a successful system-wide 14 day performance test as specified in Part 3). In the event that tests and inspections disclose latent defects or failure to meet the specified requirements, the CONTRACTOR upon notification by the ENGINEER shall proceed at once to correct or repair any such defects or non-conformance or to furnish, at the delivery point named in the Contract Documents, such new equipment or parts as may be necessary for conformity to the specified requirements, and shall receive no additional compensation therefore. In the case of any required repairs or other corrective or remedial work covered under warranty, the warranties on all such corrections, repairs, new equipment, or parts shall be extended for an additional 24 months from the date of final acceptance or 12 months from the date of completion of any such corrections, repairs, new equipment, or parts, whichever date is later. The CONTRACTOR shall reimburse the

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CITY for all costs incurred in the removal of the defective material and installation of the replacement.

PART 2 PRODUCTS

2.01 GENERAL

- A. The requirements of Section 17100 apply to this Section.
- B. All materials and all PLCS equipment furnished under this Contract shall be new, free from defects, of first quality, and produced by manufacturers regularly engaged in the manufacture of these products.
- C. Hardware Commonality: Where there is more than one item of similar equipment being furnished all such similar equipment shall be the product of a singular manufacturer.
- D. PLCS Growth Provisions:
 - 1. In addition to satisfying the functional requirements of these specifications, all PLCS equipment and resources including PLC memory requirements, historian, data base, reporting packages, hard disks, magnetic storage devices, etc., shall be provided to accommodate a twofold expansion in the number of I/O points shown on the drawings and/or listed in the appendix.
 - 2. All equipment and resources, including PLC I/O cards and implementation services, shall be provided such that at least 20% project growth can be implemented into the PLCS without any additional cost to the CITY.
 - 3. The I/O points included in the 20% project growth requirement shall be termed "implemented spare I/O". Implemented spare I/O shall be fully wired as if it were active I/O, including any loop isolators, fuses, terminal blocks, relays, etc..
 - 4. The entire PLCS being furnished shall be capable of being modularly expanded to accommodate a twofold increase in process report/display requirements and manual input requirements.

2.02 PLC ENCLOSURES

- A. Each PLC and its corresponding I/O modules, power supply module(s), communication interface device(s) and peripheral equipment, shall be mounted inside suitable enclosures. All I/O wiring from the field to the I/O modules shall be routed within wireways and terminated on terminal blocks in the enclosure.
- B. PLCS enclosures shall be provided in accordance with Section 17200 - Control Panels.

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2.03 HARDWARE

A. Programmable Logic Controllers

1. PLCs

- a. Each programmable logic controller shall consist of central processor, process controller, power supply, memory, input/output, interconnecting cables, and optional items as specified.
- b. Power Supply: Manufacturer: Modicon M340, model BMX CPS 3500, no equal
- c. Central Processor:
 - i) Memory: 4096KB, minimum
 - ii) Ports: 1 Modbus, 1 USB, 1 Ethernet Modbus TCP/IP
 - iii) Accessories: Provide a 16MB Flash memory card as manufactured by the CPU manufacturer
 - iv) Manufacturer: Schneider Electric Modicon M340 BMX P34 2020, no equal.
- d. Discrete Input Module: Manufacturer: Schneider Electric Modicon M340 model BMX DAI 1604, no equal
- e. Discrete Output Module: Manufacturer: Schneider Electric Modicon M340 model BMX DRA 0805, no equal
- f. Analog Input Module: Manufacturer: Schneider Electric Modicon M340 model BMX AMI 0410, no equal
- g. Analog Output Module: Manufacturer: Schneider Electric Modicon M340 model BMX AMO 0210, no equal
- h. I/O card terminal connectors shall be screw type on each I/O card. CableFast systems shall not be used.
- i. Redundant (2) - Network Option Ethernet (NOE): Manufacturer: Schneider Electric Modicon M340 model BMX NOE 0100, no equal
- j. PLC Rack Manufacturer: Schneider Electric Modicon M340 model BMX XBP 1200, no equal

B. Operator Interface Hardware

1. Where indicated on the System Architecture Diagram, the CONTRACTOR shall install an operator interface unit suitable for use with the Vijeo Designer development software.

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2. The panel-mounted unit shall be equipped with a color, 5.7" display with integrated, analog resistive touch-screen and rated NEMA 12. The units shall be furnished with 1GB of Flash Memory, 32MB of RAM, and a 10/100 Base-T Ethernet port. The operator interface unit shall be as manufactured by Schneider Electric, Magelis XBT-GT 7340.

2.04 PERIPHERAL DEVICES

- A. General: Peripheral devices shall be furnished and installed by the CONTRACTOR as detailed in this section and as shown and/or specified on the System Architecture Diagram.
- B. Firmware modules, where applicable, shall be of the latest revision. If the specified model has been, or is currently scheduled to be discontinued by the manufacturer, the CONTRACTOR shall furnish (with the approval of the ENGINEER) the manufacturer's recommended replacement model of equal or better functionality, performance, and reliability.
- C. N-Tron 508TX-A Ethernet switches shall be mounted within the MCP as shown on the System Architecture Diagram. Switches shall have a minimum of 8, 10/100 Base-T ports.
- D. Supplied UTP Ethernet plenum cables shall be as manufactured by Annixter Corp. and shall be of quality consistent with Annixter Level 6 installation requirements. Unless indicated otherwise, enclosed Panduit wire management systems shall be used to route exposed network cabling (as applicable).

2.05 SOFTWARE

- A. General: All PLC programming, workstations, communication, and data gathering software shall be provided under provisions of Specifications Section 17520 – PLC Based Control Systems-Software.

