

## APPENDIX - I

### WATER/WASTEWATER SPECIFICATIONS

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**SECTION 01505**

**MOBILIZATION**

**PART 1 GENERAL**

1.01 WORK INCLUDES

Work consists of preparatory work and operations, including, but not limited to, those necessary for scheduling; preliminary meetings; traffic control planning; cost of bonds and any required insurance; movement of personnel, equipment, supplies and incidentals to the project; and establishment of all facilities necessary for work on this project.

1.02 BASIS OF PAYMENT

- A. Maximum amount to be bid on this item will be two percent (2%) of the total bid amount.
- B. Payment will be based on a lump sum amount. Payment for this item will be made in partial payments based on the following payment table:

Percent of Total Contract <u>Amount Earned</u>	Allowable Percent of the Lump <u>Sum Price for the Item</u>
1 <sup>st</sup> Partial Payment	25
10	50
25	75
50	100

**PART 2**

Not Used

**PART 3**

Not used

**END OF SECTION**

## SECTION 01520

### MISCELLANEOUS CONSTRUCTION REQUIREMENTS

#### PART 1 GENERAL

##### 1.01 REQUIREMENTS INCLUDED

- A. Water
- B. Sanitary Facilities
- C. Barriers
- D. Protection of Installed Work
- E. Controls
- F. Cleaning During Construction
- G. Access to Emergency and Other Facilities
- H. Traffic Regulation
- I. Temporary Surfacing
- J. Construction Parking
- K. Removal
- L. Unit Prices

##### 1.02 WATER

- A. Source: Arrange with authorities and connect to public utility. No connections shall be allowed without approval of Lafayette Utilities System.

##### 1.03 SANITARY FACILITIES

- A. Provide required facilities and enclosures.
- B. Toilet Facilities: Enclosed portable self-contained units or temporary water closets and urinals, secluded from the public view.
- C. Provide facilities at time of site mobilization.

- D. Clean areas of facilities daily, maintain in sanitary condition. Provide toilet paper, paper towels, and soap in suitable dispensers.

#### 1.04 BARRIERS

- A. Provide as required to prevent public entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Prohibit traffic and material storage on lawn and landscaped areas.

#### 1.05 PROTECTION OF INSTALLED WORK

- A. Provide temporary protection for installed products. Control traffic in immediate area to minimize damage from subsequent operations.

#### 1.06 CONTROLS

- A. All aspects of Louisiana Pollutant Discharge Elimination System (LPDES) Permit shall be followed by the Contractor.
- B. Water Control: Rough grade site to prevent standing water and to direct surface drainage away from excavations, trenches, adjoining properties, and public rights-of-way. Maintain excavations and trenches free of water. Provide and operate pumping equipment and dewatering systems of a capacity to control water flow as required to conduct construction operations properly.
- C. Dust Control: Execute Work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere.
- D. Mud Control: Control accumulation of excessive mud or debris from the work site onto the Public Access Road.
- E. Erosion and Sediment Control:
  - 1. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
  - 2. Minimize amount of bare soil exposed at one time.
  - 3. Provide temporary measures such as berms, dikes, and drains to prevent water flow.

4. Construct fill areas by selective placement to avoid erosive surface silts or clays.
5. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

F. Noise:

1. Noise abatement measures are to be exercised during the course of the project in order to maintain construction noise as low as is practicable.
2. Maintain and operate equipment in a manner which will minimize noise generation.
3. Equipment to be equipped with properly functioning mufflers.

1.07 CLEANING DURING CONSTRUCTION

- A. Control accumulation of waste materials, rubbish and other debris; remove periodically and dispose of off-site.

1.08 ACCESS TO EMERGENCY AND OTHER FACILITIES

- A. Maintain access, free from obstruction, hydrants under pressure, valve boxes, fire and police call boxes, or other emergency or utility controls which are not part of the Work.

1.09 TRAFFIC REGULATION

- A. Conduct operations to minimize interference with public travel and vehicles utilizing public and private highways, streets, and roads.
- B. Provide and maintain warning signs, flagmen, flares, lights, barricades, pavement markings, and other devices as necessary to regulate traffic through the construction area.
- C. Provide representative to receive calls and dispatch proper personnel and equipment on a 24 hour basis for the purpose of maintaining traffic regulation devices.
- D. Provide regulation and safety precautions as required by insurers.
- E. Bear responsibilities for the safety of the traveling public and for any liability in connection therewith.
- F. Comply with all State and local laws and ordinances.

- G. Comply with all other requirements regarding the protection of the work, workmen, and safety of the public.
- H. Regulate traffic to comply with the following requirements:
  - 1. All streets, roads and highways:
    - a. Provide and maintain local traffic and access.
    - b. Restore traffic prior to sunset.
- I. Provide adequate notification (4 days minimum) to appropriate government entities and private owners prior to commencement of construction operations that may interfere with their daily routine operations.
  - 1. Provide 24 hour notice to owners of private driveways prior to interference.
  - 2. Provide seven day notice to owners of above and below grade utilities and owners of other underground facilities prior to commencing construction in the vicinity of their facilities.

#### 1.10 TEMPORARY SURFACING

- A. Maintain temporary surfacing as required by the individual Specification Sections.
- B. Provide representative to receive calls and dispatch proper personnel and equipment on a 24 hour basis for the purpose of maintaining temporary surfacing.

#### 1.11 CONSTRUCTION PARKING

- A. Control vehicular traffic to prevent interference with public traffic and access by emergency vehicles.
- B. Monitor parking of construction personnel's vehicles.
- C. Prevent parking on or adjacent to public roadways, private driveways or in non-designated areas.

#### 1.12 REMOVAL

- A. Remove temporary materials, equipment, services, and construction prior to Substantial Completion inspection.

- B. Clean and repair damage caused by installation or use of temporary facilities. Remove underground installations; underground installations over a depth of 2 feet may remain if approved by the Engineer. Grade site as indicated. Restore existing facilities used during construction to specified, or to original condition.

1.13 UNIT PRICES

- A. Method of Measurement: Items and actions required by and provided under this Section will not be measured for payment.

**PART 2 PRODUCTS**

Not Used.

**PART 3 EXECUTION**

Not Used.

**END OF SECTION**

## SECTION 01531

### TEMPORARY FENCING

#### **PART 1 GENERAL**

##### 1.01 DESCRIPTION OF WORK

- A. Included in the work is the erection, maintenance, and dismantling of temporary fencing.
- B. The completed fence installation shall provide a secure and continuous barrier. The Contractor shall perform all miscellaneous work required to meet this requirement.

##### 1.02 SUBMITTALS

- A. Submit manufacturer's technical data for posts fabric, gates, and other components necessary for the complete installation of temporary fencing.
- B. Submit shop drawings where required by LUS.

##### 1.03 WORKMANSHIP

- A. The installer shall use workmen experienced in fence erection for the installation, maintenance, and removal of temporary fencing.

#### **PART 2 - PRODUCTS**

##### 2.01 MATERIALS

- A. Upon approval by the Engineer, used fencing material in good condition may be used for temporary fencing.
- B. Line Posts: All line posts shall be galvanized steel pipe section 1.9" o.d. weighing 2.7 pounds per foot (standard 1-1/2" pipe).
- C. Fabric: Wire fabric shall be a one piece 11 gauge galvanized chain link fabric woven of commercial quality steel wire with a uniform square mesh of 2".
- D. Gates:
  - 1. Interior temporary gates shall be equal in construction quality to the temporary fencing.

2. Exterior gates and corner posts shall be standard 3" pipe (3-1/2" o.d.). All posts shall be heavily coated with zinc by the hot-dip process after fabrication. All posts shall be of such length that they may be embedded in concrete foundations to a depth of not less than 24". Gate frames shall be 2" o.d. high carbon-steel tubing welded at all joints to provide rigid water-tight construction. Gate fabric shall be one piece 11 gauge galvanized chain link. Contractor shall furnish hinges, latches, stops and keepers necessary for the complete erection and smooth working of the gates and posts.
- E. Concrete: Concrete shall have a minimum 28-day strength of 2500 psi.
  - F. Other: Provide all clamps, braces, hinges, latches, ties, post caps tension bands, loop caps, sleeves, ties, wire, and other items necessary for a complete installation, manufactured by the same maker of the fencing and posts.

### **PART 3 - EXECUTION**

#### 3.01 GRADE PREPARATION

- A. Remove all weeds, refuse, and debris along proposed temporary fence line. Rough grade ground surface as required to receive bottom of fence fabric.

#### 3.02 INSTALLATION

- A. Line posts shall be set 2'-6" below grade and spaced a maximum of 10'-0" o.c. Posts may be driven or set in holes, backfilled and tamped. Concrete plugs approximately 12" square and 4" to 8" deep (top flush with grade) shall be poured around line post if ground is soft or unstable.
- B. Fabric shall extend to within 2" of stable ground. Anchor bottom of fabric to ground at the one-third points between line posts with 24" long 3/8" wide rebar driven 20" into the ground and secured to the bottom stand of fabric with 11 gauge wire. The fabric shall be installed on the construction area side of the post. The fabric shall be attached to the post 12" o.c. with 9 gauge wire. Wire fabric shall be continuous and stretched taut enough to give a straight and flat appearance.

#### 3.03 MAINTENANCE

- A. The Contractor shall be responsible for maintaining the fencing in good condition and appearance from erection to takedown. Damage from any cause shall be reported to the Engineer and repaired promptly.

### 3.04 REMOVAL

- A. Upon completion of work or when authorized, the Contractor shall remove the temporary fence and any concrete plugs completely. Upon removal of the fence posts and plugs, the Contractor shall fill the holes in a manner that will reduce or eliminate any hazardous conditions. Backfill in holes shall be compacted; holes in paving shall be surfaced to match existing paving.

**END OF SECTION**

## SECTION 02060

### MAINTENANCE AGGREGATE

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Aggregate for temporary applications.
- B. Aggregate for permanent applications.

##### 1.02 REFERENCES

- A. DOTD Designation: TR 113 – Sieve Analysis of Fine and Coarse Aggregates.

##### 1.03 UNIT PRICES

- A. Method of Measurement:
  - 1. Maintenance Aggregate (Temporary and Permanent Applications): Measured by the ton in approved hauling vehicles at the point of delivery. No adjustment factor will be used.
- B. Basis of Payment:
  - 1. Maintenance Aggregate (Temporary and Permanent Applications): Paid for by the ton which includes furnishing, placement, compaction, maintenance, removal, stockpiling, reuse and disposal.

#### PART 2 PRODUCTS

##### 2.01 MATERIALS

- A. Maintenance Aggregate (Limestone): Limestone aggregate material shall be approved 100% crushed limestone; shall show not more than 45% loss when tested by AASHTO Designation: T96; shall show not more than 15% loss when tested in accordance with DOTD Designation: T104, and shall meet the following gradation requirements:

**U.S. SIEVE**

**PERCENT PASSING (BY WEIGHT)**

1 ½"	100
1"	90 to 100
¾"	70 to 95
⅜"	50 to 80
No. 4	35 to 65
No. 10	25 to 50
No. 40	10 to 26
No. 200	4 to 12

**PART 3 EXECUTION**

**3.01 TEMPORARY APPLICATIONS**

- A. Verify thickness of aggregate to be used.
- B. Verify subgrade is properly compacted.
- C. Place and compact aggregate by suitable means to tight uniform condition. Compact to the satisfaction of the Engineer.
- D. Maintain aggregate in good condition at all times.
- E. Maintain by blading, recompacting, and adding additional material as necessary to maintain a tight uniform condition.
- F. Remove and reuse or stockpile for future reuse aggregate which is no longer necessary for the particular temporary application.
- G. Dispose of removed aggregate when no longer necessary for temporary applications.

**3.02 PERMANENT APPLICATIONS**

- A. Verify thickness of aggregate to be used.
- B. Verify subgrade is properly compacted, to proper grade and approved.
- C. Place and compact aggregate by suitable means to tight uniform condition. Compact to the satisfaction of the Engineer.
- D. Fill and blade ruts as necessary to prevent breaking through into subgrade.

- E. Level surface to elevations and gradients. Holes, waves and deficiencies in thickness not corrected by blading to be rectified by the addition of more material.
- F. Perform hand tamping in areas inaccessible to compaction equipment.
- G. Final surface to be smooth, uniform, closely knit, and free from ridges, depressions or loose material.

### 3.03 SCHEDULE OF APPLICATIONS

#### A. Temporary Applications:

1. Temporary patching for driveways, shoulders, walks, roadways, and other areas as necessary.
2. Locations as directed by the Engineer.

#### B. Permanent Applications:

1. Permanent surfacing for driveways and shoulders.
2. Locations designated in the Drawings and as directed by the Engineer.

**END OF SECTION**

## SECTION 02200

### SITE PREPARATION

#### PART 1 GENERAL

##### 1.01 SPECIFICATION INCLUDES

- A. Clearing and Grubbing
- B. Removing Surface Debris
- C. Removal of Structures and Obstructions
- D. Salvage
- E. Relocated or Reinstalled Items

##### 1.02 REGULATORY REQUIREMENTS

- A. Conform to applicable laws and ordinances for disposal of debris.

##### 1.03 DEFINITIONS

- A. Clearing and Grubbing: Consists of cutting timber, logs, brush, stumps, cane and debris; excavation and removal of all stumps, roots, submerged logs, snags, corduroy and other perishable and objectionable material; and disposing of removal material and cleaning up the construction area.
- B. Removal of Structures and Obstructions: Consists of removal and satisfactory disposal of all buildings, septic tanks, fences, culverts, structures, pavements, abandoned pipelines and other obstructions not designated or permitted to remain on the Site; includes salvaging of designated materials and backfilling trenches, holes and pits.
- C. Removal and Replacement of Signs: Consists of removal and satisfactory replacement of existing sign. Sign shall be re-installed to the satisfaction of the Engineer. If existing sign is damaged by Contractor, the sign shall be replaced using the same materials of equal quality, color, and texture as the original at no expense to the owner. The sign shall be the same size, shape, and form as the original or as directed by the Owner.

##### 1.04 UNIT PRICES

- A. Method of Measurement:

1. Work described under this section will not be measured for payment.

## **PART 2 PRODUCTS**

### 2.01 MATERIALS

- A. See Section 1.03.C

## **PART 3 EXECUTION**

### 3.01 PREPARATION

- A. Protect existing structures and appurtenances to remain from damage or displacement.
- B. Protect bench marks and existing work from damage or displacement.
- C. Protect above and below grade utilities and other Underground Facilities designated to remain.
- D. Protect items salvaged until reuse or delivery to Owner.

### 3.02 CLEARING AND GRUBBING

- A. Minimize areas to be cleared for access and execution of work.
- B. Remove trees and shrubs only as necessary for execution of work. Grub out stumps, roots, and other perishable and objectionable matter.
- C. Remove and promptly dispose of contaminated, vermin infested, or dangerous materials encountered.
- D. Backfill and compact stump holes and other holes from which obstructions are removed.

### 3.03 REMOVAL OF STRUCTURES AND OBSTRUCTIONS

- A. Remove as required for proper execution of work, existing structures, foundations, pavements or other obstructions as indicated in the Drawings or designated in individual Specifications Sections. Demolish and remove in an orderly and careful manner.
- B. Exercise due care in removal of items to be stored and reused as indicated in the Drawings or required by individual Specifications Sections.

### 3.04 DISPOSITION OF MATERIALS

- A. Salvaged Items: Salvage items designated with reasonable care and deliver to a location specified by the Owner within 10 miles of the site. Store and protect on the site until time of delivery.
- B. Unsalvaged Items: Remove from site in accordance with the provisions of this Section.
- C. Relocated or Reinstalled Items: Remove items designated to be removed or reused in the same or different location on the site. Store and reinstall in such a manner to prevent damage to the item.

### 3.05 REMOVAL

- A. Remove debris from site as work progresses. Leave site in a clean condition.
- B. Debris to be removed from site prior to commencement of other work.

**END OF SECTION**

**SECTION 02271**  
**GEOTEXTILE FABRIC**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Geotextile Fabric

1.02 REFERENCES

- A. DOTD Section 1019 – Geotextile Fabric and Geocomposite Systems.

1.03 UNIT PRICES

- A. Method of Measurement: Measured by the square yard of “Geotextile Fabric (Class D)”.
- B. Basis of Payment: Paid for by the square yard which includes furnishing and placement.

**PART 2 PRODUCTS**

2.01 Materials

- A. Geotextile fabric shall be composed of at least 85 percent of weight of polyolefins, polyesters, or polyamides. The geotextile fabric shall be resistant to chemical attack, rot and mildew and shall have no tears or defects which adversely alter its physical properties.
- B. When required, the geotextile fabric shall contain stabilizers and/or inhibitors added to the base material to make filaments resistant to deterioration due to ultraviolet and heat exposure.
- C. Edges of geotextile fabric shall be finished to prevent the outer yarn from pulling away from the fabric. Fibers of other composition may be woven into the geotextile fabric for reinforcing purposes. Durability of these fibers shall be equivalent to that of the geotextile fabric.
- D. Geotextile fabric rolls shall be furnished with an opaque, waterproof wrapping for protection against moisture and extended ultraviolet exposure prior to placement. Each roll shall be labeled or tagged with the manufacturer’s name, date of manufacture, batch number, name of product.
- E. Unless otherwise specified on the plans or in the project specifications, the geotextile fabric shall be an approved product in LA DOTD Qualified Products List (QPL) 61.

F. The geotextile fabric shall conform to the requirements in Table 1 below and shall be utilized as follows unless otherwise specified:

<u>Use:</u>	<u>Classes</u>
(1) Drainage:	
Underdrains	A, B, C, or D
Pipe and Precast Manhole Joints	A, B, C, or D
Weep Holes	A, B, C, or D
Bedding Fabric	B, C, or D
Approach Slabs	D
(2) Stabilization:	
Bulkheads	C or D
Flexible Revetments	C or D
Rip Rap	D
Railroad Crossings	D
Soil Stabilization	C, D or S
(3) Silt Fence:	
Wire Supported	F
Self Supported	G

**Table 1**  
**GEOTEXTILE FABRICS**

<b>PROPERTY</b>	<b>TEST METHOD</b>	<b>CLASSES</b>							
		<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>S</b>	<b>F</b>	<b>G</b>	
AOS, U.S. Sieve, Min.	ASTM D 4751	50	50	50	70	32	20	20	
Grab Tensile, lb. Min.	ASTM D 4632	75	90	130	180	180	90	90	
% Elongation @ Failure Min.	ASTM D 4632	--	--	50	50	--	--	50	
Burst Strength psi, Min.	ASTM D 3787	100	140	210	290	290	--	--	
Puncture, lb., Min.	ASTM D 4833	25	30	40	75	75	--	--	
Trapezoid Tear Strength, lb. Min.	ASTM D 4533	25	30	40	50	50	--	--	

<b>PROPERTY</b>	<b>TEST METHOD</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>S</b>	<b>F</b>	<b>G</b>
Permittivity, Sec. – 1 Min.	ASTM D 4491	1.0	1.0	1.0	1.0	.2	.01	.01
Strength Retained at 150 h Weatherometer, %, Min.	ASTM D 4632 DOTD TR 611	70	70	70	70	70	--	--
Strength at 500 h Weatherometer, %, Min.	ASTM D 4632 DOTD TR 611	--	--	--	--	--	70	70

**PART 3 EXECUTION** - NOT USED

END OF SECTION

## SECTION 02315

### SPECIAL BACKFILL AND TOPSOIL

#### **PART 1 GENERAL**

##### 1.01 SECTION INCLUDES

- A. Special backfill for backfilling of trenches or around structures.
- B. Topsoil for final dress-up applications.

##### 1.02 REFERENCES

- A. DOTD Section 715-Topsoil.

##### 1.03 UNIT PRICES

###### A. Method of Measurement:

- 1. Special Backfill: Measured by the cubic yard in approved hauling vehicles at the point of delivery. Special backfill shall be used only with the Engineers approval where the excavated material is not suitable for backfilling the trench or obtaining the required compaction.
- 2. Topsoil: Measured by the cubic yard in approved hauling vehicles at the point of delivery.

###### B. Basis of Payment:

- 1. Special Backfill: Paid for by the cubic yard, which includes furnishing, placement, and compaction.
- 2. Topsoil: Paid for by the cubic yard, which includes placement and grading.

#### **PART 2 PRODUCTS**

##### 2.01 MATERIALS

- A. Special Backfill: Class A-6 soil classification, as per La. DOTD Designation: TR 423, Plasticity Index of between 11 and 20 and a Liquid Limit of 40, free of all foreign matter.

- B. Topsoil: Natural, workable, loamy soil, free of debris, refuse, and similar foreign matter and reasonably free of subsoil, hard lumps, gravel, roots, and other such material. Topsoil shall have a minimum plasticity index of 4 and shall be capable of supporting adequate vegetation.

### **PART 3 EXECUTION**

#### **3.01 PLACEMENT OF SPECIAL BACKFILL**

- A. Special Backfill shall be used, with the Engineer's approval, where the excavated material is not suitable for backfilling the trench and obtaining the required compaction. (At the Contractor's option, limestone may be used for special backfill at no additional cost to L.U.S.)
- B. Where compaction density is specified, maximum density shall be determined in accordance with requirements of Louisiana DOTD Designation: TR 418 and TR 401.
- C. Placement of special backfill shall follow the provisions as set forth in Section 02530.

#### **3.02 PLACEMENT OF TOPSOIL**

- A. Topsoil shall be used, with the Engineer's approval, where final dressing is being conducted.
- B. Placement of topsoil shall conform to the existing natural ground and shall have a smooth transition to existing natural ground.
- C. Hand raking shall be utilized to obtain the necessary placement, if required by the Engineer.

#### **3.03 PROTECTION OF FINISHED WORK**

- A. Maintain settlement of backfills which may occur within one year after final completion of the Contract under which the Work was performed.

**END OF SECTION**

## SECTION 02510

### WATER MAIN DISTRIBUTION SYSTEM

#### PART I GENERAL

##### 1.01 SECTION INCLUDES

- A. Pipe Materials and Fittings
- B. Main Installation
- C. Testing and Disinfection

##### 1.02 SCOPE OF WORK

The work covered by this section of the specifications consists of furnishing all labor and material for the construction of water lines and appurtenances as described in the plans and elsewhere in the specifications.

##### 1.03 REFERENCES

- A. ANSI/ASTM D 1784 Rigid Poly (vinyl Chloride) (PVC) Compounds.
- B. ANSI/ASTM D 2241 Poly (vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
- C. ANSI/AWWA C104/A21.4 Cement Mortar Lining for Ductile-Iron Pipe and Fittings.
- D. ANSI/AWWA C110/A21.10 Ductile-Iron and Gray-Iron Fittings, 3 In. through 48 In.
- E. ANSI/AWWA C111/A21.11 Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
- F. ANSI/AWWA C150/A21.50 Thickness Design of Ductile-Iron Pipe.
- G. ANSI/AWWA C151/A21.51 Ductile-Iron Pipe for Water or Other Liquids.
- H. AWWA C651 Disinfecting Water Mains.
- I. AWWA C900 Poly (vinyl Chloride) (PVC) Pressure Pipe 4 In. through 12 In.
- J. AWWA C605 Underground Installation of PVC Pressure Pipe & Fittings for Water.

#### 1.04 REGULATORY REQUIREMENTS

- A. Conform to applicable state and local codes for installation and testing of the work in this section.

