

Document 00910

ADDENDUM NO. 1

Date of Addendum: 12/11/15

PROJECT NAME: East Water Purification Plant – Chemical Feed Systems
Improvements – Bid Package 3 – Plant 1-2 Improvements

PROJECT NO: WBS No. S-000056-0071-4

BID DATE: 12/17/2015 (There is no change to the Bid Date.)

FROM: J. Timothy Lincoln , P.E., City Engineer
City of Houston, Department of Public Works and Engineering
611 Walker Street
Houston, Texas 77002

JML Attn: John Msigwa, P.E., Project Manager

TO: Prospective Bidders

This Addendum forms a part of the Bidding Documents and will be incorporated into the Contract documents, as applicable. Insofar as the original Project Manual and Drawings are inconsistent, this Addendum governs.

Time of day and place for submittal of bid remains the same.

This Addendum uses the change page method: remove and replace or add pages, or Drawing sheets, as directed in the change instructions below. Change bars (|) are provided in the outside margins of pages from the Project Manual to indicate where changes have been made; no change bars are provided in added Sections. Reissued Drawing Sheets show the Addendum number in the title block and changes in the Drawing are noted by a revision mark and enclosed in a revision cloud.



CHANGES TO PROJECT MANUAL

INTRODUCTORY INFORMATION

There are no changes to the Introductory Information

BIDDING REQUIREMENTS

There are no changes to the Bidding Requirements in this Addendum.

CONTRACT FORMS

There are no changes to the Contract Forms in this Addendum.

CONDITIONS OF THE CONTRACT

There are no changes to the Conditions of the Contract in this Addendum.

SPECIFICATIONS

1. Section 11063 – PUMPING EQUIPMENT: SELF-PRIMING CENTRIFUGAL PUMPS: Remove Page 11063-3 and replace with attached, revised Page 11063-3.
2. Section 11080 – PUMPING EQUIPMENT: HOSE PUMPS. Remove pages 11080-3 through 11080-10 and replace with attached, revised Pages 11080-3 through 11080-10.
3. Section 11320 – DOUBLE DISC POSITIVE DISPLACEMENT PUMPS: Remove pages 11320-1 through 11320-16 and replace with the attached, revised Pages 11320-1 through 11320-16.
4. Section 13202 – STAINLESS STEEL CHEMMICAL STORAGE TANKS: Remove pages 13202-1 through 13202-8 and replace with the attached, revised Pages 13202-1 through 13202-8.
5. Section 13210 – CHEMICAL STORAGE TANK TESTING & INSPECTION: Remove pages 13210-4 through 13210-10 and replace with the attached, revised Pages 13210-4 through 13210-10.
6. Section 15114 – MISCELLANEOUS VALVES: Remove pages 15114-13 through 15114-14 and replace with the attached, revised Pages 15114-13 through 15114-16.

CHANGES TO DRAWINGS

1. Sheet 00 G-2 (Sheet 2 of 235). Delete this sheet in its entirety and replace with the attached Sheet 00 G-2.
2. Sheet 27 E-4 (Sheet 198 of 235). Delete this sheet in its entirety and replace with the attached Sheet 27 E-4.
3. Sheet 27 E-5 (Sheet 199 of 235). Delete this sheet in its entirety and replace with the attached Sheet 27 E-5.
4. Sheet 70 D-01 (Sheet 228 of 235). Delete this sheet in its entirety and replace with the attached Sheet 70 D-01.
5. Sheet 70 D-02 (Sheet 229 of 235). Delete this sheet in its entirety and replace with the attached Sheet 70 D-02.

END OF ADDENDUM NO. 1




Ravi Kaleyatodi, P.E., CPM
Senior Assistant Director
Department of Public Works and Engineering


Date

END OF DOCUMENT

2.03 EQUIPMENT

A. Performance and Configuration Requirements:

1. Performance Requirements

- a. Pump shall be designed for a hydrated lime slurry with a specific gravity of 1.33, a viscosity of 3,000 centipoise, and solids concentration of 35%.

2. Design Requirements:

- a. Pump tag numbers: O-UP-2051, O-UP-2052
- b. Design flow: 150 gpm
- c. Design Total Dynamic Head (TDH): 40 FT
- d. Design pump efficiency: 45 %
- e. Shutoff condition: 0 gpm at 45 FT TDH
- f. Maximum pump speed: 2100 rpm
- g. Nameplate driver horsepower: 20
- h. Drive type: Constant speed
- i. Drive configuration: Vertical V-belt drive
- j. Minimum solids passage: 3 IN
- k. Suction nozzle size: 4 IN DIA minimum
- l. Discharge nozzle size: 4 IN DIA minimum.
- m. Total dynamic suction lift: -2 FT
- n. Net positive suction head available (NPSH_A): 32 FT

2.04 ACCESSORIES

- A. Provide mechanical shaft seal. Shaft seal faces shall be tungsten titanium carbide. Seal shall run in an oil chamber.
- B. Provide one automatic air release valve and vertical v-belt steel base for each pump.

- a. Watson-Marlow/Bredel
 - b. ProMinent DulcoFlex DFC/DFD Series
 - c. Periflo
 - d. Verderflex
2. Pulsation dampeners:
- a. Blacoh.
 - b. Approved equal.
3. Pressure gauges:
- a. Ashcroft Series 1079
 - b. Approved equal
4. Diaphragm seals:
- a. Red Valve.
 - b. Approved equal.
5. Calibration columns.
- a. Griffco Industries.
 - b. Primary Fluids.
 - c. Approved equal.
6. Pressure relief and back pressure valves.
- a. Plast-O-Matic, Inc
 - b. Primary Fluids
 - c. Approved equal

B. Submit requests for substation in accordance with Specification Section 01630.

2.02 MATERIALS

A. Hose Pump:

1. Pump body: Cast iron, ASTM A48, Class 25 or 40.
2. Pump Cover: ASTM A245 GR 36 carbon steel; Plexiglas inspection window.
3. Integral bearing: Steel, minimum 125,000 psi yield strength.
4. Shaft: Steel SAE 1045, minimum 125,000 psi yield strength.
5. Rotor Assembly:
 - a. Rotor: Cast iron, ASTM A48, Class 25 or 40.
 - b. Shoe: Polished aluminum.
 - c. Shims: Type 316 stainless steel.
6. Connections:
 - a. Flanges: Type 316 stainless steel
 - b. Flange brackets: Type 316 stainless steel
 - c. Wetted inserts: polypropylene
7. Hose:
 - a. Outer layer as recommended by pump supplier for each chemical of service
 - b. Natural rubber inner wetted layer; verify wetter layer is compatible with pumped liquid.
 - c. Burst rating: 660 psi
 - d. 53 – 68 shore durometer.
 - e. Lubricant: food grade glycerin/glycol blend
8. Base: Type 316 stainless steel.

2.03 EQUIPMENT

A. Performance and Configuration Requirements:

1. Pump Tag Numbers: O-MP-01, O-MP-02, O-MP-03, and O-MP-04 (Recirculation Pumps).

- a. Fluid service: 35% Lime Slurry
 - b. Number of pumps: 4
 - c. Maximum capacity: 68 gpm
 - d. Minimum turndown ratio: 100:1
 - e. Minimum pump discharge pressure: 100 psig
 - f. Maximum pump speed: 30 rpm
 - g. Drive type: Constant speed
 - h. Nameplate driver maximum horsepower 15 hp.
 - i. Power supply: 480V, 3 phase, 60 Hz
 - j. Inner Diameter pump Hose size: As required by pump supplier.
 - 1) Model Numbers:
 - a) Watson-Marlow Bredel 80
 - b) ProMinent DulcoFlex DFD 100
 - c) Periflo
 - d) Verderflex VF 80
2. Pump Tag Numbers: I-FD-01, I-FD-02, I-FD-03, I-FD-04, I-FD-05, I-FD-06, and I-FD-07 (Feed Pumps).
- a. Fluid service: 35% Lime Slurry
 - b. Number of pumps: 7
 - c. Maximum capacity: 1.33 gpm
 - d. Minimum turndown ratio: 100:1
 - e. Minimum pump discharge pressure: 100 psig
 - f. Maximum pump speed: 70 rpm
 - g. Drive type: Variable speed
 - h. Nameplate driver maximum horsepower: 1.0 hp

- i. Power supply: 480V, 3 phase, 60 Hz
 - j. Inner Diameter pump hose size: As required by pump supplier.
 - k. Model Numbers:
 - a) Watson-Marlow Bredel 20
 - b) ProMinent DulcoFlex DFC 30
 - c) Periflo
 - d) Verderflex Dura15
3. Pump Tag Numbers: D-FD-01, D-FD-02, D-FD-03. D-FD-04, D-FD-05, and D-FD-06 (Feed Pumps).
- a. Fluid service: 12% PAC Slurry
 - b. Number of pumps: 6
 - c. Maximum capacity: 6 gpm
 - d. Minimum turndown ratio: 100:1
 - e. Minimum pump discharge pressure: 100 psig
 - f. Maximum pump speed: 120 rpm
 - g. Drive type: Variable speed
 - h. Nameplate driver maximum horsepower: 1.5 hp
 - i. Power supply: 480V, 3 phase, 60 Hz
 - j. Inner Diameter pump hose size: As required by pump supplier.
 - k. Model Numbers:
 - a) Watson-Marlow SPX 32
 - b) ProMinent DulcoFlex DFC
 - c) Periflo
 - d) Verderflex DURA 35

2.04 FABRICATION

A. General

1. Capable of operation in either direction without flow variation.
2. Intermittent operation.
3. Capable of running dry without damage to pump or hose.
4. Capable of pulling 95% of full vacuum.
5. Repeatability within 1 percent accuracy.
6. Provide pump head housing capable of rotation in 90-degree increments.
7. Valveless/glandless with no dynamic seals in contact with the pump product.

B. Rotor Assembly

1. Shoes shall have the ability to shim for compression adjustment.
2. Mount Shoes 180 degrees apart.
3. Shoes must be adjustable without removing housing cover or housing.
4. Hose must be replaceable without removing pump from installed position.
5. Fill approximately 50 percent of the pump housing with specified lubricant blend to provide cooling and lubrication.

C. Bearings:

1. Use antifriction type, minimum ABMA B-10 life of 40,000 hours at maximum operating speed and pressure.

2.05 CONTROL PANELS

A. General

1. Provide a control panel for each group of hose pumps as shown on the Drawings. One common panel shall be provided for each group of pumps as follows:
 - a. Pumps I-FD-05, -06, and -07
 - b. Pumps I-FD-01, -02, -03, and -04

- c. Pumps O-MP-01 and O-MP-02
 - d. Pumps O-MP-03 and O-MP-04
 - e. Pumps D-FD-1, -2, and -3
 - f. Pumps D-FD-4, -5, and -6
2. Panels shall be suitable for a 480 VAC, 60 Hz, 3 phase power supply. Panel enclosure shall be NEMA 4X rated, constructed of Type 316 stainless steel. Provide control power 480 VAC to 120 VAC transformer.
 3. Panels shall house the variable frequency drive (VFD) for the pump. Provide door mounted main power disconnect.
 4. In addition to the requirements specified herein, panel construction shall meet the requirements of Division 13 and 16.
- B. Door Mounted Pushbuttons and Controls
1. Provide the following door mounted controls and pushbuttons:
 - a. VFD pushbutton control pad (speed control).
 - b. Control power ON/OFF selector switch.
 - c. Control power ON white indicator light.
 - d. Pump Hand-Off-Auto (H-O-A) selector switch.
 - e. Pump RUN green indicator light.
 - f. Pump STOP red indicator light.
 - g. Pump IN AUTO white indicator light.
 - h. Pump emergency stop pushbutton.
 - i. Pump hose leak alarm amber indicator light.
 - j. Pump drive failure amber alarm indicator.
 - k. Pump high discharge pressure amber alarm indicator.
 - l. Pump run elapsed time meter.
- C. Panels shall be provided with the following remote dry contact outputs for communication with the plant SCADA system:

1. Pump failure.
2. Pump running.
3. Pump VFD fault.
4. Pump high pressure.
5. Pump hose leak.
6. Pump in hand.

D. Panels shall be provided with a 4 to 20 mA output signal proportional to pump speed. Panel shall be provided with a 4 to 20 mA input signal capability to receive a remote, flow proportional pump speed setpoint.

E. Pumps shall shut-down in the event of a hose leak or high discharge pressure alarm in either HAND or AUTO mode.

2.06 ACCESSORIES

A. Provide the following accessories for each pump:

1. Provide leak detection system to detect hose failure.
2. If required, provide pulsation dampeners with isolation valve sized for pump capacity and medium pumped.
3. Provide pressure gauge and high pressure switch with annular diaphragm seal for installation on the discharge piping of each pump. Seals shall be Red Valve Series 40W or equal by Onyx. Seal fill liquid shall be selected by the seal supplier and shall be compatible with the pumped medium. Gauges and switches shall be as specified in Section 13315.

2.07 SOURCE QUALITY CONTROL

A. Perform manufacturer's standard factory pump test. Supply documentation of test.

2.08 MAINTENANCE MATERIALS

- A. Supply additional hose or tubing (either individual lengths or one roll) for changing the hose or tubing in each pump provided at least 2 times.
- B. Provide on spare of any other materials or parts that require replacement more than once every 2 years under normal operating conditions.

2.09 FINISH PAINTING

- A. Manufacturer shall provide factory prime and finish paint system for all surfaces scheduled for painting. System shall be manufacturer's standard system, compatible with and resistant to the chemicals of service specified herein.
- B. Stainless steel, aluminum, packing glands, flexible connectors, and mechanical mating and bearing surfaces shall not be primed or painted.

PART 3: EXECUTION

3.01 INSTALLATION

- A. Comply with requirements of Section 11005 and 11060.

3.02 FIELD QUALITY CONTROL

- A. Provide Manufacturer's Field Services as defined in Specification Section 01665 to provide the following.
 - 1. Inspection, checking, and adjustment as required for equipment to function as warranted by manufacturer and necessary to provide written approval of installation.
 - 2. Revisiting the site as required to correct problems and until installation and operation are acceptable to Owner.
 - 3. Assistance during Demonstration Period functional and performance testing and until product acceptance by the Owner.

B. VENDOR TRAINING

- 1. See Section 01735 for vendor training requirements.