2.06 SPARE PARTS

- A. PLC system spare parts shall be provided in accordance with Section 17100 – Process Control and Instrumentation Systems.

PART 3 EXECUTION

3.01 INSTALLATION

- A. The CONTRACTOR shall utilize personnel to accomplish, or supervise the physical installation of all elements, components, accessories, or assemblies which it furnishes.
- B. The CONTRACTOR shall employ installers who are skilled and experienced in the installation and connection of all elements, components, accessories, and assemblies it furnishes.

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- C. All components of the PLCS including all communication cabling and transceivers shall be the installation responsibility of the CONTRACTOR unless specifically noted otherwise. Installation of the communication network shall be the complete installation responsibility of the CONTRACTOR including all transceivers, cables, connectors, terminators, cross-connect boxes, and any required electrical grounds. Grounding shall be shown on submittal drawings. After installation of the PLCS is completed, the installation shall be inspected jointly by the CONTRACTOR and the Equipment Manufacturer's representatives. Any problems shall be corrected, and when both are satisfied with the installation, a written certification of the installation shall be delivered to the ENGINEER. The certification shall state that all PLC communications, I/O modules, transceivers, system grounds, communication networks, and all other components of the PLCS System have been inspected and are installed in accordance with the manufacturer's guidelines.

3.02 FACTORY ACCEPTANCE TEST

- A. General: Prior to the delivery and installation of the PLCS at the job site, but after the procurement, assembly, and configuration of all components, the CONTRACTOR shall conduct a witnessed factory test. The factory test is intended to be a complete PLCS (excluding the Top-End SCADA system). As a minimum, this shall include: the PLC panel including the OIU and network equipment, and with new control displays loaded. The factory test shall demonstrate the functionality of the PLC control program and OIU, prove network communications and verify links to the control screens. The test shall include verification of all PLC units, network communications and I/O points. A complete system checklist shall be maintained during the test for recording results. Testing of the Top-End SCADA interface shall be performed as part of the Commissioning activities.
- B. Test Setup: The complete PLCS system as shown on, or referenced by, the System Architecture Diagram shall be assembled and interconnected on the CONTRACTOR's factory floor (excluding the Top-End SCADA system). The interconnection shall include all communication cable segments to simulate as closely as possible the eventual job site installation. The PLC's, PLC programming terminal, OIU and communication devices shall be loaded with their applicable software packages and configuration programming. PLC input and output modules shall be installed in their assigned housings and wired to field termination points in the enclosures. The CONTRACTOR shall have a current and complete set of wiring diagrams, and a PLC I/O register list available for review throughout the test.
- C. CONTRACTOR shall schedule the factory test after receiving approval of the factory test procedures submittal. The CONTRACTOR shall provide the ENGINEER with written notice of the start and expected duration of the factory test at least 30 days prior to the start of the test.
- D. Test Procedure: The factory test shall be conducted in accordance with the previously submitted and approved test procedures. The test procedures shall include written descriptions of how individual tests shall be performed and shall incorporate testing the following features as a minimum. All testing shall be

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completed in one continuous factory test, which may extend over several continuous days if necessary.

1. Communication: Verify all network components are able to communicate over the control system network using the contract required protocols and mediums. Verify redundant Ethernet communication links with no communication disruption or data loss.
2. Power Failure: External power to each enclosure and workstation shall be cycled in order to test the operation of the UPS units. Backup power time period shall be verified to be in conformance with the project requirements.
3. Redundant Systems: Proper configuration and operation of the redundant panel power supplies shall be confirmed. Failure of the primary power supply should result in no detectable impact on PLC operation.
4. I/O Verification: All I/O terminal point wiring shall be verified for the PLC. The CONTRACTOR shall provide a means of easily introducing a discrete or variable analog signal to all I/O points. Signals shall be verified at the associated PLC register.
5. Control Registers: The availability of PLC registers reserved for new setpoints, control mode selection, data transfer to the HMI and adjustment of control parameters shall be confirmed. The ability to download program changes from the laptop shall also be confirmed.
6. Peripheral Equipment Verification: CONTRACTOR shall demonstrate that all equipment supplied is in proper working order without damage or defect. Setup and installation of all equipment with applicable accessories and appurtenances shall be as approved by the equipment manufacturer.
7. Functional Testing: All system functions shall be tested, including local hardwired control functions, manual operation, and automatic operation. Failure conditions, alarms, and permissives shall all be tested.
8. All components shall be individually inspected to confirm adherence with contract specification documents.
9. Test Report: The CONTRACTOR shall record the results of all factory testing on preapproved test forms which the CITY's and ENGINEER's representatives shall sign. A copy of the completed test forms and a report certifying the results shall be provided to the ENGINEER within 10 days of completing the test.
10. Rework and Retest: If the PLCS does not operate as required, the CONTRACTOR shall make whatever corrections are necessary, and the failed portion of the test shall be repeated. If, in the opinion of the ENGINEER's representative, the changes made by the CONTRACTOR to effect such a correction are sufficient in kind or scope to effect parts of system operation already tested, then the effected parts shall be re-tested also. If a reliable determination of the effect of

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changes made by the CONTRACTOR cannot be made, then the ENGINEER's representative may require that all operations be re-tested.