#### 1.05 QUALITY CONTROLS

- A. Submit manufacturer's certifications that PVC pipe and fittings meet requirements of AWWA or the appropriate ASTM standard.
- B. Submit manufacturer's certifications that ductile iron pipe and fittings meet requirements of the appropriate ANSI standard.

#### 1.06 MEASUREMENT AND PAYMENT

- A. Method of Measurement:
  - 1. Water Main: Water main installed will be measured by the linear foot of the various sizes and types actually installed excluding water main that is required to complete other items of work that have been defined in the bid. Measurement shall be continuous from end to end without deductions for fittings, valves, or jack or bored mains.
  - 2. Fittings: Ductile iron fittings installed with water lines shall be measured by the ton, based on the catalog weight per fitting. The weights of the fittings shall be exclusive of bolts, nuts, and gaskets and exclusive of glands when a retainer is used. All fittings not specifically included in the other items of work defined in the proposal shall be included in this measurement.
  - 3. Jacking or Boring: Jacking or boring measurement shall be by the linear foot and shall be the actual center line length of pipe so installed as measured from the vertical cut on each side of the obstruction to be bored but shall not exceed two (2') feet beyond obstruction. Jacking or boring operations shall in no way interfere with the operation of railroads, streets, highways, or other facilities and shall not weaken or damage such facilities. Jacking or boring HDPE pipe quantity shall include adapters, reducers, and fittings necessary to tie-in HDPE pipe with PVC pipe.
  - 4. Casing Pipe: The basis of measurement for casing pipe shall be by the linear foot and shall be the actual center line of casing so installed.
  - 5. Stream Crossing: Stream crossing shall be measured by the lump sum for the limits designated in the water details which includes pipe, fittings, and all incidentals necessary to complete the work for this item.

6. Tie-In To Existing Mains: Tie-in connections to existing mains shall be paid for per each. Valves and fittings are measured and paid for under other items.
7. Select Fill: Select fill for foundation or for backfill over pipe shall be measured by the cubic yard based on the truck volume placed, as ordered by the Engineer.

B. Payment:

1. Water Main: Payment for water main installed, tested, and accepted will be made at the unit price bid per linear foot of pipe of the various sizes. Such payment shall also include excavation, backfill, hauling, and disposition of surplus excavated material.
2. Fittings: Payment shall be based on the number of tons actually installed and shall be made at the price bid per ton. Payment shall include full compensation for all labor, materials, supplies, thrust blocks, anchors, equipment, tools and incidentals necessary for completely installing the fittings in accordance with these specifications and the contract drawings.
3. Jacking or Boring: The work performed and materials furnished as specified herein shall be paid for at the contract unit price bid per linear foot of jacking or boring, which price shall be full compensation for furnishing all materials (except carrier pipe, casings, or liners), labor, tools, equipment and incidentals necessary to complete the work.
4. Casing Pipe: Payment for casing installed will be at the unit price bid for furnishing and installing the casing pipe. No direct payment will be made for casing spacers installed around the carrier pipe in the casing.
5. Stream Crossing: Payment for stream crossing shall be lump sum as stipulated in the bid. This work will consist of furnishing all labor, material, equipment, tools and other incidentals necessary to complete this item as shown on the plans.
6. Tie-In To Existing Mains: Tie-in to existing main shall be paid for per each and includes full compensation for furnishing all equipment, tools, labor, and incidentals necessary to complete the connection.
7. Select Fill: Payment for select fill shall be by the cubic yard at the unit price bid and shall constitute full compensation for furnishing, hauling, placing the fill and removal of excavated material.

## **PART 2 PRODUCTS**

### 2.01 WATER MAIN

#### A. PVC Pipe (2 Inch)

1. Pipe and fittings shall be made from clean, virgin NSF approved Type I, Grade I PVC conforming to ASTM Resin Specification D1784-65T.
2. Clean, reworked material generated from the manufacturer's own pipe production may be used.
3. Pipe shall meet working pressure of 160 psi, SDR 26, Commercial Standard C5256-63, and be approved by the National Sanitation Foundation. Laying lengths shall be 20 feet  $\pm$  1 inch.
4. Fittings shall be brass, compression type.
5. Provisions must be made for contraction and expansion at each joint with a rubber ring. Pipe and fitting must be assembled with a non-toxic lubricant.
6. No 2" PVC pipe joint will be allowed in roadway.

#### B. PVC Pipe (Above 2 Inch)

1. Pipe:
  - A. 4 - 12 inch: AWWA C900, SDR 18, 235 psi pressure, NSF approved, 12454 B PVC compound conforming to ASTM Resin Specification D1784.
  - B. 14 - 24 inch: AWWA C905, SDR18 DIPS, 235 psi rating, NSF approved, 12454 B PVC compound conforming to ASTM Resin Specification D1784.
2. Provide pipe which is homogeneous throughout, free of voids, cracks, inclusions, and other defects, uniform as commercially practical in color, density, and other physical properties.
3. Fittings shall be ductile iron and conform to Section 2.01.E.
4. Joints shall be made of gasket bell push-on type. Joints shall be gasket joints conforming to ASTM F477. Joints assembled with non-toxic lubricant.

5. All joints under roadways shall be restrained.
6. PVC pipe shall be supplied in standard nominal laying lengths of 20 feet. The color of pipe shall be blue or white with blue lettering. The pipe shall be marked with the size, material code, dimension ratio (DR), AWWA pressure class and AWWA designation.

C. Ductile Iron Water Pipe

Pipe shall be designed in accordance with ANSI Specification A21.50 (AWWA C150), latest revision. All pipe shall be designed for the following minimum conditions, unless noted otherwise:

1. Internal working pressure of 250 psi plus 100 psi surge allowance plus safety factor of 2.
2. Earth load of 5 feet of cover or as shown on the plans.
3. Laying Condition Type 2.
4. AASHTO H-20, truck loading.

Pipe shall be manufactured in accordance with ANSI Specification A21.51 (AWWA C151), latest revision, except the minimum nominal wall thickness shall be as shown on the following table:

<u>Size</u>	<u>Pressure Class</u>	<u>Thickness</u>
6"	350	0.25
8"	350	0.25
10"	350	0.26
12"	350	0.28
14"	250	0.28
16"	250	0.30
18"	250	0.31
20"	250	0.33
24"	250	0.37
30"	250	0.42

Pipe shall be standard cement lined and seal coated on the inside with a bituminous coat in accordance with ANSI Specification A21.4 (AWWA C104), latest revision. The exterior of the pipe shall be coated, with an asphaltic coating approximately 1 mil thick in accordance with ANSI Specification A21.51 (AWWA C151), latest revision. Ductile iron pipe shall be as manufactured by American Cast Iron Pipe Company, Clow Corporation, U.S. Pipe and Foundry Company, or approved equal.

Joints shall be push-on, conforming to ANSI Specification A21.11 (AWWA C111), latest revision, unless noted otherwise. Push-on joints shall be equal to push-on joints manufactured by American Cast Iron Company, U.S. Pipe and Foundry Company, or approved equal.

Fittings shall be furnished in accordance with ANSI Specification A21.10 (AWWA C110), latest revision. Joints shall be mechanical joint or push-on, conforming to ANSI Specification A21.11 (AWWA C111), latest revision. Fittings shall conform to Section III-8.2, Technical Specifications for Water Distribution System: Valves, Hydrants, Fittings and Services, of these specifications.

All pipe is to be hydrostatically proof tested to a minimum of 75% yield strength after manufacture. The manufacturer will furnish the Owner sworn certificates that pipe has been manufactured, tested and inspected in accordance with applicable specifications.

D. Ductile Iron Restrained Joint Pipe

Restrained joint pipe shall be ductile iron pipe designed and manufactured in accordance with Section B, Ductile Iron Pipe, of this article. Restrained joint fittings and the restraining components shall be ductile iron in accordance with the applicable requirements of ANSI/AWWA C110/A21.10, C111/A21.11 and C153/A21.53.

Restrained joint pipe and fittings for 12 inch and smaller diameter pipe shall be "Flex-Ring" by American Cast Iron Pipe Company, "TR-Flex" by U.S. Pipe and Foundry Company, "Super-Lock" by Clow Corporation, or approved equal. Restrained joint pipe and fittings for 14 inch and larger diameter pipe shall be "Lok-Ring" by American Cast Iron Pipe Company, "TR-Flex" by U.S. Pipe and Foundry Company, "Super-Lock" by Clow Corporation, or approved equal. Fittings for use with restrained joint pipe shall be ductile iron and shall conform to ANSI/AWWA C110/A21.10 and C153/A21.53. Where bolts are required, they shall be corrosion resistant. Field cut restrained joints shall be installed in accordance with the manufacturer's recommendations.

E. Fittings

Ductile Iron: Ductile iron fittings shall be standard body ANSI A21.10/AWWA C110 or compact body ANSI A21.53/AWWA C153. The rated working pressure shall be 350 psi. Sufficient quantities of gaskets, glands, bolts and nuts shall be furnished to provide for each socket opening. Bolts and nuts shall be alloy steel (Corten Type). All fittings shall be asphalt coated outside and cement lined and seal coated inside in accordance with ANSI A21.4/AWWA C104. Fittings must be manufactured in the United States.

F. Polyethylene Pipe (PE Pipe)

1. Pipe: AWWA C906, SDR11, PE 3408 High Density, DIPS, Cell Classification 345434C, in accordance with ASTM D3350.
2. Transition Fittings shall be a mechanical joint adapter (Harvey Adapter) fabricated from HDPE pipe conforming to ASTM 3350. The fitting shall have a pre-positioned stiffener and shall offer full axial restraint.

G. Casing

1. Casing shall be welded smooth steel pipe conforming to APL 5L, Grade B or ASA B36.10, coated inside and outside with asphalt or painted with two coats of bitumastic paint.
2. Minimum thickness of 0.375 inches is required.
3. Spacers shall be provided at manufacturer's recommended increments.

H. Polyethylene Encasement

1. Polyethylene wrap is to be used in open-cut construction for ductile iron pipe when a cathodic protection system is required.
2. Polyethylene encasement shall conform to AWWA C105.
3. Film shall be Class C-Black, minimum thickness of 0.008 inches (8 mils), and furnish a certificate of conformance of the material to the requirement of AWWA C105.
4. Tape shall have a pressure sensitive adhesive face capable of bonding to metal, bituminous coating, and polyethylene, minimum thickness of 8 mils, and a minimum width of 3 inches.

I. Detection Wire

1. A THW 14 insulated solid copper wire shall be placed over the center of PVC and PE pipe for the entire length including crossings.
2. Attach wire to all fixtures and appurtenances to ensure continuous flow of electrical current.
3. Splices in detection wire shall be installed in a direct bury splice kit manufactured by 3M or approved equal.

4. Detection wire and splice kit is to be included in unit price for either PVC or PE pipe.

J. Retainer Glands

1. Retainer glands and bell joint restraints shall be of the following manufacturer or approved equal:

Retainer Glands – UFR 1400 Ford or EBBA Megalug for Ductile Iron Pipe

Retainer Glands – UFR 1500 Ford or EBBA Megalug for PVC Pipe

Bell Joint Restraints – UFR 1390 Ford or EBBA Megalug for PVC and Ductile Iron Pipe

K. Marking Tape

All PVC pipe shall be marked using a nonmetallic tape buried at least 15 inches above the top of the pipe. Water mains shall be marked with blue tape. Tape shall be 3 inches wide minimum and on the Board's list of materials and approved manufacturers. After the tracer wire has been placed, the pipe trench shall be backfilled to approximately 15 inches over the top of the pipe then the nonmetallic tape shall be placed flat over top of pipe within trench. Backfill shall be carefully placed to a depth of 3 inches by hand to assure that the tape is secured in place over the pipe. It is the intent to provide a visible marker in the event of excavation near a water line.

## 2.02 WORKMANSHIP

- A. Furnish pipe and fittings that are homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects. Provide pipe as uniform as commercially practical in color, opacity, density, and other physical properties.

## **PART 3 EXECUTION**

### 3.01 PREPARATION

- A. Less than 48 hour notice for approved disconnection to customers shall be the responsibility of the contractor.
- B. Identify and protect above and below grade utilities and other underground facilities to remain.
- C. Conform to applicable manufacturers installation specifications for types of pipe used.

- D. Lay pipe to lines and grades shown on drawings. Establish the route for water lines along with highway and stream crossings.
- E. Provide minimum 6 feet horizontal clearance between water mains and sewer lines running parallel and minimum 18 inch vertical clearance at crossings. In cases where it is not practical to maintain a 6 foot separation, Lafayette Utilities System (LUS) may allow deviation on a case-by-case basis.

### 3.02 TRENCHING

- A. Maintain a minimum cover for pipes eight (8") inches or less in diameter at 36" and for pipes ten (10") or greater at 48", except where required to meet existing water lines.
- B. The bottom of the trench shall be excavated to a uniform grade and shall be free from obstructions, which would result in the weight of the pipe being concentrated at certain points.
- C. Where subsurface obstructions are encountered in the trenching operations, the Contractor will be permitted to lay pipe above the obstruction if the minimum cover required can be obtained while providing at least three (3") inches thick clearance between the bottom of the pipe and the top of the obstruction.
- D. Where the 6" minimum cover cannot be obtained above an obstruction, the Contractor will be required to lay the pipe under the obstruction. No additional compensation for additional depth of bury will be paid for constructing the line in this manner.
- E. Maximum length of trench to be opened in advance of a section of completed water main shall be 200 feet.
- F. The Engineer shall at his discretion limit the maximum length of trench opened in advance of the completed main.
- G. The Contractor will be required to keep the sides of the trench as nearly vertical as possible by means of sheathing or bracing, as may be required to thoroughly support the sides of the excavation.
- H. If sheathing is used, the bottom width of the trench in the clear shall be twelve (12") inches wider than the greatest horizontal diameter of the water pipe. Unless otherwise ordered by the Engineer, that portion of sheathing in the trench extending below the top of the water main shall not be withdrawn before more than six (6") inches of earth is placed above the top of the main. If the sheathing cannot be removed without injury to the water main or to the adjoining structures, it shall be left in place, or it shall be cut where directed and the upper part shall be removed.
- I. Excavated material shall be placed in such a manner that will not endanger the work or prevent obstruction of sidewalks or driveways. No street shall be closed to through traffic without the permission of the Engineer.

- J. The Contractor shall take every precaution to protect existing structures and landscaping.
- K. The Contractor shall give sufficient notice to the interested utility of his intention to remove or disturb any other pipe or conduit and shall abide by their regulations governing such work.
- L. During construction operations the Contractor shall make all provisions to not disturb existing piping or conduit systems. If any existing systems are damaged, the Contractor shall be responsible for any and all repairs to the satisfaction of the Engineer.
- M. If during construction operations a utility service line is broken, the Contractor shall repair the line at his own expense, or if preferred by the utility involved, shall pay the utility for utilizing their own forces. Delays for extended periods will not be tolerated, thus the Owner reserves the right to make repairs at the Contractor's expense without prior notification.
- N. Mains shall be jack or bored under all concrete roadways and sidewalks except where specified or in special cases where no other practical method for installation is available. In the event the concrete surface is damaged during construction operations, repairs to the pavement shall be made by the Contractor at no additional cost to the Owner.
- O. Lafayette City-Parish Consolidated Government Code of Ordinance Chapter 78, Article III, Division 2 shall be followed in all trenching and backfilling operations.

### 3.03 DEWATERING

- A. The Contractor shall furnish all equipment necessary for pumping water accumulated in the trenches.
- B. Trenches and other excavations shall be kept clear of water while pipe is being installed or concrete structures are being constructed.
- C. No pipe or appurtenances shall be laid in water.

### 3.04 PIPE INSTALLATION

- A. Excavate bottom of trench to uniform grade to achieve stable trench conditions and satisfactory compaction of foundation or bedding materials.
- B. Where, in the opinion of the Engineer, the floor of the trench is not sufficiently stable to prevent vertical or lateral movement of the pipe after installation, the pipe shall be laid on a timber foundation or the trench shall be excavated below grade and brought back to grade with suitable filling of limestone or select fill material, as directed.
- C. Immediately prior to placement of embedment materials, the bottoms and sidewalls of trenches shall be free of loose or unsuitable soil.

- D. Thoroughly clean interior of pipe before lowering into the trench while keeping pipe interior free of foreign matter during laying operations.
- E. When work is not in progress, the ends of the pipe and fittings shall be sealed so foreign material cannot enter pipe.
- F. The pipe shall be installed and backfilled in accordance with the manufacturer's specifications. Items of work not mentioned specifically herein shall be performed in compliance with the current revision of AWWA C605, "Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water."
- G. Pipe laying operations shall not block, obstruct, or prevent streams, ditches, canals, culverts, conduits, or gutters from carrying their normal flows or of serving their normal function without the approval of the Engineer. Any disruption shall be restored by the Contractor.
- H. The trench shall provide continuous support for the pipe without voids or soft spots under the pipe.
- I. Concrete thrust blocks shall be provided at all fittings where a change of direction occurs or as specified by the Engineer for all pipe three (3") in diameter or greater. Thrust blocks shall be poured against undisturbed soil and shall not cover the bolts or nuts on the fittings. A plastic barrier shall protect bolts or nuts from being covered.
- J. The water main shall be installed in steel casing where indicated in the Drawings, typically under state highways, railroads, or as indicated by the Engineer.
- K. Pipe shall be laid beneath all ditches, sewers, culverts, pipes, conduits, drainage canals, tracks and similar structures. Regular pipe laying methods shall be used in all such cases except where special crossings are indicated.
- L. The Contractor shall not operate any valves that will allow water to flow or stop the flow of water. These valves will be operated by the Lafayette Utilities System personnel **only**.
- M. Water service to customers shall be maintained without interruption as much as possible. Interruption of service shall be allowed only at times agreed to by the Owner and with proper notice to the customer (at least one hour in advance).
- N. The Owner may require that major connections which require lengthy interruptions to service be made during periods of low water use or that temporary service lines be provided by the Contractor at no additional cost to the Owner.
- O. Assembly of fittings and other preparatory work shall be done in advance to reduce the off time and to keep interruption to a minimum.

### 3.05 BACKFILLING OF TRENCH

- A. Perform backfill operations and restore surface as soon as practicable. Leave only the minimum length of trench open as necessary for construction.
  - B. Re-excavation of the trench for replacement of pipe, tapping, testing, or disinfecting shall be done by the Contractor at no additional cost to the Owner.
  - C. The Owner reserves the right to order any trench or trenches backfilled at any time after installation of pipe if the particular trench remaining open constitutes a public nuisance.
  - D. Outside of Public Right-of-Ways:
    - 1. Compact excavated material around and to a depth of 12" above the pipe for the entire length of the trench to 90 percent of maximum standard proctor density in 6" to 8" lifts.
    - 2. The remaining portion of the trench shall be backfilled in 12" lifts and thoroughly compacted leaving a slightly crowned condition, not to exceed 12" above natural ground.
  - E. Inside of Public Right-of-Ways:  
Outside of Public Roadways:
    - 1. Compact excavated material around and to a depth of 12" above the pipe for the entire length of the trench to 95 percent of maximum standard proctor density in 6" to 8" lifts.
    - 2. The remaining portion of the trench shall be backfilled in 12" lifts and thoroughly compacted leaving a slightly crowned condition, not to exceed 12" above natural ground.
- Underneath roadways, streets, shoulders, walks, and drives (as per details in the drawings):
- 1. Limestone shall be compacted in 12" lifts to 95 percent density up to 3" (min.) –12" (max.) above pipe.
  - 2. A mechanical vibrator shall be used to compact the limestone.
  - 3. The remainder of the trench shall be filled with fill-crete (188 lbs. of cement, 3010 lbs. of sand, and 46.2 gals. of water).
- F. All excavated material shall be cleared from adjacent street surfaces, gutters, sidewalks, and lots. Salvaging and replacement of sod on lawns may be ordered by the Engineer at no additional cost to the Owner. All surplus excavated

material shall be removed by the Contractor, and shall be disposed of at locations and in a manner approved by the Engineer.

### 3.06 FLUSHING OF WATER MAIN

- A. As-built information shall be provided to LUS personnel prior to any flushing and testing.
- B. The flushing process shall be performed in the presence of LUS personnel. The Contractor shall notify LUS personnel at least 48 hours prior to flushing of the water mains.
- C. All water mains shall be flushed before testing and sampling of the water system.
- D. Provide properly sized riser pipes for flushing when hydrant outlets are not convenient. LUS personnel shall approve size of riser pipes for flushing.
- E. The duration of the flushing shall be determined in the field by the Engineer.
- F. The size of the flushing outlet shall be as shown below:

<u>Water Main Size</u>	<u>Size of Flushing Outlet</u>
2"	2" Riser
4"	2" Riser
6"	One 4 ½" Hydrant Pumper Outlet or One 6" Riser
8"	One 4 ½" Hydrant Pumper Outlet or One 6" Riser
10"	One 6" Riser
12"	One 8" Riser
16"	One 12" Riser

### 3.07 HYDROSTATIC TESTING OF MAINS

- A. The Contractor shall furnish all materials, equipment, and labor to satisfactorily test the pipe at no cost to Owner.
- B. The Owner shall supply water for testing purposes.
- C. The allowable leakage for push-on or mechanical joint ductile iron pipe per inch of diameter, per miles, per twenty-four (24) hour day, when tested at one hundred fifty (150) pounds per square inch pressure, shall not be more than twenty-three point three (23.3) gallons, based on nominal lengths of eighteen (18) or twenty (20) feet.

### 3.08 DISINFECTION OF WATER LINES

- A. All water lines and appurtenances shall be disinfected before placing in service.
- B. Disinfection shall be performed in accordance with the latest revision of AWWA C651.
- C. A solution of calcium hypochlorite, sodium hypochlorite , or liquid chlorine shall be used to obtain a solution of at least 50 mg/l of available chlorine throughout the entire piping system.
- D. While the disinfectant is being applied to any section of the system, the water shall be allowed to flow at all extremities of the section until an orthotolidine test shows a deep orange color.
- E. Allow the chlorine solution to remain in the pipe for minimum of 24 hours. Then tests shall be performed to determine that a chlorine residual of at least 5 mg/l remains in the system.
- F. Repeat disinfection if chlorine residual is less than 5 mg/l.
- G. Following disinfection, the lines shall be thoroughly flushed to remove the chlorine.
- H. The Contractor shall be responsible to furnish taps, corporation stops, tubing, faucets, and labor to help obtain samples of water from the disinfected lines.
- I. The disinfection process shall be made in the presence of Lafayette Utilities System personnel. The Contractor shall notify LUS Personnel at least 48 hours prior to testing of the water lines.
- J. If bacteriological tests indicate that the water lines are not free of coliform organisms, the disinfection procedure shall be repeated on that part of the system until samples are proven to be free of contamination.
- K. Disinfection shall be considered acceptable when reports indicate the lines are free of contamination and with the approval of the Engineer.
- L. The Contractor will be responsible for removing all testing and flushing risers within 5 working days after notice of clear sample.
- M. After all tests have been completed and risers removed, the corporation stops shall be plugged with a Mueller brass plug (No. H10033) or approved equal.

### 3.09 COOPERATING WITH LAFAYETTE UTILITIES SYSTEM (LUS)

- A. The source of water shall be the public water system operated by the Lafayette Utilities System.
- B. Connections to the water system shall be made in accordance with the plans and in cooperation with LUS personnel.

### 3.10 STORAGE OF MATERIALS

- A. All water main pipe and appurtenances shall be stored in an appropriate stock yard upon receipt by the Contractor and shall be secured so foreign and contaminating substances do not enter the water line materials.
- B. Pipe and fittings shall be placed on the job site only as needed and not in quantities greater than those to be installed in one working day.

