

**ADDENDUM NO. 2**

**1.1 MGD WASTEWATER TREATMENT FACILITY REHABILITATION  
FOR  
HARRIS COUNTY MUNICIPAL UTILITY DISTRICT NO. 82**

**Date: March 9, 2010**

**VVI Job No: 05900-501-8-STP (br)**

**To: All Bidders of Record**

This ADDENDUM is an amendment to the CONTRACT DOCUMENTS and SPECIFICATIONS and shall become part of the AGREEMENT. All bidders shall acknowledge receipt of this ADDENDUM in the space provided on the Bid Proposal. Failure to do so may subject the Bidder to disqualification.

**BIDDING REQUIREMENTS**

No changes. The bid date, location and time are unchanged from Addendum No. 1.

**CONTRACT FORMS**

No changes

**PROPOSAL**

Items have been changed and added to the bid proposal. All bidders must use the revised bid proposal attached to this Addendum. The following revisions have been made:

1. Bid Item 7 – Bid items 7, 8, 9 and 11 have been combined into Bid Item 7. “Remove and relocate one-ton cylinder and scale as shown on drawings” has been added.
2. Bid Item No. 8 formerly Bid Item No. 10, has been revised to include capacity of proposed crane and crane supplier.
3. Bid Item No. 9 formerly Bid Item No. 12
4. Bid Item No. 10 – Bid Items No. 13,14,15,16, 17 and 21 have been combined.
5. Bid Item No. 11 has been added. An attachment showing existing conditions have been provided.
6. Bid Item No. 12 – Bid Items No. 18, 19 and 20 have been combined. “Modify existing Return Sludge line...” has been revised to include “valves”.
7. Bid Item No. 13 has been added.
8. Bid Item No. 14 – 40, formerly Bid Item No. 22-40.
9. Bid Item No S17 has been added.

**CONDITIONS OF THE AGREEMENT**

No changes

**TECHNICAL SPECIFICATIONS**

The following specifications were inadvertently left out of the original contract documents:

1. 11 261 – Chlorination Equipment
2. 15 201 – Sluice Gates and Slide Gates
3. 15 051 – Piping and Related Items

Copies are available at the office of Van De Wiele & Vogler, Inc. for pick-up or can be downloaded from the website.

**CONSTRUCTION DRAWINGS**

Additions and changes have been made to the following sheets:

1. Sheet 7 of 55
2. Sheet 8 of 55
3. Sheet 9 of 55
4. Sheet 11 of 55
5. Sheet 12 of 55
6. Sheet 13 of 55
7. Sheet 19 of 55
8. Sheet 20 of 55
9. Sheet 21 of 55
10. Sheet 22 of 55
11. Sheet 23 of 55
12. Sheet 24 of 55

The revisions are noted on the revised sheets. The revised sheets are available at the office of Van De Wiele & Vogler, Inc. for pick-up or can be downloaded from the website.

**END OF ADDENDUM NO. 2**



Erik Spencer, P.E.  
District Engineer

**BID PROPOSAL**  
**HARRIS COUNTY MUD NO. 82 WASTEWATER TREATMENT FACILITY**  
**REHABILITATION**  
**PROJECT NO. 05900-501-8-STP (c&e)**

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT BID
1.	Mobilization, Bonds & Permits	EA	1	\$ _____	\$ _____
2.	Clearing and Grubbing (Chip and Haul)	AC	0.63	\$ _____	\$ _____
3.	Relocate existing chain link fence	LF	568	\$ _____	\$ _____
4.	6' Chain Link Fence with 3 strand barbed wire	LF	170	\$ _____	\$ _____
5.	Remove and Dispose of existing sidewalk (limits to be marked by Engineer)	SY	132	\$ _____	\$ _____
6.	Reinforced Concrete Sidewalk	SY	179	\$ _____	\$ _____
7.	Remove and dispose of Sulfur Dioxide feeder equipment including piping. Equipment and appurtenances not being relocated or re-used. Remove and dispose of existing chlorine storage pads as shown on drawings, including all piping, equipment, and appurtenances not being relocated or re-used. Remove and relocate existing one-ton cylinder and scale as shown on drawings. Modify Existing Chlorine Feeder and Storage Building, including partition wall, door, fans, windows, heater, and all features shown on drawings. Provide all supervision, labor, materials, tools, equipment, piping, fittings, incidentals and related items to relocate existing chlorinator, install one (1) new 500 ppd chlorinator and two (2) new 500 ppd sulfonators, refurbish and relocate existing scales and/or trunnions as shown on drawings, for a complete operating system.	LS	1	\$ _____	\$ _____
8.	Provide all supervision, labor, materials, tools, equipment, incidentals and related items to construct proposed disinfection storage building including 2-ton crane as supplied by Gaffey, piping, valves, fittings and all equipment shown on drawings for a complete operating system.	LS	1	\$ _____	\$ _____