11. The CONTRACTOR shall bear all of its own costs for the factory test, including any required re-testing.

3.03 FIELD TESTING

A. Testing: Reference Section 17100 Part 3 for testing requirements.

B. Performance Testing

1. Subsequent to start-up (and prior to issuance of Final Acceptance), the CONTRACTOR shall conduct a 72-hour final acceptance test for the entire PLCS system. In the test, the entire PLCS (control equipment and communication subsystem) shall be continuously operated and maintained (i.e., 72-hours continuous, 24 hours per day) during the test period with zero downtime resulting from system failures. If a system failure occurs, the 72 hour day test shall be considered a failure and not acceptable. The CONTRACTOR shall repeat the 72-hour test. The PLCS system shall be acceptable only after all equipment and software has satisfied the performance test requirements.
2. Downtime resulting from the following shall be considered system failures:
 - a. If a component or software failure cannot be repaired/replaced within 4 hours.
 - b. Downtime in excess of 4 hours resulting from any I/O component failure.
 - c. Downtime resulting from concurrent failure of 2 or more I/O components in a single PLC.
 - d. Downtime of any component/peripheral associated with the communication network if the failed component (1) results in disabling or significant retardation of the control system network communications; (2) results in failure of pump station PLC control; (3) results in failure of the OIU operation; (4) results in communications failure to/from the existing SCADA system; and (5) the failed component is not repaired or replaced within 4 hours.
3. The CONTRACTOR shall submit a final performance test completion report which shall state that all contract requirements have been met and which shall include (1) a listing of all PLCS equipment maintenance/repair activities conducted during testing and (2) a listing of all components which were unable to operate successfully. Final acceptance, in writing, of the PLCS system shall be provided by the ENGINEER if the results of all of the performance tests are acceptable.
4. After acceptance of all required performance tests, the CONTRACTOR shall be responsible for furnishing the spare parts/tools on site. All spare parts/tools

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stored on-site shall become the property of the CITY upon completion of the guarantee period. The CONTRACTOR shall guarantee that the completed system shall perform all of the data acquisition/logging, control/monitoring, and trending/reporting functions as shown and specified.

END

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PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. General: The CONTRACTOR through the use of the Manufacturer System Integrator shall furnish, supervise installation, assemble, configure, program, and place into service the PLC-Based Control System, hereafter called the PLCS, specified under this Section and in Section 17510 - PLC-Based Control System Hardware, all in accordance with the requirements of the Contract Documents.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. PLCS software reference specifications, codes, and standards shall be provided in accordance with Section 17100 - Process Control and Instrumentation Systems.
- B. All programming work shall adhere to the latest AWU programming standards. The following are OWNER's specifications and standards:
 - 1. 17000 Appendix A1 - PLC Interface Documentation
 - 2. 17000 Appendix A3 - Packaged System PLC Programming Criteria

1.03 CONTRACTOR SUBMITTALS

- A. Software Submittal: The software submittal shall be a singular all-inclusive submittal which shall include a complete description of the standard application software programs, operating system and utility programs to be furnished, including modifications and explanation of how the specific functional requirement will be met. A cross reference between the specification and the software submittal shall be provided to allow the ENGINEER to clearly identify how each specified section or function is being met by the CONTRACTOR. An index shall be provided that clearly identifies each software package and the computer hardware in which the proposed software is to be installed.
- B. PLC Program Submittal: After all software submittals required herein have been approved by the ENGINEER, the CONTRACTOR shall submit the following items. Submittal approval by the ENGINEER and implementation of these submittals is required prior to the start of system testing (i.e., the PLCS must be operational prior to any process system test).
 - 1. PLC Program Listing in PDF format for ENGINEER'S review subsequent to the Graphics/PLC Meetings specified in this section and 15 days prior to the Manufacturer's Factory Acceptance Test. ENGINEER will provide comments in appropriate hard or soft copy format. The PLC Program shall adhere to the latest PLC Programming Standard provided by the OWNER.
- C. Operator Interface Unit Graphics Submittal: After all software submittals required herein have been approved by the ENGINEER, the CONTRACTOR shall submit the following items. Submittal approval by the ENGINEER and implementation of these

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submittals is required prior to the start of system testing (i.e., the PLCS must be operational prior to any process system test).

1. All Operator Interface Unit (OIU) display submittals (both graphic and trend displays) shall be in full color as they will appear on the OIU in PDF format. This submittal shall be prepared after the requisite Graphics/PLC Meetings specified in this Section and 15 days prior to the Manufacturer's Factory Acceptance Test.
 2. Each display shall be uniquely titled. Locations for process data shall be clearly identified either through the use of simulated data or by showing variables on the displays and providing a reference list describing those variables. All dynamic points shall be identified by tag number as a minimum and their operation shall be described on separate sheets (color change, symbol change, etc.).
- D. Additional Requirements: The following items shall be submitted with the final sets of O&M Manuals.
1. All software specified in this Section.
 2. All program manuals supplied by the CONTRACTOR(s) with the standard software packages.
 3. All original program discs and/or CDs supplied by the CONTRACTOR(s) with the standard software packages, including any program revisions or updates issued by the CONTRACTOR(s) during the construction period.
 4. All PLC program and OIU configuration program files stored on labeled compact disks. The PLC program and OIU configuration file disks shall also be updated as required if any changes or corrections are required in the programming prior to project completion.
 5. A change of ownership registration form for each standard software package supplied under this project to allow the CITY to register the software with the CONTRACTOR.

1.04 CONTRACTOR'S REPRESENTATIVE

- A. PLCS software CONTRACTOR's representative services shall be provided in accordance with Section 17510.

PART 2 - PRODUCTS

2.01 GENERAL

- A. This Section covers the furnishing of standard and customized software fully installed and configured in the control system specified herein. It is the intent of this Specification to have the CONTRACTOR furnish the latest generation, standard, field proven, fully debugged and supported PLC software package for this application with a minimum of additions or changes. Customized or specially written software shall be furnished if required to meet all of the functional requirements specified herein.

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Any custom applications software required shall be fully integrated into the basic software and shall not require unique command structures. No attempt has been made to list all software or list all characteristics of software required by the instrumentation supplier to meet the functional requirements specified herein.