### 3.11 CARE OF STREETS, SIDEWALKS & ROADS

- A. Remove all excess materials, debris or other obstruction from streets or roads immediately after completing backfilling, at Contractor's expense.
- B. Wash streets, sidewalks and roads daily to remove dust problem.
- C. No cross streets, sidewalks or roads shall be wholly obstructed except by written permission from the Engineer.
- D. If at any time the Contractor neglects to remove such material or obstruction and place streets, sidewalks and roads in suitable condition for traffic within twenty-four (24) hours after having received notice (written or verbal) from the Engineer, the work may be done by L.U.S., and the cost thereof charged to the Contractor and deducted from his final estimate.
- E. Repair and replace streets, sidewalks, roads, ditches and culverts to the satisfaction of the Engineer and parties concerned.

### 3.12 PROTECTION AND CARE OF PUBLIC OR PRIVATE PROPERTY AND SERVITUDES

- A. Continuously maintain and protect all underground and above ground structures, utilities, including the restoration of all public utilities, water mains, water services, gas mains, gas services, culverts, drains, ditches, curbs, sidewalks, landscaping and/or other facilities which may be damaged, to a condition at least equal to their original status, at no additional cost to L.U.S. In the event of damage to any facilities, the appropriate utility will be notified immediately. L.U.S. will repair damaged facilities at the Contractor's expense or require the Contractor to repair said damage.
- B. All construction work under this contract on servitudes, right-of-way, private property or franchise shall be confined to the limits of such servitudes, right-of-way or franchise. All work shall be accomplished so as to cause the least amount of disturbance and a minimum amount of damage.
- C. No trees or shrubbery shall be removed or trimmed without the consent of the Engineer. With such approval ornamental trees and shrubbery shall be carefully removed, with the earth surrounding their roots wrapped in burlap and replanted in their original positions within forty-eight (48) hours. All shrubbery or trees destroyed or damaged shall be replaced by the Contractor with material of equal quality at no cost to L.U.S.
- D. All obstacles such as fences, markers, mail boxes, driveway culverts, etc. shall be removed by the Contractor and immediately replaced after the trench is backfilled in their original position and condition at no direct cost to L.U.S.

E. Maintain adequate drainage during the process of construction.

3.13 CLEAN-UP

- A. Remove from the site all tools, equipment, temporary structures and surplus materials.
- B. Dispose of all excess soil, waste, rubbish, debris or objectionable materials off the site and in a manner and a location that complies with local ordinances and laws and is acceptable to all parties concerned and is approved by the Engineer.
- C. When disposal of excess soil is upon private lands, the Contractor shall be required to produce a written agreement with the private landowner stating the agreed terms and conditions.
- D. The entire construction site shall be left clean and to the satisfaction of the Engineer.

**END OF SECTION**

## SECTION 02515

### FIRE HYDRANTS, SERVICES, AND VALVES

#### PART I GENERAL

##### 1.01 SECTION INCLUDES

- A. The work covered by this section consists of furnishing all labor, equipment, appliances, materials, and all operations in connection with the installation of fire hydrants, services, and valves complete and in place, in accordance with the specifications and drawings.

##### 1.02 REFERENCES

- A. AWWA C502 Dry-Barrel Fire Hydrants.
- B. AWWA C509 or C515 Resilient-Seated Gate Valves for Water and Sewerage Systems.
- C. AWWA C700 Cold Water Meters – Displacement Type.
- D. AWWA C800 Underground Service Line Valves and Fittings.
- E. AWWA C901 Polyethylene (PE) Pressure Pipe and Tubing.

##### 1.03 QUALITY ASSURANCE

- A. Submit a certificate of compliance from the manufacturer stating product meets standards as set forth in these specifications.

##### 1.04 UNIT PRICES

- A. Method of Measurement:
  - 1. Fire Hydrant: Measured per each according to the type installed. Hydrant leads (pipe required in addition to typical hydrant installation) shall be measured and paid for as water main.
  - 2. Vertical Hydrant Extensions: Measurement shall be by the vertical foot actually installed.
  - 3. Service Connections: The following are the type of services available for installation per each.

- a. Type-A Service Connections - Type-A service connections shall be measured at the unit price per each as bid for the various sizes.
  - b. Type-B Service Connections - Type-B service connections shall be measured at the unit price per each as bid for the various sizes. Measurement shall be the quantities actually installed, as described in the bid form and on the plans.
  - c. Type-C Service Connections - Type-C service connections shall be paid for at the unit price per each as bid for the various sizes. Measurement shall be the quantities actually installed, as described in the bid form and on the plans. Connection shall be paid for at the unit price per each as bid for the various sizes.
  - d. Type-D Service Tap for Water Mains Four (4") Inches or Smaller: Type-D service taps shall be paid for at the unit price per each as bid for the various sizes. Measurement shall be the quantities actually installed as described in the bid form and on the plans.
  - e. Type-E Service Taps for Water Mains Six (6") Inches or Larger: Type-E service taps shall be paid for at the unit price per each as bid for the various sizes. Measurement shall be the quantities actually installed as described in the bid form and on the plans.
4. Valves and Valve Boxes: Payment for valves and valve boxes shall be based on the actual number installed and shall be paid for at the contract price per each for the various size valves and valve boxes, such price to cover both valve and valve box and any necessary joint adapters for fitting the valves into the system.
  5. Tapping Sleeves and Valves: Measurement shall constitute full compensation for furnishing the sleeves and valves, valve boxes, the labor, equipment, tools, materials, supplies, thrust blocks, anchors and other incidentals necessary for complete installation in accordance with these specifications and the contract drawings.
  6. Cut-In Sleeves and Valves: Measurement of cut-in sleeves and valves shall be based on the number of each size actually installed and payment shall be at the unit price bid per each.
  7. Polyethylene Tubing: Measurement of tubing shall be based on the actual linear foot installed and accepted.
  8. Corporation Stops: Measurement shall be per each based on the quantities actually installed.

B. Basis of Payment:

1. Fire Hydrant: Paid for per each installed and accepted, according to type of installation, includes hydrant, anchoring fittings, labor, equipment, tools, materials, and supplies necessary to complete the hydrant installation.

2. Vertical Hydrant Extension: Paid for at the contract unit price per vertical foot including full compensation for furnishing all materials, tools, labor, equipment, and incidentals necessary to complete the installation.
3. Service Connections:
  - a. Type-A Service Connection: Connection shall be paid for at the unit price per each as bid for the various sizes.
  - b. Type-B Service Connection: Connection shall be paid for at the unit price per each as bid for the various sizes. Payment shall constitute full compensation for furnishing a new corporation stop and the labor, equipment, tools and incidentals necessary for changing the existing service from the old main to the new main.
  - c. Type-C Service Connection: Connection shall be paid for at the unit price per each as bid for the various sizes. Payment shall constitute full compensation for furnishing materials, labor, equipment, tools, supplies, and other incidentals necessary for complete installation of the service and valves from the main to the meter.
  - d. Type-D Service Tap for Water Mains 4” or Smaller: Connection shall be paid for at the unit price per each as bid for the various sizes. Payment shall constitute full compensation for furnishing and installing the corporation stop and strap.
  - e. Type-E Service Taps for Water Mains 6” or Larger: Connection shall be paid for at the unit price per each as bid for the various sizes. Payment shall constitute full compensation for furnishing the corporation stop.
4. Valves and Valve Boxes: Valves shall be paid for at contract unit price per each for the various size valves and valve boxes. Such payment shall constitute full compensation for furnishing the valves and valve boxes and for all labor, equipment, tools and supplies necessary for installation of the valves and valve boxes in accordance with these specifications and the drawings.
5. Tapping Valves and Sleeves: Payment of tapping sleeves and valves shall be based on the number of each size actually installed at the unit price bid per each which shall include all labor, equipment, tools and supplies necessary to complete the installation.
6. Cut-Valves and Sleeves: Payment of each size actually installed shall constitute full compensation for furnishing the sleeves and valves, valve boxes, the labor, equipment, tools, materials, supplies, thrust blocks, anchors and other incidentals necessary for complete installation in accordance with these specifications and the contract drawings.

7. Polyethylene Tubing: Paid for by the actual linear feet installed and accepted.
8. Corporation Stops: Paid for at the unit price per each as bid for the various sizes and types.

## **PART 2 PRODUCTS**

### 2.01 FIRE HYDRANTS

- A. The fire hydrant shall conform to AWWA Standards C 502-94 or updated revisions thereof for improved type three-way dry barrel type hydrants. All hydrants must be UL and FM approved.
- B. Features:
  1. Operating nut must be:
    - a. Bronze.
    - b. Non-rising, pentagonal in shape, measuring 1-1/2" from point to flat.
  2. Hold-down nut must:
    - a. Incorporate an integral resilient weather seal.
    - b. Must be: counterclockwise.
  3. Lubrication chamber must be provided:
    - a. Sealed top and bottom with "O" rings.
    - b. Filled with lubricant which shall be either oil or grease.
    - c. The design shall be such that the thrust collar and the threaded operating parts are automatically lubricated each time the hydrant is cycled.
    - d. There must not be less than two (2) "O" rings separating the lubrications reservoir from the waterway and that portion of the stem contracting these "O" rings shall be sleeved with bronze.
    - e. An anti-friction device must be in place above the trust collar to further minimize operating torque.

4. Hydrants bonnet – must be attached to the upper barrel by not less than four (4) bolts and nuts, with an inserted flat rubber gasket as a pressure seal.
5. Hydrants must be:
  - a. “Three-way”, having two (2) 2-1/2” hose nozzles with National Standards Threads and one (1) pumper nozzle measuring 4-1/2” I.D. with National Standard Thread.
  - b. Nozzles must attach counterclockwise into hydrant barrel utilizing “O” ring pressure seals.
  - c. A suitable nozzle lock must be in place to prevent inadvertent nozzle removal.
  - d. “Traffic-model”, having upper and lower barrels joined approximately 2” above the ground line by a separated and breakable “swivel” flange providing 360 degree rotation of upper barrel for proper nozzle facing. This flange must employ not less than eight (8) bolts.
  - e. Stem must be: two-piece, not less than 1-1/4” diameter or 1” x 1” square (excluding threaded or machined areas) and must be connected by a breakable stem coupling near the ground line flange. Screws, pins, bolts or fasteners used in conjunction with the stem coupling must be stainless steel.
  - f. Painted with Yellow Enamel #54-302 PPG or equal on exterior.
6. Hydrant shoe and barrel casting must be fabricated of ASTM, A-126, Class B Gray Iron or Ductile Iron ASTM, A1-536, but no combination thereof, assuring uniform strength of all cast components, minimizing the possibility of shoe breakage upon traffic impact. The inside diameter of the hydrant barrel shall not be less than six and one-eighth inches (6-1/8).
7. Main valves must be:
  - a. Compression type closing with the pressure and must be not less than 5-1/4” diameter.
  - b. Composition of the main valve must be molded rubber or neoprene, having a durometer hardness of 95 (+) (-) 5 and must be not less than 1” thick.

8. Hydrants must be equipped with drain valves which drain the barrel when the hydrant is closed and seal shut when the hydrant is open.
9. Seat ring and drain ring (show bushing) must be:
  - a. Bronze (ASTM B-62) and work in conjunction to form an all bronze drain way.
  - b. Two (2) drain openings are required and if they are in the cast iron shoe, they must be bronze lined and the bronze seat ring must thread into bronze drain ring (or shoe bushing) providing bronze to bronze connection.
  - c. Seat ring seals must be "O" rings. The 6" shoe connection must be specified (flanged, A/C, M.J., etc.) having ample blocking for sturdy setting and a minimum of eight (8) bolts and nuts is required to fasten the shoe to the lower barrel.
  - d. The interior of the shoe shall have a protective coating of a two-part thermosetting epoxy of at least 4 mils. If a stem cap nut is utilized it must be locked in place by a stainless steel lock washer or similar non-corrosive device.
10. Hydrant must have:
  - a. A working pressure rating of 250 PSIG and be tested at 500 PSIG.
  - b. Have a manufacture's warranty against defects in material or workmanship for a period of (5) years from date of manufacture.
11. Upon request, supplier must furnish flow data indicating friction loss in PSI at the flow of 1,000 GPM from the pumper nozzle. Such friction loss must not exceed 3 PSI.
12. Hydrant bury shall be three (3'), four (4'), five (5') and six (6') feet unless specified in bid form.
13. Hydrant extension sections shall be furnished by the same manufacturer as for the hydrant to which section is to be added.
14. One (1) hydrant wrench shall be furnished with each ten (10) hydrants or fraction thereof.
15. All nozzle caps shall have extra long, heavy (no smaller than five (5) gauge) link chains that will not kink. The chain loop at the cap end shall permit free turning of the caps.

16.
  - a. Anchor couplings or swivel hydrant fittings shall be used where indicated on the drawings or where required by the Engineer to tie six (6") inch pipe from the main to the hydrant.
  - b. The three (3) types of anchoring fittings available are- anchoring tees, anchoring elbows and anchoring couplings.
  - c. Swivel mechanical joint hydrant fittings shall be made with AWWA Class "D" metal thickness throughout, with applicable dimensions, laying lengths and radii, conforming to AWWA A21.10 and AWWA C-111.
  - d. All anchoring tees shall be six (6") inch by six (6") inch by six (6") inch MJ by MJ by Swivel.
  - e. All anchoring elbows shall be six (6") inch by six (6") inch Swivel by Swivel ninety (90<sup>0</sup>) degree elbow.
  - f. All anchoring couplings shall be six (6") inch by six (6") inch Swivel by solid adapter twelve (12") long.
  - g. Acceptable manufacturers of anchor couplings: Tyler Pipe and Foundry Company, U.S. Pipe and Foundry Company, James B. Clow and Sons or approved equal.

C. Acceptable manufacturers:

1. Mueller A-423 "Centurion"
2. M & H Dresser 929 "Reliant" or 129
3. Kennedy K-81 "Guardian"
4. Clow F2545 A Medallion
5. American B-84-B

2.02 SERVICE CONNECTIONS

- A. Water Tubing (high density polyethylene): All high density polyethylene plastic tubing shall be SDR 9, Class 200 PSI, PE-3408 (Cell Class 355434-C) and shall conform to ASTM D2737-37, the latest amendment thereof. Stainless steel inserts (liners) are required on all connections to pack joint fittings.
- B. Corporation Stops: All corporation stops used shall conform to AWWA Standard C-800 and shall be Ford No. F-1000 or approved equal and shall be of the size required in the drawings.
- C. Curb Stops: Curb stops shall not be used unless such use is specifically requested and is approved by the Water Division. If required, these shall conform to AWWA Standards and shall be Ford Ball Valves or approved equal and shall be of the size required.

- D. Meter Boxes: Cast iron meter boxes shall be sized by the Water Division and shall be of the following types or approved equal.

SIZE OF CONNECTIONS		METER SIZE	TYPE
INLET	OUTLET		
1"	1"	5/8" X 3/4"	Ford Yokebox No. YL 244-244
1"	1"	1"	Ford No. 4 Yokebox
2"	2"	1-1/2" & 2"	1/4" Cast Iron Box with 1/4" steel floor plate cover (Per Detail)

Meter boxes for meters up to and including 1" shall have pack joint fittings on each inlet and outlet connection and shall be coated with a coal tar type paint. Lids shall have "WATER METER" imprinted on them.

- E. Check Valves: All one (1") inch services shall use Stockman B-345 or approved equal. Check valves less than one (1") inch shall be used when determined by the Water Division or LCG Codes as necessary.
- F. Service Fittings: Brass goods and fittings shall be made of red brass of composition 85-5-5-5. All threads shall be standard in accordance with AWWA Standard C-800 for service fittings.
- Pack joints for joining galvanized pipe, K copper and polyethylene plastic tubing PE 3408 shall be Ford Pack Joint Couplings or approved equal.
- G. Customer Shut-Off Valve: The customer shut-off valve shall be a gate valve type, Mueller H 10914, Nibco T-22 or approved equal. Body shall be of waterworks brass, tapped and threaded for iron pipe. Valves shall be a positive stop to prevent flow.
- H. Service Saddle Clamps: The service saddle clamps shall be as called for in the plans and/or bid form.

### 2.03 VALVES AND VALVE BOXES

- A. Gate valves shall be mechanical joint gate valves (four (4") inch through twelve (12") inch) having a resilient seat and shall conform to AWWA Specifications C509 or C515 and UL/FM approved.
- B. Design of gate valves four (4") inch through twelve (12") inch shall provide non-rising stem (NRS), dual seal between gate and body, smooth closing gate and one piece cast iron wedge with integral lugs. Valve shall be furnished with standard o-ring seals, two o-ring seals shall be set above the stem thrust collar and one below. Direction to open shall be counter-clockwise equivalent to American Flow 2500, M&H 4067-01 or 7571, Clow F6100 (C509 or C515) or Mueller A-2360.

- C. Valves for use with two (2") inch pipe shall be AWWA non-rising stem, iron body, resilient seat gate valves, similar to the type specified for larger sizes, except that the joints shall be screwed ends.
- D. Valves larger than twelve (12") inch shall be approved by LUS Civil Engineering Division.
- E. Valves shall be provided with two (2") inch operating nuts marked to indicate the direction of opening. Valves shall open counterclockwise.
- F. Valve boxes for all valves twelve (12") inch in diameter and smaller shall be made of cast iron and shall be of the heavy roadway type with inside diameter of not less than five (5") inches. The top section shall be adjustable for elevation. The base shall be sufficiently enlarged so that it will not come in contact with the valve or pipe at any point. All valve boxes shall be provided with covers on which the word "WATER" is printed in raised letters. A pre-cast concrete pad shall be installed for all valve boxes outside pavement.

#### 2.04 TAPPING SLEEVES AND VALVES

- A. Mechanical joint type cast iron tapping sleeves and valves shall be used where indicated on the drawings or where required by the Engineer to make connections to existing four (4") inch and larger water mains.
- B. The tapping valves shall have a resilient seat and shall conform to AWWA Specifications C509 or C515. (Approved manufacturers: Kennedy, Clow, M&H, American Flow, or Mueller)
- C. For connecting to Class 150 asbestos cement pipe, stainless steel tapping sleeves shall be used. (Romac SST 304 stainless steel flange or approved equal)
- D. The tapping sleeves shall be Mueller No. H-615 or Kennedy 920; or Romac FTS 420, Smith-Blair 622 or Ford FTSC, epoxy coated with stainless steel nuts and bolts.

#### 2.05 CUT-IN SLEEVES AND VALVES

- A. Cut-in valves shall be furnished with mechanical joints and shall installed within a valve box.
- B. Cut-in valves shall be Mueller H-866 or approved equal.
- C. Cut-in sleeves shall be Mueller H-842 or approved equal.

### **PART 3 EXECUTION**

#### 3.01 FIRE HYDRANT INSTALLATION

- A. Install hydrants at locations indicated in the Drawings with pumper nozzles facing the street.

- B. Each hydrant shall be placed on a concrete base and shall be secured against dislocation, as indicated on the typical detail drawings.
- C. A minimum of seven (7) cubic feet of clean washed gravel shall be placed around each hydrant base. Backfill above gravel shall be thoroughly tamped.
- D. Bury hydrants to the point indicated on the barrel. Where necessary and where required by the Engineer, hydrant extension sections shall be installed to adjust the hydrant to grade.
- E. Fire hydrant bury shall be 3 ½ ' for both 6" and 8" mains and 4 ½' for 10" and above mains.
- F. Hydrants shall be installed plumb. Hydrants shall be properly lubricated and shall be in good working order before acceptance.
- G. Touch up painting will be required prior to acceptance.
- H. Fire hydrant leads (pipe required in addition to typical hydrant installation) will be classified as mains and will be paid for as such.

### 3.02 SERVICE CONNECTION INSTALLATION

- A. Install service connections as detailed in the Drawings with all necessary connections, fittings, and appurtenances.

### 3.03 VALVE AND VALVE BOX INSTALLATION

- A. Valves shall be installed in locations shown on the plans or at locations designed by the Engineer.
- B. Installation of valves shall conform to the detail drawings or in accordance with manufacturer's instructions.
- C. All water valves shall be set vertically, unless otherwise directed by the Engineer.
- D. A concrete foundation shall be provided for each valve.
- E. Before being placed in the trench, all valves and fittings shall be carefully examined by the Contractor to assure that they are in good working order.
- F. A valve box shall be placed over each valve with the cover being placed level with the surface of the ground, finished street grade, or the elevation specified by the Engineer.
- G. The weight of the valve box shall not be supported by the valve or piping.

END OF SECTION

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## SECTION 02530

### WASTEWATER COLLECTION SYSTEM

#### **PART 1 GENERAL**

##### 1.01 SECTION INCLUDES

- A. Collection line piping, fittings, and accessories.
- B. Manholes.
- C. Pipe Testing.

##### 1.02 DEFINITION

- A. "L.U.S." shall refer to the Lafayette Utilities System (a Department of the Lafayette City-Parish Consolidated Government (LCPCG)) or their authorized representative.

##### 1.03 REFERENCES

- A. Where reference standards are specified throughout this section, the date of the standard is that in effect as of the Bid Date, or date of Owner-Contractor Agreement when there are no bids.
- B. ASTM A 746 - Ductile Iron Gravity Sewer Pipe.
- C. ANSI/ASTM D 1784 - Rigid Polyvinyl Chloride (PVC) Compounds.
- D. ANSI/ASTM D 2241 - Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR).
- E. ANSI/ASTM D 2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
- F. ANSI/ASTM D 3034 - Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- G. ASTM F 477 - Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- H. ANSI A21.11/AWWA C111 - Standard for Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
- I. ANSI A21.50/AWWA C150 - Thickness Design of Ductile Iron Pipe.
- J. ANSI A21.51/AWWA C151 - Standard for Ductile Iron Pipe for Water or Other Liquids.
- K. ASTM C 923 - Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.

- L. Louisiana Standard Specifications for Roads and Bridges, Department of Transportation and Development, Office of Highways, 2000 Edition.
- M. ASTM C 39 - Compressive Strength of Cylindrical Concrete Specimens.
- N. ASTM C 150 - Portland Cement.
- O. ASTM C 443 - Specification for Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets.
- P. ASTM C 478 - Precast Reinforced Concrete Manhole Sections.
- Q. ANSI/ASTM D 3212 - Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- R. ANSI A21.4/AWWA C104 - Cement-Mortar Lining for Ductile Iron and Gray-Iron Pipe.
- S. ASTM D 2564 - Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
- T. ASTM D 2855 - Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

#### 1.04 REGULATORY REQUIREMENTS

- A. Observe and comply with all applicable federal, state and local laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project.
- B. Observe and comply with all applicable safety and health standards published by the Secretary of Labor under Section 107, Part 1585 of the Contract Work Hours and Safety Standards Act.

#### 1.05 SUBMITTALS

- A. Submit product data for pipe, fittings and accessories.
- B. Submit when requested by the Engineer, manufacturer's printed instructions for delivery, storage, preparation, assembly, installation, adjusting and finishing.
- C. Submit, if requested by the Engineer, within thirty days after signing the Contract, a list of all materials and equipment ordered for the project, the manufacturers or agents from whom ordered, catalog and type, quantity ordered and promised delivery date of each item. Any subsequent changes in this list shall be promptly brought to the attention of the Engineer.

#### 1.06 PROJECT RECORD DOCUMENTS

- A. Accurately record location of pipe runs, connections, manholes, and invert elevations.