END OF SECTION

Section 11320

DOUBLE DISC POSITIVE DISPLACEMENT PUMPS

PART 1 G E N E R A L

1.01 SECTION INCLUDES

- A. Double Disc Positive displacement pumps complete and operational with motors, 304SS side motor mount pump frame, control equipment, and accessories as shown and specified.
- B. Pumps shall be complete pump units consisting of pump, v-belt drive arrangement, motor, and all appurtenances completely assembled on a fabricated steel base and shall conform to the pump requirement described herein.
- C. Coordination:
 - 1. Review installation procedures under other Sections and coordinate with the Work related to this Section.
 - 2. Coordinate pumps, piping, valves, pipe supports and appurtenances with mechanical work as specified in Division 15, Mechanical.
 - 3. Coordinate pumps and motors with instrumentation and controls work as specified in Division 13, Special Construction.
 - 4. Coordinate pumps and motors with electrical work as specified in Division 16, Electrical.

1.02 REFERENCES

- A. Reference Standards: Comply as a minimum with applicable provisions and recommendations of the following:
 - 1. American Bearing Manufacturers Association, (ABMA)
 - 2. American National Standards Institute (ANSI)
 - 3. American Society for Testing and Materials (ASTM)
 - 4. Anti-Friction Bearing Manufacturers Association (AFBMA)

5. Hydraulic Institute (HI).
6. Institute of Electrical and Electronic Engineers (IEEE)
7. National Electric Code (NEC)
8. National Electrical Manufacturers Association (NEMA)

1.03 PERFORMANCE REQUIREMENTS

- A. Furnish and install the double disc positive displacement pumps capable of handling water treatment plant thickened backwash sludge in accordance with these Specifications and as shown on the Drawings.
- B. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall equipment assembly by the double disc positive displacement pump manufacturer.
- C. The pump manufacturer shall review and approve or prepare all Shop Drawings and other submittals for all components furnished under this Section.

1.04 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01330 - Submittal Procedures.
- B. Submit a list of not less than 10 installations where pumping equipment of the type and approximate size specified has been in successful operation for at least 5 years.
- C. Submit locations of the nearest permanent service headquarters of the pump and motor manufacturer for the size of pump and motor submitted.
- D. Submit descriptive literature, including a cross-sectional view of each pump and motor combination, which indicates materials of construction, weights, principal dimensions and other important details.
- E. Performance data and curves showing allowable suction lift, flow rate, head, brake horsepower, motor horsepower and speed. Where variable speed units are specified, curves shall have at least five speeds plotted between maximum and minimum rpm.
- F. Setting drawings, templates, and directions for the installation of anchor bolts and other anchorages.

- G. Drawings of control panels, furnished in accordance with the requirements of Section 13410, Instrumentation Control Systems and Field Devices.
 - H. Manufacturer's Certifications:
 - 1. Submit manufacturer's certification that he has carefully examined the Contract Documents in detail, including the arrangement and conditions of proposed electrical, mechanical and structural systems affecting the performance of the pumping equipment units, and the detailed requirements of manufacturing and subsequent installation of the pumping equipment units.
 - 2. Submit manufacturer's certification that there are no omissions, ambiguities or conflicts in the Contract Documents or in the pumping station piping layout that affects the pumping unit, as shown on the Drawings, which have not already been clarified in writing.
 - 3. Submit manufacturer's certification that the running amperes of the motor will not exceed the nameplate rating of the motor under all expected operating conditions.
 - 4. Submit manufacturers certification that spare parts, seals, bearings, o-rings and power cable shall be available locally for models to be supplied.
 - I. Factory Tests: Submit 3 copies of certified test reports to the City Engineer for review.
 - 1. The pump manufacturer shall provide certified test reports for each pump at the specified design condition.
 - 2. Each certified curve shall be sealed by a registered professional engineer.
 - 3. If the certified performance curves do not meet performance specifications, Contractor shall correct deficiencies to provide the specified performance.
 - J. Operation and Maintenance Data: Submit operation and maintenance data under provisions of Section 01782 - Operations and Maintenance Data.
- 1.05 QUALITY ASSURANCE
- A. All materials used shall be new, of high grade, and with properties best suited to the work required.
 - B. Manufacturer's Qualifications:

1. Pumping equipment provided under this Section shall be type and size specified in regular production by manufacturers whose products have proven reliable with not less than 10 installations for at least 5 years in similar service.
2. Manufacturer shall satisfy the City Engineer that it is capable of the following:
 - a. Providing local factory trained personnel to service the pumps and allied equipment when needed within a 48 hour period.
 - b. Providing all needed spare parts for the pumps within a 48-hour period.
3. Provide a written manufacturer's certification that spare parts, trunnion seals, bearings, disks, o-rings and power cable shall be available locally in the State of Texas for models to be supplied.

C. Coordination Responsibility

1. In order to ensure equipment compatibility, one manufacturer shall be responsible for providing all double disc positive displacement pumping equipment, including pump and motor, access frame and guides.
2. The Contractor shall name a pump manufacturer, who will have responsibility for the function of the complete system in accordance with the intent of these Specifications. The named manufacturer shall be experienced in similar work.
3. Contractor shall retain overall responsibility for equipment coordination, installation, testing and operation.

D. Substitution. The engineering design is based on a certain manufacturer's equipment. If the Contractor's choice of equipment is approved but requires modifications to plant, equipment or piping for installation, the Contractor is responsible for submitting revised engineering design and drawings to make the proposed equipment compatible with the project, at no additional cost to the City.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver equipment to site, all store and protect equipment under provisions of Section 01610 - Basic Product Requirement.

- B. Store all equipment off the ground in enclosed shelter.
- C. The pump cable end shall be sealed with a high quality protective covering to make it impervious to moisture or water seepage from submersion or other causes prior to electrical installation.

1.07 EVALUATION AND SELECTION

- A. The City reserves the right to select any equipment which is deemed to be in its best interest.

1.08 WARRANTY

- A. Provide warranty under provisions of Section 01770 - Closeout Procedures.
- B. Pump manufacturer shall furnish to the City a warranty written expressly from the manufacturer to the City of Houston, covering workmanship and material for the first of either 5 years or 10,000 hours of operation under normal use and service. The warranty shall cover 100 percent of parts and labor for at least one full year. The warranty period shall commence on the day of initial operation for City's beneficial use. Warranty shall be in printed form and previously published as the manufacturer's Standard Warranty for all similar units manufactured. Pumps repaired under warranty will be returned to the job site freight pre-paid.

1.09 MEASUREMENT AND PAYMENT

- A. No separate payment for materials furnished and installed or work performed under this Section. Include cost in Contract price bid for work of which this is a component.

PART 2 P R O D U C T S

2.01 GENERAL OPERATING REQUIREMENTS

- A. General: Equipment shall be designed to be suitable for the process and service conditions described below and in the Schedule of Service Conditions.

1. Pumps shall be horizontal double disc positive displacement type capable of providing 1.07 gallons per revolution when operating at 60 feet of total dynamic head. The pumps shall be capable of operating dry for an indefinite period of time without damage. The pumps shall be capable of self-priming up to 14 inches of Hg and 25 inches of Hg when fully primed.

B. Schedule of Service Conditions are as follows:

Raw Sludge Pumps

Design Conditions	Pump No. 1	Pump No. 2
Equipment Tag:	1-DDP	2-DDP
Number of Pumps:	1	1
Location:	Plant 3 Raw Sludge Pump Station	
Liquid Pumped:	Raw Sludge	
Solids, (percent):	9	
Suction Head, (ft.):	0-16	0-16
Suction Size, (in.):	6	6
Discharge Size, (in.):	6	6
Speed, (rpm):	200	200
Design Capacity, (gpm):	100	100
Design Head, (ft.):	20	20
Drive:	Single	Single
Motor, (Hp):	15	15
Longest Suction Line (FT)	325	325
Sedimentation Basin Water Surface Elevation (FT)	31	31
New Pump Elevation (FT)	15	15
Length of Discharge Line (FT)	30	30

2.02 ACCEPTABLE MANUFACTURERS

- A. Through shop drawing submittals, the following named manufacturers will be considered, provided the submitted equipment meets the specified requirements and system operating conditions:
 1. Simplex Double Disc Model 6DDSX107 as manufactured by Penn Valley Pump Co., Inc. of Warrington, Pennsylvania
 2. Or Approved Equal.

- B. Listing as an acceptable manufacturer will not relieve the manufacturer from conforming to Contract Specifications.

2.03 PUMP CONSTRUCTION

A. Pump Housing:

1. Each pump shall be a simplex heavy duty, double disc positive displacement type pump with Class 30 Cast Iron Housings with glass lining. Duplex pump arrangements shall not be acceptable.
2. The pump shall consist of three (3) housings horizontally split to allow access to the internal components.
3. The pump shall incorporate a repair-in-place hinged design that allows the pump to be serviced and internal wear parts replaced without removal of the pump from pump base, or the suction and discharge piping.
4. The discharge housing shall contain the mounting lugs and be bolted directly to the mounting frame.
5. The discharge, intermediate and suction housings shall incorporate an integral hinge design that allows the suction and intermediate housings to be lowered and removed. The hinges shall be connected with a quick release ball detent pin allowing for easy pin removal.
6. The suction housing entry port shall be a two (2) piece design allowing for mounting of the suction connection in a 90 degree orientation.
 - a. The suction housing opening shall be a full 6-inch diameter with a minimum opening of 28.26 square inches to minimize debris buildup and blockages.
 - b. The clack valve seating surface shall be machined on the mounting face of the suction housing and integrally mounted to the housing to facilitate access and replacement.
 - c. The clack valve shall be manufactured of neoprene construction with multiple layers of fabric encapsulating a rigid core. The clack valve shall be used as a priming element only and does not affect the pumping operation. Pumps utilizing ball valves or check valves on the suction and discharge side of the pump are not acceptable.

7. Each pump housing shall have a stainless steel nameplate attached with raised lettering indicating the manufacturer's model and serial number, rated capacity, head, speed and all other pertinent data.

B. Flexible Discs:

1. Each pump shall contain two (2) reciprocating flexible discs attached to high tensile aluminum connecting rods driven by a rotating eccentric shaft in a single pumping chamber. Manufacturer's utilizing hard, non-flexible disks are not acceptable.
2. The flexible discs shall be constructed of integral-type, high tensile neoprene with multiple layers of fabric for longevity and strength.
3. Each flexible disc shall be mounted to the connecting rod by a stub shaft constructed of hardened high tensile stainless steel.

C. Pump Seal:

1. Flexible trunnions shall seal the pump fluid chamber only. The flexible trunnion shall not perform as the pumping element. Manufacturers utilizing trunnions and/or diaphragms as pumping elements or seats shall not be acceptable.
2. The trunnion seal shall be constructed of fabric-reinforced neoprene capable of withstanding pressures from 0 to 110 PSI with a maximum operating pressure of 140 feet TDH.

D. Drive Shaft:

1. The drive assembly shall consist of two (2) aluminum modular pedestals designed to provide accurate bearing alignment, superior bearing loading and ease of assembly. Cast or ductile iron pedestals are not acceptable.
2. The drive shaft shall be a maximum 1-15/16" diameter and capable of withstanding a dead head situation.
3. The drive shaft shall be constructed of hardened 400 series high-tensile stainless steel and shall be mounted on four (4) self-aligning, sealed bearings.
4. The eccentric cams shall be constructed of high tensile, cast bronze alloy and shall be pinned to the shaft by spirol drive pins for the

absorption of reciprocating loads generated by the pumping action. Cast or ductile iron eccentric cams that are keyed to the shaft are not acceptable.

5. All drive bearings shall be completely sealed type with no provisions for scheduled grease lubrication.
 6. Belt Drive Assembly:
 - a. The V-belt drive assembly shall consist of a 2 or 3 groove Type B arrangement. The use of a gear reducer/gear motor shall not be acceptable.
 - b. The V-belt pulley ratios shall be sized to provide the specified maximum pump speed and torque generated between the pump and motor.
 7. Drive Assembly Guards and Covers:
 - a. All pumps shall be provided with OSHA approved guards and covers. The V-belt drive guard and pump drive assembly cover shall be manufactured from 304SS material.
- E. Pump Base:
1. Each pump and V-Belt assembly shall be mounted on a common 304SS side motor mount sub base. The use of fabricated steel and supporting pedestal feet are not acceptable.
 2. The base design shall have raised cross-members on the suction and discharge end to allow for complete wash-out and draining without trapping liquid.
 3. The sub base shall be manufactured from 2-1/2" 304SS square tubing and sufficiently gusseted, reinforced, and braced to withstand shock loads and resist wearing or buckling during pump operation. Tubing ends shall be capped with black plastic plugs for neat appearance.
- F. Pulsation Dampeners:
1. Pulsation dampeners shall be standard equipment provided on the suction and discharge lines.

2. Pulsation dampeners shall be 6" ASA 150 lb. flanged units with the main tube 8 inches in diameter, SCH 40 carbon steel pipe, with fully welded end caps.
3. Pulsation dampeners shall be pressure tested to 60 psi for leaks.
4. Each pulsation dampener shall be provided with a 1-inch half coupling located at the top suitable for mounting a vacuum and pressure switch assembly.
5. Each pulsation dampener shall be supplied with a 1 ½" NPT coupling and plug in the bottom to act as a drain/sample port.
6. Bladder type and three-piece assembly pulsation dampeners using connecting rods and gaskets are not acceptable.

G. Vacuum and Pressure Protection

1. The pump manufacturer shall provide vacuum and discharge pressure sensors and switch assemblies to mount on the suction and discharge pulsation dampeners.
2. The pressure sensors shall be a PVP420, Red Valve 42/742, 1-inch NPT isolation pressure sensor with SS316 body and EPDM elastomeric sensing tube.
3. The pressure gauge and switch shall be attached to the pressure sensor with SS316 fittings.
4. The vacuum assembly shall be fitted with 2.5-inch stainless steel 30-inch Hg – 30psi gauge and Ashcroft, or Barksdale adjustable vacuum switch set at 10-inch Hg.
5. The discharge assembly shall be fitted with a 2.5-inch stainless steel 0-60 psi pressure gauge and shall be fitted with Ashcroft, or Barksdale adjustable switch preset at 30 psi.
6. The pressure gauge and switches shall be clean in place type using the process pressure through a SS316 isolation valve mounted to the top of the sensor. The opposite end of the valve shall be fitted with a universal, quick acting coupling, suitable for compressed air to charge the dampener with compressed air.