1. Software specified herein is described in broad, functional categories. The instrumentation supplier shall furnish a complete software package including the functional requirements specified herein along with whatever additional software is required for proper and efficient operation of the PLCS System.
2. The software package shall provide a system capable of controlling system level activities and a higher level process control language allowing the operator to monitor and control the process through an interactive human interface. The software environment shall support a multi-programming atmosphere allowing concurrent execution of more than one program in a background/foreground mode or multi-tasking mode.
3. Throughout the execution of all software modules, the operator shall be presented with all of the command or operation choices available at that point in the program using sufficient verbiage or symbols to make the choices self-explanatory and unambiguous. Question and answer or fill-in-the-blank requests shall only be permitted where file names, tag names, or other unique text or numerical information is required.

2.02 HARDWARE

- A. General: All PLCs, remote I/O systems, OIU, communication equipment, etc., shall be provided under provisions of Specifications Section 17510.

2.03 PLC SOFTWARE

- A. PLC Programming Software: All PLC programming shall be accomplished using a standard IEC-61131-3 compliant software package developed for this purpose. The PLC programming software shall be compatible with Microsoft Windows XP Professional Service Pack 3 and Windows 7.

1. The PLC programming software shall be Schneider Electric, Modicon Unity Pro XL.

2.04 OPERATOR INTERFACE UNIT (OIU) SOFTWARE

- A. Complete software packages shall be supplied. The software package shall be a standard commercially available product capable of configuring, designing and animating screens on the OIU. The CONTRACTOR shall be responsible for supplying sufficient development, configuration, run time packages, and PLC driver packages, to meet all PLC requirements. OIU configuration software shall be Scheider Electric Vijeo Designer.

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2.05 OPERATION SYSTEM AND APPLICATION SOFTWARE

- A. In an attempt to address possible version compatibility problems, the version of each software package to be provided shall be reviewed during the Pre-submittal Conference and confirmed during the CONTRACTOR'S software submittal review process.

2.06 VIDEO TRAINING

- A. Not required.

2.07 OIU GRAPHICS AND PLC PROGRAM GENERATION

- A. It is the responsibility of the MANUFACTURER to design, configure, and test the OIU graphic displays and PLC program required for this project. All of this work shall take into account the specific needs of the end user. To facilitate this work, the CONTRACTOR shall conduct the following meetings with the OWNER.

- B. Graphics/PLC Meeting No. 1

- 1. The CONTRACTOR shall chair and develop an agenda for a meeting which shall address the basic criteria to be adhered to in the configuration and development of OIU graphic displays and PLC programming. At this meeting, the CONTRACTOR shall distribute sample display formats for illustration purposes. As a minimum, this meeting shall address the following issues:

- a. OIU Graphic Displays

- i) All facility conventions for identifying tag names and descriptors.
- ii) Organization of the systems universal display hierarchy.
- iii) Paging schemes to be used to enable the movement from one display to another.
- iv) An itemization of the type of display to be used at each level in the graphic hierarchy (e.g., pre-formatted displays, templates, custom graphics, etc.).
- v) All facility color conventions to be employed on all graphics for the annotation of various status information, differentiation between alarms on the basis of alarm priority, background colors, static field colorization and dynamic field colorization.
- vi) The utilization of blinking and conditional text.
- vii) Definition of graphic symbolism to be used on the project. This listing shall include but not be limited to symbols to be used for process instrumentation, process equipment, piping, vessels and valves. All symbolism must be specific as opposed to generic in that shapes must define both function and type (e.g., specific symbols for each valve design, each pump design, each type of flow meter, etc.). If the CONTRACTOR's library of shapes does not adequately describe the equipment conditions, the CONTRACTOR shall develop additional shapes

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to meet the plant's requirements. Symbols should match existing top-end system objects in shape, color, and function to the degree possible.

- viii) Definition of all display select commands that enable the operator to move within the display hierarchy.
 - ix) The utilization of cursor movement commands which enable the operator to move within a display.
 - x) Definition of control input commands which enable the operator to interact with faceplate control stations and custom graphic displays to implement control outputs/functions.
 - xi) Definition of data input commands which enable the operator to enter numeric values into the PLC system.
 - xii) Definition of the utilization of "poke" points or fields which are dynamically sensitive to operator inputs to facilitate operator entry directly into graphic displays.
 - xiii) Security login/logout.
- b. PLC Programming
- i) Review OWNER's PLC programming standard with owner.
 - ii) Definition of data exchange with other PLCs and with top-end SCADA system.
2. Subsequent to the adjournment of Graphics/PLC Meeting No. 1, the CONTRACTOR shall prepare and formalize a document titled "GRAPHICS CRITERIA" that shall contain detailed meeting minutes and a definition of all PLC and graphic guidelines to be adhered to. This report shall be supplemented by graphic examples which illustrate the incorporation and application of each graphic criteria, and associated PLC programs. The report shall be submitted within 30 calendar days of the meeting's adjournment.

C. Graphics/PLC Meeting No. 2

- 1. Subsequent to the finalization of the overall system-wide graphics and PLC program criteria, the CONTRACTOR shall develop the project OIU graphics and demonstrate the graphics on a live running OIU during Graphics/PLC Meeting No. 2. Graphics/PLC Meeting No. 2 shall include the following:
 - a. A review of the graphic package and PLC program for content and completeness.
 - b. A review of all data fields that display automatically updated process information.
 - c. A review of all required input commands associated with the graphic access and control manipulation.
- 2. Subsequent to the adjournment of Graphics/PLC Meeting No. 2, the CONTRACTOR shall prepare a formalized submittal of the graphic/PLC package

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for review along with the detailed meeting minutes. The report shall be submitted within 30 calendar days of the meetings' adjournment.