- B. Reference measurements to appropriate datum control.
- C. Document field changes of dimension and detail.
- D. Submit construction record drawings as per L. U. S. standard format.

#### 1.07 QUALITY ASSURANCE

- A. Submit a certificate of compliance from the pipe, pipe coupling, fittings, and manhole manufacturers stating that the material complies with the specifications. Certificate shall include all applicable test result data and the date manufactured for each lot of material delivered to the project site. Certificate shall also show the date of the latest test.
- B. Materials used on the basis of a certificate of compliance may be sampled and tested at any time. Materials used on said basis shall not relieve the Contractor of responsibility for incorporating material in the work which conforms to the plans and specifications. Such material not conforming to requirements will be rejected.
- C. Each fitting, length of pipe, and manhole section shall be legibly marked with the name of the manufacturer, rating or class, type, service, schedule and specification number, in conformance with the applicable standard.
- D. Where industry standard specifications, such as ANSI, ASTM or AWWA have been referenced for pipe and materials, the manufacturer or supplier shall furnish copies of the latest edition of the standard upon request by the Engineer.

#### 1.08 QUALITY CONTROL

- A. All testing that may be required by L.U.S. to determine the quality, fitness and suitability of materials shall be performed at the direction and upon the order of the Engineer, and at no expense to the Contractor provided the tests prove that the materials meet the specified requirements.
- B. Where tests prove that materials do not meet the specified requirements, the Contractor shall bear the cost of that test and of all retesting until satisfactory results are achieved. L.U.S. will only pay for tests which demonstrate compliance with the specified requirements.
- C. Samples of materials may be secured and tested whenever considered necessary by the Engineer.
- D. The Contractor, at his own expense, shall deliver the materials for testing at the time and to the place designated by the Engineer.

#### 1.09 STORAGE AND HANDLING

- A. Store all materials and equipment in an appropriate stock yard upon receipt, in accordance with the manufacturer's recommendations, and in a manner that leaves the material and equipment accessible to Inspectors.
- B. Store fittings and other appurtenances on pallets.

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- C. Replace damaged material.

#### 1.10 PRE-CONSTRUCTION CONFERENCE

- A. Within ten days of the date of the Notice to Proceed, the Contractor and his project superintendent shall meet with the representative of L.U.S. for a pre-construction conference.
- B. Submit a proposed construction schedule at this meeting.
- C. Location of the meeting to be designated by L.U.S.
- D. Provide L.U.S. with a phone number where someone is available to take calls at all times, in case of emergency, trouble or other matters requiring the Contractor's attention.

#### 1.11 COPIES OF PLANS AND SPECIFICATIONS FURNISHED

- A. Contractor will be furnished with three (3) sets of plans and specifications for construction purposes.
- B. Upon request, additional copies of plans and specifications may be obtained at the cost of reproduction.

#### 1.12 UNIT PRICES

- A. Method of Measurement:
  - 1. Sewer Main: Measured by the linear foot actually installed according to size and incremental depth. Measurement will be horizontally from center to center of manholes and from center of manhole to end of pipe without deductions for fittings, manholes, length of sewer main designated to be jacked or bored or lengths of sewer main installed in casing. The depth of cut for the various sizes of pipe will be the average depth of cut between manholes measured along the center line of the trench. The average depth will be calculated from elevations taken approximately 50 feet apart on the ground or pavement before it is disturbed to the invert of the sewer pipe directly below. The average depth will be the summation of the depths taken, divided by the number of depths taken, from manhole to manhole. In irregular terrain, measurements shall be taken at such other spacing as may be necessary to determine a true average. In cases where the average determined is an exact foot, payment will be made under the pay item for which that exact foot is the upper limit.
  - 2. Manholes: Manholes shall be measured by the actual number constructed at the incremental depths. Depths of the manholes will be measured from the invert of the lowest pipe to the top of the manhole cover. In cases where the depth is an exact foot, measurement and payment will be made under the bid item for which that exact foot is the upper limit. Measurement shall include all items used in the construction of manholes including cast iron frame and cover, base and top, walls, and bedding material under the manhole base and under the connecting pipes as shown on the Typical Sewer Details.

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3. Manhole Drop Inlet: Measured by the actual number installed and accepted per each at the depth indicated. Drop inlet shall include vertical pipe, bends, and tee.
4. 6" Service Line: Measured horizontally from end to end of service lines actually installed with no deductions in length for fittings, jacked or bored, or length of service installed in steel casing.
5. Service Riser: Measured according to size and linear foot installed, from the invert of the main to invert of the service line without deductions for fittings and as shown on the Drawings.
6. Fittings: Measured per each according to size and type actually installed. Only fittings designated as pay items will be measured for payment.
7. Embedment Material: Measured by the linear foot from end to end of each run of sewer main to be used in areas of unstable soil conditions. Cross sectional areas shall be as detailed in the Typical Sewer Detail drawings as Type II sewer foundation. Type I sewer foundation shall not be measured for payment; likewise, required Type II sewer foundation for sewer mains 12' or deeper shall not be measured for payment.
8. Connection to Existing Manhole: Measured per each connection to existing manhole actually installed.
9. Jacking or Boring (Sewer Main or Service Line): Measured, end to end along the centerline, by the linear foot according to the size and type of pipe.
10. Furnish and Install Steel Casing (Jack or Bore): Measured by the linear foot installed according to size and type of installation.
11. Furnish and Install Steel Casing (Open Cut): Measured by the linear foot installed according to size and type of installation.
12. Sheeting Left in Place: Measured per thousand board feet of sheeting left in place as ordered by the Engineer. Sheeting and bracing not required to be left in place shall be included in the cost of sewer main.
13. Stainless Steel Watertight Manhole Inserts: Measured per each including valve body and components.

B. Basis of Payment:

1. Sewer Main: Payment for furnishing and installing sewer main shall be based on the actual number of linear feet installed according to size and incremental depth.
2. Manholes: Payment for manholes shall be based on the actual number constructed at the incremental depths per each.

3. Manhole Drop Inlet: Payment shall be per each based on the actual number installed and accepted at the depth indicated.
4. 6" Service Line: Payment for service lines shall be paid for per linear of line installed and accepted.
5. Service Riser: Payment shall be per vertical linear foot installed including heavy wall sewer pipe, wye, bend at top of riser, and limestone encasement of the service riser.
6. Fittings: Payment shall be per each installed and accepted for the various sizes and types.
7. Embedment Material: Payment shall be by the linear foot of embedment material placed in poor soil conditions, as shown in the Drawings as Type II sewer main foundation.
8. Connection to Existing Manhole: Payment shall be per each and shall include all items necessary to tie sewer main to existing manhole.
9. Jacking or Boring (Sewer Main or Service Line): Payment shall be per linear foot of the various sizes and materials. The sewer main and service line shall be paid for under other items.
10. Furnish and Install Steel Casing (Jack or Bore): Payment shall be by the linear foot installed and accepted according to the size and type of pipe which includes the steel casing and installation by the jack or bore method.
11. Furnish and Install Steel Casing (Open Cut): Payment shall be by the linear foot installed and accepted according to size and type of pipe which includes the steel casing and installation by the open cut method.
12. Sheeting Left in Place: Payment for sheeting left in place shall be based on the actual sheeting ordered to be left in place by the Engineer and shall be paid for per thousand board feet.
13. Stainless Steel Watertight Manhole Inserts: Payment for manhole inserts shall be per each and shall include all components necessary to install the insert according to manufacturers instructions.

## **PART 2 PRODUCTS**

### 2.01 SEWER PIPE

#### A. PVC:

1. a. Pipe (for depths up to 12 feet): ANSI/ASTM D 3034, SDR 35, 12454-B PVC cell classification in accordance with ASTM D 1784; additives and fillers shall not exceed 10 parts (by weight) per hundred of PVC resin in the compound.

- b. Pipe (for depths greater than 12 feet): ANSI/ASTM D 2241, SDR 26, 12454-B PVC cell classification in accordance with ASTM D 1784; additives and fillers shall not exceed 10 parts (by weight) per hundred of PVC resin in the compound.
  - 2. Joints: Push on type joint in accordance with ASTM D 3212; flexible elastomeric seals (gaskets) in accordance with ASTM F 477.
  - 3. Fittings: Same material and cell classification as pipe.
  - 4. Solvent Cements: ASTM D 2564
- B. Ductile Iron:
  - 1. Pipe: ASTM A 746, thickness in accordance with ANSI A21.50 for Class 50 pipe wall thickness; asphalt coated outside and cement lined and seal coated inside in accordance with ANSI A21.4/AWWA C104.
  - 2. Joints: Push on (boltless, single gasketed) similar to that known as "Super-Bell-Tite", "Fastite", "Tyton" or approved equal; or Mechanical Joint in accordance with ANSI A21.11/AWWA C111, corrosion resistant high strength low alloy steel bolts and nuts ("COR-TEN").
  - 3. Fittings: Ductile iron, ANSI A21.10/AWWA C110.
- C. Polyethylene Pipe (P.E. Pipe):
  - 1. Pipe: PE 3408, minimum cell classification valves shall be 345434C in accordance with ASTM D3350, 160 psi pressure rating, SDR17.
  - 2. Joints: Butt fusion
  - 3. Fittings: Molded from a polyethylene compound having a cell classification equal to or exceeding the pipe compound; supplied by the same manufacturer of the pipe being supplied.
- D. Joining Pipe of Different Material:
  - 1. Connect pipe of dissimilar material with manufactured adapters specifically intended for this purpose. Devices shall be manufactured by Fernco Systems or approved equal.

2.02 CASING FOR JACKED, BORED AND OPEN TRENCH INSTALLATIONS

- A. Welded standard smooth steel pipe conforming to ASA B36.10; precoated inside and out with an approved bitumen compound. Minimum pipe thickness shall be as follows:

INSIDE DIAMETER (Inches)	SMOOTH STEEL PIPE (Min. Wall Thickness, Inches)
4	0.237

6	0.280
8	0.322
10	0.365
12 - 36	0.375

### 2.03 MANHOLES

- A. Manholes (Precast Shaft, Cone Top, and Base Pad Construction): conform to ASTM C478; integral base pad.
- B. Watertight Connectors: ASTM C923, flexible watertight connectors, KOR-N-SEAL (NPC Systems, Inc.), Z-LOK XP (A-Lok Products, Inc.) or approved equal.
- C. Frame and Cover: Size and type shown on Typical Sewer Details.

### 2.04 STAINLESS STEEL WATERTIGHT MANHOLE INSERTS

- A. Insert and all components shall be manufactured from corrosion proof material suitable for atmospheres containing hydrogen sulfide and dilute sulfuric acid as well as other gases associated with wastewater collection systems.
- B. The insert shall be manufactured of 304 stainless steel with a thickness of not less than 18 gage.
- C. The insert shall have a configuration such that the lip will rest on the seating surface of the manhole frame.
- D. In order to reduce excess weight accumulation, the insert shall not exceed 6 1/2" in overall depth.
- E. The gasket shall be manufactured of close cell neoprene or approved equal. The gasket shall be compatible with the stainless steel insert to form a long lasting bond in wet or dry conditions.
- F. The watertight manhole insert as specified above, upon installation as per manufacturer=s recommendations, shall not allow more than 1 gallon of inflow during a period of 24 hours.
- G. The manhole insert shall have a handle of 3/16" minimum plastic coated stainless steel cable attached to the insert body. The handle shall be attached with a No. 6 high grade stainless steel rivet. The cable shall be braided in a manner which resists cutting with common bolt cutters. The cable terminal and eye shall be stainless steel.

### 2.05 CONCRETE

- A. Cement shall be Portland Cement conforming to ASTM C 150.
- B. Test for compressive strength of concrete in accordance with ASTM C 39.

- C. Concrete for Embedment: 3000 psi minimum at 28 days, five sacks of cement minimum per cubic yard, not more than 7 gallons of water per sack of cement.
- D. Grout: One part Portland Cement, two parts mortar sand, and water as required for proper consistency; use within 30 minutes of mixing.

2.06 EMBEDMENT MATERIAL

- A. A mixture of either gravel or stone with 35 percent (plus or minus) sand as verified by proof of material deliveries, conforming to the following requirements:

- 1. Gravel: Material from a source on the DOTD Qualified Products List conforming to the following gradation:

<u>U. S. SIEVE</u>	<u>PERCENT PASSING</u>
1-1 1/2"	95-100
No. 4	0-15
No. 200	0-2

- 2. Stone: Material from the DOTD Qualified Products List conforming to the following gradation:

<u>U. S. SIEVE</u>	<u>PERCENT PASSING</u>
1-1 1/2"	95-100
3/4"	40-85
No. 4	0-15

- 3. Sand: Non-plastic siliceous material conforming to the following gradation requirements:

<u>U. S. SIEVE</u>	<u>PERCENT PASSING</u>
1/2"	100
No. 4	75-100
No. 200	0-10

- B. Limestone conforming to the following gradation requirements:

<u>U.S. SIEVE</u>	<u>PERCENT PASSING (BY WEIGHT)</u>
1-1/2"	100
1"	90-100
3/4"	70-95
3/8"	50-80
No. 4	35-65
No. 10	25-50
No. 40	10-26
No. 200	4-12

2.07 SAND

- A. Non-plastic siliceous material conforming to the following gradation requirements:

<u>U.S. SIEVE</u>	<u>PERCENT PASSING (BY WEIGHT)</u>
1/2"	100
No. 10	75-100
No. 200	0-10

2.08 MORTAR SAND

- A. Non-plastic siliceous material conforming to the following gradation requirements:

<u>U.S. SIEVE</u>	<u>PERCENT PASSING (BY WEIGHT)</u>
No. 4	100
No. 8	95-100
No. 100	0-25
No. 200	0-10

- B. Percentage of foreign matter not to exceed the following:

1. Coal or Lignite	0.25 percent
2. Clay Lumps	0.50 percent

**PART 3 EXECUTION**

3.01 ALIGNMENT AND GRADE

- A. Prior to excavation, the Engineer will provide alignment and location of manholes. Notify Engineer at least two working days prior to the time staking is required.
- B. Uncover, relay and backfill installed pipe where horizontal and vertical alignment is determined by Engineer to be unacceptable or erroneous, at no cost to L.U.S.

3.02 EXCAVATION AND TRENCHING

- A. Excavation shall include the removal, handling, rehandling, refill or backfilling, and disposal of any and all materials encountered in the work, and shall include all pumping, bailing, drainage and sheeting and bracing. It includes clearing and the removal of shrubbery and other obstructions not otherwise provided for.
- B. Perform all excavation, of whatever substance encountered, to depths indicated on the drawings or established by field stakeout.
- C. If the Engineer determines it is necessary to adjust, correct, relocate or in any way change the line and profile shown on the Plans, the Contractor shall perform the excavation and backfill required by said change under the terms of these specifications.
- D. Fill all excavations beyond authorized depths and widths with compacted

embedment material at no cost to L.U.S. Over-excavated trenches shall not be brought up to grade with excavated material.

- E. All excavation shall be by open cut except where indicated otherwise in the Plans.
- F. Width of the trench to a point two (2) feet above the top of the pipe installation shall not exceed the external diameter of the barrel of the pipe plus nine (9) inches on each side. Additional cost for special foundation and backfill material and requirements as a result of failure to confine the excavation to this width shall be borne by the Contractor.
- G. Keep banks of trenches as nearly vertical as practical.
- H. Where required to control trench width, protect adjacent structures and to safeguard employees, properly sheet and brace trench.
- I. Where in the opinion of the Engineer, damage is liable to result from withdrawing sheeting, the sheeting will be required to be left in place. Neither the giving of such orders by the Engineer nor his failure or refusal to issue such orders shall in any way relieve the Contractor of the responsibility for damages to pavements or structures.
- J. When embedment material is not required, lay pipe on a firm, undisturbed, native earth foundation.
- K. Prevent surface ground water from flowing into the excavations.
- L. Remove all water accumulated in the trenches or other excavations by pumping or other approved methods, at no cost to L.U.S., prior to laying pipe.
- M. Stockpile material suitable for backfilling a sufficient distance back from the edges of the excavation to avoid overloading and to prevent slides or cave-ins.
- N. Control banks of all excavated areas to prevent movement of soil in areas supporting existing foundations, slabs, pole lines, pipelines or other structures. If, as a result of such excavation or through fault or neglect of the Contractor, the earth or ground under such structures is disturbed, corrective measures, as approved by the Engineer, shall be taken by and at the expense of the Contractor.
- O. Keep all drains, gutters, culverts, etc. for surface drainage open, or if they are unavoidably closed, make other provisions for this drainage.
- P. Length of the trench to be opened or the area of surface to be disturbed and unrestored at any one time will be limited by the Engineer with regard to both expeditious construction and the convenience and comfort of persons residing in the neighborhood or frequenting the street in question.
- Q. Trenches left open during non-working hours shall be properly protected from accidental entry.

### 3.03 EMBEDMENT

- A. Typical sewer foundations are as shown on the Typical Sewer Details.

- B. All pipe shall be bedded in a Type I Foundation or as otherwise stated herein, in the Plans, or as determined in the field.
- C. Where cuts to inverts of sewer mains are twelve (12) feet or more, Type II foundation shall be required.
- D. Where the bottom of the trench is not sufficiently stable or firm to prevent vertical or lateral displacement of the pipe after installation, the Engineer may direct the Contractor to provide a Type II foundation.

#### 3.04 MANHOLE INSTALLATION

- A. Construct precast manholes to proper alignment and elevation as shown in the Plans and in accordance with the Typical Sewer Details.
- B. Provide minimum of six (6) inches clear between the outer surface of the manhole and the embankment or timber sheeting.
- C. Set metal frames as shown in standard details.
- D. Invert channels shall be smooth, accurately shaped and in accordance with L.U.S. template and the Typical Sewer Details.
- E. All pipe connections to manholes shall be installed using watertight connectors as per Article 2.03(B).
- F. Manhole drop inlets and services into manholes shall be constructed as shown on the Typical Sewer Details with materials meeting all requirements of these specifications.

#### 3.05 PIPE INSTALLATION

- A. Where a certain pipe material is specified on the Plans, only that material can be used. Where the term "Sewer Pipe" is shown on the plans or in the proposal, it shall be interpreted to mean any of the specified pipe materials meeting the requirements of this section, as the Contractor elects, of the dimension shown on the plans.
- B. Install pipe in accordance with the manufacturer's recommendations and in accordance with the specifications herein. In addition, install PVC pipe in accordance with ASTM D 2321. In the event there is a conflict, consult with Engineer for clarification.
- C. Install solvent weld cap on the new line into the first manhole constructed immediately upstream of the existing manhole to prevent sewer gases from entering the work area and to prevent drainage into the existing system.
- D. Thoroughly clean interior of pipe before lowering into the trench. Keep pipe interior clean and free of foreign matter during laying operations.
- E. Do not lay pipe in unsuitable weather conditions. Stabilize wet trench conditions before laying pipe.

- F. Plug open ends of pipe and fittings when work is not in progress.
- G. Replace pipe found to be defective, before or after laying, with new pipe by and at expense of the Contractor.
- H. Use embedment material for pipe bedding where required.
- I. Grade pipe bedding by hand to provide uniform pipe bearing for its entire length and to provide proper grade and alignment.
- J. Provide bell or coupling holes at each joint to permit proper joint assembly and pipe support.
- K. Lay pipe with spigot end pointing in direction of flow.
- L. Walking or working on the completed sewer pipe, except as may be necessary in tamping or backfilling shall not be permitted until the trench has been backfilled to a height of at least one foot above the top of the pipe.
- M. Check each joint of pipe for line and grade before the next succeeding joint is placed.
- N. Maintain proper alignment of pipe during haunching and initial and final backfilling operations.
- O. Keep the sewer line pumped dry at all times.

### 3.06 SERVICE RISERS

- A. Install service risers as indicated on the Typical Sewer Details at locations shown on the Plans or designated in the field by the Engineer.
- B. For sewer mains 8" or larger, the tee shall be a short-body ductile iron tee conforming to AWWA C153.

### 3.07 WYE BRANCHES OR TEES

- A. Furnish wye branches or tees with connection of the size specified, securely and permanently fastened to the barrel of the pipe in the process of manufacture.
- B. Wyes and tees shall be given an inclination above a horizontal line and shall be properly bedded.
- C. All wyes and tees shall conform to the specifications and test standards of the pipe it is to be installed on.

### 3.08 CONNECTION TO EXISTING MANHOLES

- A. Connection to existing manholes shall be made above the existing manhole base.
- B. Manhole penetrations shall be cored as shown in standard details.

- C. Provide watertight connectors at tie-in to the manhole.
- D. Cap new sewer pipe from existing system at first manhole constructed immediately upstream from existing system tie-in.
- E. Where the connection has to be made at the same elevation as the existing pipe, the base shall be broken in the area where the connection is to be made and the new base shall conform to the requirements set forth in these specifications.

### 3.09 BACKFILLING

- A. Where compaction density is specified, maximum density shall be determined in accordance with requirements of Louisiana DOTD Designation: TR 418 and TR 401.
- B. Upon completion of joints and approval of Engineer, place acceptable material, free from stones, hard clay lumps, or other hard substances under the haunches of the pipe and up to the spring line of the pipe. Place initial backfill, in not more than six (6) inch uniform loose lifts, to a point twelve (12) inches above the top of the pipe. Compact each stage by hand or mechanical tamping to obtain a minimum of 85% maximum density.
- C. Avoid displacement of the pipe in placement of backfill about the haunches.
- D. Take care to avoid contact between the pipe and compaction equipment.
- E. Backfill trenches for mains and services beneath existing pavement as shown in the Typical Sewer Details.
- F. Compact remainder of backfill over and above 12" above the surface of the pipe for mains and services laid within the right-of-way as follows:
  - 1. Backfill with select excavated site materials in not more than twelve inch (12") uniform loose layers with each layer mechanically compacted to a minimum 90% of maximum density.
  - 2. Within state highway right-of-way, the compaction requirements shall be 100% of the density of the surrounding undisturbed material, compacted in uniform loose layers of not more than twelve inches (12").
  - 3. Slightly overfill the trench with backfill to create a crowned condition but not to exceed 6".
- G. Compact remainder of backfill over and above 12" above the surface of the pipe for mains and services laid outside the right-of-way as follows:
  - 1. Backfill with select excavated material, in not more than eighteen (18) inch uniform loose lifts, to the elevation 24" below the finished ground surface.
  - 2. Compact each layer of the material to eliminate all voids and to obtain a soil density equivalent to the existing undisturbed surrounding soil.
  - 3. Compact the remaining top two feet of the trench backfill, in not more than

twelve (12) inch uniform loose lifts, to obtain a minimum of 90% of maximum density.

4. Slightly overfill the trench with backfill to create a crowned condition but not to exceed 6".
- H. The Contractor shall be responsible for obtaining suitable compaction of all trench backfill, including that in proposed streets, parking areas or other surfaced locations and shall be responsible for the failure of any surfacing due to trench settlement.
- I. Compaction will be verified through compaction tests ordered by the Engineer at no expense to the Contractor, except as stated herein. If the test results indicate insufficient compaction, the cost for that compaction test and of all retesting shall be borne by the Contractor until satisfactory results are achieved. L.U.S. will pay only for those tests which prove that the specified compaction has been achieved.
- J. Avoid damage to pipe during compaction.
- K. Backfill material shall contain no stumps or roots and shall be free of lumber, trash, or other debris.
- L. Use special backfill, with Engineer's approval, where the excavated material is not suitable for backfilling the trench and obtaining the required compaction. At the Contractor's option, limestone may be used for special backfill at no additional cost to L.U.S.
- M. Maintain trenches in good and safe condition during construction and during one year warranty period.