H. Pump Isolation Valves

1. The pump manufacturer shall provide pump isolation valves.
2. Pump isolation valves shall be TRU-TECH “Series 100” Diaphragm Valve, manufactured by TRU-TECH Valve LLC, Canonsburg, PA.
3. The valve Body shall be unlined, ductile iron or cast iron conforming to ASTM A536, Gr. 65-45-12 or A126 Class B, with flanges drilled per ANSI B16.5 Class 150.
4. The valve body shall be of the compact design, having a face to face dimension conforming to ASME / ANSI B16.10 Class 125 cast iron and Class 150 Cast Steel.
5. The valve diaphragm shall be of fabric reinforced neoprene material with a precision cast metal compressor embedded into the diaphragm during the molding process. The diaphragm shall be attached to the compressor with two bolts to positively prevent pullout under severe vacuum conditions up to 27” of Mercury.
6. The valve shall be of the rising stem type with adjustable limit stops and position indicators to provide visual indication of valve position.
7. The valve shall be geared handwheel operated with the handwheel securely attached to the bushing or stem. The gear operator shall utilize ACME threads capable of providing a minimum of 10,000 cycles at full rated line pressure.
8. A ball, roller type, or Nylon thrust bearing shall be furnished for ease of operation. A grease fitting shall be furnished to lubricate the bearing without disassembling the valve. Valves that require packing shall not be acceptable.
9. The valve shall insure 0% fugitive emissions and all mechanical wear parts shall be removable and replaceable without the removal of the valve body from the piping.
10. The Valve shall be TGIC powder polyester coated on the interior and exterior for maximum corrosion protection.
11. The Valve shall function to provide substantially unobstructed flow in the open position, throttle in the intermediate position and shut off bubble tight in the closed position.

- I. Motor
 1. Motors shall be a totally enclosed fan cooled motor with Class B insulation, with a maximum speed of 1,200 rpm.
 2. Motors shall be suitable for operation on 460 volt, 3 phase 60 Hz power.
 3. The motor shall be adequately sized to withstand the loads during starting and pump operation.
 4. The motor shall be a Baldor, Reliance, WEG, or Toshiba severe duty, premium efficient, inverter ready per NEMA STD MG1 Part 31.4.4.2 with epoxy coated cast iron frame with internal thermal overloads.
 5. Provide space heaters, 120 volt, single phase.
 6. Motor shall have a 1.15 service factor, and shall comply with the latest ANSI, NEMA, ABMA and IEEE Standards as a minimum.
 7. Locked rotor current shall be as specified in NEMA standards.
 8. Motor thrust bearings shall be adequate to carry continuous thrust loads under all conditions of service, and shall have a minimum B-10 life of 100,000 hours.
 9. Motors shall have a stainless steel nameplate which shall provide the following: Type, frame, insulation, class, HP, full load current, RPM, centigrade degree rise, manufacturer's name and serial number, model number, voltage, locked rotor KVA code, bearing numbers and a connection diagram.
 10. Motor terminal boxes shall be oversized to provide adequate space for connections and shall be constructed of cast-iron or fabricated steel, neoprene gasketed and bolted. Motor leads shall be permanently marked in agreement with the connection diagram.
 11. Motor Sensors
 - a. Each pump motor shall be equipped with a minimum of three thermal sensors embedded in the stator windings and wired to the control panel for supplemental motor protection.
 12. Motors shall have built-in thermal overload protection.
 13. Motor Tests and Data.

- a. For each motor from one to ten horsepower in size, furnish an inspection report for the motor or for a previously manufactured electrically duplicate motor which was tested. Provide the following minimum data:
 - (1) Running light current.
 - (2) Locked rotor current.
 - (3) Winding resistance measurement.
 - (4) High potential test.
 - (5) Bearing inspection.
- J. Control Panel
1. Furnish a common control panel for all pumps.
 2. Panel construction shall be NEMA 4X 304SS and shall conform to the applicable requirements of Section 13471, Control Cabinet Enclosures.
 3. Factory test control panel prior to shipment.
 4. Furnish a 480 VAC, 3 phase, 60 Hz power feeder to the control panel. Include a main disconnect and 480 V-120 AC transformer.
 5. Panel shall contain the following for each unit:
 - a. "HAND/OFF/AUTOMATIC" selector switch for pump operation.
 - b. One green pilot light for pump "ON" status.
 - c. One red pilot light for pump "OFF" status.
 - d. Control relays, if required, to implement the control logic described below.
 - e. A main 30A, three pole breaker.
 - f. High discharge and high vacuum alarm lights in amber.

- g. Input line reactor, output load filter.
 - h. Speed dials.
 - i. 1000 BTU Nema 4X Stainless Steel A/C Unit.
 - j. 7-day timer with time relay
 - k. 15 HP Constant Torque Variable Frequency with Analog Output reference.
- 1. Pump Operation.
 - a. In the "HAND" position, the pump will run continuously. In the "AUTOMATIC" position, the pump will be started from a remote control station.

2.04 TOOLS AND SPARE PARTS

- A. Furnish and deliver the following boxed and labeled:
 - 1. Two (2) Universal Disc, Neoprene.
 - 2. Two (2) Trunnion Seals, Neoprene.
 - 3. One (1) Suction Housing Gasket.
 - 4. One (1) Discharge Housing Gasket.
 - 5. One (1) Swan Neck Gasket.
 - 6. One (1) Clack Valve with Gasket and Retaining Screws, Neoprene.
 - 7. One (1) Set of V-Belts.
 - 8. One (1) Disc Removal Tool.
- B. Spare parts shall be packed in sturdy containers with clear indelible identification markings and shall be stored in a dry, warm location until transferred to the OWNER at the conclusion of the Project.

- C. Manufacturer shall furnish a list of additional recommended spare parts for an operating period of one year. The list shall describe each part, the quantity recommended, and the unit price of the part.

2.05 BOLTS, STUDS AND NUTS

- A. All bolts, studs and nuts shall have American National form right-hand machine cut threads which shall be in conformity with the current ANSI B1.1, "Screw Threads", Coarse Thread Series, unless otherwise specified.
- B. Bolt heads and nuts shall be semi-finished and shall be in conformity with ANSI B18.2, "Wrench-Head Bolts and Nuts and Wrench Openings", Heavy Series, unless otherwise specified. All nuts shall be hexagonal in shape.
- C. Anchor bolts, flange bolts, studs and nuts shall be Type 316 stainless steel in conformity with ASTM A276.

2.06 SHOP PAINTING

- A. Pump motor size up to 100 HP.
 - 1. Pump Exterior:
 - a. Pre-treatment.
 - b. Primer. One coat of alkyd resin primer, 1.6 mils minimum.
 - c. Finish. Chloric rubber paint, 2.4 mils minimum.
 - 2. Machine Finished Surfaces:
 - a. Machined parts are cleaned to remove all dirt and grease.
 - b. Cleaning is done so as not to affect primer or deteriorate adherence to finish paint.
 - c. Storage and transport is carried out in such a way that rust attack on machined surfaces does not occur.
 - d. At assembly, surfaces are coated with a corrosion preventive paint.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Installation of the pumping equipment shall conform to the manufacturer's instructions and recommendations and reviewed shop drawings.
- B. Manufacturer's representative shall check and approve the installation prior to operation. Manufacturer's representative shall field test and calibrate the equipment to assure that the system operates to the OWNER'S satisfaction.
- C. Install pumping units on concrete bases and secure with anchor bolts in accordance with the manufacturer's recommendations and as shown. Concrete bases shall be poured up to 1-inch below the metal bases or soleplates. Concrete work and grout are specified in Division 03, Concrete. The base with the equipment mounted thereon, or the soleplate, shall then be accurately shimmed to grade and the spaces between filled with an approved non-shrink grout. After the grout has reached its initial set, exposed edges shall be cut back 1/2-inch and the edges neatly finished with 1 to 2 cement mortar.
- D. Field Tests:
 - 1. All equipment will be given running tests by CONTRACTOR at the job Site following installation of the equipment and controls. Should the tests indicate any malfunction, CONTRACTOR shall make any necessary repairs and adjustments. Such tests and adjustments shall be repeated until, in the opinion of the ENGINEER, the installation is complete and the equipment is functioning properly and accurately, and is ready for permanent operation.
 - 2. A factory trained representative shall be provided for installation supervision, start-up and test services and operation and maintenance personnel training services. The representative shall make a minimum of 2 visits, minimum 8 hours on-Site for each visit, to the Site. The first visit shall be for assistance in the installation of equipment. Subsequent visits shall be for checking the completed installation, start-up and training of the system. Manufacturer's representative shall test operate the system in the presence of the ENGINEER and verify that the equipment conforms to the requirements. Representative shall revisit the Site as often as necessary until all trouble is corrected and the installation is entirely satisfactory
- E. Start-up Data: Contractor shall complete and submit the start-up records and maintenance data sheets.

END OF SECTION

SECTION 13202

STAINLESS STEEL CHEMICAL STORAGE TANKS

PART 1: G E N E R A L

1.01 SUMMARY

A. Section Includes:

1. Stainless steel chemical storage tanks and accessories for the following systems:
 - a. Lime Slurry Bulk Storage Tanks

B. Related Specification Sections include but are not necessary limited to:

1. Division 0 – Bidding Requirements, Contract Forms, and Conditions of the Contract.
2. Division 1 – General Requirements.
3. Sections 09905 – Paint and Protective Coatings
4. Section 11005 – Equipment: Basic Requirements.
5. Section 13315 – Instrumentation and Controls - Products
6. Section 15060 – Pipe and Pipe Fittings: Basic Requirements.
7. Section 15100 – Valves: Basic Requirements.

1.02 QUALITY ASSURANCE

A. Reference Standards

1. API 620 – Design and Construction of Large Welded Low Pressure Storage Tanks.
2. ASTM A193 - Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service.
3. ASTM A194 - Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service.

B. Manufacturer's Qualifications

1. Manufacturer shall be regularly engaged in the manufacturer of bulk storage facilities for not less than 5 years.
2. Structural design shall be performed by a structural engineer registered in the State of Texas.

1.03 SYSTEM DESCRIPTION

- A. The lime slurry bulk storage tanks specified herein and the lime tank mixers specified in Section 11373 shall be coordinated, and supplied by a competent systems integrator. The systems integrator shall be regularly engaged in the business of assembling tanks and mixer systems. The integrator shall be responsible for ensuring that a complete functioning system is supplied and that all required internal tank baffles are located and installed to provide proper tank mixing.

1.04 SUBMITTALS

A. Shop Drawings

1. See Specification Section 01330 and 01340 for requirements for the mechanics and administration of the submittal process, and shop drawings.
 - a. Design data on the tank
 - b. Coating system (interior and exterior) to be used on the tank.
 - c. General arrangement drawings showing arrangement of the fitting and accessories, interfaces with lime slurry mixer and site components, and loads imposed in other site support structures.
 - d. Submit welder's certificate with shop drawings.
 - e. Structural design calculations by a structural engineer registered in the State of Texas shall be submitted for record purposes only.
 - f. Submit manufacturer's certificates of compliance with ASME, ANSI, AWWA and other listed standards.

B. Operation and Maintenance

1. See Specification Section 01782 for requirements for:
 - a. The mechanics and administration of the submittal process.
 - b. The content of operation and maintenance manuals.

1.05 DELIVERY, STORAGE AND HANDLING

A. See Section 01610.

1.06 WARRANTY

A. All tanks and associated equipment and appurtenances shall be guaranteed against defects in material and workmanship for a period of two years from the date of substantial completion of the project.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:

1. Tanks:

- a. Pittsburgh Tank and Tower Company, Inc.
- b. Palmer Mfg and Tank , Inc.
- c. Roy E. Hanson Jr. Mfg
- d. Joe White Tank Company
- e. Hallmark Industrial Supply

2.02 DESIGN REQUIREMENTS

A. General

1. Nominal capacities noted below shall be defined as the tank volume below the invert of the tank overflow nozzle.
2. Seismic Design Category A
3. Wind Load: 100 mph
4. Top Loads:
 - a. Concentrated top load: Compute at 100 psf plus dead load
 - b. Tank shall be designed to support the dead weight and all imposed loads from the vertical shaft mixer installed on top of tank.
5. Uplift:

- a. The tank anchoring system shall be designed for uplift forces caused by flooding in the chemical containment area.
 - b. The storage tank shall be assumed to be empty with liquid level outside the tank equal to the top of containment wall.
6. Provide a minimum of four anti-rotation baffles in each tank configured and located within the tank as recommended by the mixer and tank manufacturer. Baffles shall be constructed from the same material as the tanks.

B. Lime Slurry Storage Tanks

1. Tank Tag No.: I-T-1, I-T-3
2. Chemical Stored: Hydrated Lime Slurry
3. Chemical Concentration: 35%
4. Chemical Specific Gravity: 1.33
5. Nominal Capacity (gallons): 23,500
6. Diameter: 12 FT 0 IN
7. Shell Length: 30 FT 0 IN
8. Tank Orientation: Vertical as shown on the Drawings
9. Wall Type: Vertical
10. Bottom: Flat

2.03 TANKS

A. Materials

1. Tanks and supports shall be constructed from ASTM SA-240, Type 304L stainless steel. All flange and accessory hardware shall be type 316 stainless steel. Gaskets shall be compatible with the material stored.
2. All welds shall be full penetration welds and shall be performed by an AWS certified welder.

B. Fabrication

1. Tanks shall be designed in accordance with the requirements of API 620.

2. Minimum design safety factors and wall thickness per governing standard but not less than the following:
 - a. Internal Pressure: 10:1
 - b. External Pressure: 5:1
 - c. Seismic Loads: 3:1

C. Surface Preparation

1. Tank interior shall be commercial blasted per SSPC-SP6 and cleaned free of rust, slag, and other foreign matter.
2. Tank exterior shall be brush blast cleaned per SSPC-SP7 to provide an even tank color.

D. Tank Nozzles and Accessories

1. General

- a. Nozzles to have full penetration welds. Nozzles to be 150 ANSI flanges or NPT threaded connection as shown on the Drawings or as specified herein.
- b. Provide lifting lugs on tanks.
- c. Tank Mounted Pipe Supports
 - 1) Provide to support overflow piping, tank fill piping, and other locations were shown on the Drawings and as required to support conduits.
 - 2) Supports shall be spaced 3 FT on center and within 1 FT of elbows, valves, and pipeline appurtenances.
- d. All flange and accessory hardware shall be Type 316 stainless steel.