- D. The CONTRACTOR shall allow 8 hours for Graphics/PLC Meeting No. 1 and 4 hours for Graphics Meeting No. 2.
- E. Reference Appendix A for an excerpt of AWU PLC Programming Criteria and PLC Interface Documentation.

2.08 SOFTWARE LICENSE AND REGISTRATION

- A. All software provided shall be installed and used within the terms of the software contractor's license agreement. All software purchased by the CONTRACTOR shall be registered to the OWNER. Between original software purchase and substantial completion, the CONTRACTOR shall be responsible for providing and incorporating minor software package updates issued by the software contractor. For example, if Version 3.1 of a program is purchased, and Version 3.2 and 3.3 are released prior to project completion, the CONTRACTOR shall be responsible for incorporating these later versions into the final project. The CONTRACTOR would not be responsible for incorporating major software revisions such as the release of a Version 4.0 or 4.1.

2.09 FACTORY TEST

- A. General: The PLCS software factory test shall be provided in accordance with Section 17510.

PART 3 - EXECUTION

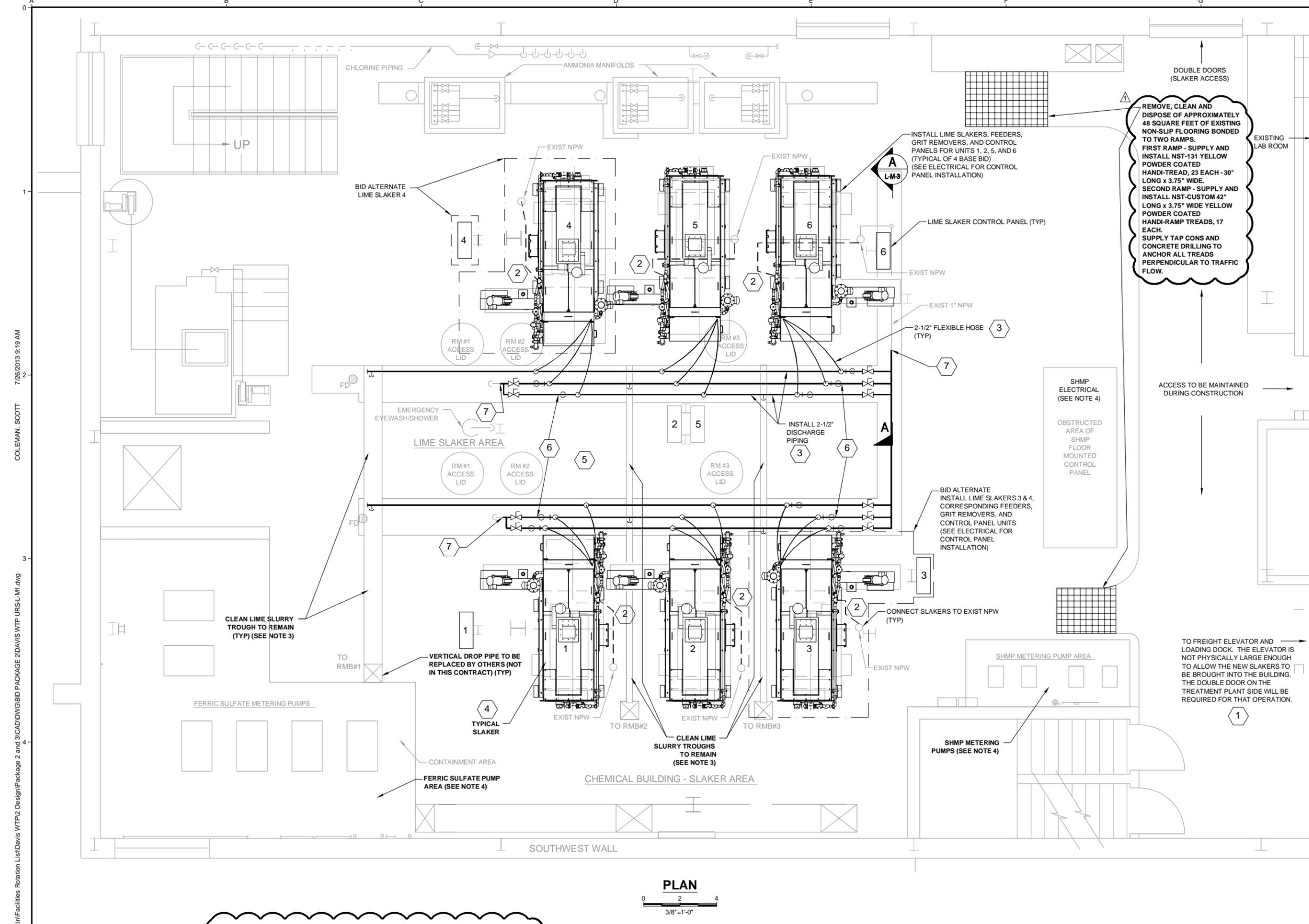
3.01 INSTALLATION AND CONFIGURATION

- A. The PLCS software installation shall be provided in accordance with Section 17510.

3.02 PROGRAMMING, TESTING, AND INSTRUCTION

- A. General: The PLCS software calibration, testing, and instruction shall be provided in accordance with Section 17510 - PLC-Based Control Systems-Hardware.