### 3.10 CASING INSTALLATION

- A. Clean and coat weld joints with approved bitumen compound after joining and before installation.
- B. Install casing as to prevent the formation of a waterway below the obstruction traversed.
- C. Casing shall have even bearing throughout its length and shall slope toward one end.
- D. Provide casing lengths to meet requirements of Plans or as established by the Engineer.
- E. Seal ends of the casing to prevent entrance of earth and groundwater.
- F. Provide polyethylene or stainless steel casing spacers attached to the sewer pipe to prevent damage to pipe and bell joints during installation and to provide proper long-term line support, at no cost to L.U.S. Skid arrangement to be in accordance with manufacturer's recommendations. Spacers shall be manufactured by Advance Products and System, Inc. or approved equal.

### 3.11 JACKING OR BORING

- A. Install pipe by means of a boring machine, auger, jack or by other means satisfactory to the Engineer.
- B. In the event the jacking or boring operations result in injury or damage to railroad tracks or pavements, repairs shall be the responsibility of the Contractor and shall be done at no cost to L.U.S.
- C. Any overcutting of the borehole shall be remedied by pressure grouting the entire length of the installation.
- D. Backfill boring pits to the bottom of the pipe with limestone at no direct cost to L.U.S.
- E. Schedule jacking or boring operations such that no pits shall be left open at the end of the day.

### 3.12 EXISTING STRUCTURES

- A. Existing structures shall be defined as all above and below ground level structures, including all pipelines, poles, tracks, roads, culverts, sidewalks, drains, cables, wires, conduits, vaults, manholes, landscaping, and other appurtenant facilities, whether owned or operated by public bodies, private individuals, corporations, firms or companies.
- B. Protect all existing structures from damage during construction.
- C. Utility facilities shown on the Plans are approximate locations and do not include service locations. There is no expressed or implied guarantee as to the accuracy of the various utilities or any omissions.
- D. The Contractor shall verify the locations of all utilities and follow OSHA Law Section 1926.651 at no cost to L.U.S. Final project location will be determined in the field by the Engineer upon the Contractor's verification of all utilities.
- E. In no case shall the Contractor receive additional compensation due to the location of existing utilities in relation to the final location of the proposed lines and appurtenances.
- F. Notify all utilities or other interested parties prior to starting work and advise them of any adjustments required.
- G. Contractor shall be responsible for investigating and informing himself of the condition, character, and extent of all structures which may be encountered during construction.
- H. Perform work in a manner to prevent interference with or damage to existing structures. Any damages done by the Contractor shall be his responsibility and all repairs shall be made immediately to the satisfaction of L.U.S.
- I. L.U.S. and/or his agents shall not be responsible for any damages to or any costs incurred as a result of any delays due to existence, removal, adjustment or repair to any structures mentioned herein, shown on the Plans or encountered during

construction.

### 3.13 FLUSHING SEWER LINES

- A. Water flush and thoroughly clean all sewer lines prior to acceptance by L.U.S.

### 3.14 TESTING SEWER LINES

#### A. General:

1. Test sewer lines by low pressure air testing and television equipment. Deflection tests may also be performed as described in paragraph (D) below.
2. Test manholes by air vacuum testing, visual inspection, and by infiltration. Manhole leakage will not be acceptable.
3. Repair and retest manholes and sections of sewer lines which fail to meet the specified tests.
4. Do not remove plugs installed on the new system until the system has been accepted.
5. Furnish all equipment, labor and materials required for making the test.

#### B. Low pressure air testing

1. Clean the interior of the pipe immediately prior to testing.
2. Furnish test plugs, air compressor, test gages, stop watch and personnel for conducting the test.
3. The Engineer has the option to have the Contractor's testing equipment independently checked and certified for accuracy.
4. All pneumatic plugs shall be tested before being used in the actual test installation.
  - a. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked.
  - b. Air shall be introduced into the plugs to 25 psig.
  - c. Pressurize the sealed pipe to 5 psig.
  - d. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.
5. After pneumatic plugs are checked by the above procedure, place the plugs in the line at each manhole and inflate to 25 psig.
6. Introduce low pressure air into the sealed line until the internal air pressure

reaches 4 psig greater than the average back pressure of any ground water that may be over the pipe.

7. Allow at least two minutes for the air pressure to stabilize.
8. After the stabilization period (3.5 psig minimum pressure in the pipe), disconnect the air hose from the control panel to the air supply.
9. The portion of the line being tested shall be termed "Acceptable" if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back pressure of any ground water that may be over the pipe) shall not be less than the time shown for the given diameter in the following table:

<u>PIPE DIAMETER IN INCHES</u>	<u>MINUTES</u>
4	2.0
6	3.0
8	4.0
10	5.0
12	5.5
15	7.5
18	8.5
21	10.0
24	11.5

10. If ground water is known to be present over the pipe, the Contractor shall install a one-half inch diameter capped pipe nipple, approximately 10" long, through the manhole wall directly over one of the sewer lines entering the manhole. This is to be done at the time the sewer line is installed. Immediately prior to the performance of the test, the ground water shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the pipe nipple. The hose shall be held vertically and a measurement of the height in feet of water over the invert of the pipe shall be taken after the water has stopped rising in this plastic tube. The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is 11.5 feet above the invert of the pipe, then the added pressure will be  $11.5/2.3$  or 5 psig. This increases the 3.5 psig to 8.5 psig, and the 2.5 psig to 7.5 psig.) The allowable drop of one pound and the timing remain the same. In no case should the starting test pressure exceed 9.0 psig. Recap and seal the pipe nipple to prevent any future infiltration.
11. In lieu of (10) above, if the ground water level can be readily determined during the installation of the manhole, and jointly agreed upon by the Contractor and L.U.S., the height of the ground water above the invert of the sewer pipe can be used in determining the pounds of pressure to be added to all readings.

C. Television Testing

1. Prior to putting each system into service, the line will be visually inspected by television equipment operated by the L.U.S. Wastewater Collection Division. The Contractor shall be responsible for cleaning the system prior to inspection by television equipment. If rejected, the Contractor shall pay at current rates for television equipment operation until proper flushing and/or pipe installation has been achieved.

D. Deflection Test

1. If during the operation of the television equipment by L.U.S. there is suspicion of deflection of the sewer pipe, the Engineer reserves the right to require the Contractor to perform a deflection test on that section of pipe at the Contractor's expense.
2. No pipe shall exceed a deflection of 5%.
3. Test for deflection using a mandrel with a diameter equal to 95% of the inside diameter of the pipe.
4. Perform test without mechanical pulling devices.
5. Should any deflection test fail, L.U.S. reserves the right to require the Contractor to perform deflection tests on any or all additional pipe at no cost to L.U.S.

E. Manhole Air Vacuum Test

1. Air vacuum testing of manholes shall be performed on at least 20% of the manholes, minimum of one (1) per project. The selection of which manhole(s) to be vacuum tested shall be determined by the Engineer.
2. Test manholes immediately after assembly of the manhole and the connecting pipes and before any backfill is placed around the manhole.
3. Plug lift holes.
4. Plug pipe openings, taking care to securely brace the plugs and the pipe.
5. Perform test using an inflatable compression band, vacuum pump and appurtenances specifically designed for vacuum testing manholes.
6. After the testing equipment is in place, a vacuum of 10 inches of Hg shall be drawn on the manhole. The manhole will be considered to have passed the test if the vacuum does not drop more than 1 inch of Hg in one minute.
7. If the manhole fails the initial test, the Contractor shall locate the leakage and make proper repairs, and retest until a satisfactory test result is obtained.
8. If any manhole fails the vacuum test, the Engineer reserves the right to require the Contractor to test any or all additional manholes at the Contractor's expense.

F. Manhole Infiltration Test

1. Construct a minimum 2' deep by 2' wide trench around the manhole.
2. Fill the trench with water and drill 3/4" (minimum) holes 5' deep (or the depth of the manhole). These holes shall circle the manhole at 6" intervals.
3. Two hours later the trench shall be refilled with water.
4. Up to two hours after the second filling, the Engineer will check the manhole for infiltration.
5. The manhole will be considered to have passed the test if no infiltration is detected. Repair and retest manholes failing the above test.

G. Visual Inspection

1. After the manholes have been backfilled and prior to final acceptance of the project, any signs of leaks or weeping visible from the inside of the manhole shall be repaired by the Contractor and the manhole made watertight.

3.15 MAINTENANCE OF TRAFFIC

- A. Refer to "Louisiana Department of Highways Maintenance Traffic Controls Handbook" (for state highway right-of-way) and "The Work Area Traffic Control Handbook" (for City-Parish streets).
- B. Conduct operations as to minimize interference with public travel and inconvenience to the public and to property owners.
- C. Provide and maintain, at Contractor's expense, suitable bridges, detours or other temporary facilities for the accommodation of public or private travel, as directed by the Engineer.
- D. Give twenty-four (24) hours notice to owners of private driveways prior to interfering with them.
- E. Keep local fire protection authorities informed at all times of the location of construction operations and fire lanes. Maintain access for fire-fighting equipment as requested by the Fire Department.
- F. Maintain traffic on all streets during construction, except where suitable detours or other arrangements are agreed upon. LCG Traffic and Transportation shall be given a minimum 4 day notice of any detours or disruptions in traffic patterns.
- G. Provide motorized rubber wheel road grader on site upon completion of backfilling of all excavations in roadways and streets. Maintain all streets and roadways in a satisfactorily condition approved by the Engineer for the duration of the contract.
- H. Contractor shall have someone available to take calls at all times. Provide L.U.S. with a night phone number to call so that the Contractor may be advised of any

emergency, trouble or other matter requiring his attention.

### 3.16 CARE OF STREETS, SIDEWALKS & ROADS

- A. Remove all excess materials, debris or other obstruction from streets or roads immediately after completing backfilling, at Contractor's expense.
- B. Wash streets, sidewalks and roads daily to remove dust problem.
- C. No cross streets, sidewalks or roads shall be wholly obstructed except by written permission from the Engineer.
- D. If at any time the Contractor neglects to remove such material or obstruction and place streets, sidewalks and roads in suitable condition for traffic within twenty-four (24) hours after having received notice (written or verbal) from the Engineer, the work may be done by L.U.S., and the cost thereof charged to the Contractor and deducted from his final estimate.
- E. Repair and replace streets, sidewalks, roads, ditches and culverts to the satisfaction of the Engineer and parties concerned.

### 3.17 PROTECTION AND CARE OF PUBLIC OR PRIVATE PROPERTY AND SERVITUDES

- A. Continuously maintain and protect all underground and above ground structures, utilities, including the restoration of all public utilities, water mains, water services, gas mains, gas services, culverts, drains, ditches, curbs, sidewalks, landscaping and/or other facilities which may be damaged, to a condition at least equal to their original status, at no additional cost to L.U.S. In the event of damage to any facilities, the appropriate utility will be notified immediately. L.U.S. will repair damaged facilities at the Contractor's expense or require the Contractor to repair said damage.
- B. All construction work under this contract on servitudes, right-of-way, private property or franchise shall be confined to the limits of such servitudes, right-of-way or franchise. All work shall be accomplished so as to cause the least amount of disturbance and a minimum amount of damage.
- C. No trees or shrubbery shall be removed or trimmed without the consent of the Engineer. With such approval ornamental trees and shrubbery shall be carefully removed, with the earth surrounding their roots wrapped in burlap and replanted in their original positions within forty-eight (48) hours. All shrubbery or trees destroyed or damaged shall be replaced by the Contractor with material of equal quality at no cost to L.U.S.
- D. All obstacles such as fences, markers, mail boxes, driveway culverts, etc. shall be removed by the Contractor and immediately replaced after the trench is backfilled in their original position and condition at no direct cost to L.U.S.
- E. Maintain adequate drainage during the process of construction.

### 3.18 CLEAN-UP

- A. Remove from the site all tools, equipment, temporary structures and surplus materials.
- B. Dispose of all excess soil, waste, rubbish, debris or objectionable materials off the site and in a manner and a location that complies with local ordinances and laws and is acceptable to all parties concerned and is approved by the Engineer.
- C. When disposal of excess soil is upon private lands, the Contractor shall be required to produce a written agreement with the private landowner stating the agreed terms and conditions.
- D. The entire construction site shall be left clean and to the satisfaction of the Engineer.

**END OF SECTION**

## SECTION 02532

### WASTEWATER FORCE MAINS

#### **PART 1 GENERAL**

##### 1.01 WORK INCLUDES

- A. The work covered by this section of the specifications consists of furnishing all labor, supervision, equipment, tools, appliances and all materials and in performing all operations in connection with the installation of sewage force mains, complete, in accordance with the specifications and the applicable drawings.

##### 1.02 REFERENCES

- A. ANSI/ASTM D 1784 Rigid Poly (Vinyl Chloride) (PVC) Compounds.
- B. ANSI/ASTM D 2241 Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
- C. ANSI/ASTM D 3139 Joints for Plastic Pressure Pipe Using Flexible Elastomeric Seals.
- D. ANSI/ASTM D 1248 Polyethylene Plastics Molding and Extrusion Materials.
- E. ANSI/ASTM D 3350 Polyethylene Plastics Pipe and Fittings Materials.
- F. ANSI/AWWA C 111/A21.11 Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
- G. ANSI/AWWA C 151/A21.51 Ductile Iron Pipe for Water or Other Liquids.
- H. DOTD Designation: TR 401 – Method of Test for the Determination of In-Place Density.
- I. DOTD Designation: TR 418 – Method of Test for Moisture-Density Relationships.
- J. DOTD Designation: TR 423 – Procedure for the Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.

##### 1.03 PROTECTION

- A. Locate, maintain, and protect above and below grade utilities and other underground facilities remaining within the construction area.

- B. Protect and maintain trench excavations by cribbing, sheathing, shoring, and bracing as necessary for protection of Work, existing foundations, utilities, underground facilities, other structures, and the safety of personnel. Responsibility for the design, installation, and maintenance of cribbing, sheathing, and shoring required by job conditions is the obligation of the Contractor.
- C. Prevent surface water from entering trench.
- D. Adequate pumping equipment shall be on hand to remove any surface or groundwater from trench.
- E. Protect plants, lawns, bench marks, existing structures, fences, sidewalks, pavement, and curbs from excavation equipment and vehicular traffic.
- F. Access to hydrants, valve boxes, fire and police call boxes which are not part of the Work.

#### 1.04 QUALITY ASSURANCE

- A. Submit a certificate of compliance from the pipe manufacturer stating chemical and physical properties of materials used.
- B. Verify that survey benchmarks and intended elevations are as shown on the Drawings.

#### 1.05 PROJECT RECORD DOCUMENTS

- A. Accurately record location of pipe runs, valves, and changes in invert elevations.

#### 1.06 STORAGE OF PIPE AND FITTINGS

- A. Store pipe and fittings in accordance with manufacturer's recommendations.
- B. Any damaged pipe shall be replaced by the Contractor.

#### 1.07 UNIT PRICES

- A. Method of Measurement:
  - 1. Force Main: Measured by the linear foot according to size, along the centerline of the pipe installed and accepted without deductions for fittings, length of force main designated to be jacked or bored, or length of force main installed in steel casing.

2. Jacked or Bored Force Main: Measured by the linear foot along the centerline length according to size installed and accepted.
3. Force Main Tie-in to Manhole: Measured per each installed and accepted.
4. Force Main Tie-in to Lift Station: Measured per each installed and accepted.
5. Furnish and Install Steel Casing: Measured by the linear foot installed according to size and type of installation.

B. Basis of Payment:

1. Force Main: Paid for by the actual number of linear feet installed and accepted, according to size of pipe.
2. Jacked or Bored Force Main: Paid for by the actual number of linear feet installed and accepted according to size of pipe. This item is to cover the additional cost of installing this pipe by the jacking or boring method.
3. Force Main Tie-in to Manhole: Paid for per each installed and accepted.
4. Force Main Tie-in to Lift Station: Paid for per each installed and accepted.
5. Furnish and Install Steel Casing (Jack or Bore) or (Open Cut): Paid for by the linear foot furnished, installed, and accepted according to size and type of installation.

## **PART 2 PRODUCTS**

### 2.01 PIPE MATERIALS:

A. Force Main:

1. Ductile Iron (DI)
  - a. Pipe shall be designed in accordance with ANSI Specification A21.50 (AWWA C-150) for 200 psi water working pressure.
  - b. Pipe shall be manufactured in accordance with ANSI Specification A21.51 (AWWA C-151), latest revision, except the minimum nominal wall thickness shall be as shown on the following table:

<u>SIZE</u>	<u>THICKNESS</u>	<u>SIZE</u>	<u>THICKNESS</u>
6"	.25	12"	.31
8"	.27	14"	.33
10"	.29	16"	.34

c. All pipe beyond the valve box shall be asphalt-coated outside and ceramic epoxy lined inside. Epoxy ceramic lining shall be PROTECTO 401 as manufactured by US Pipe & Foundry Company, or approved equal, and shall be installed in accordance with manufacturer's recommendations.

d. The following joint types shall be used, conforming to ANSI A21.11:

1. Mechanical Joint (Type III)
2. Push-On (boltless, single-gasketed) joint similar to that known as "Super-Bell-Tite", "Fastite", "Tyton", or approved equal.
3. Submarine, flexible, ball and socket joint (for underwater installation).

e. Fittings: Ductile iron; Manufactured in strict accordance with AWWA C153, AWWA C110 and AWWA C111. Fitting shall be asphalt coated outside and ceramic epoxy lined inside. Epoxy ceramic lining shall be PROTECTO 401 as manufactured by US Pipe & Foundry Company, or approved equal, and shall be installed in accordance with the manufacturer's recommendations.

2. PVC Pipe:

- a. Pipe shall conform to ASTM 2241, 160 psi working pressure, standard dimension ratio SDR 26, shall be made from clean, virgin, Type I, Grade I, PVC compound in accordance with ASTM D 1784.
- b. Clean, reworked material generated from the manufacturer's own pipe production may be used.
- c. Joint material shall be push-on type in accordance with ANSI/ASTM D 3139 and assembled with a non-toxic lubricant.
- d. Fittings smaller than 3" shall be the same material as pipe with 160

psi working pressure rating. Fittings 3" and larger shall be ductile or cast iron with restrained mechanical joints in accordance with ANSI/AWWA C111/A21.11 respectively. All fittings shall be asphalt-coated outside and cement-lined to standard thickness and seal coated inside in accordance with ANSI Standard A21.4.

- e. Laying lengths shall be 20 feet (plus or minus 1").
- f. A THW 14 insulated solid copper wire shall be placed above the center of all PVC pipe for its entire length. This wire must be connected from the discharge pipe inside the pump station to the ring of the discharge manhole. Splices in detection wire shall be installed in a direct bury splice kit manufactured by 3M or approved equal.
- g. Marking Tape

All PVC pipe shall be marked using a nonmetallic tape buried at least 15 inches above the top of the pipe. Tape shall be 3 inches wide minimum and on the Board's list of materials and approved manufacturers. After the tracer wire has been placed, the pipe trench shall be backfilled to approximately 15 inches over the top of the pipe then the nonmetallic tape shall be placed flat over top of pipe within trench. Backfill shall be carefully placed to a depth of 3 inches by hand to assure that the tape is secured in place over the pipe. It is the intent to provide a visible marker in the event of excavation near a water line.

3. Polyethylene Pipe (P.E. Pipe):

- a. Pipe: PE 3408, minimum cell classification values shall be 345434C in accordance with ASTM D 3350, 160 psi pressure rating, SDR 11.
- b. Joints: Butt fusion.
- c. Fittings: Molded from a polyethylene compound having a cell classification equal to or exceeding the pipe compound; supplied by the same manufacturer of the pipe being supplied.

- B. Sample of pipe and physical and chemical data sheets shall be submitted to the Engineer for approval and his approval shall be obtained before pipe is purchased.
- C. The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects.

- D. At the option of the owner, manufacturers may be disqualified if they do not have proper experience in the manufacture of the material specified.

2.02 CASING FOR JACKED, BORED, AND OPEN TRENCH INSTALLATIONS

- A. Welded standard smooth steel pipe conforming to ASA B36.10 or API Standard 5L; pre-coated inside and out with an approved bitumen compound; minimum thickness shall be as follows:

<u>INSIDE DIAMETER (INCHES)</u>	<u>SMOOTH STEEL PIPE</u> (Min. Wall Thickness, Inches)
4	0.237
6	0.280
8	0.322
10	0.365
12-36	0.375

2.03 WATERTIGHT CONNECTORS

- A. Connectors shall meet ASTM C923, shall be KOR-N-SEAL flexible watertight connectors as manufactured by NPL Systems, Inc., or approved equal.

**PART 3 EXECUTION**

3.01 PREPARATION

- A. Identify and protect above and below grade utilities and other underground facilities to remain.
- B. Pipe shall be installed in accordance with the manufacturer's recommendations.
- C. The Owner reserves the right to change the location of the pipe within the streets and sewer-ways as may be required by the Engineer at the time of construction.
- D. Force mains shall be installed with a clear distance of not less than 6', horizontally and 18" vertically from water lines.
- E. Pipe shall be installed with lettering facing upward.

3.02 TRENCHING

- A. The trench shall be excavated to the depth established by the Engineer and under no condition shall the cover over the pipe be less than thirty-six (36) inches, forty-eight (48) inches of cover for 12" pipe and above.
- B. Depth of cover over pipe at specific locations to avoid other utilities or obstructions shall be as indicated on the plans or as authorized by the Engineer.
- C. The bottom of the trench shall be excavated to a uniform grade and shall be free from obstructions which would result in the weight of the pipe being concentrated at certain points.
- D. Where unknown subsurface obstructions are encountered in the trenching, the Contractor will be permitted to lay pipe above the obstruction if the minimum cover required can be obtained while providing a cushion between the bottom of the pipe and the top of the obstruction of at least six (6) inches. Where this minimum cover cannot be obtained, the Contractor will be required to lay pipe under the obstruction and he will receive no additional compensation for constructing the line in this manner.
- E. Stockpile excavated material in a manner that will not endanger the Work or prevent obstruction of sidewalks and driveways.
- F. Verify excavated material is a usable soil and suitable for backfilling, otherwise remove non-conforming material from the site and replace with usable soil.
- G. Remove excess excavated material from the site.
- H. Remove water by pumps from the trench until the pipe has been installed and the backfill has been placed to a sufficient height to prevent pipe flotation.

### 3.03 PIPE FOUNDATION

- A. Maintain uniform pipe support over its entire length.
- B. Provide bell holes at each joint to permit proper joint assembly and uniform pipe support.
- C. Do not use blocking to change pipe grade or to intermittently support pipe across excavated sections.
- D. Install concrete thrust blocks at changes in direction.

### 3.04 BACKFILLING

- A. In backfilling all trenches, the excavated materials shall be thoroughly tamped and compacted around and to a depth of six (6) inches above the pipe for the entire length of the trench, due care being exercised so as not to damage the pipe or pipe connections in the tamping operation.
- B. The remaining portion of the trench shall be backfilled and thoroughly compacted for the entire length of the trench and left in a slightly overfilled and crowned condition.
- C. The method of compacting trenches shall be strictly in accordance with the manufacturers' recommendations, and as approved by the Engineer.
- D. Exercise due care so as not to damage the pipe during compaction operations.
- E. Reshape ditches and ground surfaces to original contours to assure proper drainage.