2. Nozzles and Manways

- a. Provide the following nozzles and manways at a minimum. Orient and locate as shown on the Drawings.
 - 1) 2, 30 IN diameter minimum bolted and hinged access hatch (top and side)
 - 2) 6 IN flange, overflow (side)

- 3) 6 IN flange, drain (side)
 - 4) 3 IN flange, tank fill (top)
 - 5) 3 IN flange, Utility Water (top)
 - 6) 2 IN flange, pump suction (side)
 - 7) 2 IN flange, recirculation return (top)
 - 8) 2 IN flange, spare (side)
 - 9) 6 IN flange, spare (top)
 - 10) 2 IN NPT, tank level sensor (side)
 - 11) 1 IN NPT, spare (side)
3. Access Ladder, Handrail, and Access Platform
- a. As required for each tank as shown on the Drawings.
 - b. Ladder
 - 1) Type 316 stainless steel with a minimum capacity of 300 lb. Ladder shall be 18 IN between side rails, 12 IN between rungs. Rungs shall be non-slip and square.
 - 2) OSHA approved design with safety cage, mounted and supported from the tanks. Attachment hardware shall be stainless steel to match.
 - 3) Provide clips to mount the ladder to the concrete containment area pad.
 - c. Handrail
 - 1) Provide a 42 IN tall, aluminum handrail with toe-board around the top perimeter of each tank. Handrail shall be OSHA approved. Provide dielectric isolating hardware as required.
 - d. Access Platform
 - 1) Provide an access platform to connection to adjacent lime slurry storage tank as shown on the Drawings. Platform shall be of aluminum construction and designed for a 300 lbs load of 100 psf.
 - 2) Provide dielectric isolating hardware as required.

4. Tank Signage

a. Design Label

- 1) Chemical contents, including:
 - a) Concentration
 - b) Specific Gravity
 - c) Maximum Temp
- 2) Tank capacity
- 3) Manufacturer
- 4) Manufacturer location
- 5) Date of manufacture
- 6) Materials of construction
- 7) Seismic requirements

b. NFR Designation Sign

- 1) Per NFPA 704
- 2) 1.5 FT x 1.5 FT
- 3) Clearly visible to personnel once tanks installed

2.04 SOURCE QUALITY CONTROL

- A. The tank shall be factory hydrostatically tested at a pressure of 10 psig. The pressure shall be held and each weld tested with seam test solution to demonstrate there are no leaks.

PART 3: EXECUTION

3.01 INSTALLATION

- A. The tanks shall be installed in accordance with the manufacturer's written instructions. Tanks shall be installed on a neoprene pad or other resilient support as recommended by the tank manufacturer.
- B. The contractor shall be responsible for installing mixer, piping and other equipment on the tank.

C. Cleaning

1. Tank interior surfaces shall be cleaned and decontaminated following field testing.
2. Surfaces to be cleaned must be cleaned with a mild detergent capable of removing grease, oil, or other residue. No abrasive cleaning agents shall be used. Thoroughly rinse detergent. Pressure washers shall not be used on the tank surfaces.

3.02 FIELD QUALITY CONTROL

A. Provide Manufacturer's Field Services as defined in Specification Section 01665 to provide the following.

1. Inspection, checking, and adjustment as required for equipment to function as warranted by manufacturer and necessary to provide written approval of installation.
2. Revisiting the site as required to correct problems and until installation and operation are acceptable to Owner.
3. Assistance during Demonstration Period functional and performance testing and until product acceptance by the Owner.

B. Field Testing

1. After shipment to the jobsite, but prior to installation, tank shall be hydrostatically pressure tested by the Contractor at 40 psi for 1 hour. During testing, connections may be plugged but shall not be blocked or plugged on the inside. If there are leaks or indications of leaks, the tank shall be replaced with a new tank and tested after shipment to the jobsite.
- 2.

C. VENDOR TRAINING

1. See Section 01735 for vendor training requirements.

END OF SECTION

- b. Waste disposal facilities shall comply with all federal and state regulations applicable to their facilities and shall be properly certified and licensed by the TCEQ and the USEPA to handle the types and quantities of waste to be generated and removed from the EWPP.
 - c. Prior to shipment of excess chemical tank contents and tank rinsate, provide documentation that all firms engaged in the transportation and disposal of the waste material are properly certified and licensed to engage in the transportation and/or disposal of the waste materials being removed from the EWPP.
- 4. Health and Safety Plan
 - 5. Draft Findings Report for each bulk storage tank inspected.
 - 6. Final Findings Report for each bulk storage tank inspected.
- B. Submittal data shall be in such form and so presented that the Engineer may readily review the data.

PART 2: PRODUCTS

2.01 ACCEPTABLE TANK INSPECTION FIRMS

- A. METCO – Materials Evaluation and Testing Corporation, Houston, TX
- B. Sentinel Integrity Solutions, Inc.
- C. HMT Innovative Tank Solutions
- D. Intertek AIM, Inc.
- E. Submit request for substitution in accordance with Specification Section 01630.

2.02 DESCRIPTION OF BULK STORAGE TANKS TO BE INSPECTED

- A. Sodium Hydroxide Storage Tanks
 - 1. Number of Tanks: 2
 - 2. Tank Contents: Sodium Hydroxide, 25% to 50% solution

3. Material of Construction: Type 316L stainless steel
4. Tank Type: Vertical, atmospheric
5. Nominal Tank Diameter: 12 FT
6. Nominal Tank Height: 20 FT
7. Nominal Tank Volume: 16,075 gallons, each

B. Aqueous Ammonia Storage Tanks:

1. Number of Tanks: 2
2. Tank Contents: Aqueous Ammonia, 19% to 29%
3. Material of Construction: Type 316L stainless steel
4. Tank Type: Vertical, ASME code pressure vessel
5. Nominal Tank Diameter: 10 FT
6. Overall Tank Height: 20 FT
7. Nominal Tank Volume: 11,750 gallons, each

C. Aqueous Ammonia Scrubber Tank (I-ST-1)

1. Number of Tanks: 1
2. Tank Contents: Aqueous Ammonia, 19% to 29%
3. Material of Construction: Fiberglass Reinforced Plastic
4. Tank Type: Vertical, atmospheric
5. Nominal Tank Diameter: 3.5 FT
6. Overall Tank Height: 6.7 FT
7. Nominal Tank Volume: 300 gallons

D. Aqueous Ammonia Day Tanks (C-DT-3 and C-DT-4)

1. Number of Tanks: 2

2. Tank Contents: Aqueous Ammonia, 19% to 29%
3. Material of Construction: Fiberglass Reinforced Plastic
4. Tank Type: Vertical, ASME code pressure vessel
5. Nominal Tank Diameter: 5 FT
6. Overall Tank Height: 6 FT
7. Nominal Tank Volume: 750 gallons, each

E. Lime Slurry Storage Tanks

1. Number of Tanks: 2
2. Tank Contents: Lime Slurry, 35%
3. Material of Construction: Type 316L stainless steel
4. Tank Type: Vertical, atmospheric
5. Nominal Tank Diameter: 14.5 FT
6. Nominal Tank Height: 30 FT
7. Nominal Tank Volume: 35,500 gallons, each

F. Ferric Sulfate Storage Tanks

1. Number of Tanks: 6
2. Tank Contents: Ferric Sulfate, 25 to 50%
3. Material of Construction: Fiberglass Reinforced Plastic (FRP)
4. Tank Type: Vertical, atmospheric
5. Nominal Tank Diameter: 12 FT
6. Nominal Tank Height: 18 FT
7. Nominal Tank Volume: 25,000 gallons, each

G. Hydrofluorosilicic Acid Storage Tanks (I-T-7 and I-T-8)

1. Number of Tanks: 2
2. Tank Contents: Hydrofluorosilicic Acid, 15 to 25%
3. Material of Construction: High Density Polyethylene
4. Tank Type: Vertical, atmospheric
5. Nominal Tank Diameter: 6 FT
6. Nominal Tank Height: 8 FT
7. Nominal Tank Volume: 3,100 gallons, each

H. Hydrofluorosilicic Acid Scrubber Tank (I-ST-2)

1. Number of Tanks: 1
2. Tank Contents: Hydrofluorosilicic Acid, 15 to 25%
3. Material of Construction: High Density Polyethylene
4. Tank Type: Vertical, atmospheric
5. Nominal Tank Diameter: 3 FT
6. Nominal Tank Height: 5 FT
7. Nominal Tank Volume: 200 gallons

PART 3: EXECUTION

3.01 PREPARATION FOR INSPECTION

A. Test Plan and Schedule

1. Prepare a schedule for disposal of excess tank contents, tank rinsing, shipping of waste rinsate, inspection, testing, report preparation and delivery, and restoration of the inspected tank to operational service.
2. Schedule shall comply with the requirements of Section 01114. At least one of each of the bulk aqueous ammonia, caustic and lime slurry storage tanks shall remain in service, or available for serviceable use by EWPP staff at all times.

B. Health and Safety Plan

1. Prepare a health and safety plan, meeting OSHA requirements, that addresses all potential hazards and corresponding mitigating measures, in compliance with the requirements of 29 CFR 1910.
2. Health and Safety Plan shall include a Confined Space Entry Plan.

C. Flushing, Rinsing, Cleaning, and Disposal

1. Clean each tank prior to inspection and testing in accordance with API Standard 2015, latest edition.
2. Prior to removal of tank contents, flush the fill lines and recirculation lines of chemical, into the tank to be tested. Scope of work should include excess product disposal of up to 25% of the nominal volume of each bulk storage tank.
3. Neutralization of tank contents prior to characterization and disposal is acceptable, subject to compliance with applicable regulations.
4. Contractor will dispose of the excess contents remaining in the tank prior to rinsing.
 - a. Characterize the excess product in accordance with the requirements of the TCEQ licensed waste disposal facility. Obtain approval for waste shipment in accordance with all applicable EPA and TCEQ regulations.
 - b. Properly complete all documentation, forms and shipping manifests in accordance with applicable regulations. The City of Houston will execute all forms requiring the signature of the waste generator.
5. Conduct low pressure water cleaning of all of internal surfaces of all tanks in accordance with SSPC-SP WJ-1.
6. Conduct analytical testing of the rinsate and dispose of the rinsate in accordance with the resulting rinsate characterization. Comply with the requirements for disposing the excess contents of the tank described above.

3.02 INSPECTION SERVICES

A. Internal Inspection

1. Conduct an internal inspection on all tanks in accordance with API 510 for ASME Code vessels, or STI SP001 for atmospheric vessels. Perform photographic documentation of the inspection and include the photographs in the written report.
2. Comply with all OSHA regulatory requirements, including the requirements for work in Confined Spaces.

B. External Inspection

1. Conduct an external inspection on all tanks in accordance with API 510 for ASME Code vessels, or STI SP001 for atmospheric vessels. Perform photographic documentation of the inspection and include the photographs in the written report.

3.03 TESTING SERVICES

A. Corrosion Mapping

1. Conduct ultrasonic corrosion mapping on all internal surfaces of all tanks. The resultant C-Scan images shall be included in the written report.

3.04 DELIVERABLES

A. Testing Report

1. Provide a draft findings report with all the data collected during the inspection and testing services. Include all inspection data evaluation, analysis, and recording in accordance with API 510, or STI SP001 as applicable. Include recommendations for repairs, alterations, and rerating of the tanks.
2. Revise the draft findings report to address or respond to provided comments. Provide a final findings report signed by the NACE Corrosion Specialist or Fitness-For-Service Inspector.

END OF SECTION

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5. Gaskets: PTFE

C. Design Requirements

1. Designed specifically for use with ASME Code aqueous ammonia pressure tanks (bulk and day storage).
2. Pressure relief range: 1.0 to 55.0 IN W.C.
3. Vacuum relief range: 1.0 to 55.0 IN W.C.
4. Set point accuracy of plus/minus 3 percent.
5. Field replaceable pallet and seat assemblies.
6. ANSI 150 lb flange.

2.09 PLASTIC DIAPHRAGM VALVES

A. Acceptable Manufacturers:

1. Chemtrol
2. George Fisher
3. Approved equal

B. Materials

1. Body and bonnet: PVC
2. Diaphragm:
 - a. Sodium hydroxide service: EPDM
 - b. All other chemical services: Viton

C. Design Requirements

1. True union with socket weld connections
2. Handwheel operator

2.10 ADJUSTABLE BACK PRESSURE VALVE

- A. A 6 inch Flanged Adjustable Back Pressure Valve shall be furnished by the Pump Manufacturer and installed by the contractor in the discharge line where noted on the Drawings.

MISCELLANEOUS VALVES

- B. The valve shall consist of a swing check valve modified with a custom stainless steel spring/arm assembly designed by Penn Valley Pump or approved equal. The engineered spring shall allow the tension to be fully adjustable for pressure between 2-10 psi. When the valve is fully opened, the back pressure only increases a maximum of 3 psi over the set pressure.
- C. The valve shall be of cast iron construction with an elastomeric faced valve disc for positive sealing and silent operation. The valve shall be 8" with 125 lb. ASA flanged connection and have a working pressure of 200 psi.
- D. Valve shall be Model PVP759-6 or approved equal.

2.11 FABRICATION

- A. Completely shop assemble unit including any interconnecting piping, speed control valves, control isolation valves and electrical components.
- B. Provide internal epoxy coating suitable for potable water for all iron body valves in accordance with AWWA C550.

2.12 SOURCE QUALITY CONTROL

- A. Shop hydrostatically test to unit test pressure.

2.13 MAINTENANCE MATERIALS

- A. Provide one set of any special tools or wrenches required for operation or maintenance for each type valve.

PART 3: EXECUTION

3.01 INSTALLATION

- A. General: See Section 11005 and Section 15100.
- B. Air Release, Vacuum Relief, and Pressure Relief Valves:
 - 1. Pipe exhaust to a suitable disposal point.
 - 2. Where exhausted to a trapped floor drain, terminate exhaust line 6 IN minimum above floor.

3.02 FIELD QUALITY CONTROL

- A. Clean, inspect, and operate valve to ensure all parts are operable and valve seats properly.