END



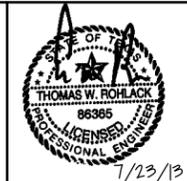
- GENERAL REQUIREMENTS**
1. TO MAINTAIN PLANT OPERATIONS AND SUFFICIENT REDUNDANCY, THE CONTRACTOR SHALL LIMIT DEMOLITION AND REPLACEMENT ACTIVITIES TO NO MORE THAN TWO (2) SLAKERS SYSTEMS, INCLUDING PIPING, ELECTRICAL AND ALL SUPPORT EQUIPMENT SO THAT FOUR SLAKERS ARE AVAILABLE DURING THE WINTER MONTHS OF NOVEMBER 1ST THROUGH MAY 1ST. BETWEEN MAY 1ST AND OCTOBER 31ST ONLY ONE SLAKER SYSTEM CAN BE OUT OF SERVICE AT ANY TIME.
 2. THE REPLACEMENT OF THE SIX (6) ROTARY VALVES & VIBRATORS ON THE LIME SILOS WILL REQUIRE COORDINATION WITH THE OWNER TO DEplete THE LIME STORED IN EACH SILO PRIOR TO THE REPLACEMENT OF ANY OF THE THREE (3) VALVES MOUNTED TO EACH SILO. THE WILL REQUIRE TAKING THREE (3) SLAKERS OUT OF SERVICE SIMULTANEOUSLY WHILE REPLACING THE VALVES ON EACH SILO. THE REPLACEMENT OF THESE VALVES/VIBRATORS SHALL BE RESTRICTED TO THE LOW WATER USE PERIOD FROM JANUARY THROUGH MARCH. THE ALLOWABLE DURATION THAT THREE (3) SLAKERS CAN BE OUT OF SERVICE IS 96 HOURS AFTER WHICH THE SILO SHALL BE READY TO ACCEPT BULK DELIVERY OF LIME.
 3. CONTRACTOR SHALL PROTECT AT ALL TIMES AND MAINTAIN IN SERVICE THE THREE (3) LIME SLURRY TROUGHS CONVEYING LIME SLURRY FROM THE SLAKERS TO THE RAPID MIX BASINS.
 4. THE AREAS IDENTIFIED FOR FERRIC SULFATE AND SHMP METERING PUMPS, AND RELATED ELECTRICAL, WERE STILL UNDER CONSTRUCTION AT THE DATE OF THESE BID DOCUMENT PRODUCTION. THE CONSTRUCTION OF THESE FACILITIES WILL BE COMPLETED PRIOR TO CONSTRUCTION OF THE LIME SLAKER/LIME SLURRY FEED SYSTEM IMPROVEMENTS (THIS CONTRACT) AND THE AREAS INDICATED REPRESENT THE AREA TO BE OCCUPIED BY THE NEW EQUIPMENT. THE CONTRACTOR WILL BE RESPONSIBLE FOR MAINTAINING OPERATION AND PROTECTING IN PLACE ALL EXISTING FACILITIES AT THE TIME OF THIS CONTRACT.

- NOTES:**
- 1 REFER TO DRAWING L-D-1 FOR CHEMICAL BUILDING OVERALL VIEW.
 - 2 CONNECT EXISTING NPW PIPING TO 1-1/2" FNPT OF EACH PROPOSED SLAKER. REPLACE WITH SAME PIPING SIZE AND MATERIAL AS EXISTING (GALVANIZED). CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL FITTINGS AND PIPING NECESSARY FOR A COMPLETE AND OPERATING SYSTEM.
 - 3 REFER TO L-M-3 FOR SLURRY & NPW PIPING REPLACEMENT PLAN AND SECTIONS.
 - 4 REFER TO L-M-2 FOR PROPOSED SLAKER SYSTEM GENERAL DIMENSIONS.
 - 5 REFER TO L-M-4 FOR GRATING AND FLOORING IMPROVEMENTS.
 - 6 RECONNECT NPW TO SLURRY PIPING. SEE L-M-3.
 - 7 RECONNECT PROPOSED TO EXISTING NPW PIPING.

PLAN
0 2 4
3/8"=1'-0"

ADDENDUM #2 - REMOVAL AND REPLACEMENT OF NON-SLIP SURFACE FOR TWO RAMPS. 7/23/13 TWR

SCALES
0 1"
0 25mm
IF THIS BAR IS NOT DIMENSION SHOWN, ADJUST SCALES ACCORDINGLY.