### 3.05 JACKING OR BORING

- A. Begin work at the outfall end of the pipe whenever possible.
- B. Excavate adequate size pits when conducting operations for jacking or boring. Use sheathing and bracing when necessary.

### 3.06 FORCE MAIN TIES TO MANHOLES OR LIFT STATIONS

- A. Connect force main to manholes or lift stations at locations indicated in the Drawings.
- B. Provide watertight connector at force main tie-in.
- C. Force main tie-in shall be installed as shown on standard details.
- D. The Contractor shall repair and coat the inside surfaces of the receiving manhole or lift station. Refer to LUS Civil Engineering Construction Specifications section 02535.2.17.B for applicable coating systems.

### 3.07 TESTING

- A. Mains shall be tested to hydrostatic pressure of 100 psi for sufficient time to determine the leakage rate, but for no less than one hour.
- B. The leakage shall not exceed ten (10) gallons per hour per mile for pipe up to and including twelve (12) inches in diameter. For large pipe the allowable rate shall be computed in accordance with the above mentioned specifications for installation.

### 3.08 CASING INSTALLATION

- A. Install casing as to prevent the formation of a waterway below the obstruction.
- B. Ends of casing shall be sealed.
- C. Spacers shall be installed inside of casing pipe.

### 3.09 CARE OF STREETS, SIDEWALKS & ROADS

- A. Remove all excess materials, debris or other obstruction from streets or roads immediately after completing backfilling, at Contractor's expense.
- B. Wash streets, sidewalks and roads daily to remove dust problem.
- C. No cross streets, sidewalks or roads shall be wholly obstructed except by written permission from the Engineer.
- D. If at any time the Contractor neglects to remove such material or obstruction and place streets, sidewalks and roads in suitable condition for traffic within twenty-four (24) hours after having received notice (written or verbal) from the Engineer, the work may be done by L.U.S., and the cost thereof charged to the Contractor and deducted from his final estimate.
- E. Repair and replace streets, sidewalks, roads, ditches and culverts to the satisfaction of the Engineer and parties concerned.

### 3.10 PROTECTION AND CARE OF PUBLIC OR PRIVATE PROPERTY AND SERVITUDES

- A. Continuously maintain and protect all underground and above ground structures, utilities, including the restoration of all public utilities, water mains, water services, gas mains, gas services, culverts, drains, ditches, curbs, sidewalks, landscaping and/or other facilities which may be damaged, to a condition at least equal to their original status, at no additional cost to L.U.S. In the event of damage to any facilities, the appropriate utility will be notified immediately. L.U.S. will repair damaged facilities at the Contractor's expense or require the Contractor to repair said damage.
- B. All construction work under this contract on servitudes, right-of-way, private property or franchise shall be confined to the limits of such servitudes, right-of-way or franchise. All work shall be accomplished so as to cause the least amount of disturbance and a minimum amount of damage.
- C. No trees or shrubbery shall be removed or trimmed without the consent of the Engineer. With such approval ornamental trees and shrubbery shall be carefully removed, with the earth surrounding their roots wrapped in burlap and replanted in their original positions within forty-eight (48) hours. All shrubbery or trees destroyed or damaged shall be replaced by the Contractor with material of equal quality at no cost to L.U.S.

- D. All obstacles such as fences, markers, mail boxes, driveway culverts, etc. shall be removed by the Contractor and immediately replaced after the trench is backfilled in their original position and condition at no direct cost to L.U.S.
- E. Maintain adequate drainage during the process of construction.

### 3.11 CLEAN-UP

- A. Remove from the site all tools, equipment, temporary structures and surplus materials.
- B. Dispose of all excess soil, waste, rubbish, debris or objectionable materials off the site and in a manner and a location that complies with local ordinances and laws and is acceptable to all parties concerned and is approved by the Engineer.
- C. When disposal of excess soil is upon private lands, the Contractor shall be required to produce a written agreement with the private landowner stating the agreed terms and conditions.
- D. The entire construction site shall be left clean and to the satisfaction of the Engineer.

**END OF SECTION**

## SECTION 02535

### SUBMERSIBLE SEWAGE LIFT STATION

#### **PART I GENERAL**

##### 1.01 SECTION INCLUDES

- A. The work covered by this section of the specifications consists of furnishing all labor, plant, equipment, appliances and materials for installing an automatic, submersible sanitary sewage pumping station, complete with all necessary accessories, controls and equipment.
- B. The station shall be installed in accordance with the contract drawings and specifications and the installation instructions of the manufacturers.

##### 1.02 COORDINATION

- A. Coordinate pumps and motors with electrical work as specified in Division 16-Electrical.
- B. Review installation procedures under other Sections and coordinate with the Work related to this Section.
- C. Be aware that certain areas of the pump station are considered Class I, Division I, Group C and D “hazardous” areas, as defined in Articles 500 and 501 in the National Electrical Code. Special wiring techniques, materials, and equipment must be used in such areas. All equipment used in hazardous areas must be suitable for use in such areas.
- D. All equipment shall be designed and arranged to comply fully with provisions of NFPA 820, “Fire Protection in Wastewater Treatment and Collection Facilities”, relative to hazardous environments. All wiring methods, enclosures, options and accessories required to comply fully with NFPA 820 shall be included in the bid.

##### 1.03 REFERENCES

- A. ANSI/ASTM C76 – Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
- B. ASTM C923 – Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.
- C. ANSI/AWWA C151/A21.51 – Standard for Ductile Iron Pipe for Water or Other  
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Liquids.

- D. ANSI/AWWA C111/A21.11 – Standard for Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
- E. ANSI/AWWA C115/A21.15 – Standard for Flanged Ductile Iron and Gray Iron Pipe with Threaded Flanges.
- F. ANSI/AWWA C110/A21.10 – Standard for Ductile Iron and Gray Iron Fittings, 3 In. through 48 In., for Water and Other Liquids.
- G. ASTM A53 – Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
- H. ASTM A123 – Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.
- I. ASTM A153 – Zinc Coating (Hot Dip) on Iron and Steel Hardware.
- J. ASTM A276 – Stainless and Heat Resisting Steel Bars and Shapes.
- K. ASTM A307 – Carbon Steel Externally Threaded Fasteners.
- L. ASTM A666 – Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar for Structural Applications.
- M. ASTM C150 – Portland Cement.
- N. AASHTO M198 – Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets.
- O. DOTD Standard Specifications Section 805 – Structural Concrete.
- P. DOTD Standard Specifications Section 902 – Portland Cement Concrete for Minor Structures.
- Q. DOTD Standard Specifications Section 1006.05 – Concrete Pipe Joints.
- R. DOTD Standard Specifications Section 1008.07 – Asphaltic Varnish.

#### 1.04 PERFORMANCE AND QUALITY ASSURANCE

- A. Furnish and install wastewater pumps capable of handling raw sewage in accordance  
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with the Specifications and as shown on the Drawings.

- B. All materials used shall be new, high grade, and with properties best suited to the work required.
- C. In order to ensure equipment compatibility, one manufacturer shall be responsible for providing all wastewater pumping equipment, including pump, motor ~~access frame~~ and guides.
- D. Pumping equipment provided under this section shall be a standard product in regular production by manufacturers whose products have proven reliable in similar service.
- E. The Contractor shall retain overall responsibility for equipment coordination, installation, testing, and operation.

#### 1.05 WARRANTY

- A. The Contractor shall furnish a written guarantee from the pump manufacturer which shall warrant the pumps and motors against defects in workmanship and materials for a period of five (5) years under normal use, operation and service to commence from the date of acceptance by LUS.
- B. The Contractor shall furnish a written guarantee covering all other parts and equipment for a period of one (1) year from the date of acceptance by LUS. It shall be warranted that all parts and equipment are free from defects in design, materials and workmanship.
- C. Replacement parts of all components found to be defective shall be furnished and installed by the Contractor at no additional cost to LUS during the guarantee period.
- D. The Contractor shall furnish to LUS at least four (4) copies of instructions for installation, maintenance and operation of the pumps and components, together with parts lists and pump performance curves.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store equipment off the ground and in accordance with manufacturers recommendation.

#### 1.07 SUBMITTALS

- A. Five (5) copies of all shop drawings and operating manuals shall be submitted.
- B. At the time of submission, Contractor shall in writing call Engineer's attention to any

deviations that the Shop Drawings may have from the requirements of the Contract Documents.

- C. Engineer will review and approve with reasonable promptness Shop Drawings, but his review and approval shall be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents. The approval of a separate item as such will not indicate approval of the assembly in which the item functions. Contractor shall make any corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings. Contractor shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections called for by Engineer on previous Submittals. Contractor's stamp of approval on any Shop Drawing shall constitute a representation to LUS and Engineer that Contractor has either determined or verified all quantities, dimension, field construction criteria, materials, catalog numbers and similar data or he assumes full responsibility for doing so, and that he has reviewed or coordinated each Shop Drawing with the requirements of the work and the Contract Documents.
- D. No related work shall be commenced until the Shop Drawing(s) has been approved by Engineer. A copy of each approved Shop Drawing shall be kept in good order by Contractor at the site and shall be available to Engineer.
- E. Engineer's approval of Shop Drawings shall not relieve Contractor from his responsibility for any deviations from the requirements of the Contract Documents unless Contractor has in writing called Engineer's attention to such deviation at the time of submittal and Engineer has given written approval to the specific deviation, nor shall any approval by Engineer relieve Contractor from responsibility for errors or omissions in the Shop Drawings.

#### 1.08 LIFT STATION STARTUP FIELD TESTS

- A. Contractor shall ensure that the wet well is free of mud and all debris prior to the lift station start-up field test.
- B. Start-up field tests shall be conducted by the pump manufacturer's factory trained start-up representative. The start-up test shall be conducted in the presence of the design engineer, representatives of the LUS Lift Station Maintenance Section and Civil Engineering Section, and the contractor.
- C. A start-up test shall be conducted on each pump and shall consist of continuous operation for a period equivalent to drawdown of one half the total volume of the wet well.
- D. The test shall be performed with the motor fully loaded and the wet well water level held above the pump/motor assembly.

## 1.09 UNIT PRICES

### A. Method of Measurement:

1. Submersible Sewage Lift Station: Measured on a lump sum basis installed and accepted.

### B. Basis of Payment:

1. Submersible Sewage Lift Station: Paid for on a lump sum basis for lift station installed and accepted which includes the wet well and valve box structures, bedding material, piping, pumps and pump installation, valves and valve installation, access frames and covers, vent pipes, electrical control box foundation, electrical components, and all other appurtenances necessary for construction of the lift station in accordance with the Drawings and these Specifications. Such payment also constitutes full compensation for installation, equipment, tools, labor, supervision, incidentals, and all work necessary to complete the sewage lift station.

## **PART 2 PRODUCTS**

### 2.01 WET WELL AND VALVE BOX

- A. Concrete pipe used for the wet well and outside valve box shall be standard strength reinforced concrete pipe conforming with all requirements of the "Standard Specifications for Reinforced Concrete Culvert Pipe", ASTM Designation C-76 for Class III, Wall B. Circular reinforcement shall be utilized, ASTM A615-82 and the supplementary requirement S1, Grade 60. Use No. 14 or 16 gauge wire, tie wire and supply chairs, bolsters, bar supports, and spacers as necessary for reinforcement support.
- B. All concrete pipe joints shall be made watertight by using a profile gasket for single step joints. Profile gasket shall be Type 288-4G as manufactured by Press-Seal Gasket Corporation.
- C. All penetrations of the concrete pipe shall be cast-in-place or cored. Electrical conduit shall extend 4" within the inside wall. The electrical conduit risers through which the submersible pump cables pass shall extend 18 inches above the top of the wet well cover.
- D. Watertight connectors shall be ASTM C923, KOR-N-SEAL, flexible watertight connectors as manufactured by NPL Systems, Inc. or approved equal.
- E. Provide Class A concrete under the provisions of DOTD Standard Specification 901.

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- F. Grout shall be one part portland cement, two parts mortar sand, and water as required for proper consistency; to be used within 30 minutes of mixing.
- G. The quick connect installed in the valve box shall be a 4" Camlock Type F, aluminum, male camlock x male pipe thread. The Cam shall be fitted with a Camlock dust cover.
- H. Piping and fastening appurtenances which will be in contact with wastewater after installation shall be shop primed then painted with an epoxy phenolic coating system, or approved equal, as specified in section 2.17.
- I. Internal surfaces of the wet well shall be painted with an epoxy phenolic coating system, or approved equal, as specified in section 2.17.

## 2.02 PIPE, VALVES, AND FITTINGS

- A. Pipe 3 inches and larger within and between the wet well and valve box shall be ductile iron, ANSI/AWWA C151/A21.51 with flanged or restrained mechanical joint ends in accordance with ANSI/AWWA C110/A21.10 AND ANSI/AWWA C111/A21.11, respectively. All ductile pipe shall be ceramic epoxy lined inside. Epoxy ceramic lining shall be PROTECTO 401 as manufactured by US Pipe & Foundry Company, or approved equal, and shall be installed in accordance with the manufacturer's recommendations.
- B. Flanged fittings shall conform to ANSI A21.10 (AWWA C110) or ANSI B16.1 Specifications. Gaskets for all flanged joints shall be full-faced, 1/8" solid rubber. Ductile iron fittings shall be manufactured in strict accordance with AWWA C153, AWWA C110 and AWWA C111. Fittings shall be asphalt coated outside and ceramic epoxy lined inside. Epoxy ceramic lining shall be PROTECTO 401 as manufactured by US Pipe & Foundry Company, or approved equal, and shall be installed in accordance with the manufacturer's recommendations.
- C. Gate valves over 2" shall conform to the latest edition of AWWA Specification C509, and shall have a non-rising stem, iron body, iron wedge encapsulated with molded rubber and "O"-ring seals, Mueller 2360 Series Resilient Wedge Gate Valve, Catalogue No. 2360-6 Flanged Ends, or equal.
- D. Gate valves 2" and under shall be bronze, with rising stem, double disk with screwed ends (Crane Bronze Gate Valve, Class 150, Rising Stem, Threaded Ends, Figure 4310B, or equal). All gate valves shall be furnished with operating handwheels.
- E. Check valves shall be iron body, bronze mounted, swing type spring and lever check

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valves with flanged ends,(Meuller Catalogue No. A-2602-6-02, or approved equal). Check valve shall comply with AWWA C508.

- F. Check valves 2" and under shall be bronze, swing type spring and lever check valves with screwed ends (Crane 1700 Series Bronze Check Valve, Class 125, Threaded Ends, Figure 1707, or equal).
- G. Measuring and sensing devices shall require a ball valve with brass body and stainless steel ball.

### 2.03 PUMP CONSTRUCTION

- A. The pumps shall be fitted with impellers of the non-clog design, constructed of a material suitable for continuous submergence in raw sewage.
- B. The impeller shall be a closed, single or two vane type, capable of passing 3" solids and easily removable.
- C. Pump casings shall be fitted with a wear-ring system that will provide efficient sealing between the volute and impeller. Pumps impellers shall be easily removable.
- D. The pump shafts shall be of high grade alloy steel, accurately machined and ground to exact size, and shall be isolated from the pumped liquid.
- E. Double mechanical pump shaft seals shall be provided to prevent leakage. The seals shall not require maintenance nor adjustment; however, the seals shall be easily inspected and replaceable.
- F. The seals shall be oil lubricated from a oil chamber. The seal system shall not rely upon the pumped media for lubrication.
- G. The shaft sealing system shall be capable of operating submerged to depths of, or pressures equivalent to 50 feet. No seal damage shall result from operating the pumping unit out of its liquid environment.
- H. Pump fasteners shall be of 303 stainless steel or better.

### 2.04 MOTORS

- A. Pump motors shall be of the sealed submersible type, having a nameplate rating that exceeds the maximum horsepower required by the pumps.

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- B. Motors shall be sized in accordance with N.E.M.A. design Class B, and incorporate Class F insulation materials to withstand a continuous operating temperature of 155°C (311°F).
- C. All pump motors shall be designed for continuous duty and shall be non-over loading over the full range of the pump curve.
- D. Motors shall be capable of sustaining a minimum of fifteen (15) starts per hour. Lubrication and cooling systems, double mechanical seals, double sealed roller bearings, and other components shall be adequately designed for the stated operating conditions.
- E. Motors and pumps shall be capable of unsubmerged operation for a minimum period of at least one (1) hour without damage to the units.
- F. Motors shall be provided with thermal overload protection and two moisture detection sensors. The moisture detection sensors shall be wired internally to the control cable at the top of the motor.
- G. Comply with the National Electrical Code (N. E. C.) requirements for Class 1, Group C and D, Division 1 locations.

## 2.05 MOTOR CABLE

- A. The special pump motor multi-conductor cable shall be suitable for submersible pump application and shall comply with the National Electrical Code (NEC) requirements for Class I, Division 1 Hazardous (Classified) Locations. This shall be indicated by a code or legend permanently embossed on the cable.
- B. The flexible cable shall be of a type listed for extra-hard usage. It shall contain a grounding conductor having a continuous identifying marker readily distinguishing it from other conductors (i.e., motor phase conductors, seal failure probe conductors, over-temperature conductors) in an approved manner.
- C. Cable shall be connected to terminals of supply conductors in an approved manner and be sized according to NEC ampacity tables (for 125% of load).
- D. Cable shall be supported by clamps or other suitable means that will prevent tension on the terminal connections.
- E. Cable shall be provided with suitable CG hub-type seals where the flexible cord leaves the wet well conduit and where it enters the intermediate junction box.

- F. The flexible cable must be removable without entering the wet well.
- G. The cable entry water seal design shall be such that precludes specific torque requirements to insure a watertight and submersible seal.
- H. Epoxies, silicones or other secondary sealing systems shall not be required or allowed.
- I. The cable entry junction box and motor shall be separated by a sealing device which shall isolate the motor interior from foreign materials gaining access through the pump top.

## 2.06 PUMP REMOVAL

- A. Lift station shall be furnished with a submersible discharge connection system to permit removal and installation of the pump without the necessity of an operator entering the wet well. The design must insure an automatic and firm connection of the pump to the discharge piping when lowered into position.
- B. Pump Mounting Base:
  - 1. A separate mounting plate shall be furnished for each pump. These plates shall include adjustable guide rail supports and discharge elbow with flange to align with pump hydraulic sealing flange.
  - 2. The discharge base elbow shall be furnished by the pump manufacturer. The discharge elbow shall have a foot for anchoring to the wet well floor and a means for firmly supporting the guide rails.
  - 3. Contractor shall verify location of anchor bolts prior to pouring wet well base.
  - 4. The design and mass of the discharge elbow shall be sufficient for rigidly supporting the eccentric load of the pump unit and discharge piping.
  - 5. The discharge of each pump shall be fitted with a hydraulically operated sealing flange.
  - 6. When the pump is in operation, pressure shall provide a leak-proof seal. When pump is idle, pressure shall be removed so that pump can be removed from sump with no mechanical contact of sealing flanges.
  - 7. Complete weight of pump to rest on bottom support plate, no weight to be supported on guide rails or discharge elbow.

8. The discharge elbow outlet shall connect to the discharge piping riser.
9. The elbow outlet shall have ANSI, 125 pound flange dimensions and drilling, of the size indicated on the construction drawings.
10. Plates and fittings shall be cast iron with stainless steel hardware.

C. Guide Bracket:

1. A sliding guide bracket shall be an integral part of the pump unit.
2. The design of the bracket shall obtain a pure vertical shearing action at the pump to discharge flange face when connecting or disconnecting to pump to the discharge elbow. The bracket design shall obtain a wedging action at the flange faces as the final alignment of pump to piping occurs.

D. Guide Rails:

1. Each pumping unit support shall be equipped with a stainless steel dual guide rail system sized to fit the discharge elbow and guide bracket, as recommended by manufacturer's specifications.
2. The dual guide rails shall extend from the pump up to the access frame at the top of the wet well.
3. Intermediate stainless steel supports shall be installed to stiffen the pump guide rails (at maximum of 10 foot intervals). Supports shall be secured to the wet well wall utilizing Type 316 stainless steel wedge anchors.

E. Lifting Cable:

1. Provide a stainless steel cable/chain for each pump/motor assembly, sized according to manufacturer's recommendations, for installing and removing the entire assembly without failure.
2. Provide a means for attaching the other end of the cable to the wet well access frame.

F. Wire Hanger:

1. The cable wire hanger shall be as per the detail in the plans.

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2. Three quarter inch aluminum rods and one-quarter inch thick aluminum shall be used to fabricate the rack.
3. All hardware shall be stainless steel.
4. Cables shall be supported on the wire hanger by stainless steel cable grips.
5. The wire hanger needs to be clear of pump guide system and discharge piping (gravity and/or force main), and beam path of ultrasonic transducer.
6. The wire hanger shall be readily accessible from main hatchway.

## 2.07 ACCESS FRAMES AND COVERS

### A. Wet Well:

1. An access assembly shall be installed in the wet well cover capable of supporting a live load of 150 pounds per square foot.
2. Concrete in contact with aluminum surfaces shall be isolated by coating concrete surfaces with an approved phenolic epoxy system as specified in section 2.17.B.
3. Size of clear opening shall accommodate both pumps with a minimum opening of 36" x 48".
4. Single or double access doors are acceptable; single doors shall open toward the valve box; double doors shall open towards the front and back of site layout. Double doors are required on wet wells with internal diameters greater than 72".
5. Cover assembly and hardware shall be aluminum and shall be supplied with upper guide bearing brackets, stainless steel safety chain hook, hinged and hasped covers, level sensor cable holders, automatic lock when opened 90 degrees, and shall be lockable.
6. The wetwell access hatch shall be fitted with a hinged grating panel to provide a system for fall through protection. The safety system shall be manufactured by Halliday Products, Inc. or approved equal.
7. Proper clearance for pump removal shall be assured by the Contractor. The actual clear opening of the wet well access hatch frame cover shall provide a minimum of 3-1/2 inches clearance behind the pump opposite the discharge and a minimum of

2-1/2 inches clearance on the side of the pump.

B. Valve Box:

1. Construction and materials shall be same as for wet well cover and frame with a minimum opening of 36" x 48".

## 2.08 PRESSURE GAUGES

- A. The contractor shall furnish and install, as indicated on the plans, a 4" diameter pressure gauge with 1/2" inch male connection on lower back and 1/2" gate or stainless steel needle shut off valve.
- B. Pressure gauge shall be as manufactured by Tel-Tru Manufacturing Company, Model 30 or approved equal. Pressure range of each gauge shall be 0 - 60 psi.
- C. Each gauge shall be equipped with a diaphragm seal protector as manufactured by Tel-Tru Manufacturing, Model M - Mini seal for up to 4 1/2" gauges or approved equal.
- D. Gauges shall be glycerin filled. All components of gauges shall be non-corrosive (i.e. stainless steel or other acceptable nonferrous material).

## 2.09 ANCHOR BOLTS

- A. All assembly and anchor bolts, nuts, and washers shall be stainless steel. Bolts shall conform to ASTM A276, Type 430; nuts shall conform to ASTM A276, Type 302. Washers shall conform to ASTM A666, Type 302 or 304.

## 2.10 MISCELLANEOUS

- A. All hardware and appurtenances shall be a minimum type 316 stainless steel unless a higher grade is called out.
- B. Stainless steel fabrications to be in accordance with ASTM specifications applicable to the type of component or hardware.
- E. Provide Reliner modular inside drop system with stainless steel straps by Duran, Inc. (800-504-8008) or approved equal. The bowl size shall be determined considering the incoming pipe diameter at full flow in accordance with manufacturer's recommendations.
- F. A four inch aluminum quick-connect shall be installed in the valve box (Cam-Locks or approved equal).