- B. Check and adjust valves and accessories in accordance with manufacturer's instructions and place into operation.
- C. For aqueous ammonia pressure/vacuum relief valves, provide services of manufacturer's factory service representative to inspect installation of and adjust the pressure and vacuum relief setpoints of the valves.

END OF SECTION

MISCELLANEOUS VALVES

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SHEET NUMBER SHEET TITLE

AREA 00 - GENERAL

1	00 G-1	Cover Sheet
2	00 G-2	General - Sheet Index
3	00 G-3	General - Plant 1-2 - Overall Site Plan
4	00 G-4	General - Area 20 - Enlarged Site Plan
5	00 G-5	General - Area 70 - Enlarged Site Plan
6	00 G-6	General - Drawing Legend
7	00 C-1	General - Civil Standard Details I
8	00 C-2	General - Civil Standard Details II
9	00 C-3	General - Civil Standard Details III
10	00 S-1	General - Structural Notes
11	00 S-2	General - Special Structural Inspection Schedule
12	00 S-3	General - Structural Standard Details I
13	00 S-4	General - Structural Standard Details II
14	00 S-5	General - Structural Standard Details III
15	00 S-6	General - Structural Standard Details IV
16	00 D-1	General - Process Equipment and Piping Legend
17	00 D-2	General - Process Standard Details I
18	00 D-3	General - Process Standard Details II
19	00 D-4	General - Process Standard Details III
20	00 M-1	General - HVAC Legend, General Notes and Abbreviations
21	00 M-2	General - HVAC Schedules I
22	00 M-3	General - HVAC Standard Details I
23	00 M-4	General - HVAC Standard Details II
24	00 E-1	General - Electrical Legend and Abbreviations
25	00 E-2	General - Electrical Site Plan
26	00 E-3	General - Electrical Standard Details
27	00 E-4	General - Electrical Standard Details II
28	00 E-5	General - Electrical Instrumentation and Control Scope of Work
29	00 E-6	General - Electrical Instrumentation and Control Scope of Work II
30	00 E-7	General - Electrical Instrumentation and Control Scope of Work III
31	00 E-8	General - Electrical Instrumentation and Control Scope of Work IV
32	00 Y-1	General - Instrumentation Legend
33	00 Y-2	General - Instrumentation - Ammonia System P&ID - Bulk Storage Tanks Transfer Pump and Day Tank
34	00 Y-3	General - Instrumentation - Ammonia System P&ID - Day Tanks
35	00 Y-4	General - Instrumentation - Ammonia System P&ID - Metering Pumps I
36	00 Y-5	General - Instrumentation - Ammonia System P&ID - Metering Pumps II
37	00 Y-6	General - Instrumentation - Caustic System P&ID - Bulk Storage Tanks and Recirculation Pumps
38	00 Y-7	General - Instrumentation - Caustic System P&ID - Transfer Pumps and Day Tanks
39	00 Y-8	General - Instrumentation - Caustic System P&ID - Metering Pumps I
40	00 Y-9	General - Instrumentation - Caustic System P&ID - Metering Pumps II
41	00 Y-10	General - Instrumentation - Caustic System P&ID - Metering Pumps III
42	00 Y-11	General - Instrumentation - Ferric System P&ID - Bulk Storage Tanks I
43	00 Y-12	General - Instrumentation - Ferric Sulfate System P&ID - Bulk Storage Tanks II
44	00 Y-13	General - Instrumentation - Ferric System P&ID - Transfer Pumps and Day Tanks
45	00 Y-14	General - Instrumentation - Ferric System P&ID - Feed Pumps I
46	00 Y-15	General - Instrumentation - Ferric System P&ID - Feed Pumps II
47	00 Y-16	General - Instrumentation - Ferric System P&ID - Feed Pumps III
48	00 Y-17	General - Instrumentation - Lime System P&ID - Plant 1 Bulk Storage Tanks and Recirculation Pumps
49	00 Y-18	General - Instrumentation - Lime System P&ID - Plant 1 Feed Pumps
50	00 Y-19	General - Instrumentation - Lime System P&ID - Plant 2 Bulk Storage Tanks and Recirculation Pumps
51	00 Y-20	General - Instrumentation - Lime System P&ID - Plant 2 Feed Pumps
52	00 Y-21	General - Instrumentation - Fluoride System P&ID - Bulk Storage Tanks & Scrubber
53	00 Y-22	General - Instrumentation - Fluoride System P&ID - Transfer Pumps & Day Tanks
54	00 Y-23	General - Instrumentation - Fluoride System P&ID - Feed Pumps
55	00 Y-24	General - Instrumentation - PAC System P&ID - Mix Tank & Scrubber I
56	00 Y-25	General - Instrumentation - PAC System P&ID - Mix Tank & Scrubber II
57	00 Y-26	General - Instrumentation - PAC System P&ID - Feed Pumps I
58	00 Y-27	General - Instrumentation - PAC System P&ID - Feed Pumps II
59	00 Y-28	General - Instrumentation - PAC System P&ID - Utility Water
60	00 Y-29	General - Instrumentation - Flash Mix P&ID
61	00 Y-30	General - Instrumentation - Filter Aid Polymer System P&ID
62	00 Y-31	General - Instrumentation - Flocculation Aid Polymer System P&ID
63	00 Y-32	General - Instrumentation - Coagulant Aid Polymer System P&ID I
64	00 Y-33	General - Instrumentation - Coagulant Aid Polymer System P&ID II
65	00 Y-34	General - Instrumentation - Coagulant Aid Polymer System P&ID III

AREA 05 - PLANT 1-2 GENERAL SITE WORK

66	05X-1	Plant 1&2 Roadways - Proposed Paving Improvement Demolition Plan
67	05X-2	Plant 1&2 Roadways - Demolition Photographs
68	05C-1	Plant 1&2 Roadways - Proposed Paving Improvement Key Plan
69	05C-2	Plant 1&2 Roadways - Proposed Paving Improvement Enlarged Plans I
70	05C-3	Plant 1&2 Roadways - Proposed Paving Improvement Enlarged Plans II
71	05C-4	Plant 1&2 Roadways - Proposed Paving Improvement Enlarged Plans III
72	05C-5	Plant 1&2 Roadways - Details I
73	05C-6	Plant 1&2 Roadways - Details II

AREA 21 - PLANT 2 LIME STORAGE AND TRANSFER FACILITY

74	21-C-1	Area 21 - North Lime Storage and Transfer Facility - Site Plan
75	21-S-1	Area 21 - North Lime Storage and Transfer Facility - Plans
76	21-S-2	Area 21 - North Lime Storage and Transfer Facility - Sections
77	21-D-1	Area 21 - North Lime Storage and Transfer Facility - Plan
78	21-D-2	Area 21 - North Lime Storage and Transfer Facility - Sections
79	21-D-3	Area 21 - North Lime Storage and Transfer Facility - Section, Detail, & Photo
80	21-E-1	Area 21 - North Lime Storage & Transfer Facility - Site Plan
81	21-E-2	Area 21 - North Lime Storage & Transfer Facility - Lighting and Power Plan
82	21-E-3	Area 21 - North Lime Storage & Transfer Facility - Lighting and Power Plan
83	21-E-4	Area 21 - North Lime Storage Unloading Station - Lighting and Power Plan
84	21-E-5	Area 21 - North Lime Storage & Transfer Facility - Feed Pumps One-Line Diagram & Panel Elevations
85	21-E-6	Area 21 - North Lime Storage & Transfer Facility - Recirculation Pumps One-Line Diagram & Panel Elevation

SHEET NUMBER SHEET TITLE

AREA 21 (CONT)

86	21 E-7	Area 21 - North Lime Storage & Transfer Facility - Sump Pumps One-Line Diagram & Panel Elevations
87	21 E-8	Area 21 - North Lime Storage & Transfer Facility - Unloading Pump One-Line Diagram & Panel Elevations
88	21 E-9	Area 21 - North Lime Storage & Transfer Facility - Lime Mixers and Panel Elevation
89	21 E-10	Area 21 - North Lime Storage & Transfer Facility - Mini Power Center

AREA 22 - CHEMICAL BUILDING NO. 2

90	22 M-1	Area 22 - Chemical Building 2 - HVAC Plans & Photographs
91	22 E-1	Area 22 - Chemical Building No.2 - First Floor Modification Plan
92	22 E-2	Area 22 - Chemical Building No.2 - Second Floor Modification Plan
93	22 E-3	Area 22 - Chemical Building No.2 - One-Line Diagram
94	22 E-4	Area 22 - Chemical Building No.2 - MCC-G2 Elevation and Panel Schedule

AREA 23 - NORTH CHEMICAL STORAGE AREA

95	23 X-1	Area 23 - North Chemical Storage Area - Demolition Plan
96	23 X-2	Area 23 - North Chemical Storage Area - Demolition Photographs
97	23 X-3	Area 23 - North Chemical Storage Area - Ammonia Storage Tank - Demolition Plans
98	23 D-1	Area 23 - North Chemical Storage Area - Area Plan
99	23 D-2	Area 23 - North Chemical Storage Area - Ammonia Storage Tanks Plan and Sections
100	23 D-3	Area 23 - North Chemical Storage Area - Caustic Recirculation Pump Plan and Sections
101	23 E-1	Area 23 - North Chemical Storage Area - Demolition Plan
102	23 E-2	Area 23 - North Chemical Storage Area - Modified Plan

AREA 24 - CHEMICAL TRANSFER BUILDING

103	24 X-1	Area 24 - Chemical Transfer Building - Demolition Plan & Photos
104	24 X-2	Area 24 - Chemical Transfer Building - Ammonia Transfer Pumps Demolition Plan, Section & Photos
105	24 X-3	Area 24 - Chemical Transfer Building - Lime Feed Pump Room Demolition Plan and Photos
106	24 X-4	Area 24 - Chemical Transfer Building - Fluoride Room Demolition Plan, Section and Photos
107	24 X-5	Area 24 - Chemical Transfer Building - Coagulant Polymer Feed System Demolition Plan & Photographs
108	24 D-1	Area 24 - Chemical Transfer Building - Caustic Transfer Pump Plans, Photo and Section
109	24 D-2	Area 24 - Chemical Transfer Building - Ammonia Transfer Pumps Plan and Sections
110	24 D-3	Area 24 - Chemical Transfer Building - Fluoride Room Plan
111	24 D-4	Area 24 - Chemical Transfer Building - Fluoride Room Section and Detail
112	24 D-5	Area 24 - Chemical Transfer Building - Coagulant Polymer Feed System -Room Plan
113	24 D-6	Area 24 - Chemical Transfer Building - Coagulant Polymer Feed & Storage Room Sections & Elevations
114	24 M-1	Area 24 - Chemical Transfer Building - HVAC Plan & Photographs
115	24 E-1	Area 24 - Chemical Transfer Building - Site Plan
116	24 E-2	Area 24 - Chemical Transfer Building - Fluoride, Caustic & Ammonia Demolition Plan
117	24 E-3	Area 24 - Chemical Transfer Building - Coagulant Aid Polymer Demolition Plan
118	24 E-4	Area 24 - Chemical Transfer Building - Lime Demolition Plan
119	24 E-5	Area 24 - Chemical Transfer Building - Fluoride, Caustic & Ammonia Proposed Plan
120	24 E-6	Area 24 - Chemical Transfer Building - Coagulant Aid Polymer Proposed Plan
121	24 E-7	Area 24 - Chemical Transfer Building - Coagulant Aid Polymer Proposed Plan
122	24 E-8	Area 24 - Chemical Transfer Building - Modification One-Line Diagram
123	24 E-9	Area 24 - Chemical Transfer Building - Proposed One-Line Diagram
124	24 E-10	Area 24 - Chemical Transfer Building - Coagulant Aid Polymer One-Line Diagram I
125	24 E-11	Area 24 - Chemical Transfer Building - Coagulant Aid Polymer One-Line Diagram II
126	24 E-12	Area 24 - Chemical Transfer Building - Fluoride Feed Pumps One-Line Diagram
127	24 E-13	Area 24 - Chemical Transfer Building - Coagulant Tank Mixer Control Panel Elevation
128	24 E-14	Area 24 - Chemical Transfer Building - Coagulant Tank Mixer Control Panel Elevation
129	24 E-15	Area 24 - Chemical Transfer Building - Existing "MCCC-1" Elevation

AREA 25 - CHEMICAL BUILDING NO. 1

130	25 X-1	Area 25 - Chemical Building No.1 - Ammonia Room Demolition Plan & Photos
131	25 X-2	Area 25 - Chemical Building No.1 - Caustic Room Demolition Plan & Photographs
132	25 X-3	Area 25 - Chemical Building No.1 - Ferric Sulfate Metering Pump Room Demolition Plan
133	25 X-4	Area 25 - Chemical Building No.1 - Ferric Sulfate Metering Pump Room Demolition Sections and Photos
134	25 X-5	Area 25 - Chemical Building No.1 - Flocculation Aid Polymer Demolition Plan, Section and Photos
135	25 D-1	Area 25 - Chemical Building No.1 - Ammonia Feed Room Plan
136	25 D-2	Area 25 - Chemical Building No.1 - Ammonia Feed Room Sections
137	25 D-3	Area 25 - Chemical Building No.1 - Caustic Feed Room Plan and Section
138	25 D-4	Area 25 - Chemical Building No.1 - Caustic Feed Room Photographs
139	25 D-5	Area 25 - Chemical Building No.1 - Ferric Sulfate Metering Pump Room - Plan
140	25 D-6	Area 25 - Chemical Building No.1 - Ferric Sulfate Metering Pump Room - Sections & Photos
141	25 D-7	Area 25 - Chemical Building No.1 - Flocculation Aid Polymer Plan, Sections & Photographs
142	25 M-1	Area 25 - Chemical Building No.1 - Chemical Building 1 - HVAC Plans and Photos
143	25 E-1	Area 25 - Chemical Building No.1 - First Floor Demolition Plan
144	25 E-2	Area 25 - Chemical Building No.1 - Second Floor Demolition Plan
145	25 E-3	Area 25 - Chemical Building No.1 - Third Floor Caustic Area Demolition Plan
146	25 E-4	Area 25 - Chemical Building No.1 - Third Floor Ammonia Area Demolition Plan
147	25 E-5	Area 25 - Chemical Building No.1 - First Floor Proposed Plan
148	25 E-6	Area 25 - Chemical Building No.1 - Second Floor Proposed Plan
149	25 E-7	Area 25 - Chemical Building No.1 - Third Floor Caustic Area Proposed Plan
150	25 E-8	Area 25 - Chemical Building No.1 - Third Floor Ammonia Area Proposed Plan
151	25 E-9	Area 25 - Chemical Building No.1 - Modification One-Line Diagram I
152	25 E-10	Area 25 - Chemical Building No.1 - Modification One-Line Diagram II
153	25 E-11	Area 25 - Chemical Building No.1 - Modification One-Line Diagram III
154	25 E-12	Area 25 - Chemical Building No.1 - North Ferric Sulfate Demolition One-Line Diagram
155	25 E-13	Area 25 - Chemical Building No.1 - North Ferric Sulfate Proposed One-Line Diagram
156	25 E-14	Area 25 - Chemical Building No.1 - South Ferric Sulfate Demolition One-Line Diagram
157	25 E-15	Area 25 - Chemical Building No.1 - South Ferric Sulfate Proposed One-Line Diagram
158	25 E-16	Area 25 - Chemical Building No.1 - Ferric Sulfate Demolition One-Line Diagram
159	25 E-17	Area 25 - Chemical Building No.1 - Ferric Sulfate Proposed One-Line Diagram
160	25 E-18	Area 25 - Chemical Building No.1 - Caustic Feed Pumps One-Line Diagram I
161	25 E-19	Area 25 - Chemical Building No.1 - Caustic Feed Pumps One-Line Diagram II
162	25 E-20	Area 25 - Chemical Building No.1 - Caustic Feed Pumps One-Line Diagram III