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ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT BID
9.	Provide all supervision, labor, materials, tools, equipment, incidentals and related items to construct, start up and place in operation the new headworks structure including Duperon Q.FPFS.2A.4 Flex Rake fine screen with Custom C.3.EVDF.PB.WC.29 Controls Package, Ultrasonic Transducer, 304 SS Enclosure, and 304 SS Dual Auger washer compactor; manual bar screen, weir gate, slide gates, stairs, handrails, grating, bollards, dumpster pad and all piping, valves, fittings and pavement as shown on plans and as described in specifications for a complete operating system.	LS	1	\$ _____	\$ _____
10.	Remove and Dispose of existing 4" and 6" drain lines as shown on plans. Remove and Dispose of existing 6" scum lines as shown on plans. Modify Existing forcemain at Lift Station and Install proposed 12" force main including all valves and fittings. Install proposed 6" drain line including all fittings. Install proposed 24" influent line including all fittings and connection to existing Influent Channel. Install proposed 2" non-potable water line including all fittings and hose bibs. Connect to existing non-potable water system and proposed headworks structure.	LS	1	\$ _____	\$ _____
11.	Construct reinforced concrete wall with wall pipe at north end of Influent Channel for connection of proposed forcemain. Remove and dispose of existing steel wall. (The existing conditions is shown in an attached sheet.)	LS	1	\$ _____	\$ _____
12.	Provide all supervision, labor, materials, tools, equipment, incidentals and related items to construct Scum Pit including valve vault, grating and all features shown on plans. Supply and install two (2) 6 HP submersible pumps in scum pit including access hatch and all pump accessories. Install 4" and 6" scum pump piping including all valves, fittings, and pipe supports as shown on plans. Modify existing scum line at Clarifier to accommodate connection to proposed scum pump station. Modify existing Return Sludge line including piping, valves and fittings as shown on drawings.	LS	1	\$ _____	\$ _____

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ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT BID
13.	Supply and install one (1) 2000 Gallon hydropneumatic tank with 75 PSI working pressure by Bulldog or Acme. Connect to existing non-potable water system, supply and install backwash piping to enable backwashing from either non-potable water pump, construct extension of existing concrete pad, furnish and install pressure gauge and all piping, valves and fittings required to tie into proposed chemical feed system.	LS	1	\$ _____	\$ _____
14.	6" Lime-Fly Ash Stabilized Subgrade	SY	733	\$ _____	\$ _____
15.	Lime (20 LB/SY)	TON	8	\$ _____	\$ _____
16.	Fly-Ash (46LB/SY)	TON	17	\$ _____	\$ _____
17.	6" Reinforced Concrete Pavement	SY	629	\$ _____	\$ _____
18.	Crushed Concrete compacted on existing access road for maintenance and repair of access road during construction per 8 CY truck load	LOAD	10	\$ _____	\$ _____
19.	Tensar Triax TX160 Geogrid (WWTP access road)	SY	2,620	\$ _____	\$ _____
20.	Tensar Triax TX160 Geogrid (WP2 access road)	SY	430	\$ _____	\$ _____
21.	4" Compacted Crushed Concrete overlay (WWTP access road)	SY	2,620	\$ _____	\$ _____
22.	4" Compacted Crushed Concrete overlay (WP2 access road)	SY	430	\$ _____	\$ _____
23.	Install 18" RCP Culvert across existing Water Plant 3 access road at low area	EA	1	\$ _____	\$ _____
24.	Regrade existing swale at Water Plant 3 access road	LF	200	\$ _____	\$ _____
25.	Crushed Concrete compacted on existing Water Plant 3 access road for repair per 8 CY truck load	LOAD	5	\$ _____	\$ _____

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ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT BID
26.	Storm Water Management including NOI, PPP inspection, posting, monthly reports for construction duration, etc.	LS	1	\$ _____	\$ _____
27.	Reinforced filter fabric fence	LF	400	\$ _____	\$ _____
28.	Hydromulch Seeding	AC	1	\$ _____	\$ _____
29.	Block sodding along newly paved concrete and the area around headworks structure and scum pump station (includes topsoil and adequate watering and maintenance period)	SY	100	\$ _____	\$ _____
30.	Cut exposed rebar from existing aeration, digester, and chlorination basins and apply epoxy protective coating on cut end of each bar.	LS	1	\$ _____	\$ _____
31.	Site Drainage Swales	LF	440	\$ _____	\$ _____
32.	Site Final Grading and Stockpiling of Spoil Dirt at location shown on plans.	LS	1	\$ _____	\$ _____
					\$ _____

**Electrical**

33.	Provide and install all work shown on plans and described in specifications including as follows: Provide and install pump control panel, lighting and receptacles, pump motor feeders, MCC feeders, head works control panel, autosensory controls, and all appurtenances as shown on plans and as described in specifications for a complete operating system.	LS	1	\$ _____	\$ _____
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**Subtotal Electrical**

\$ \_\_\_\_\_

**TOTAL AMOUNT BASE BID** \$ \_\_\_\_\_

**BID PROPOSAL  
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ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT BID
<b><u>Supplementary Work Items</u></b>					
S1.	Extra excavation, placement and compaction on site.	CY	200	\$ _____ (\$5)	\$ _____
S2.	Extra excavation and backfill for utilities, all widths, 8 ft. to 20 ft. depth, complete in place.	LF	100	\$ _____ (\$40)	\$ _____
S3.	Extra cement stabilized sand, complete in place:	CY	10	\$ _____ (\$25)	\$ _____
S4.	Extra reinforced concrete, all types, complete in place:	CY	100	\$ _____ (\$500)	\$ _____
S5.	Extra fittings	TON	1	\$ _____ (\$2000)	\$ _____
S6.	Extra aluminum handrail, all types, complete in place	LF	50	\$ _____ (\$15)	\$ _____
S7.	Extra FRP grating including supports, complete in place	SF	30	\$ _____ (\$35)	\$ _____
S8.	Extra drainage swale, up to 2 ft. depth	LF	150	\$ _____ (\$3)	\$ _____
S9.	Extra C900 PVC pipe 4-10 inches diameter up to 8 ft. depth, complete in place	LF	100	\$ _____ (\$30)	\$ _____
S10.	Extra Class 52 DIP 4-10 inches diameter up to 8 ft. depth, complete in place	LF	100	\$ _____ (\$55)	\$ _____
S11.	Extra Class 52 DIP 12-18 inches diameter up to 8 ft. depth, complete in place	LF	100	\$ _____ (\$130)	\$ _____
S12.	Extra Class 53 FExFE up to 10 inches diameter, complete in place	LF	100	\$ _____ (\$55)	\$ _____
S13.	Extra GS pipe 4-10 inches diameter, complete in place	LF	100	\$ _____ (\$45)	\$ _____
S14.	Extra Schedule 80 PVC, up to 4" diameter, complete in place	LF	100	\$ _____ (\$6)	\$ _____