## 2.11 BEDDING MATERIAL

- A. Stone material shall consist of 100 percent stone and shall conform to the following gradation:

<u>U.S. Sieve</u>	<u>Percent Passing</u>
1 1/2"	100
1"	90-100
3/4"	70-100
No. 4	35-65
No. 40	12-32
No. 200	5-12

- B. The fraction of stone passing the No. 40 sieve shall be non-plastic.
- C. Location & thickness to be as shown on plan detail.

## 2.12 STRUCTURAL CONCRETE

- a. Concrete used in construction of the foundations shall have a minimum compressive strength of 4,000 psi at twenty-eight (28) days when tested in accordance with AASHTO Designation T22.
- b. Forms for concrete structures shall be designed and built so as to be mortar-tight, sufficiently rigid to prevent pressure distortion, and capable of being removed without injuring the concrete. Forms shall not be removed until the concrete has obtained sufficient strength to support the load imposed.
- c. Steel reinforcing bars shall be new billet stock, Grade 60 conforming to ASTM Specification A-615 and deformed to conform to ASTM Specification A-305. Splicing of bars will not be permitted without approval of the Engineer. Bent bar reinforcement shall be cold bent to the shapes shown on the plans. All bends shall be made around a pin having a diameter not less than six times the minimum thickness of the bar. All reinforcement shall be free from loose rust scale or other coatings that will destroy or reduce the bond. All reinforcement shall be inspected and approved by the Engineer before placing concrete.
- d. Curing of the finished concrete surfaces shall be by covering within twelve (12) hours with canvas, burlap, straw or sand, which shall be kept wet by sprinkling for at least three (3) days.
- e. Completed concrete that will be left exposed shall be finished by rubbing the exposed surfaces with Carborundum or other abrasive to a smooth surface and to the removal of

all form marks. Non-exposed surfaces shall have the form finish, except that all defects and holes shall be corrected. All edges or corners shall be chamfered as indicated on the Plans or as directed by the Engineer.

### 2.13 DOMESTIC WATER SUPPLY

- A. The Contractor shall provide a Metro Code approved water service (the Metro Code fee shall be the responsibility of the Contractor).
- B. The 1" water riser with hose bib shall be located within the lift station site to the left of the main gate unless otherwise directed.
- C. The Contractor shall furnish and install the water meter box as approved by LUS.

### 2.14 CONTROL SYSTEM

- A. For submersible sewage pump stations installed for new residential or commercial development, the developer or the developer's contractor may request LUS to furnish the Control Panel, complete in all respects, including an ultrasonic level transducer, to control the liquid level in the wet well. Cost of the Control Panel must be borne by the developer or the developer's contractor (contact LUS for current cost). As an option, the control panel may be supplied by the contractor subject to complete conformance with LUS control panel standard specifications and details.
- B. The unit shall include an alternator or pump controller (see plans), to alternate the starting sequence of Pump No. 1 and Pump No. 2 (starting the first pump as a "Lead" pump) - in addition, the controls shall be able to operate the pumps singly, either automatically or manually. Should either pump, operating alone, fail to run, the other pump shall start. Should the first pump fail to lower the level, then the other pump shall operate and run as a "Lag" pump.
- C. Across-the-line magnetic starters and thermo-magnetic circuit breakers shall be provided for each pump, along with a Hand-Off-Automatic (H-O-A) selector switch for each starter, with overload relay and reset button.
- D. LUS shall furnish two (2) tip float type level sensors. The tip floats shall be LUS Material Specification 33005305. No mercury switches will be acceptable. The contact closure shall be dry form "C" contacts (both a n/o & n/c with a common). The floats and cables shall be made of a material that will withstand raw sewage. Cables shall be minimum forty (40) feet in length (Contractor shall verify that the length is sufficient for the application). Float tip switches shall be the Consolidated Electric's Direct Acting Model 9G-EF (EF =

Environmentally Friendly) Float Switch (or prior approved equal) Teflon coated 316 SS with PVC jacketed cable that resists build up of solids. The tip float type level sensors shall be installed by Contractor.

- E. One of the float switches shall act as a Low Water Cut Off (LWCO) and the other shall act as a High Level indicator. In addition, these two float switches shall act as emergency pump start/stop switches in the event of a control failure.
- F. Additional controls to be provided are as follows:
  - a. Heat sensing units attached to motor winding to trip starter if motor overheats.
  - b. Motor seal failure alarm light to indicate water in seal chamber.
  - c. Pump elapsed time meters.
  - f. Delay in motor starting, to prevent both pumps starting simultaneously after a power outage.
  - g. Starting capacitors shall be provided by the contractor, if required, and shown on the plans.
- G. The control panel enclosure shall be NEMA 4X aluminum or stainless steel, weatherproof and tamper-proof. The circuit breakers, overload reset buttons and control switches shall be operable from an inner door.
- H. The control panel shall be mounted and terminated by the Contractor.
- I. The Contractor shall furnish a 7.5-kVA, 240/120-V, single-phase transformer to provide control circuit power from a 480-V service.
- J. The Contractor shall furnish a 100-A (or if required by motor power requirements, a 200-A) service duty double throw switch (On-Off-On) for routing power from either the utility service or the generator service receptacle. The generator service receptacle, mounted on the underside of the double-throw switch enclosure, shall be rated at either 100-A or 200-A, depending on the motor power requirements.

## 2.15 ELECTRICAL

- A. See Section 16000 and 16900 for Electrical and Pump Controls.
- B. The electrical system shall be installed as shown on the plans, and as required in these specifications and shall conform to the requirements of the National Electrical Code (latest edition) for a Class I, Division 1 location, the applicable local codes, and the rules and regulations of the local utility.

- C. The electrical service, as shown on the plans, (100-A or 200-A, depending on the motors) shall be provided by LUS up to the sewage pump station equipment rack as part of this Contract, as well as a 100-A (or 200-A) service-side meter disconnect and meter base. The Contractor shall mount the meter base upon the equipment rack and provide all conduit and wiring from the weather-head or pad-mounted transformer.
- D. It is to be expressly noted that the Contractor shall furnish and install all electrical wiring, fixtures, and connections required for the complete hookup of the pump station, including conduit, conductors, bulbs, etc. as required.
- E. All wiring in the pump station shall be color coded as indicated on the wiring diagram. Wiring diagrams matching the unit wiring shall be provided to LUS.

## 2.16 ACCEPTABLE PUMP MANUFACTURERS

- A. Fairbanks Morse
- B. Flygt
- C. Gorman Rupp
- D. Hydromatic
- G. Goulds
- H. ABS
- I. Yeomans

## 2.17 PAINTING

- A. Piping and Fastening Appurtenances.
  - a. Piping and fastening appurtenances shall be coated with Carboline 187 Epoxy Phenolic System or an approved equal. Carboline 187 Epoxy Phenolic System shall consist of two (2) coats, 4.0 – 6.0 mils DFT each. The first coat shall be Red color number 274-0500 and the finish /topcoat color shall be Gray color number 274-C703
  - b. A “Stripe Coat” shall be applied to all flanges, appendages, etc. during the application of both coats. In the event of a spray application (preferred), a “stripe coat” is defined as an application of the given coating material to all edges, seams and other difficult to reach, see or hard to coat surfaces. These areas shall be given special attention (even by brush/roller application if needed), thinned as necessary

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to insure adequate mils DFT are applied. Immediately after the application of the said stripe coat, the full and overall application of the given coat is then applied, i.e. in a wet-to-wet mode.

- c. The pipe shall be clean, dry and decontaminated prior to abrasive blasting. Surfaces to be coated shall be cleaned per SSPC-SP1. Following this process, the surfaces shall be abrasive blasted to meet SSPC-SP5 cleanliness standard to obtain a 1.5 – 3.0 mil anchor profile.
- d. Field touchup of pipe coating:
  - i. All shop coats shall be touched-up and completed at welds or joints after field erection. Surfaces shall be properly prepared per the following procedure for all field repairs of welds and coating system damages:
    - Clean, dry and decontaminate the surfaces to be repaired per SSPC-SP1.
    - Clean surfaces per SSPC-SP2 and/or SSPC-SP3 – Hand/Power Tool Cleaning as needed.
    - All edges of existing, tightly adhered coatings shall be feather-edged to provide a beveled/smooth transition configuration for the coating to be applied. All discolored coatings surrounding weld burns shall be removed to a point where the existing coating are sound (typically 1” – 2” from the weld seam).
    - Apply a coat of Carboline’s Carbomastic 15 (or Carbomastic 15 FC for temperatures below approximately 80 deg. F) to obtain 6.0 – 8.0 mil DFT.
    - Apply a finish/topcoat of Carboline’s Phenoline 187 Finish Topcoat color Gray number 274—C703.
    - All priming and finish/topcoat shall be applied as per manufacture’s Product Data Sheet (PDS).

#### B. Wetwell Internal Surfaces

- a. Wetwell internal surfaces shall be coated with Carboline 187 Epoxy Phenolic System, Zebron 386, Warren M210/S301, Polyurea, Raven 405, Dynakote #21, Belzona 5811 or approved equal.
- b. Plugging and patching repairs shall be made with Preco Plug and Preco Patch.
- c. Surface preparation, plugging, patching and coating application shall be performed in accordance with manufacturer’s recommendations.
- d. Coating thicknesses shall be as recommended by the manufacturer of the product utilized.

### 2.18 SCADA POLE

- A. When required by LUS, the Contractor shall furnish and install a utility pole of the size indicated on the Plans for the installation of SCADA transceiver antenna. Contractor

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shall coordinate the installation of the pole with Lafayette Utilities System.

### **PART 3 EXECUTION**

#### **3.01 PREPARATION**

- A. Verify orientation of pumps, access openings and site layout.
- B. Verify location of influent and effluent lines.
- C. Verify location of electrical conduit.
- D. Installation of the pumping equipment shall conform to the manufacturer's instructions and recommendations and reviewed shop drawings.

#### **3.02 EXCAVATION, BACKFILL, AND GRADING**

- A. The Contractor shall excavate to the depths required to install the structures in accordance with the drawings, keeping the limits of excavation to within two (2) feet of the neat lines of foundations wherever possible.
- B. Excavation beyond the required depths and widths shall be filled with suitable materials at no extra cost to LUS.
- C. Excavated material shall be stockpiled for use in backfilling. It shall be placed a safe distance from the excavation without overloading the undisturbed soil.
- D. The excavation shall be accomplished in a manner to protect adjacent structures and to safeguard workmen.
- E. It shall be the responsibility of the Contractor to install underpinning, shoring, sheeting or other protection where needed to protect facilities and workmen.
- F. All existing structures, pipes and foundations which are to be incorporated into the final work shall be adequately protected or shall be replaced by the Contractor.
- G. Surface water shall be directed away from the excavation by grading and/or constructing ditches or berms.
- H. The Contractor shall submit his proposed excavation plan to the Engineer in writing before commencement of the work.

- I. The method of construction adopted shall be subject to approval of the Engineer, but such approval shall not relieve the Contractor of his responsibility for the safety and adequacy of his construction procedures.
- J. Prior to placing backfill, all trash, debris and timber shall be removed from the trench or excavation. The backfill shall be made from suitable materials.
- K. Backfill shall be placed in layers not to exceed 8 inches in depth and shall be compacted by mechanical tamping or rolling, or by other methods proposed in writing by the Contractor and approved by the Engineer.
- L. Fill shall be compacted to 90% maximum density in accordance with ASTM 1557 (modified proctor).
- M. Final lift station slab elevation shall be one foot (1') above the one hundred (100) year flood elevation unless otherwise approved in writing by the LUS Wastewater Superintendent. Fill material and grading of site as shown on plans shall be included as lump sum payment for pump station.
- N. All affected areas of the project site shall be graded to the elevations, contours, and shapes as required on the drawings. All roots, trash, and debris shall be removed. The earth shall be finished to be free of humps, ridges and depressions.

### 3.03 WET WELL AND VALVE BOX INSTALLATION

- A. Excavate to depths required to install the structures in accordance with the Drawings. Maintain limits of excavation to 3 feet of the lines of foundations as much as possible.
- B. Holes shall be predrilled in wet well and valve box to receive watertight connectors at influent lines.
- C. Provide foundation bedding as indicated on the Drawings.
- D. Erect wet well precast pipe sections with watertight joints as indicated in the Drawings.
- E. Access frames and covers shall be installed in the pre-cast concrete top, assuring correct orientation and location with regard to hinges, direction of opening, components, and accessories.

### 3.04 WET WELL TIGHTNESS TESTING

- A. Prior to backfilling wetwell, a hydrostatic test shall be performed on the wetwell structure in accordance with ACI 350.1R-01.

### 3.05 PUMPS, PIPING, VALVES, AND ACCESSORIES INSTALLATION

- A. Attach the upper guide brackets to the access frame.
- B. Install anchor bolts, nuts, and washers for mounting pump base to wet well floor in accordance with pump manufacturers instructions.
- C. Position pump mounting base and discharge elbow on the floor on the wet well.
- D. Install guide rails between upper guide brackets and discharge elbow with intermediate brackets.
- E. Insure guide system is properly aligned and level and anchored according to manufacturers instructions.
- F. While pumps are being lowered onto the guide rail system, a check shall be made between the volute flange and discharge elbow flange.
- G. After pump base is grouted into place, install all piping in accordance with manufacturers instructions and the Drawings.
- H. Install pressure gauges on discharge piping at the location as indicated in the Drawings.
- I. Install inside drop system as per manufacturers instructions.

### 3.06 FENCE, DRIVEWAY AND SURFACING

- A. The Contractor shall furnish and install a 6-foot cedar or chain link fence (as called for by the engineer) around the perimeter of the pump station site in accordance with the details shown on the construction drawings and specifications contained within Section 02830. The fence shall be fitted with extension arms and three strands of barbed wire along its top rail (as called for by the engineer).
- B. The Contractor shall provide 8-inch thick limestone surfacing with geotextile fabric for entire lift station site. A 6-inch thick concrete driveway shall be provided to the pump station as seen on the lift station site plan. Compaction shall be to a uniform density of at least 95% of maximum density at optimum moisture. The site shall be graded to drain and swale side ditches shall be constructed as necessary to carry the drainage run-off to

the main road ditch.

- C. The Contractor shall furnish and install pipe culverts in the location and of the type and size as shown on the construction drawings. Reinforced concrete pipe shall conform to the requirements of ASTM Designation C-76 for Class III, Wall B (Table III) pipe.

### 3.07 ELECTRICAL

- A. Install electrical equipment, controls, and accessories in accordance with the provisions of Division 16 and the Drawings.

**END OF SECTION**

## SECTION 02537

### WASTEWATER TREATMENT FACILITY

#### PART I GENERAL

##### 1.01 SECTION INCLUDES

- A. The work covered by this section of the specifications consists of furnishing all labor, plant, equipment, appliances and materials for installing wastewater treatment plants, complete with all necessary accessories, controls and equipment.
- B. The facility shall be installed in accordance with the contract drawings and specifications and the installation instructions of the manufacturers.
- C. The facility layout and access plan shall be submitted to LUS for approval. The entire treatment and lift station facility shall be constructed inside the fence area. Access to the facility lift station shall be directly at the entrance to the facility inside fenced area. Electrical plans shall include proper lighting of the entire facility.

##### 1.02 COORDINATION

- A. Coordinate pumps and motors with electrical work as specified in facility electrical plan sheets.
- B. Review installation procedures under other Sections and coordinate with the Work related to this Section.
- C. Be aware that areas of the pump station are considered Class I, Division I, Group C and D "hazardous" areas, as defined in Articles 500 and 501 in the National Electrical Code. Special wiring techniques, materials, and equipment must be used in such areas. All equipment used in hazardous areas must be suitable for use in such areas.
- D. All equipment shall be designed and arranged to comply fully with provisions of NFPA 820, "Fire Protection in Wastewater Treatment and Collection Facilities", relative to hazardous environments. All wiring methods, enclosures, options and accessories required to comply fully with NFPA 820 shall be included.

##### 1.03 PERFORMANCE AND QUALITY ASSURANCE

- A. Furnish and install wastewater facility capable of handling raw sewage in accordance with the Specifications and as approved by Manufacturer.
- B. All materials used shall be new, high grade, and with properties best suited to the work required.
- C. In order to ensure equipment compatibility, one manufacturer shall be responsible for providing all wastewater treatment equipment, including pump, motor, blower, controls, etc.

- D. Wastewater treatment equipment provided under this section shall be a standard product in regular production by manufacturers whose products have proven reliable in similar service.
- E. The Contractor shall retain overall responsibility for equipment coordination, installation, testing, and operation.

#### 1.04 WARRANTY

- A. The Contractor shall furnish a written guarantee from the equipment manufacturer which shall warrant the equipment including pumps, blowers and motors against defects in workmanship and materials for a period of one (1) year under normal use, operation and service to commence from the date of acceptance by LUS.
- B. The Contractor shall furnish a written guarantee covering all parts and equipment for a period of one (1) year from the date of acceptance by LUS. It shall be warranted that all parts and equipment are free from defects in design, materials and workmanship.
- C. Replacement parts of all components found to be defective shall be furnished and installed by the Contractor in a reasonable time period at no additional cost to LUS during the guarantee period.
- D. The Contractor shall furnish to LUS at least five (5) copies of instructions for installation, maintenance and operation of the wastewater treatment facility, together with parts lists and pump performance curves.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store equipment off the ground and in accordance with manufacturer's recommendation.

#### 1.06 SUBMITTALS

- A. Five (5) copies of all product data, shop drawings, and operating manuals shall be submitted.
- B. At the time of submission, Contractor shall in writing call Engineer's attention to any deviations that the Submittals may have from the requirements of the Contract Documents.
- C. Engineer will review and approve with reasonable promptness Submittals, but his review and approval shall be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents. The approval of a separate item as such will not indicate approval of the assembly in which the item functions. Contractor shall make any corrections required by Engineer and shall return the required number of corrected copies of Submittals. Contractor shall direct specific attention in writing or on resubmitted Submittals to revisions

- other than the corrections called for by Engineer on previous Submittals. Contractor's stamp of approval on any Submittal shall constitute a representation to LUS and Engineer that Contractor has either determined or verified all quantities, dimension, field construction criteria, materials, catalog numbers and similar data or he assumes full responsibility for doing so, and that he has reviewed or coordinated each Submittal with the requirements of the work and the Contract Documents.
- D. Engineer shall provide LUS with three (3) copies of approved Submittals for review and approval. LUS shall be allowed ten (10) work days to submit rejection of submittal. No related work shall be commenced until the Submittal(s) has been approved by Engineer. A copy of each approved Submittal shall be kept in good order by Contractor at the site and shall be available to Engineer.
  - E. Engineer's approval of Submittals shall not relieve Contractor from his responsibility for any deviations from the requirements of the Contract Documents unless Contractor has in writing called Engineer's attention to such deviation at the time of submittal and Engineer has given written approval to the specific deviation, nor shall any approval by Engineer relieve Contractor from responsibility for errors or omissions in the Submittals.

## 1.07 DESIGN REQUIREMENTS

- A. The Wastewater Treatment Facility shall be designed to meet the appropriate effluent and water quality standards that are set forth in the discharge permit for the facility.
- B. Wastewater from commercial or industrial sites should be characterized prior to design to establish loading rates. In no case shall commercial plant be designed with loading less than that of a residential project. Pretreatment of wastewater may be a consideration.
- C. Plans shall be approved by Louisiana Department of Health and Hospitals prior to commencement of construction.

## **PART 2 PRODUCTS**

### 2.01 GENERAL

- A. All materials and/or equipment shall be new and unused.
- B. The wastewater treatment facility must be designed as sound, watertight, corrosion resistant structures, with all components needing to be routinely maintained easily accessible to the system operator. Units must be constructed of precast reinforced concrete. All tanks shall be installed in-ground, maximum of 18" above natural ground level and a minimum of 1' above 100-year base flood level. Design and installation shall prevent settling or any movement due to buoyancy regardless of the water level in the plant.
- C. All mechanical equipment furnished shall be of a proven design having been manufactured and furnished for use under similar service for not less than five years.

- D. All piping within the plant will be Schedule 40 galvanized steel pipe except as may be noted otherwise in other sections of the specifications. All piping shall be attached to the plant by means of stainless steel attachments.
- E. The wastewater treatment facility shall be of extended aeration process. The principle items of equipment for the wastewater treatment facility shall include, but not be limited to the following:
  - a. Aeration tank(s) including air diffusion system
  - b. Hopper bottom settling tanks(s) including surface skimmer, weir, baffle and sludge return piping
  - c. Aerated sludge holding tank
  - d. Air supply and diffusion system including blowers
  - e. Central electric control panel with associated conduits and wiring
  - f. All piping, fittings, valves, specials required for proper operation of the system
  - g. Chlorination equipment, including booster pumps if necessary
  - h. Recorders such as hour meters on pumps and blowers
  - i. Lift station
  - j. Fences, driveways and landscaping that applies

## 2.02 LIFT STATION

- A. The lift station shall be designed to have sufficient holding capacity as approved by Louisiana Department of Health and Hospitals.
- B. Lift stations with a wet well diameter of 6' or greater shall meet the plans and specifications set forth by LUS Standard Specification: Section 02535 Submersible Sewage Lift Station.
- C. The wet well shall consist of pre-cast reinforced concrete. All joints shall be made watertight. All penetrations of the concrete shall be cast-in-place or cored. Design and construction of the wet well shall prevent any movement caused by settling or buoyancy.
- D. The wet well shall have a vent pipe with screen and a stainless steel cover that includes a hinged lid that is large enough to allow for pumps to be removed. Lid shall include hardware to allow the placement of a master lock to lock it to the cover.
- E. Two submersible 230 volt grinder pumps shall be installed and shall be operated alternately. The unit shall include an alternator or pump controller to alternate the starting sequence of Pump No. 1 and Pump No. 2 (starting the first pump as a "Lead" pump) - in addition, the controls shall be able to operate the pumps singly, either automatically or manually. Should either pump, operating alone, fail to run, the other pump shall start. Should the first pump fail to lower the level, then the other pump shall operate and run as a "Lag" pump.
- F. Pump controller shall use 4 floats to control pump operations. The lower float shall shut off pump(s), the next higher shall start the lead pump, the next higher shall start the second pump and the highest float shall activate a high alarm. The high alarm shall activate a flashing red light that is visible over the wooden fence.

- G. Piping from the pump to the plant shall be schedule 40 galvanized steel. Pump riser shall be attached to the upper header using a galvanized union that is easily accessible from the lid opening. A check valve and gate valve shall be provided for each pump located downstream from the union. The piping exit shall be into the treatment plant.
- H. Wiring in the wet well shall allow for pump removal without removal of the floats or its wiring. Pumps should not require disconnection of its wiring for removal. All wiring shall be rated for corrosive environment and a wet well application. Wiring shall be hung from wet well cover using a stainless steel hanger attached to cover.
- I. Each pump shall be equipped with a coated stainless steel cable attached to the pump of sufficient size to support the pump and riser when lifting from wet well. Cable shall be attached to pump and be of sufficient length to enable it to be attached to the wiring hanger.
- J. Electrical controls for the pumps shall be enclosed in a NEMA 4X stainless steel weatherproof tamper-proof (lockable) panel enclosure. The panel shall include: duplex pump controller, across-the-line fusible switch type combination starters, control transformer, electrical alternator, reset push buttons and terminals for connections of overload or high-water alarm, and HOA auto selector switches. The circuit breakers, overload reset buttons, control switches, etc. shall be operable from an inner door.
- K. Electrical control panel enclosure and meter boxes to be installed adjacent to wet well and mounted on a galvanized steel stand.
- L. All electrical wiring shall be in an enclosure or an aluminum conduit. All wiring shall be color coded as indicated on the wiring diagram. Wiring diagrams matching the unit wiring shall be provided.