SHEET NUMBER SHEET TITLE

AREA 25 (CONT)

163	25 E-21	Area 25 - Chemical Building No.1 - Ammonia Feed Pumps One-Line Diagram I
164	25 E-22	Area 25 - Chemical Building No.1 - Ammonia Feed Pumps One-Line Diagram II
165	25 E-23	Area 25 - Chemical Building No.1 - North Ferric Sulfate Demolition One-Line Diagram
166	25 E-24	Area 25 - Chemical Building No.1 - North Ferric Sulfate Demolition One-Line Diagram
167	25 E-25	Area 25 - Chemical Building No.1 - South Ferric Sulfate Proposed One-Line Diagram
168	25 E-26	Area 25 - Chemical Building No.1 - South Ferric Sulfate Proposed One-Line Diagram
169	25 E-27	Area 25 - Chemical Building No.1 - Ferric Sulfate Demolition One-Line Diagram
170	25 E-28	Area 25 - Chemical Building No.1 - Ferric Sulfate Proposed One-Line Diagram

AREA 26 - PLANT 1 LIME STORAGE AND TRANSFER FACILITY

171	26 X-1	Area 26 - South Lime Storage and Transfer Facility - Demolition Site Plan
172	26 C-1	Area 26 - South Lime Storage and Transfer Facility - Site Plan
173	26 S-1	Area 26 - South Lime Storage and Transfer Facility - Facility Plan
174	26 S-2	Area 26 - South Lime Storage and Transfer Facility - Sections
175	26 D-1	Area 26 - South Lime Storage and Transfer Facility - Plan
176	26 D-2	Area 26 - South Lime Storage and Transfer Facility - Sections
177	26 D-3	Area 26 - South Lime Storage and Transfer Facility - Section, Detail, & Photo
178	26 E-1	Area 26 - South Lime Storage Tanks & Transfer Facility - Site Plan
179	26 E-2	Area 26 - South Lime Storage Tanks & Transfer Facility - Lighting and Power Plan
180	26 E-4	Area 26 - South Lime Storage Tanks & Transfer Facility - Lighting and Power Plan
181	26 E-5	Area 26 - South Lime Storage Unloading Station - Site Plan
182	26 E-6	Area 26 - South Lime Storage Tanks & Transfer Facility - One-Line Diagram & Panel Elevations
183	26 E-6	Area 26 - South Lime Storage Tanks & Transfer Facility - Recirculation One-Line Diagram & Panel Elevations
184	26 E-7	Area 26 - South Lime Storage Tanks & Transfer Facility - Sump Pumps One-Line Diagram & Panel Elevations
185	26 E-8	Area 26 - South Lime Storage Unloading Pump - One-Line Diagram & Panel Elevations
186	26 E-9	Area 26 - South Lime Storage Tanks & Transfer Facility - Mini Power Center
187	26 E-10	Area 26 - South Lime Storage & Transfer Facility Lime Mixers & Panel Elevation

AREA 27 - PAC BUILDING AND FLASH MIX

188	27 X-1	Area 27 - Flash Mix - Demolition Plan and Photographs
189	27 X-2	Area 27 - PAC Building - Demolition Plan, Sections and Photos
190	27 D-1	Area 27 - Flash Mix - Plan, Section and Photos
191	27 D-2	Area 27 - Flash Mix PAC Feed Lines - Plan, Sections and Photos
192	27 D-3	Area 27 - PAC Building - Plan
193	27 D-4	Area 27 - PAC Building - Section
194	27 D-5	Area 27 - PAC Building - Section
195	27 E-1	Area 27 - PAC Building - First Floor Demolition Plan
196	27 E-2	Area 27 - PAC Building - First Floor Proposed Plan
197	27 E-3	Area 27 - PAC Building - Mezzanine Demolition Plan
198	27 E-4	Area 27 - PAC Building - Mezzanine Proposed Plan
199	27 E-5	Area 27 - PAC Building - Basement Proposed Plan
200	27 E-6	Area 27 - PAC Building - Modification One-Line Diagram
201	27 E-7	Area 27 - PAC Building - Proposed One-Line Diagram
202	27 E-8	Area 27 - PAC Building - Existing MCC-D2 Elevation
203	27 E-9	Area 27 - PAC Building - North Control Panel Proposed Plan
204	27 E-10	Area 27 - PAC Building - South Control Panel Proposed Plan

AREA 28 - SOUTH CHEMICAL STORAGE AREA

205	28 X-1	Area 28 - South Chemical Storage - Ferric Transfer Pump Bldg. - Demo Plan, Section & Photo
206	28 D-1	Area 28 - South Chemical Storage - Ferric Transfer Pump Building Process Plan & Sections
207	28 E-1	Area 28 - South Chemical Storage - Ferric Sulfate /Alum Bulk Storage Area Demolition Plan
208	28 E-2	Area 28 - South Chemical Storage - Ferric Sulfate /Alum Bulk Storage Area Proposed Plan
209	28 E-3	Area 28 - South Chemical Storage - Ferric Sulfate /Alum Bulk Storage Area Demolition One-Line Diagram
210	28 E-4	Area 28 - South Chemical Storage - Ferric Sulfate /Alum Bulk Storage Area Proposed One-Line Diagram
211	28 E-5	Area 28 - South Chemical Storage - Flash Mix Demolition Plan
212	28 E-6	Area 28 - South Chemical Storage - Flash Mix Proposed Plan
213	28 E-7	Area 28 - South Chemical Storage - Flash Mix Area Proposed One-Line Diagram
214	28 E-8	Area 28 - South Chemical Storage - Flash Mix Area MCC-FM Elevation & Control Diagram

AREA 33 - NORTH (PLANT 2) FILTERS - FILTER AID POLYMER

215	33 X-1	Area 33 - Filter Aid Polymer Building - Demolition Plan & Section
216	33 D-1	Area 33 - Filter Aid Polymer Building - Plan and Section
217	33 M-1	Area 33 - Filter Aid Polymer Building - HVAC Plan
218	33 E-1	Area 33 - Filter Aid Polymer Building - Demolition Plan
219	33 E-2	Area 33 - Filter Aid Polymer Building - Proposed Plan
220	33 E-3	Area 33 - Filter Aid Polymer Building - Demolition One-Line Diagram
221	33 E-4	Area 33 - Filter Aid Polymer Building - Proposed One-Line Diagram
222	33 E-5	Area 33 - Filter Aid Polymer Building - MCC-LI Elevation

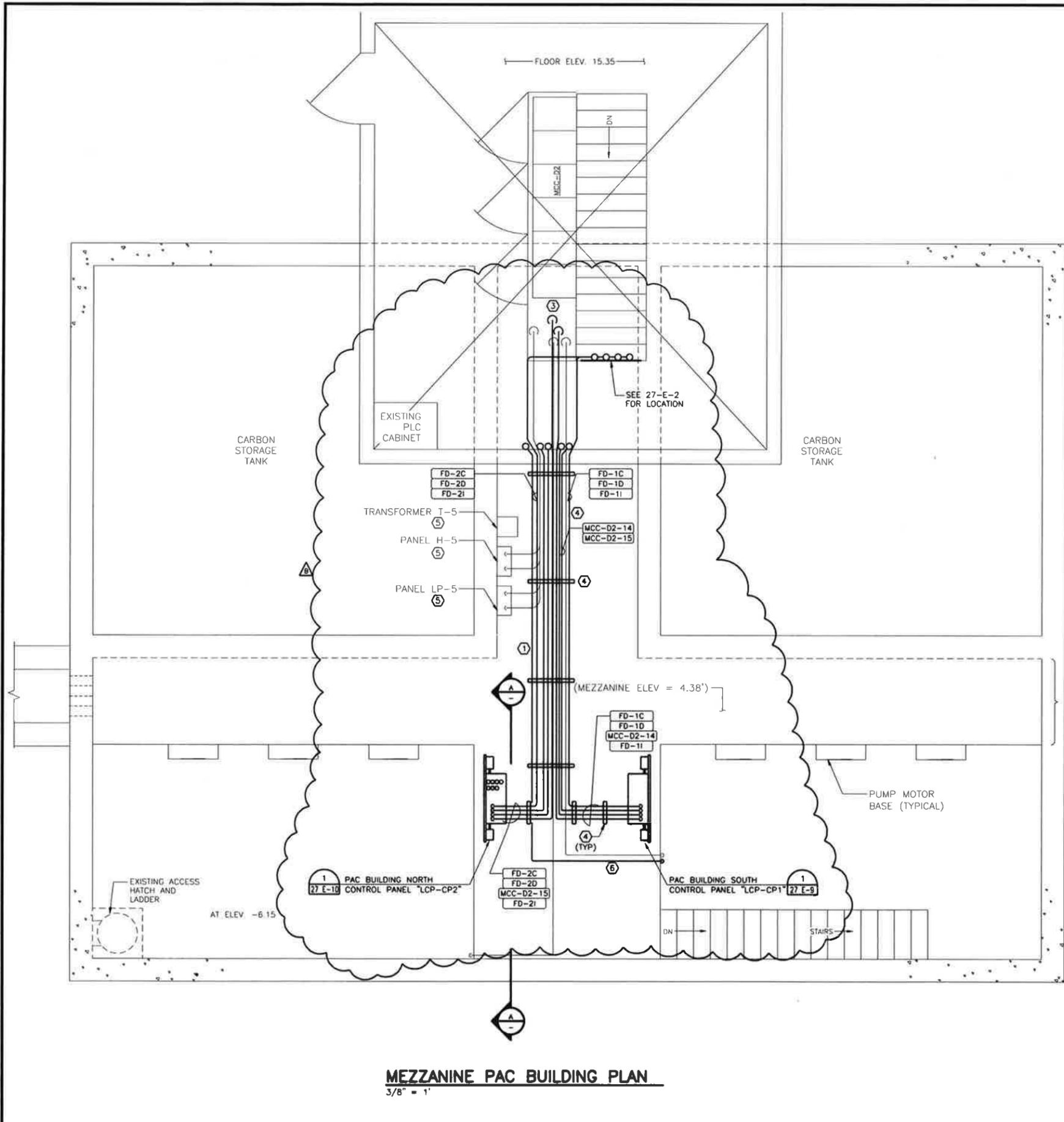
AREA 74 - PLANT 3 WEST LIME STORAGE AREA

223	74 S-1	Area 74 - Plant 3 West Lime Storage - Roof Cover Framing Plan
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EAST WATER PURIFICATION PLANT - SLUDGE HANDLING IMPROVEMENTS PLANT 3 (Supplemental Construction)

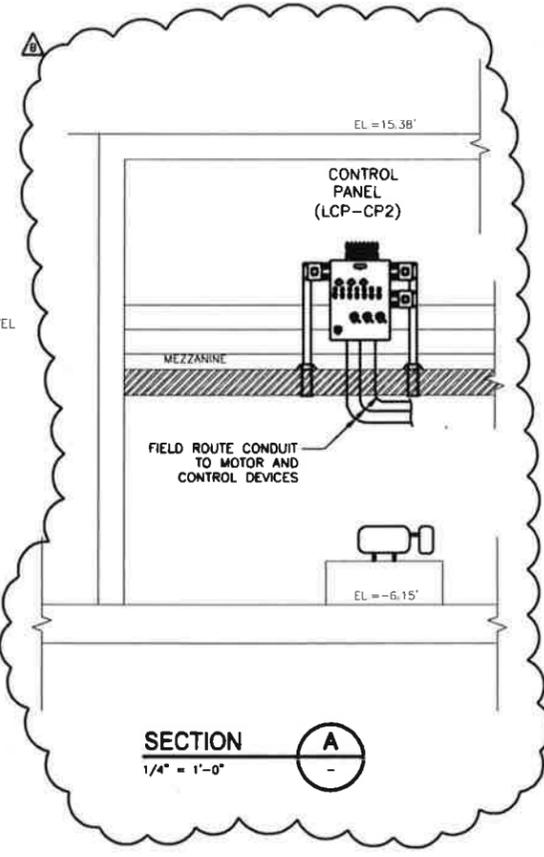
224	00 G-1	Area 70 - Enlarged Site Plan
225	00 E-1	Electrical & Instrumentation Legend and Symbols
226	00 E-2	Electrical General Notes
227	00 E-3	Electrical - Standard Details
228	70 D-1	Raw Sludge Pump Station Temporary Improvements - Mechanical Plan
229	70 D-2	Raw Sludge Pump Station Temporary Improvements - Mechanical Section
230	70 D-3	Raw Sludge Pump Station Proposed Sludge Withdrawal Flushing Piping Plan
231	70 D-4	Raw Sludge Pump Station Proposed Sludge Withdrawal Flushing Piping Sections
232	70 E-1	Raw Sludge Pump Station Temporary Improvements 00 G-01 - Electrical Plan I
233	70 E-2	Raw Sludge Pump Station Temporary Improvements - Electrical Plan II
234	70 E-3	Raw Sludge Pump Station Temporary Improvements - Electrical Plan III
235	70 Y-1	Raw Sludge Pump Station Temporary Improvements P&ID