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ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT BID
S15.	Extra GS pipe up to 4 inches diameter, complete in place	LF	100	\$ _____ (\$10)	\$ _____
S16.	Extra Removable Bollard	EA	1	\$ _____ (\$200)	\$ _____
S17.	Extra concrete sidewalk, all widths, complete in place	SY	100	\$ _____ (\$25)	\$ _____
<b>Subtotal Supplementary Work Items</b>					\$ _____

Unit costs listed for extra work items are the minimum allowable unit costs. The bidder may substitute higher unit costs. Extra Work items shall be performed only with written authorization from the Engineer. The apparent low bidder will be determined based upon the Total Base Bid. The Contract will be awarded in accordance with the Instructions to Bidders. Time of completion may be considered as a factor in determining the successful bidder.

**TOTAL AMOUNT BASE BID:** \$ \_\_\_\_\_

**ALTERNATE BID ITEMS:**

A1.	Cost increase(+) or decrease(-) to install 304 SS John Meunier Perforated Plate Fine Screen in lieu of Duperon Flex Rake Fine Screen for bid item 12. Provide all supervision, labor, materials, tools, equipment, incidentals and related items to install, start-up and place in operation 304 SS Jonh Meunier Escalator Fine Screen Model ESH-41-XA with gear and motor drives for screen and brush, control panel, differential level control system and high water level start floating switch, element washing system and anchors, and 304 SS John Meynier Rotopac Screw Washer Compactor, model RPW - 202-XI with gear and motor, control panel and anchors	(+/-) LS	1	\$ _____	\$ _____
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**TOTAL AMOUNT BID WITH INCREASE OR DECREASE FOR ALTERNATE BID ITEM:** \$ \_\_\_\_\_

## CHLORINATION EQUIPMENT

## 1.0 GENERAL

This section specifies the requirements for the manufacture, warranty, service and operation of chlorine and SO<sub>2</sub> equipment including scales, trunnions, instrument enclosure, equipment software, and restraints.

## 1.01 WEIGHT INDICATOR

The chlorine and SO<sub>2</sub> weighing system shall be a fully integrated system that allows all ton container and 150 lbs cylinder scales to be integrated into a single 6 channel digital weight indicator. Each channel shall have separate resolution, capacity and net weight outputs that are specific to each container size.

## 1.02 TON CONTAINER SACLE PLATFORMS

The quantity of ton container scales shall be as specified on drawings and shall be of the digital readout/electronic load cell type. Scale frame shall have a 2-part epoxy finish and be sized to accept one 3,600 lb/1632 kg. chlorine or sulfur dioxide ton container. The frame shall have the required number of heavy duty bronze bushed bearing trunnions installed for each container to allow easy container rotation. Scale shall be of such a size that it is within the dimensions of the tank(s) it supports. Scale shall be of the single load cell design. Weight shall be transferred via lever(s) to a single, NTEP approved, load cell of the shear beam strain gauge type. Flexible cable shall connect load cell to indicator to allow easy remote installation of the readout. Cable length shall be 20 ft. in length (20'6M standard).

## 1.03 150 LBS CYLINDER SCALE PLATFORMS

The quantity of 150 Lbs cylinders scales shall be as specified on drawings. Chlorine Cylinder scales shall be of the digital readout/strain gage load cell type. Each scale platform shall be constructed of non-corrosive PVC plastic and sized to accept one (1) 150 lb cylinder from 10 ¼" – 10 ½" (260mm – 267mm). Platform scale coating system shall be a minimum dry thickness of 80 mils and be resistant to moisture, chemicals, abrasion, impact and UV light. Load cell cable length shall be a minimum of 10 feet. A wall mounted cylinder restraining bracket with integral tool rack shall be provided.

## 1.04 INSTRUMENT ENCLOSURE, OUTPUTS &amp; ALARMS

The multichannel Indicator shall carry CE marking and shall be housed in a NEMA 4X, UL approved enclosure. Indicator shall have a 20 key digital keypad & ability to accept all scales as shown on the drawings on a backlit alphanumeric display. Display shall be able to automatically scan all scales in the system. Indicator shall have an adjustable 4-20mA signals that output net weight for each scale. Indicator shall display an alarm in any of the following conditions: Low

level, high level, low feed rate, high feed rate, max daily use, min daily use, supply exhausted and load cell failure. An alarm log shall store the most recent 10 alarm conditions with time and date of occurrence. A relay alarm contact for each scale shall be provided for remote alarm indication. Indicator shall be enabled with MODBUS protocol for remote RS-485 serial communications.

#### 1.05 DISPLAY & INVENTORY CONTROL SOFTWARE

Keypad and Menu items shall have independent password protection to prevent unauthorized operation. Both a numerical and a bar graph display shall give operator the ability to monitor chemical by weight, volume or percent full. Each of the channels shall have a user selectable, two digit scale ID number and shall display net remaining, pure chemical remaining, feed rate, daily usage, total amount used, days until empty, gross weight and tare weight. A data log shall store the DAILY USAGE for each of the previous 31 days. Indicator re-calibration in the field shall be accomplished through the keypad and shall not require the use of dead weights.

Scale shall carry a Full Five (5) Year Factory Warranty. "Limited" warranties shall be considered unacceptable. Full scale accuracy shall be better than 1/4 of 1%. Scale shall be CHLOR-SCALE® Model DR40 & PVC150 and digital display WIZARD 4000® Model 4000-6, or approved equal.