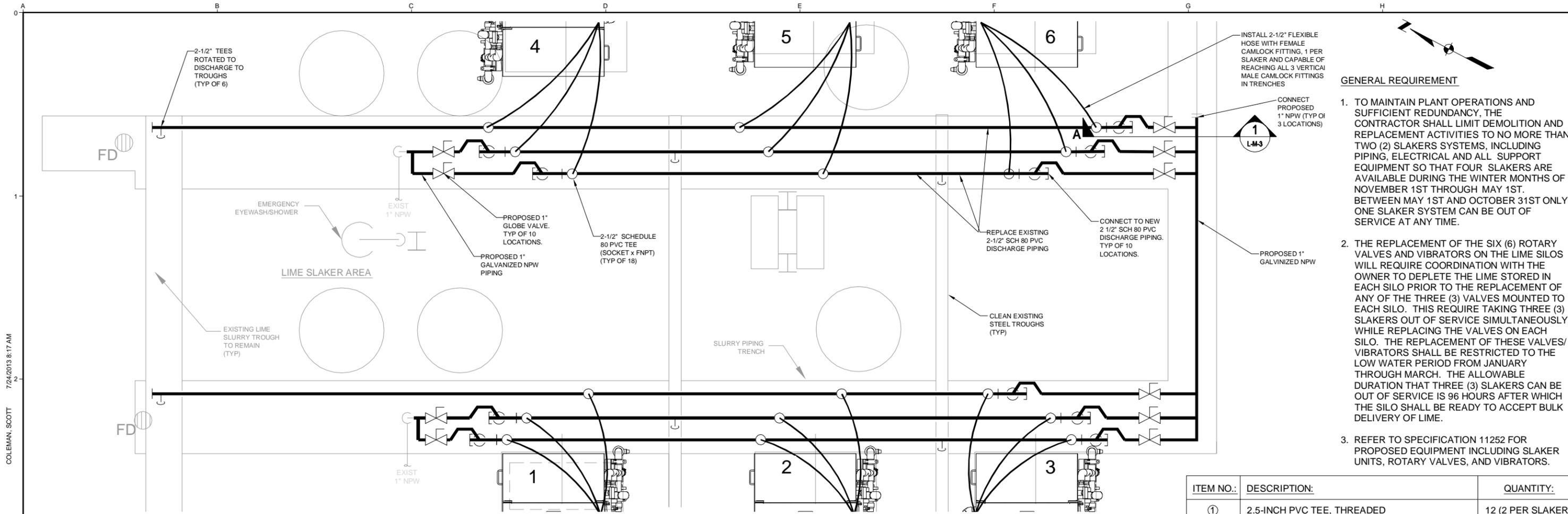


DESIGNED TWR
DRAWN SLS
CHECKED TWR
7/23/13

CITY OF AUSTIN
DAVIS WATER TREATMENT PLANT
CHEMICAL FEED SYSTEM IMPROVEMENT
CIP ID NO. 2015.047
URS CORPORATION
9400 AMBERGLEN BLVD AUSTIN, TEXAS 78729 PHONE: 512-454-4797 FIRM # 3162

BID PACKAGE 2
LIME SLAKER SYSTEM REPLACEMENT PLAN
FILE NAME: DAVIS WTP URS-L-M-1
JOB NO.: 41010824
DATE: JUNE 10, 2013
SHEET 10 OF 38
L-M-1

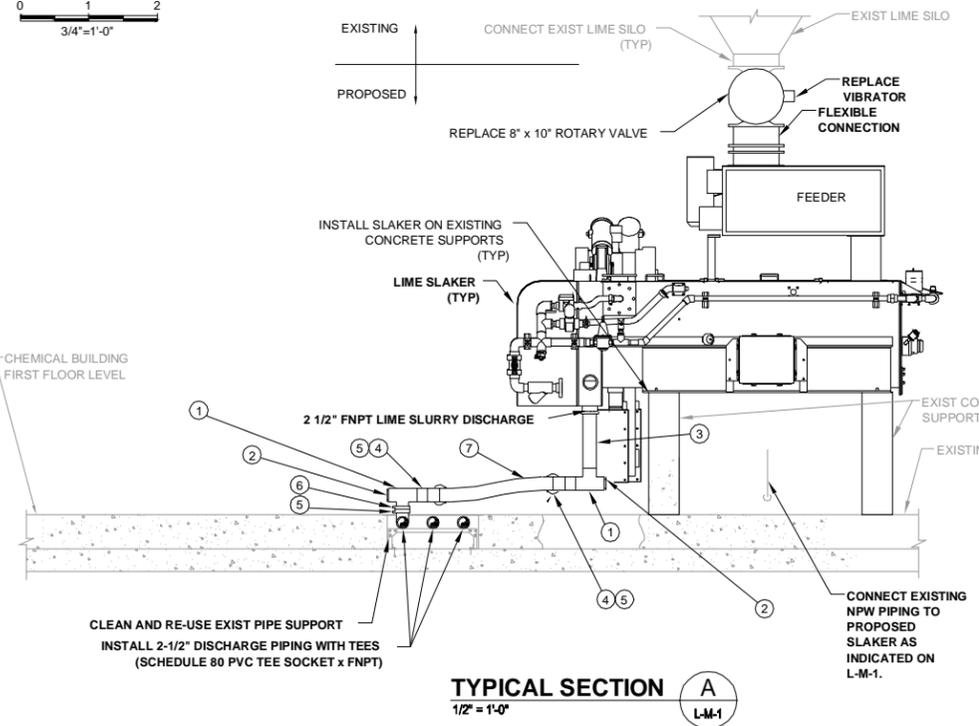
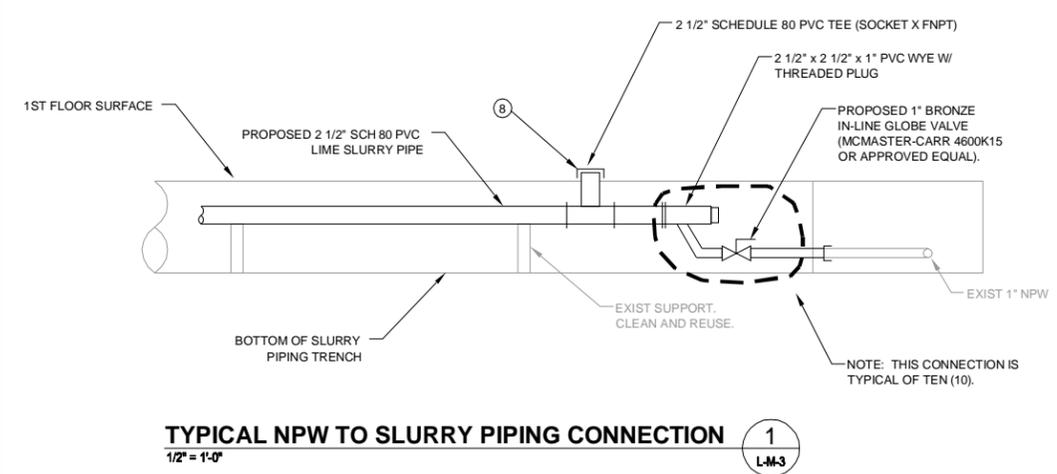
L:\AGE\Projects\WFR\City of Austin\Facilities Rotation List\Davis WTP2 Design Package 2 and 3\CADD\WGBID PACKAGE 2\DAVIS WTP URS-L-M-1.dwg 7/26/2013 9:19 AM COLEMAN, SCOTT