1	ADDENDUM NO. 1	12/11/2016	SRF	DMH
A	ISSUED FOR BID	9/14/2014	SRF	DMH
MK.	DESCRIPTION	DATE	OWN.	CHK.
REVISIONS				
PRIVATE UTILITY LINES SHOWN AT LEAST 48 HOURS BEFORE EXCAVATING IN STREET R.O.W. OR EASEMENTS CALL THE LONE STAR NOTIFICATION 713-223-4567				
Date: _____ VERIZON Approved for underground cable facilities only. Signature valid for one year.				
Date: _____ Centerpoint Energy Gas Facilities (Approved only for existing underground ductlines, unless otherwise noted.) Valid At Time Of Review Only				
Date: _____ Centerpoint Energy Gas Facilities (Centerpoint service lines are not shown)				
Date: _____ Approved for AT&T TEXAS/SWBT underground conduit facilities only. Signature valid for one year.				
HDR Inc. Texas Reg. No. 754 4635 Southwest Freeway, Suite 1000 • Houston, Texas 77027 (713) 622-9264 • Fax (713) 622-9265 • www.hdrinc.com				
Job No.: 0000218191		Dwn By: S. FRANKLIN		
Date: September 14, 2015		Chkd By: T. TOWNSEND		
CITY OF HOUSTON DEPARTMENT OF PUBLIC WORKS AND ENGINEERING				
East Water Purification Plant Chemical Feed Systems Improvements Bid Package 2 - Plant 1-2 Improvements				
GENERAL SHEET INDEX				
WBS NO.		FOR CITY OF HOUSTON USE ONLY		
S-000056-0071-4				
DRAWING SCALE				
VERT: n/a				



MEZZANINE PAC BUILDING PLAN
3/8" = 1'

- NOTES:**
- ① CORE DRILL WALL FOR CONDUITS PENETRATION.
 - ② REFER TO MECHANICAL DRAWING FOR EQUIPMENT LOCATION. (FIT'S, LSH'S, TSH'S AND FS'S).
 - ③ FIELD ROUTE CONDUITS AND CONDUCTORS TO PLC-6A AND EXISTING MCC D2. CORE FLOOR AS REQUIRED.
 - ④ PROVIDE NEW CONDUIT SUPPORT RACKS AS REQUIRED. (MATCH EXISTING TYPICAL).
 - ⑤ EXISTING LIGHTING AND MISCELLANEOUS CIRCUIT TO REMAIN.
 - ⑥ 3/4" C., WITH 4 #14. (2 SPARE) FIELD ROUTE TO EXISTING SUMP PUMP CONTROL PANEL. REPROGRAM PLC FOR NEW SIGNAL.



SECTION A-A
1/4" = 1'-0"

MK.	DESCRIPTION	DATE	DWN.	CHK.
B	ADDENDUM NO. 1	12/10/15	CM	BCS
A	ISSUED FOR BID	9/14/2015	CM	BCS

REVISIONS

PRIVATE UTILITY LINES SHOWN
AT LEAST 48 HOURS BEFORE EXCAVATING IN STREET R.O.W. OR EASEMENTS CALL THE LONE STAR NOTIFICATION 713-223-4567.

Date: _____
Signature valid for one year.

Date: _____
Signature valid for one year.

Date: _____
Signature valid for one year.

VERIZON Approved for underground cable facilities only.

Centerpoint Energy Power Facilities (Approved only for crossing underground ductlines, unless otherwise noted.) Valid At Time Of Review Only.

Centerpoint Energy Gas Facilities (Centerpoint service lines are not shown.)

Approved for AT&T TEXAS SWBY underground conduit facilities only. Signature valid for one year.

BRIAN S. CHONG
108528
1/10/2015

KGI Kalluri Group, Inc.
Consulting Engineers & Project Managers
EPC Registration No. 1-085
10407 Town & Country Way, Suite 220
Houston, Texas 77024
Phone: (713)-385-8288

HDR
HDR Inc. Texas Reg. No. 754
4635 Southwest Freeway, Suite 1000* Houston, Texas 77027
(713) 622-9264 • Fax (713) 622-9265 • www.hdrinc.com

Job No.: 0000218191 Drawn By: CM
Date: September 14, 2015 Check By: BSC

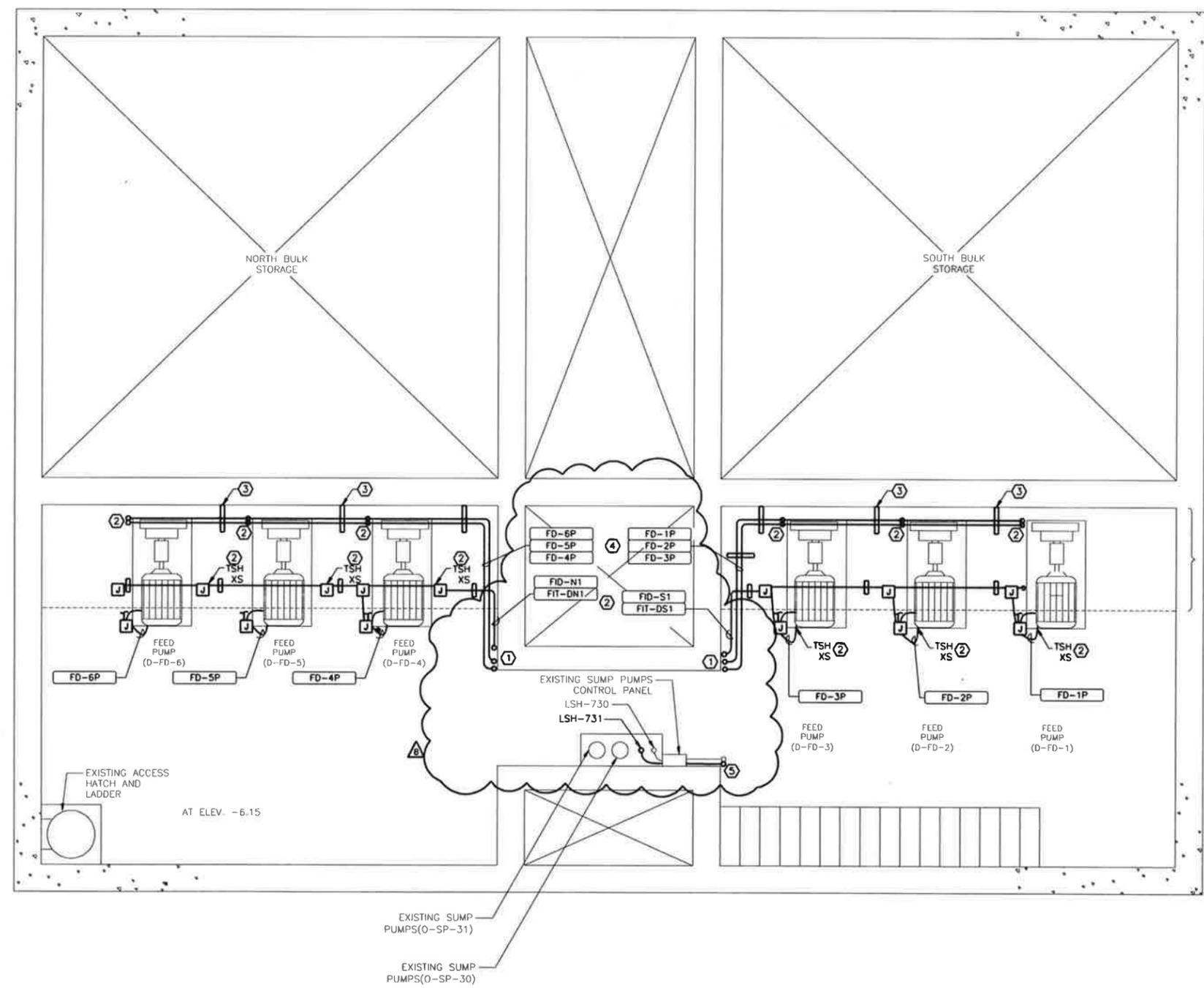
CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
East Water Purification Plant
Chemical Feed Systems Improvements
Bid Package 2 - Plant 1-2 Improvements

AREA 27
PAC BUILDING
MEZZANINE PROPOSED PLAN

WBS NO.	FOR CITY OF HOUSTON USE ONLY
S-000056-D071-4	
DRAWING SCALE	
AS NOTED	
CITY OF HOUSTON PW	
JOHN MSIGWA, P.E.	
DWG NO. 27 E-4	SHEET No: 198 OF 233

ONE INCH
IF ABOVE MARK DOES NOT
PRELIMINARY ONE INCH TYP
THIS ONE INCH TO SCALE

- NOTES:**
- 1 FIELD ROUTE CONDUITS TO PROPOSED CONTROL PANELS "LCP-CP1" AND "LCP-CP2" LOCATED ON MEZZANINE LEVEL.
 - 2 REFER TO MECHANICAL DRAWING FOR EQUIPMENT LOCATION, (FIT'S, LSH'S, TSH'S AND FS'S).
 - 3 PROVIDE 316 STAINLESS STEEL CONDUIT SUPPORTS AS REQUIRED TO FIELD ROUTE CONDUIT TO FIELD DEVICES, AVOID CONFLICT WITH PIPING, ROUTE CONDUIT AS HIGH AS POSSIBLE.
 - 4 CONDUIT ROUTED THRU PLATFORM.
 - 5 3/4" C., 2 #14, FIELD ROUTE CONDUIT AND CONDUCTORS TO PLC-6.



ELECTRICAL BASEMENT PLAN
3/8" = 1'-0"

B	ADDENDUM NO. 1	12/10/15	CM	BCS
A	ISSUED FOR BID	9/14/2015	CM	BCS
MK	DESCRIPTION	DATE	OWN	CHK

REVISIONS

PRIVATE UTILITY LINES SHOWN AT LEAST 48 HOURS BEFORE EXCAVATING IN STREET R.O.W. OR EASEMENTS CALL THE LONE STAR NOTIFICATION 713-223-4567.

DATE: _____
VERTIZON Approved for underground cable facilities only. Signature valid for one year.

DATE: _____
Centerpoint Energy Power Facilities (Approved only for covering underground ductlines, unless otherwise noted.) Valid At Time Of Review Only.

DATE: _____
Centerpoint Energy Gas Facilities (Centerpoint service lines are not shown.)

DATE: _____
Approved for AT&T TEXAS5W61 underground optical facilities only. Signature valid for one year.



KGI Kalluri Group, Inc.
Consulting Engineers & Project Managers
10497 Town & Country Way, Suite 220
Houston, Texas 77024
Phone: (713)-365-9588

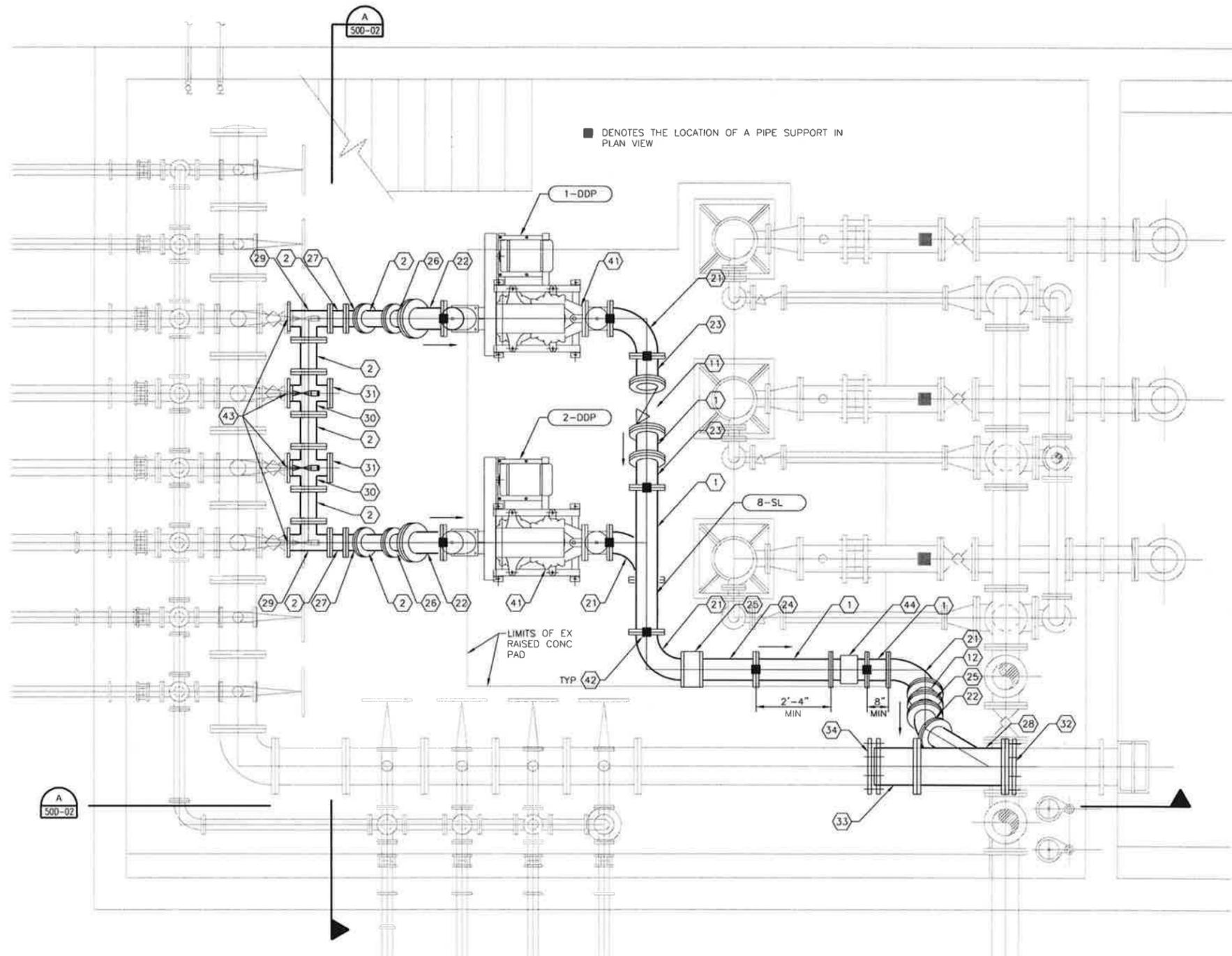
HDR
HDR Inc. Texas Reg. No. 754
4635 Southwest Freeway, Suite 1000+ Houston, Texas 77027
(713) 622-9254 • Fax (713) 622-9265 • www.hdrinc.com