#### 1.06 STORAGE ROLLER TRUNNIONS

Trunnion Base shall be of fabricated of ASTM-A36 steel and 2-part epoxy finished to resist corrosion.

Rollers shall be zinc plated and equipped with bronze bushing for ease of tank rotation and to prevent roller seizure. Roller pins shall be zinc plated steel with alemite grease fittings for ease of lubrication.

Frames shall have holes in ends to attach to floor with anchor bolts or lag bolts.

Trunnions shall carry a minimum of Five (5) Year Warranty. "Limited" Warranties shall be considered unacceptable.

Trunnions shall be CHLOR-SCALE ® Model 21L Trunnion Blocks as manufactured by FORCE FLOW or approved equal.

#### 1.07 TON CONTAINER TANK RESTRAINT

##### A. OPTION 1: CHAINS & BINDERS

Scale shall have integral hold down chains and binders for securing tank(s) to scale platform. Each tank shall require one chain set. A chain set shall consist of two (2) ten foot lengths of 1/4" Proof-Coil Galvanized Chain rated at 5,000 lb. ultimate strength. Each end of the chain shall be secured to the scale platform. Each chain set shall include

two (2) drop forged steel binders for eliminating slack in chain. Binders shall have a minimum ultimate load rating of 7,800 lbs. Chain set shall be Model No. HD4000 as manufactured by Force Flow, or approved equal.

**B. OPTION 2: POLYESTER STRAPS**

Scale shall have integral hold down straps with ratchet buckles for securing tank(s) to scale platform. Each tank shall require one strap set. A strap set shall consist of two (2) eight foot strap assemblies. Strap shall be 2" polyester webbing rated at 1500 lb working strength and ratchet buckle shall have a minimum ultimate load rating of 5000 lbs. The ends of each strap shall be secured to the scale platform. Strap set shall be Model No. PS4000 as manufactured by Force Flow, or approved equal.

PIPING AND RELATED ITEMS

1.0 GENERAL

1.01 SCOPE

This section provides requirements for furnishing and installing piping. Refer to related work specified in other sections to coordinate the complete installation.

1.02 MEASUREMENTS

Make measurements of previously installed construction before fabrication of connecting work, so that all work will fit properly.

1.03 PROJECT RECORD DOCUMENTS

Upon completion of all work, furnish as-built drawings showing location and principal details and modifications of piping systems as built.

1.04 SUBMITTALS

- A. Submit product data and shop drawings on each type of pipe, valves, fittings, and accessories in accordance with Section 01300.
- B. Provide product data for linings, coatings, and polyethylene wrap in accordance with Section 01300.

2.0 PRODUCTS

2.01 PIPING

- A. General.
  - 1. Unless otherwise indicated, conform to applicable requirements of City of Houston Standard Specifications 02501.
  - 2. Use Type 316 stainless steel bolts for submerged and below grade applications.
  - 3. Ductile iron pipe and fittings shall be ceramic epoxy- lined with Protecto 401 or equal. Provide manufacturer's standard bituminous coating inside and outside of all ductile iron pipe and fittings except on above ground piping to be painted. Above ground piping shall be coated in accordance with Section 09878.

4. Furnish an expansion/contraction system Dependo-Lok or approved equal for all air headers to allow for 125°F temperature change. Dependo-Lok couplings shall be provided with one fixed end. Expansion joints shall be provided on all continuous lengths of header between two (2) restraining points and where shown on the plans.
5. Use flange insulating kits for connecting dissimilar metals including galvanized steel to ductile iron connections.
6. Where wall pipes are shown on the drawings, use Adeka Waterstop or approved equal to provide a water tight seal.
7. At a minimum install thrust blocks or restrained joints at all locations shown on the drawings. Install additional thrust blocks or restrained joints as required to counter unbalanced thrust.
8. Unless otherwise indicated, use long radius 90 degree bends for all gravity drain and scum lines.
9. Use Class 52 ductile iron pipe below structures and pavement. Provide restrained push-on joints under all structures and pavement.

B. Ductile Iron Pipe – Above Grade.

1. Where DI-2 is shown on the plans for ductile iron pipe installed above ground and inside the wet well, valve box, or dry well, use thickness Class 53 flanged end ductile pipe unless otherwise indicated.

C. Ductile Iron Pipe – Below Grade.

1. Where DI-2 is shown on the plans for ductile iron pipe installed below ground, use thickness class 52 with push-on joints. No mechanical joints shall be allowed unless approved by the engineer.

D. Galvanized Steel Pipe

1. Provide galvanized steel pipe of the type designated on the plans. Pipe designated as GS-1 on the Drawings shall be Schedule 40 steel pipe in conformance with ASTM A53 Grade B. Pipe designated as GS-2 on the Plans shall be standard weight galvanized steel.
2. No field welding of galvanized steel piping shall be allowed. Provide expansion couplings or flanged connections to connect galvanized steel piping components.
3. Galvanized steel pipe components shall be hot-dip galvanized after fabrication.
4. Cold galvanize any damage to galvanized pipe.

5. All above grade non-potable or potable water piping smaller than three inches diameter shall be GS-1.

E. Polyvinyl Chloride (PVC) Pipe.

1. Provide PVC pipe in accordance with the designations shown on the plans.
2. Pipe designated as PVC-1 shall be schedule 80 PVC.
3. Pipe designated as PVC-2 shall be schedule 40 PVC.
4. Pipe designated as PVC-3 shall be AWWA C900, Class 150, DR 18.
5. Pipe designated as PVC-4 shall be ASTM D3034, SDR 26.
6. Pipe designated PVC-5 shall be AWWA C905, Class 235. DR 18.
7. Pipe designated PVC-6 shall be ASTM F679, SDR 26.
8. Joints shall be solvent welded, screwed or flanged. All fittings shall be manufactured by the same company that manufactures the pipe, and rated for the same working pressure as the pipe or higher.
9. Gaskets for PVC pipe shall conform to ASTM F477. Gaskets for gravity PVC joints shall conform to ASTM F477 and ASTM 3212 or ASTM 3139.