- GENERAL REQUIREMENT**
- TO MAINTAIN PLANT OPERATIONS AND SUFFICIENT REDUNDANCY, THE CONTRACTOR SHALL LIMIT DEMOLITION AND REPLACEMENT ACTIVITIES TO NO MORE THAN TWO (2) SLAKERS SYSTEMS, INCLUDING PIPING, ELECTRICAL AND ALL SUPPORT EQUIPMENT SO THAT FOUR SLAKERS ARE AVAILABLE DURING THE WINTER MONTHS OF NOVEMBER 1ST THROUGH MAY 1ST. BETWEEN MAY 1ST AND OCTOBER 31ST ONLY ONE SLAKER SYSTEM CAN BE OUT OF SERVICE AT ANY TIME.
 - THE REPLACEMENT OF THE SIX (6) ROTARY VALVES AND VIBRATORS ON THE LIME SILOS WILL REQUIRE COORDINATION WITH THE OWNER TO DEplete THE LIME STORED IN EACH SILO PRIOR TO THE REPLACEMENT OF ANY OF THE THREE (3) VALVES MOUNTED TO EACH SILO. THIS REQUIRE TAKING THREE (3) SLAKERS OUT OF SERVICE SIMULTANEOUSLY WHILE REPLACING THE VALVES ON EACH SILO. THE REPLACEMENT OF THESE VALVES/VIBRATORS SHALL BE RESTRICTED TO THE LOW WATER PERIOD FROM JANUARY THROUGH MARCH. THE ALLOWABLE DURATION THAT THREE (3) SLAKERS CAN BE OUT OF SERVICE IS 96 HOURS AFTER WHICH THE SILO SHALL BE READY TO ACCEPT BULK DELIVERY OF LIME.
 - REFER TO SPECIFICATION 11252 FOR PROPOSED EQUIPMENT INCLUDING SLAKER UNITS, ROTARY VALVES, AND VIBRATORS.

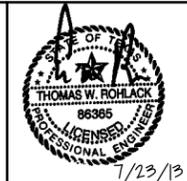
ITEM NO.:	DESCRIPTION:	QUANTITY:
①	2.5-INCH PVC TEE, THREADED	12 (2 PER SLAKER)
②	2.5-INCH PVC THREADED PLUG	12 (2 PER SLAKER)
③	2.5-INCH SCHEDULE 80 PVC, THREADED (FIELD VERIFY LENGTH)	6 (1 PER SLAKER)
④	SOCKETS WITH HOSE BARB CONNECTION, ALUMINUM CAM-AND-GROOVE HOSE COUPLING W/ SS LEVERS, SOCKET C COUPLING, SIZE, 2.5" HOSE ID (MCMASER-CARR 2084T36 OR APPROVED EQUAL)	12 (2 PER SLAKER)
⑤	PLUGS WITH THREADED MALE PIPE CONNECTION ALUMINUM CAM-AND-GROOVE HOSE COUPLING PLUG, F ADAPTER, 2.5" CPLG SIZE, 2.5" MALE NPT (MCMASER-CARR 2084T46 OR APPROVED EQUAL)	24 (4 PER SLAKER)
⑥	SOCKETS WITH THREADED MALE PIPE CONNECTION ALUMINUM CAM-AND-GROOVE HOSE COUPLING SS LEVERS, SCT B COUPLING SIZE, 2.5" NPT (MCMASER-CARR 2084T16 OR APPROVED EQUAL)	1 PER SLAKER
⑦	ABRASION-RESISTANT GUM RUBBER TUBING 2-1/2" ID, 3" OD, 1/4" WALL THICK, TAN (MCMASER-CARR 5546K39 OR APPROVED EQUAL)	6 (1 PER SLAKER) x APPROX. 4 FEET LONG (CONTRACTOR CUT TO FIT)
⑧	CAPS WITH LOCKING LEVERS, ALUMINUM CAM-AND-GROOVE HOSE COUPLING W/ SS LEVERS, 2.5" COUPLING SIZE (MCMASER-CARR 2084T86 OR APPROVED EQUAL)	12

PLAN
0 1 2
3/4"=1'-0"



NO.	REVISION	DATE	BY
1	ADDENDUM #2 - MODIFIED HOSE COUPLING EQUIPMENT FROM SS TO ALUMINUM	7/23/13	TWR

SCALES
0 1"
0 25mm
IF THIS BAR IS NOT DIMENSION SHOWN, ADJUST SCALES ACCORDINGLY.



DESIGNED
TWR

DRAWN
SLS

CHECKED
TWR

CITY OF AUSTIN
DAVIS WATER TREATMENT PLANT
CHEMICAL FEED SYSTEM IMPROVEMENT
CIP ID NO. 2015.047

URS CORPORATION
9400 AMBERGLEN BLVD AUSTIN, TEXAS 78729 PHONE: 512-454-4797 FIRM # 3162

**BID PACKAGE 2
LIME SLURRY PIPING SYSTEM
REPLACEMENT PLAN**

FILE NAME
DAVIS WTP URS-L-M3

JOB NO.
41010824

DATE
JUNE 10, 2013

SHEET 12 OF 38
L-M-3

L:\AGE\Projects\INF\City of Austin\Facilities Relocation List\Davis WTP\2 Design\Package 2 and 3\CADD\DWG\BID PACKAGE 2\DAVIS WTP URS-L-M3.dwg
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COLEMAN, SCOTT