Job No.: 00000218191 Des By: CM
Date: September 14, 2015 Chkd By: BSC

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
East Water Purification Plant
Chemical Feed Systems Improvements
Bid Package 2 - Plant 1-2 Improvements
AREA27
PAC BUILDING
BASEMENT PROPOSED PLAN

WBS NO.	FOR CITY OF HOUSTON USE ONLY
S-000056-0071-4	
DRAWING SCALE	
AS NOTED	
CITY OF HOUSTON PM	
JOHN MSIGWA, P.E.	
DWG NO.	SHEET
27 E-5	199 OF 203
	No. 235

ONE INCH
IF ABOVE MARK DOES NOT
MEASURE ONE INCH, THEN
THIS SHEET IS NOT TO SCALE



■ DENOTES THE LOCATION OF A PIPE SUPPORT IN PLAN VIEW

LIMITS OF EX RAISED CONC PAD
TYP 42

KEY NOTES:

- PIPE**
- ① 6" DIP FLG'D
 - ② 6" DIP FLG'D
- VALVES**
- ⑪ 6" ADJUSTABLE BACK PRESSURE VALVE FLG'D
 - ⑫ 6" DIAPHRAGM VALVE FLG'D
- FITTINGS**
- ⑳ 6" 90° LONG RADIUS ELBOW FLG'D
 - ㉑ 6" 45° ELBOW FLG'D
 - ㉒ 6" 22 1/2° ELBOW FLG'D
 - ㉓ 6" 45° WYE FLG'D
 - ㉔ 6" FLANGE FILLER(LENGTH AS REQ'D) FLG'D
 - ㉕ 6" SPOOL PIECE FLG'D
 - ㉖ 6" 45° ELBOW FLG'D
 - ㉗ 14"x6" 45° WYE FLG'D
 - ㉘ 6" TEE FLG'D
 - ㉙ 6" CROSS FLG'D
 - ㉚ 6" BLIND FLANGE FLG'D
 - ㉛ 14" RESTRAINED FLANGE ADAPTOR
 - ㉜ 14" FLG x PE ADAPTOR
 - ㉝ 14" SERVICE COUPLING FOR DIP (WITH FULLY RESTRAINED JOINTS)
- SPECIALS**
- ④① 6" DOUBLE DISC PUMP PER THE SPECIFICATIONS
 - ④② PIPE SUPPORT, SEE DETAIL 4 ON SHEET 00D-02
 - ④③ REMOVE EX 6" TAPPED BLIND FLANGE AND 1 1/2" GATE VALVE AS REQUIRED FOR NEW CONNECTION, SALVAGE FOR FUTURE DISTRICT USE
 - ④④ 6" MAGMETER
 - ④⑤ APS INSPECT-A-LIFT PIPE SUPPORT SYSTEM OR APPROVED EQUAL

NOTE: ALL ELEVATIONS ON THIS PLAN ARE BASED UPON THE ORIGINAL SITE REFERENCE DRAWINGS. CONTRACTOR SHALL FIELD VERIFY ACTUAL ELEVATIONS AND FIELD ADJUST ALIGNMENT WHERE AS-BUILT CONDITIONS DIFFER FROM RECORD DRAWINGS.

MK	DESCRIPTION	DATE	DWN	CHK
1	ADDENDUM NO. 1	12/11/2015	SRF	DMH
A	ISSUED FOR BID	9/14/2015	SRF	DMH

REVISIONS

PRIVATE UTILITY LINES SHOWN AT LEAST 48 HOURS BEFORE EXCAVATING IN STREET R.O.W OR EASEMENTS CALL THE ONE STAR NOTIFICATION 713-223-4567

VERIZON: Approved for underground cable facilities only. Signature valid for one year.

Centerpoint Energy Power Facilities (Approved only for crossing underground ductlines, unless otherwise noted.) Valid At Time Of Reveal Only

Centerpoint Energy Gas Facilities (Centerpoint service lines are not shown.)

Approved for AT&T TEXAS/SWHT underground conduit facilities only. Signature valid for one year.



Job No. 233330 Dwn By: T. Cook, X. Zheng
Date: May, 2015 Chkd By: David Hunn

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
East Water Purification Plant
Sludge Handling Improvements
Plant 3
Raw Sludge Pump Station
Temporary Improvements
Mechanical Plan

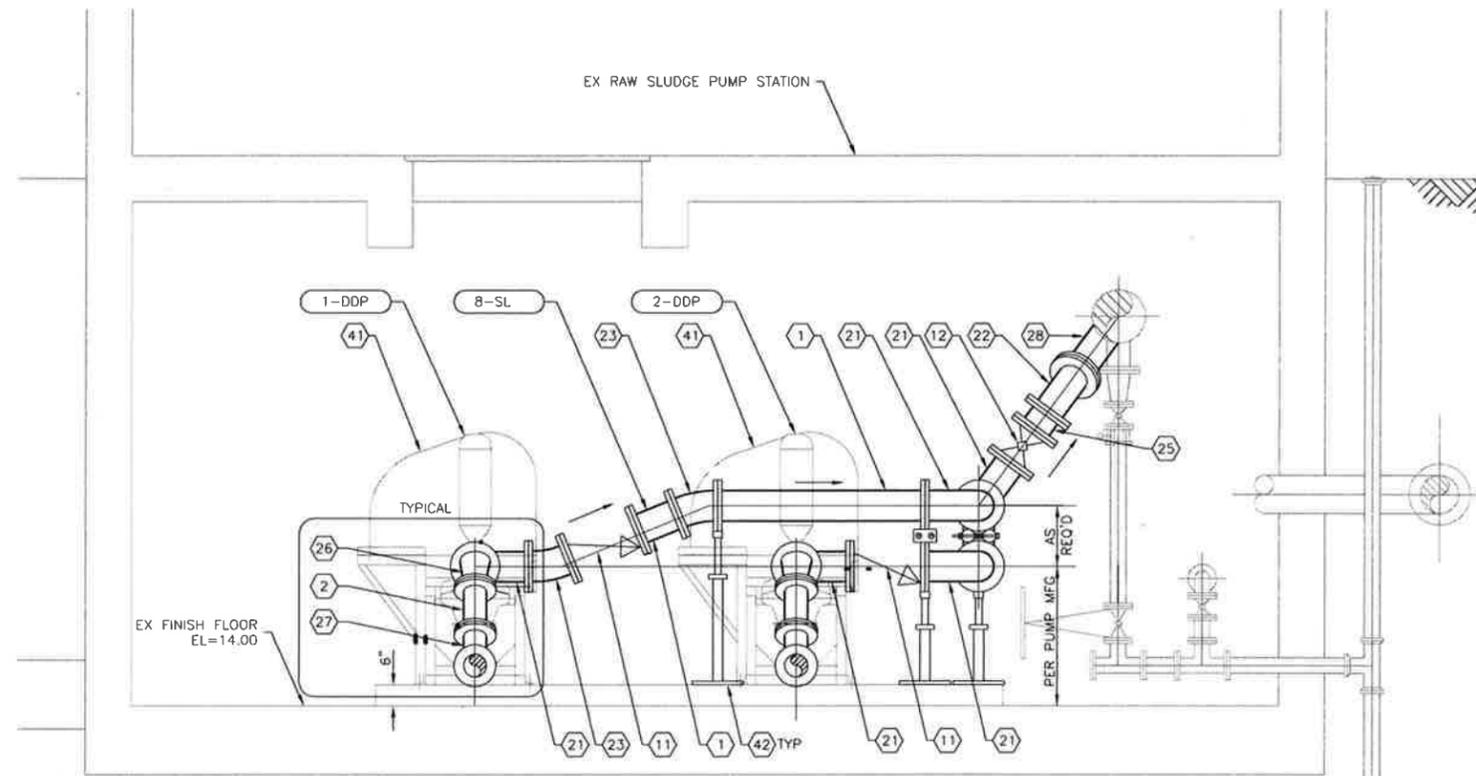
WBS NO.	FOR CITY OF HOUSTON USE ONLY
S-000056-0066-4	
DRAWING SCALE	
VERT: 1/2" HORZ: 1/2"	
CITY OF HOUSTON PM	
JOHN MSGIWA, P.E.	

ONE INCH
IF ABOVE MARK DOES NOT
MEASURE ONE INCH, THEN
THIS DRG. NOT TO SCALE

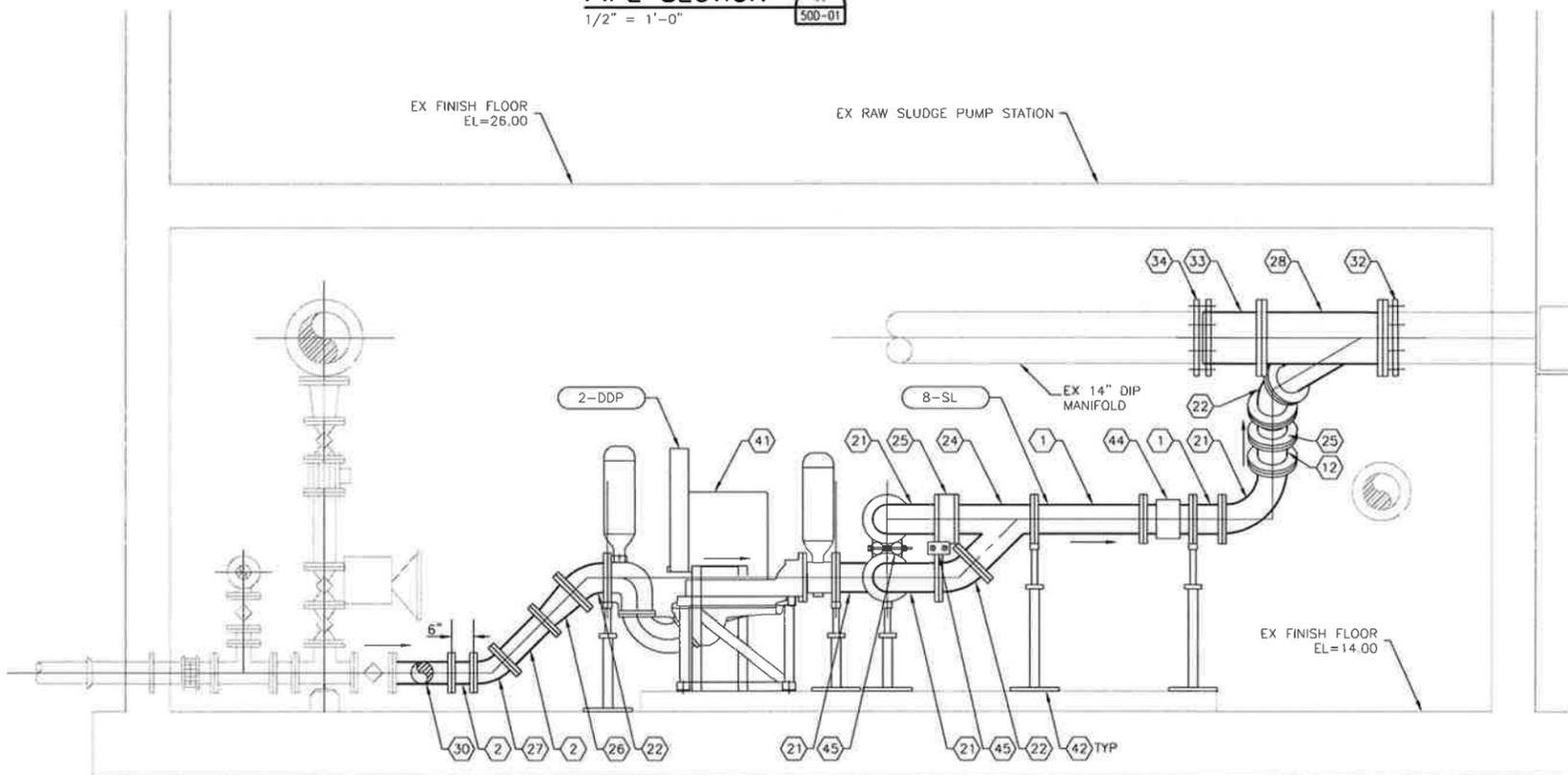
DWG NO.
70 D-01

SHEET
No. 228 OF 235

PIPING PLAN
1/2" = 1'-0"



PIPE SECTION A
1/2" = 1'-0" 500-01



PIPE SECTION B
1/2" = 1'-0" 500-01

KEY NOTES:

PIPE

1 6" DIP FLG'D

2 6" DIP FLG'D

VALVES

11 6" ADJUSTABLE BACK PRESSURE VALVE FLG'D

12 6" DIAPHRAGM VALVE FLG'D

FITTINGS

21 6" 90° LONG RADIUS ELBOW FLG'D

22 6" 45° ELBOW FLG'D

23 6" 22 1/2" ELBOW FLG'D

24 6" 45° WYE FLG'D

25 6" FLANGE FILLER (LENGTH AS REQ'D) FLG'D

26 6" SPOOL PIECE FLG'D

27 6" 45° ELBOW FLG'D

28 14"x6" 45° WYE FLG'D

29 6" TEE FLG'D

30 6" CROSS FLG'D

31 6" BLIND FLANGE FLG'D

32 14" RESTRAINED FLANGE ADAPTOR

33 14" FLG x PE ADAPTOR

34 14" SERVICE COUPLING FOR DIP (WITH FULLY RESTRAINED JOINTS)

SPECIALS

41 6" DOUBLE DISC PUMP PER THE SPECIFICATIONS

42 PIPE SUPPORT, SEE DETAIL 4 ON SHEET 00D-02

43 REMOVE EX 6" TAPPED BLIND FLANGE AND 1 1/2" GATE VALVE AS REQUIRED FOR NEW CONNECTION. SALVAGE FOR FUTURE DISTRICT USE

44 6" MAGMETER

45 APS INSPECT-A-LIFT PIPE SUPPORT SYSTEM OR APPROVED EQUAL

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SHEET No. 229 OF 235