F. Pipe Supports.

1. For vertical pipes larger than 3-inch diameter, provide at least one Type I concrete pipe support as shown on the plans mounted horizontally near the top of the wall. Place epoxy dowels into existing concrete walls where required to provide equivalent reinforcement.
2. Maximum spacing for all pipe supports shall be 10 feet.
3. Construct concrete pipe supports where shown on the plans and for piping with 9 inches or more clearance from the supporting surface, unless other indicated.
4. For piping with less than 9 inches clearance from the supporting surface and 3 inches or greater in diameter, provide roller stand Piping Technology and Products Figure 230 or approved equal.
5. Unless indicated otherwise, support pipe less than 3 inches diameter using Unistrut pipe clamp systems. Insulate above grade pipe per Section 15260.

## 2.02 FITTINGS

- A. Use fittings of same size as pipe they serve. Reducers are not permitted to facilitate an off-size fitting. Reducing bushings are also prohibited. Reduction in piping size will be made by reducing fittings unless otherwise noted on the plans. Fittings shall be lined and coated as specified for pipe they serve. Fittings for use with galvanized pipe shall be galvanized in accordance with ASTM A 153.
- B. Ductile Iron Fittings
  - 1. Unless otherwise indicated in the Drawings or Specifications, ductile iron fittings shall conform to requirements of City of Houston Standard Specification 02501.
  - 2. Use ASTM A 307, Grade B square head bolts and heavy hex nuts, ANSI B1.1 and ANSI B18.2 for above ground, non-submerged, flanged joints
  - 3. For ductile iron pipe installed above ground and inside wet wells, valve boxes, or dry wells, use flanged fittings conforming to ANSI/AWWA C115/A21.15.
  - 4. Unless otherwise indicated in the Drawings or Specifications, use restrained push-on fittings for all below ground applications underneath structures or slabs.
  - 5. Unless otherwise indicated in the Drawings or Specifications or approved by the Engineer, mechanical joints shall only be used for below ground connections to existing piping, fittings, or valves with mechanical joints.
- C. PVC Fittings
  - 1. Unless otherwise indicated in the Drawings or Specifications, polyvinyl chloride fittings for gravity piping shall conform to requirements of City of Houston Standard Specification 02506.
  - 2. Unless otherwise indicated in the Drawings or Specifications, fittings for PVC pressure piping shall be ductile iron in conformance with City of Houston Standard Specification 02501.
  - 3. All PVC fittings shall be manufactured by the same company that manufactures the pipe and rated for the same working pressure as the pipe or higher.
  - 4. All PVC pipe to be threaded shall be Schedule 80 or thicker. Joints in small diameter PVC pipe shall be solvent welded.
- D. Mechanical Joint Fittings: Shall not be allowed unless approved by the Engineer.

- E. Welding Fittings. Welding fittings for use with welded steel pipe shall be forged steel fittings in accordance with ANSI B16.9, standard weight.

## 2.03 COUPLINGS

### A. Flexible Couplings.

1. Flexible couplings shall be installed where shown on the drawings or elsewhere where allowed by the Engineer for the Contractor's convenience. Provide control units for all flexible couplings and expansion joints.
2. Couplings between structures shall be Dresser Style 38 or approved equal with a 7" middle ring that provides 4° of deflection.
3. Where flexible couplings are installed underground, Type 316 stainless steel bolts shall be used. The entire coupling shall be given a 20-mil coat of T.C. Mastic as manufactured by the Tape Coat Company, Inc., Bitumastic No. 50 as manufactured by Koppers Company, Inc., or equal.

### B. Flanged Coupling Adapters

1. Provide control units for all flanged coupling adapters.
2. Flanged coupling adapter for pipe less than 14" in diameter shall be of the bolted compression type for joining plain end pipe to adjoining flange. Adapter shall consist of one flange body, follower ring, compression gasket, and all necessary bolting. Bolting pattern shall match adjacent mating flange. Bolts and nuts shall be made of a high grade, high strength steel. Flanged coupling adapters shall be Dresser Style 127 or approved equal. Provide control units for all flanged coupling adapters.
3. Flanged coupling adapters for pipes 14" in diameter and greater shall be of the bolted compression type for joining plain end pipe to adjoining flange. Adapter shall consist of one flange body, follower ring, compression gasket, and all necessary bolting. Bolting pattern shall match adjacent mating flange. Bolts and nuts shall be made of a high grade, high strength steel. Flanged coupling adapters shall be Dresser Style 128 or approved equal.
4. Provide a dismantling joint for blower discharge piping Dresser Style 131 or approved equal.

### C. Expansion Couplings

1. Furnish expansion couplings with one fixed end, Dependo-Lok or approved equal, for all headers to allow for 125°F temperature change. Expansion joints shall be provided on all continuous lengths of header between two (2) restraining points.

## 2.04 GASKETS

1. Provide and install transition gaskets or hub x hub adapter for a leak proof connection between different pipe classes.
2. Gaskets for flexible couplings shall be Buna-N.
3. All gaskets and seals on piping and valves for compressed air service shall be EPDM or equal rated for 250°F minimum.

## 2.05 JOINTS

- A. All above ground piping shall have flanged joints with stainless steel bolts, unless otherwise noted on the drawings.
- B. All below ground piping underneath a structure shall have restrained push-on joints as manufactured by Super-Lock Joint by Clow Corporation, Flex-Ring or Lok-Ring by American Iron Pipe Company, or TR-Flex or Field-Lok by U.S. Pipe and Foundry Company.
- C. All other below ground piping shall have push-on joints unless otherwise specified as manufactured by Joint Tyton by U.S. Pipe, Super Bell-Tite Joint by Clow Corporation, or Fastite by American Cast Iron Pipe Company. Air supply pipe joints shall be installed with heat resistant EPDM gaskets rated at 250° F. Submit gaskets for approval prior to installation.
- D. Maximum allowable deflection for push-on type joints shall be as follows:

<u>Size (in)</u>	<u>Deflection (degree)</u>
12	5
14, 16	4
18-36	3

## 3.0 EXECUTION

### 3.01 JOINTS

- A. Threaded Joints. Make threaded joints using suitable joint compound applied to male threads only. Thoroughly ream field cuts. Make connections carefully so that thread engagement will be secured. Machine cut threads to American National taper pipe thread sizes. For screwed joints on PVC pipe, use Teflon tape.

- B. **Welded Joints.** Make welded joints as recommended by standards of the American Welding Society. Ensure complete penetration of deposited metal with base metal. The filler metal must be suitable for use with the base metal. The inside of fittings must be free from globules of weld metal which would restrict the flow or become loose. Do not use mitered joints.
- C. **Flanged Joints.** Accurately center and align flanged joints prior to the installation of bolts to prevent mechanical prestressing of flanges, pipe and equipment. Gaskets shall be 1/16-inch full face compressed asbestos conforming to ASTM D 1170-P1161A, except the gaskets for use with PVC flanges shall be full face neoprene 1/8 inch thick.

### 3.02 HANDLING

Handle pipe, fittings and accessories to ensure their installation in a sound, undamaged condition. Use equipment, tools and methods to prevent damage in unloading, hauling, and laying pipe and fittings. When using hooks in pipe ends, be sure that the contact surfaces are broad and well padded.

### 3.03 CUTTING

Cut pipe in a neat manner, without damage to the pipe or to the interior lining, if any. Make cuts smooth, straight, and at right angles to the pipe axis. Use mechanical pipe cutters of an approved type, except in locations where the use of mechanical cutters would be difficult or impracticable. In such locations, cut the pipe with diamond point chisels, saws, or other tools which will cut pipe without damaging impact or shock.

### 3.04 CLEANING

Thoroughly clean the interior of the pipe and fittings of foreign matter before installation. Keep the interior clean until the work has been accepted. Remove lumps, blisters, and excess coating from the exterior spigot and interior bell surfaces. Wire brush such surfaces clean until jointing is completed. Take every precaution to prevent foreign material from entering the pipe during installation. Do not place debris, tools, clothing or other materials in the pipe.

### 3.05 INSPECTION

During installation, while the pipe is suspended and hanging free, inspect each pipe and fitting for defects. Tap the pipe with a light hammer to detect cracks. Reject defective, damaged or unsound pipe and fittings and remove them from the site.

### 3.06 LAYING PIPE

- A. Protect the pipe from lateral displacement by means of pipe embedment material installed.
- B. Under no circumstances should pipe be laid in water. Do not lay pipe under unsuitable weather or trench conditions.
- C. Lay pipe with bell ends facing the direction of the laying except when making closures.
- D. Buried ductile iron pipe and fittings shall be polyethylene wrapped in accordance with AWWA C105. Polyethylene film shall be Class C.

### 3.07 JOINTING

- A. Push-on Joints. Follow instructions and recommendations of the pipe manufacturer, relative to gasket installation and other jointing operations. Lubricate joint surfaces with heavy vegetable soap solution immediately before joint is completed. Suitably bevel each spigot end to facilitate assembly.
- B. Mechanical Joints. Mechanical joints may be used only with the approval of the Engineer. If approved, carefully assemble mechanical joints in accordance with the manufacturer's recommendations. Lubricate joint surfaces with heavy vegetable soap solution immediately prior to installing gasket on spigot end. If seal is defective, disassemble the joint, thoroughly clean it, and reassemble the joint. Do not overtighten bolts to compensate for poor installation practice.
- C. Flanged Joints. When bolting, take care to ensure that there is no restraint on the opposite end of the pipe or fittings which would prevent uniform gasket compression or which would cause unnecessary stress in the flanges. Leave one flange free to move in any direction while flange bolts are being tightened. Tighten bolts gradually and at a uniform rate, in such manner that gasket compression is uniform over the entire area of gasket.
  - 1. Take special care when attaching suction and discharge piping to pumping equipment. Ensure that no stresses are transmitted to or imposed on the pump suction and discharge flanges by connection piping. Install and permanently support piping to provide accurate matching of bolt holes and uniform contact over the entire flange. In addition, leave pump connection piping free to move paralleled to its longitudinal center line while the bolts in pump connection flanges are tightened.
  - 2. Provide maximum flexibility and ease of alignment correction by taking advantage of the slack between the flange bolts and bolt holes for slight

angular rotation of connecting flanges. Assemble pump connecting piping with gaskets in place, with only a portion of the flange bolts (no fewer than four per joint) installed. After final alignment and before final bolting, test pump connections for applied piping stresses by loosening flange bolts which, if piping is properly installed, should result in no movement of piping relative to the pump, or opening of the pump connection joints.

### 3.08 REACTION ANCHORAGE AND BLOCKING

- A. Install suitable reaction blocking, struts, anchors, clamps, joint harness or other adequate means for preventing movement of pipe caused by unbalanced internal liquid pressure. Pressure can be expected at unlugged tees, Y-branches and bends deflecting 11-1/4 degrees or more which are installed in piping subjected to internal hydrostatic heads in excess of fifteen feet in exposed piping or 30 feet in buried piping. Refer to lift station drawings.
1. In trenches, fittings must be provided with concrete thrust blocking between the fitting and solid, undisturbed ground in each case, except where solid ground blocking support is not available. At tops of slopes, anchor vertical angle bends with concrete of sufficient weight to resist hydraulic thrust to which pipe will be subjected at maximum pressures. Install the concrete block and anchors so that joints between the pipe and the fittings are accessible for repair. The bearing area of the concrete reaction block against the ground or the trench bank shall be as shown or as directed by the Engineer in each case. In the event that adequate support against undisturbed ground cannot be obtained, install metal harness anchorages consisting of steel rods or bolts across the joint and securely anchored to the pipe and fittings or other adequate anchorage facilities to provide necessary support. Should the lack of solid vertical excavation face be due to careless or otherwise improper trench excavation, no additional payment will be made for furnishing and installing metal harness anchorage in excess of contract value of concrete blocking replaced by such anchorages.
  2. Provide in locations other than trenches, as shown or directed, reaction blocking, struts, anchorages, or other supports for fittings installed in fills or exposed within structures.
  3. Adequately protect from corrosion steel clamps, rods, bolts, and other metal accessories used in reaction anchorages or joint harness where subject to submergence or contact with earth or other fill material and not encased in concrete. Apply not less than two heavy coats of coal-tar mastic coating material to clean, dry metal surfaces. Allow the first coat to become dry and hard before the second coat is applied.

- B. Substitution. In lieu of reaction anchorages and blocking for underground valves and fittings, use locking-type, push-on or mechanical joints such as Lok-Tyton or Lock-Type mechanical joints as manufactured by United States Pipe and Foundry Company. Equip Lok-Tyton joints with special Lok-Tyton gaskets. Groove the pipe in strict accordance with the manufacturer's recommendations.

### 3.09 PAINTING

Paint all metal surfaces in accordance with the section 09878 or as directed by the Engineer.

END OF SECTION

SLUICE GATES AND SLIDE GATES

1.0 GENERAL

1.01 SCOPE

- A. This section provides for the furnishing of all labor, equipment and materials including all operations required for the proper installation of all sluice gates, slide gates and appurtenances located on the drawings and specified herein.
- B. Provide all miscellaneous items and include all supplementary parts necessary to complete the installation even though such work may not be definitely shown or specified.

1.02 RELATED WORK

- A. Division 3 - Concrete.
- B. Division 5 - Structural Steel.
- C. Division 9 - Painting.
- D. Division 15 - Mechanical.

1.03 SUBMITTALS

- A. Shop Drawings. Submit shop drawings, product data, and samples as specified in Division 1, General Requirements.
- B. Operation and Maintenance Instructions. Submit operating and maintenance instructions, service manuals, and parts lists applicable to each item of equipment furnished and deliver six sets to the Owner's representative for the Owner's use, as a condition of final acceptance.
- C. Manufacturer's Report. Upon completion of installation a service engineer employed by the manufacturer shall provide the Owner with a written report of start-up, set points and calibrations. Final settings will be reviewed.

## 2.0 PRODUCTS

### 2.01 EQUIPMENT

- A. Furnish and install sluice gates which meet the requirements of AWWA Specification C-561 latest edition or as modified by these specifications. The sluice gates shall be in the quantity, types and sizes indicated on the plans and described in this section.
- B. Furnish and install slide gates which meet the requirements of AWWA Specification C-561 latest edition or as modified by these specifications. The slide gates shall be in the quantity, types and sizes indicated on the plans and described in this section.

### 2.02 PERFORMANCE

- A. Sluice gates – Sluice gates shall be substantially watertight under a design seating and unseating head condition of 20 ft. Under the design seating head, the leakage shall not exceed 0.05 U.S. gallon per minute per foot of seal periphery. Under the design unseating head, the leakage shall not exceed 0.1 U.S. gallon per minute per foot of perimeter.
- B. Slide gates – Slide gates shall be substantially watertight under a design seating head condition of 20 ft. Under the design seating head, the leakage shall not exceed 0.05 U.S. gallon per minute per foot of seal periphery.

### 2.03 GATE FRAME AND GUIDE RAILS

- A. Sluice gate -- The gate frame shall be constructed of structural members or formed plate welded to form a rigid one-piece frame. The frame shall be of the flange back design suitable for mounting on a concrete wall. The guide slot shall be made of polyethylene.

The frame configuration shall be of the flush-bottom type and shall allow the replacement of top or side seals without removing the gate frame from the concrete or wall thimble.

- B. Slide gate -- The gate frame shall be constructed of structural members or formed plate welded to form a rigid one-piece frame. The frame shall be suitable for surface mounting on a concrete wall or embedded mounting between channel walls. The guide slot shall be made of polyethylene

The frame configuration shall be of the flush-bottom type and shall allow the replacement of side seals without removing the gate frame from the concrete or wall thimble.

- B. Guide rails shall be of sufficient length to retain at least two-thirds of the vertical height of the slide when gate slide is in the full open position.

#### 2.04 SEALS

- A. Side and top seals shall be made of polyethylene of the self-adjusting type. A continuous compression cord shall ensure contact between the polyethylene guide and the gate in all positions. The sealing system shall maintain efficient sealing in any position of the slide and allow the water to flow only in the opened part of the gate. The bottom seal shall be made of resilient neoprene set into the bottom member of the frame and shall form a flush-bottom.

#### 2.05 GATE SLIDE

- A. The slide shall consist of a flat plate reinforced with formed plates or structural members to limit its deflection to 1/720 of the gate's span under the design head.

#### 2.06 WALL THIMBLES

- A. Wall thimbles if specified shall be stainless steel and supplied by the gate manufacturer. Refer to the plans for applicable locations. Material thickness should be according to the manufacturer's recommendations and be of sufficient resistance to handle the operating forces.

#### 2.07 STEMS, STEM GUIDES AND COUPLINGS

- A. The operating stem shall be of stainless steel designed to transmit in compression at least 2 times the rated output of the operating manual mechanism with a 40 lbs (178 N) effort on the crank or handwheel. The stem shall have a slenderness ratio (L/r) less than 200. The threaded portion of the stem shall have machined cut threads of the Acme type. Where a hydraulic, pneumatic or electric operator is used, the stem design force shall not be less than 1.25 times the output thrust of the hydraulic or pneumatic cylinder with a pressure equal to the maximum working pressure of the supply, or 1.25 times the output thrust of the electric motor in the stalled condition.
- B. For stems in more than one piece and with a diameter of 1¼ inches (45 mm) and larger, the different sections shall be joined together by solid bronze couplings. Stems with a diameter smaller than 1¼ inches (45 mm) shall be pinned to an extension tube. The couplings shall be grooved and keyed and shall be of greater strength than the stem.
- C. Stem guides shall be fabricated from type stainless steel. The guide shall be equipped with a polyethylene bushing. Guides shall be adjustable and spaced in

accordance with the manufacturer's recommendation. The L/r ratio shall not be greater than 200.

- D. Rising stem gates shall be provided with a clear polycarbonate stem cover. The stem cover shall have a cap and condensation vents and a clear mylar position indicating tape. The tape shall be field applied to the stem cover after the gate has been installed and positioned.

## 2.08 MANUALLY OPERATED LIFTS

- A. Manual operators as specified in this section shall be provided by the gate manufacturer. All bearings and gears shall be totally enclosed in a weather tight housing. The pinion shaft of crank-actuated mechanisms shall be constructed of stainless steel and supported by roller or needle bearings. Each manual operator shall be designed to operate the gate by using a maximum effort of 40 lbs (178 N) on the crank or handwheel, and shall be able to withstand, without damage, an effort of 80 lbs (356 N). The crank shall be removable and fitted with a corrosion-resistant rotating handle. The maximum crank radius shall be 15 inches (381 mm) and the maximum handwheel diameter shall be 24 inches (610 mm).
- B. All gates having widths equal to or greater than two times the height shall be provided with two lifting devices connected to a tandem shaft with crank operator for simultaneous operation.
- C. All operator mechanisms shall be grease lubricated through zerk fittings.
- D. Handwheel or crank actuators shall be 36 inches (nominal) above walkway or grating elevation.

## 2.09 YOKE

- A. Self-contained gates shall be provided with a yoke made of structural members or formed plates. The maximum deflection of the yoke shall be 1/360 of the gate's span.

## 2.10 GATE CLASSIFICATION

- A. Sluice gates – Sluice gates shall be non-self contained, handwheel operated with rising stem and surface mounted to concrete unless otherwise designated on the plans.
- B. Sluice gates designated on the plans according to the following gate identification designation shall be provided according to the description in the following table.

<b>Gate Identification</b>	<b>Operator Support</b>	<b>Mounting</b>
SL-1	Pedestal	Standard Flange
SL-2	Pedestal	Wide Flange
SL-3	Wall Bracket	Standard Flange
SL-4	Wall Bracket	Wide Flange

- C. Slide gates – Slide gates shall be self contained with rising stem unless otherwise designated on the plans. Self contained gates shall be provided with a yoke as described in this section to support the lifting mechanism. Slide gates with a single lifting mechanism shall be handwheel operated. Slide gates with a tandem lifting mechanism shall be crank operated.
- D. Slide gates designated on the plans according to the following gate identification designation shall be provided according to the description in the following table.

<b>Gate Identification</b>	<b>Operator</b>	<b>Mounting</b>
SG-1	Handwheel	Surface
SG-2	Handwheel	Embedded
WG-1	Crank	Surface
WG-2	Handwheel	Surface

## 2.11 MATERIALS

- A. Provide components of materials as specified below.

<b>Components</b>	<b>Material</b>
Frame, yoke, stem guides, slide, stem extension	Stainless steel ASTM A-240 type 304L
Side seals, stem guide liner	Ultra high molecular weight polyethylene (UHMWPE) ASTM D-4020
Compression cord	Nitrile ASTM D2000 M6BG 708, A14, B14, E014, E034
Bottom seal	Neoprene ASTM D2000 Grade 2 BC 510
Threaded stem	Stainless steel ASTM A-276 type 303 MX or 316
Fasteners	ASTM F593 and F594 GR1
Pedestal, handwheel and crank	Tenzaloy aluminum
Gasket (between frame and wall)	EPDM ASTM 1056
Stem cover	Polycarbonate ASTM D-3935
Lift nut, couplings	Manganese bronze ASTM B584 UNS-C86500

B. For wastewater applications the gate material shall be Type 304 stainless steel unless otherwise noted.

### 3.0 EXECUTION

#### 3.01 INSTALLATION

- A. Gates shall be installed where shown in the plans and in accordance with the manufacturers working drawings after drawings have been reviewed by the Owner's representative. Before grouting is done, equipment alignment and installation shall be checked and approved by the factory representative.
- B. All grout required shall be the non-shrink type cement mortar. The installation shall be rechecked and approved by the factory representative after grouting is complete. Tighten all anchor bolts finally after approval of the installation.
- C. Where wide flange gates are shown on the drawings, the wall pipe shall be flush with the concrete surface.

#### 3.02 PAINTING

Equipment requiring coating shall be cleaned, primed and coated in accordance with Division 9 - Finishes.

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