### 2.03 AERATION COMPARTMENT

- A. The aeration compartment shall be designed to promote rapid mixing of the liquid and to obtain efficient air dispersion. The tank shall be designed to inhibit solids deposition and to prevent short circuiting of the liquid flow. The tank shall be designed to have sufficient holding capacity as approved by Louisiana Department of Health and Hospitals.

### 2.04 AIR DIFFUSER SYSTEM

- A. The Wastewater Treatment Plant shall be equipped with an air diffuser system designed to cause a rotation in the aeration chamber of sufficient velocity to scour chamber bottom and prevent sludge filleting.
- B. Diffuser system shall consist of an air header, drop pipes, flow regulating valves and diffuser assemblies. Each drop pipe shall be equipped with a union to allow easy removal of the assemblies and a flow regulating valve in order to control the flow dispersed to each of the diffuser drop pipes. All pipes to be constructed from schedule 40 galvanized steel.
- C. The air diffuser shall be constructed of injection molded plastic with a neoprene cap to provide fine bubble diffusion and to provide a positive check against liquid entering the air lines when blowers are not operating. The diffusers shall be located on six inch

centers the entire length of the aeration chamber and twelve inches from the bottom of the tank.

## 2.05 CLARIFIER

- A. The clarifier shall be equipped with a sludge return/waste airlift line and scum return line for each clarifier provided. All air lines shall be Schedule 40 galvanized pipe.
- B. Each clarifier shall include proper baffling to prevent short circuiting and therefore providing maximum uniform detention.
- C. The length to width ratio of each cell shall be one to one to insure optimum settling of solids.
- D. The total settling volume shall include the volume of the upper one third of the sludge hopper. The bottom of the chamber shall be formed by an inverted pyramidal hopper sloped no less than 1.7 vertical to 1.0 horizontal. The bottom of the hopper shall include a flat 1 foot square base.
- E. The clarifier shall be equipped with a scum removal system and a scum baffle weir trough combination. Trough shall be located at the end of the clarifier opposite the influent connection and shall include an adjustment to permit leveling of the weir after final installation.

## 2.06 AIRLIFT SLUDGE RETURN SYSTEM

- A. The sludge which settles to the bottom of the clarifier will be collected in the center sump and transferred back to the aeration tank or to the sludge holding tank by means of an airlift pump.
- B. The airlift system shall be fabricated from schedule 40 galvanized steel pipe and fittings and adequately sized to provide a transfer capacity of 0% to 150% of the total average daily flow. The airlift pump shall be designed for high efficiency by utilizing the maximum submergence possible. The air supply line to the airlift will inject air at the same elevation as the discharge point of the aeration diffusers to ensure a uniform pressure drop throughout the air supply system. The air supply line shall have an air control valve to adjust the volume of air to the airlift pipe.
- C. The top of the airlift pump will contain a clean-out plug for easy maintenance. The exit point of the pipe shall include a brass body shut off valve and a 90 degree elbow installed pointing downward. All piping shall be attached to the plant using stainless steel attachments.

## 2.07 AIRLIFT SURFACE SKIMMER

- A. A galvanized airlift surface skimmer shall be installed in the settling zone of each clarification chamber. The skimmer inlet shall be equipped with an adjustable polystyrene plastic cone to ensure proper skimming height.
- B. Air shall be supplied to the airlift skimmer through a secondary air distribution system

connected to the main air header of the treatment plant. Individual air manifold piping shall be installed for each airlift and shall be equipped with an adjustable air control valve for fine adjustment or shut-off. The skimmer shall be fabricated from schedule 40 galvanized steel pipe and fittings.

- C. A removable cleanout plug shall be installed at the top of the vertical airlift pipe. The horizontal discharge line shall return material collected from the surface of the clarifier to the aeration chamber at a point which provides a positive visible return. The exit point of the pipe shall include a brass body shut off valve and a 90 degree elbow installed pointing downward. All piping shall be attached to the plant using stainless steel attachments.

## 2.08 BLOWERS

- A. Each Wastewater Treatment Plant shall be supplied with duplex belt driven centrifugal blowers mounted on a base equipped with standard silencers with check valves. The blower system shall be sized to deliver air required for aeration chamber and air lift pumps. Blowers shall be installed to operate alternately with controls using a 24-hour, 7-day clock with 15 minute on/off settings. Air intakes and silencers shall be used to limit operating noise to 50 dB, measured adjacent to fencing.
- B. Blower system is to be mounted on plant using non-corrosive metal (aluminum or stainless steel) mounting stand and attachments.
- C. Mechanical equipment shall be mounted in a non-corrosive aluminum or stainless steel weatherproof enclosure. The base shall be sufficiently reinforced to withstand all normal motor-blower operation stresses. The hood section shall protect all internal components against environmental forces and protect personnel against injury. The hood section shall be attached to the base with a continuous hinge. The enclosure assembly shall include a hood section handle, retainer cord, air vent and latch complete with a pin tumbler type padlock that is a part of the master-keyed system used for tank openings, control cabinets, equipment housings and related equipment.

## 2.09 MOTORS

- A. Blower motors shall be of the ball bearing drip proof type, having a nameplate rating that exceeds the maximum horsepower required by the blowers. Motors shall not be loaded beyond the nameplate rating. The motor shall be mounted on an adjustable motor mounting base that provides adjustment of belt tension using a mounted bolt and threaded sleeve.
- B. All motors shall be designed for continuous duty and shall be non-over loading over the full range of the curve.
- C. Pump motors shall be capable of sustaining a minimum of fifteen (15) starts per hour. Lubrication and cooling systems, double mechanical seals, double sealed roller bearings, and other components shall be adequately designed for the stated operating conditions.
- D. Pump/Motors shall be capable of unsubmerged operation for a minimum period of at

- least one (1) hour without damage to the units.
- E. Pump motors shall be provided with thermal overload protection and two moisture detection sensors. The moisture detection sensors shall be wired internally to the control cable at the top of the motor.
  - F. Comply with the National Electrical Code (N. E. C.) requirements for Class 1, Group C and D, Division 1 locations.

## 2.10 CHLORINATION CHAMBER

- A. There shall be furnished for chlorination of the sewage treatment plant effluent tablet feeder chlorinators. The chlorinator shall be fabricated of molded fiberglass and polyvinyl chloride and made to provide disinfection of all effluent proportionate to the flow passing through the unit.
- B. The tablet feeder shall use chlorine tablets that are contained in removable tubes inserted down through the top of the chlorinator in the flow passing through the unit. The lower end of each tube shall be slotted to permit free flow of water through the tubes to ensure contact between the water and the chlorine tablets.
- C. To prevent short circuiting and to promote proper mixing, baffles shall have sufficient capacity to contain the plant effluent for a minimum of 15 minutes at design peak hourly flow.
- D. The chlorination chamber shall be equipped with a V-notch weir box for measurement of the final treatment plant effluent.

## 2.11 CENTRAL ELECTRICAL CONTROLS

- A. The treatment plant switches and controls shall be mounted on a separate panel. The electrical controls shall include a fifteen-minute multiple, 24-hour time clock to permit automatic operation cycles of the treatment facility throughout the day. A three position HOA selector switch shall be installed to allow the treatment plant aeration unit to operate either on a continuous run basis or according to the cycle established on the time clock. The control panel enclosure shall be stainless steel, weatherproof, and tamper-proof (lockable). Wiring diagrams matching the unit wiring shall be provided.

## 2.12 PIPE, VALVES, AND FITTINGS

- A. Pipe 3 inches and larger within and between the wet well and valve box shall be ductile iron, ANSI/AWWA C151/A21.51 with flanged or restrained mechanical joint ends in accordance with ANSI/AWWA C110/A21.10 AND ANSI/AWWA C111/A21.11, respectively. All ductile pipe shall be ceramic epoxy lined inside. Epoxy ceramic lining shall be PROTECTO 401 as manufactured by US Pipe & Foundry Company, or approved equal, and shall be installed in accordance with the manufacturer's recommendations.
- B. Pipe smaller than 3" shall be galvanized threaded pipe.

- C. Flanged fittings shall conform to ANSI A21.10 (AWWA C110) or ANSI B16.1 Specifications. Gaskets for all flanged joints shall be full-faced, 1/8" solid rubber. Ductile iron fittings shall be manufactured in strict accordance with AWWA C153, AWWA C110 and AWWA C111. Fittings shall be asphalt coated outside and ceramic epoxy lined inside. Epoxy ceramic lining shall be PROTECTO 401 as manufactured by US Pipe & Foundry Company, or approved equal, and shall be installed in accordance with the manufacturer's recommendations.
- D. Gate valves over 2" shall conform to the latest edition of AWWA Specification C509, and shall have a non-rising stem, iron body, iron wedge encapsulated with molded rubber and "O"-ring seals, Mueller 2360 Series Resilient Wedge Gate Valve, Catalogue No. 2360-6 Flanged Ends, or equal.
- E. Gate valves 2" and under shall be bronze body with screwed/threaded ends. All gate valves shall be furnished with operating handwheels.
- F. Check valves shall be iron body, bronze mounted, swing type spring and lever check valves with flanged ends,(Mueller Catalogue No. A-2602-6-02, or approved equal). Check valve shall comply with AWWA C508.
- G. Check valves 2" and under shall be bronze body swing type check valves with screwed ends.
- H. Measuring and sensing devices shall require a ball valve with brass body and stainless steel ball.

### 2.13 PLANT GRATING

- A. Tank openings shall be protected with galvanized metal grating panels to be used as walkways to service equipment and to prevent accidental access to the plant tanks.
- B. To permit easy removal and handling, individual grating sections shall weigh not more than fifty pounds and shall be of sufficient strength to have a deflection which does not exceed one-fourth inch under a distributed load of 150 pounds per square foot.
- C. An anti-skid surface shall be provided. Grating shall be manufactured from galvanized carbon steel sheets of commercial quality.

### 2.14 STAIRWAYS

- A. Stairways will be maximum 35 degrees to horizontal and be located so as to provide access for servicing and maintenance in a safe manner. Stairway to be of aluminum construction with 1-1/2 inch diameter aluminum handrails on both sides.

### 2.15 ANCHOR BOLTS

- A. All assembly and anchor bolts, nuts, and washers shall be stainless steel. Bolts shall conform to ASTM A276, Type 430; nuts shall conform to ASTM A276, Type 302. Washers shall conform to ASTM A666, Type 302 or 304.

## 2.16 MISCELLANEOUS

- A. All hardware and appurtenances shall be a minimum type 316 stainless steel unless a higher grade is called out.
- B. Stainless steel fabrications to be in accordance with ASTM specifications applicable to the type of component or hardware.

## 2.17 BEDDING MATERIAL

- A. Stone material shall consist of 100 percent stone and shall conform to the following gradation:

<u>U.S. Sieve</u>	<u>Percent Passing</u>
1 1/2"	100
1"	90-100
3/4"	70-100
No. 4	35-65
No. 40	12-32
No. 200	5-12

- A. The fraction of stone passing the No. 40 sieve shall be non-plastic.
- B. Location & thickness to be as shown on plan detail.

## 2.18 STRUCTURAL CONCRETE

- A. Concrete used in construction of the foundations shall have a minimum compressive strength of 4,000 psi at twenty-eight (28) days when tested in accordance with AASHTO Designation T22.
- B. Forms for concrete structures shall be designed and built so as to be mortar-tight, sufficiently rigid to prevent pressure distortion, and capable of being removed without injuring the concrete. Forms shall not be removed until the concrete has obtained sufficient strength to support the load imposed.
- C. Steel reinforcing bars shall be new billet stock, Grade 60 conforming to ASTM Specification A-615 and deformed to conform to ASTM Specification A-305. Splicing of bars will not be permitted without approval of the Engineer. Bent bar reinforcement shall be cold bent to the shapes shown on the plans. All bends shall be made around a pin having a diameter not less than six times the minimum thickness of the bar. All reinforcement shall be free from loose rust scale or other coatings that will destroy or reduce the bond. All reinforcement shall be inspected and approved by the Engineer before placing concrete.
- D. Curing of the finished concrete surfaces shall be by covering within twelve (12) hours with canvas, burlap, straw or sand, which shall be kept wet by sprinkling for at least

three (3) days.

- E. Completed concrete that will be left exposed shall be finished by rubbing the exposed surfaces with Carborundum or other abrasive to a smooth surface and to the removal of all form marks. Non-exposed surfaces shall have the form finish, except that all defects and holes shall be corrected. All edges or corners shall be chamfered as indicated on the Plans or as directed by the Engineer.

## 2.19 DOMESTIC WATER SUPPLY

- A. The Contractor shall provide a Metro Code approved water service (the Metro Code fee shall be the responsibility of the Contractor).
- B. The 1" water riser with hose bib shall be located within the site to the left of the main gate unless otherwise directed.
- C. The Contractor shall furnish and install the water meter box as approved by water provider.

## **PART 3 EXECUTION**

### 3.01 PREPARATION.

- A. Verify orientation of wastewater treatment facility and site layout.
- B. Verify location of influent and effluent lines.
- C. Verify location of electrical conduit.
- D. Installation of the pumping equipment shall conform to the manufacturer's instructions and recommendations and reviewed shop drawings.

### 3.02 EXCAVATION, BACKFILL, AND GRADING

- A. The Contractor shall excavate to the depths required to install the structures in accordance with the drawings, keeping the limits of excavation to within two (2) feet of the neat lines of foundations wherever possible.
- B. Excavation beyond the required depths and widths shall be filled with suitable material.
- C. Excavated material shall be stockpiled for use in backfilling. It shall be placed a safe distance from the excavation without overloading the undisturbed soil.
- D. The excavation shall be accomplished in a manner to protect adjacent structures and to safeguard workmen.
- E. It shall be the responsibility of the Contractor to install underpinning, shoring, sheeting or other protection where needed to protect facilities and workmen.
- F. All existing structures, pipes and foundations which are to be incorporated into the final work shall be adequately protected or shall be replaced by the Contractor.
- G. Surface water shall be directed away from the excavation by grading and/or constructing ditches or berms.

- H. The Contractor shall submit his proposed excavation plan to the Engineer in writing before commencement of the work.
- I. The method of construction adopted shall be subject to approval of the Engineer, but such approval shall not relieve the Contractor of his responsibility for the safety and adequacy of his construction procedures.
- J. Prior to placing backfill, all trash, debris and timber shall be removed from the trench or excavation. The backfill shall be made from suitable materials.
- K. Backfill shall be placed in layers not to exceed 8 inches in depth and shall be compacted by mechanical tamping or rolling, or by other methods proposed in writing by the Contractor and approved by the Engineer.
- L. Fill shall be compacted to 90% maximum density in accordance with ASTM 1557 (modified proctor).
- M. Final slab elevations shall be one foot (1') above the one hundred (100) year flood elevation unless otherwise approved in writing by the LUS Wastewater Superintendent.
- N. All affected areas of the project site shall be graded to the elevations, contours, and shapes as required on the drawings. All roots, trash, and debris shall be removed. The earth shall be finished to be free of humps, ridges and depressions.

### 3.03 FILLING OF TANKS WITH WATER

- A. Individual tank sections and components of the treatment facility should be filled with water as backfilling is taking place. Tanks should not be allowed to sit overnight without water in them because they may float if large volumes of surface water enter the excavation. If possible the tanks should have water in them to a level equal to the level of backfill. By backfilling and filling the tanks with water at the same time you will eliminate all unnecessary pressure on the tank and related structure.

### 3.04 STARTUP FIELD TESTS

- A. Contractor shall ensure that the lift station wet well and treatment and disinfection basins are free of mud and all debris prior to the start-up field test.
- B. Start-up field tests shall be conducted by the manufacturer's factory trained start-up representative. The start-up test shall be conducted in the presence of the design engineer, representatives of the LUS Wastewater Maintenance Section and Civil Engineering Section, and the contractor.
- C. A start-up test shall be conducted on each motor, pump, blower, etc.
- D. The test shall be performed with the motors fully loaded.

### 3.05 PLANT TIGHTNESS TESTING

- A. Prior to backfilling the treatment plant, a hydrostatic test shall be performed on the treatment plant structure in accordance with American Concrete Institute (ACI) standards.

### 3.06 FENCE, DRIVEWAY AND SURFACING

- A. The Contractor shall furnish and install a 6-foot cedar fence around the perimeter of the wastewater treatment site in accordance with the specifications contained within LUS Standard Specification Section 02830 Fences and Gates. Double 7' gates shall be provided, centered in the 14' concrete driveway.
- B. The Contractor shall provide 8-inch thick limestone surfacing with geotextile fabric for entire facility site. A 6-inch thick concrete driveway shall be provided to the site as seen on the site plan. Compaction shall be to a uniform density of at least 95% of maximum density at optimum moisture. The site shall be graded to drain and swale side ditches shall be constructed as necessary to carry the drainage run-off to the main road ditch.
- C. The Contractor shall furnish and install pipe culverts in the location and of the type and size as necessary. Reinforced concrete pipe shall conform to the requirements of ASTM Designation C-76 for Class III, Wall B (Table III) pipe.

**END OF SECTION**

## SECTION 02720

### CULVERTS

#### **PART 1 GENERAL**

##### 1.01 SECTION INCLUDES

- A. Furnishing and installation of culverts.

##### 1.02 REFERENCES

- A. ANSI/ASTM C76 – Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- B. AASHTO M198 – Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets.
- C. DOTD Standard Specifications Section 1006.05 – Concrete Pipe Joints.
- D. DOTD Standard Specifications Section 1019 – Geotextile Fabric (Plastic Filter Cloth).
- E. DOTD Designation: TR401 – Method of Test for the Determination of In-Place Density.
- F. DOTD Designation: TR418 – Method of Test for Moisture-Density Relationships.
- G. DOTD Designation: TR423 – Procedure for the Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.

##### 1.03 CLASSIFICATIONS AND TESTS

- A. Maximum Density: To be determined in accordance with DOTD Designation: TR418.
- B. In-Place Density: To be determined in accordance with DOTD Designation: TR401.
- C. Soil Classification: To be determined in accordance with DOTD Designation: TR423.

##### 1.04 SAMPLES

- A. Frequency for testing will be determined by the Engineer.
- B. Submit a certificate of compliance from pipe manufacturers.

##### 1.05 UNIT PRICES

- A. Method of Measurement:
  - 1. Culverts: Measured by the linear foot using the following methods:
    - a. Pipe not confined by fixed structures: Measured by the number of joints at the nominal length of each joint.

- b. Pipe confined by fixed structures: Measured along the pipe between the termini of pipe in structure walls.
  - c. Pipe confined by a fixed structure on one end and unconfined at the other end: Measured along the pipe from the terminus of pipe in the structure wall to the unconfined end of pipe.
2. Plastic Filter Cloth: Plastic filter cloth will not be measured for payment.
  3. Incidentals: Preparation, furnishing and hauling materials, excavation, dewatering, trench supporting, backfill, compaction, labor, tools and all incidentals necessary to complete the items in accordance with the Drawings and this Section will not be measured for payment but included in the price bid for the above items.

B. Basis of Payment:

1. Culverts: Paid for by the linear foot according to type and size.

**PART 2 PRODUCTS**

2.01 USABLE SOILS

A. Under roadways, parking areas, aprons, curbs, drives, walks, and shoulders:

1. Classes A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-3, & A-4 in accordance with DOTD TR423; Liquid Limit less than 35 and Plasticity Index of 15 or less, but greater than 6.

B. In open fields, lawns, unimproved rights of way, or neutral grounds, which are free from traffic:

1. Classes A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-3 & A-4 in accordance with DOTD TR423; Liquid Limit less than 35 and a Plasticity Index of 15 or less, but greater than 6.
2. Classes A-4, A-6 & A-7 in accordance with DOTD TR423; Plasticity Index of 35 or less.

C: Free of large lumps, large rock, tree stumps and other objectionable material.

2.02 MORTAR SAND

A. Non-plastic siliceous material conforming to the following gradation requirements:

<b>U.S. SIEVE</b>	<b>PERCENT PASSING</b>
No. 4	100
No. 8	95-100
No. 100	0-25
No. 200	0-10

B. Percentages of foreign matter not to exceed the following:

1. Coal or Lignite 0.25 percent
2. Clay Lumps 0.50 percent

2.03 DRAINAGE PIPE MATERIALS

02720-2

- A. Reinforced Concrete Pipe: ASTM C76, Class III, with Wall Type A, B, or C; diameter as required in the Drawings.
- B. Reinforced Concrete Pipe Joints: Bell and spigot or tongue and groove end joints meeting the requirements of AASHTO M198.
  - 1. Type 1 joints for joining pipe under drives and for side drains.
  - 2. Type 2 joints for joining pipe used for cross drains under roadways, including turnouts.
  - 3. Type 3 joints for joining pipe used for closed storm drain systems. Refer to Subsection 1006.05(a) of DOTD Standard Specifications for joint type descriptions.
- C. Gasket Materials:
  - 1. Rubber: AASHTO M198, Type A; lubricant as specified by manufacturer.
  - 2. Flexible Plastic: AASHTO M198, Type B; gasket and primer to be from a source on the DOTD QPL.

#### 2.04 PLASTIC FILTER CLOTH

- A. Plastic Filter Cloth: Geotextile fabric meeting the requirements of DOTD Section 1019.

### **PART 3 EXECUTION**

#### 3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Protect above and below grade utilities and other Underground Facilities to remain.
- C. Verify with Engineer areas to be undercut.
- D. Verify type of material for maintaining subgrades lowered at the direction of Engineer.
- E. Verify character of subgrade before installation.
- F. Beginning of installation means acceptance of substrate.

#### 3.02 DEPTH OF FOUNDATION SUBGRADES

- A. Elevations shown on the Drawings for soil subgrades of drainage pipes shall be considered as approximate and the Engineer may order, in writing, changes in dimensions or elevation of such subgrades as he deems necessary in order to secure a satisfactory foundation. Additional compensation will not be provided for additional excavations required.

#### 3.03. EXCAVATION

- A. Excavate subsoil to depths indicated on the Drawings and to a width sufficient for proper joining of pipe sections and thorough compaction of backfill material under

and around pipe, undercut, as directed, soft areas of subgrade not capable of insitu compaction or incapable of properly supporting the pipe.

- B. Dispose of material not satisfactory for backfill.

### 3.04 TRENCHING

- A. The Contractor shall perform trench excavation of whatever substance encountered to the depths indicated on the plans. Proper enlargements shall be made at each bell to distribute the load to the barrel of the pipe. Muck or other unsuitable material shall be removed and replaced with suitable material as ordered by the Engineer at no extra cost to the Owner.
- B. The trench shall be excavated so that the walls are as nearly vertical as possible to a minimum width which will provide working room to obtain specified compaction. Where required to safeguard employees or adjacent structures, the sides of the trench shall be properly sheathed and braced.
- C. Where, in the opinion of the Engineer, damage is liable to result from withdrawing the sheathing, the sheathing will be required to be left in place.
- D. Any water accumulated in the trenches shall be removed at no additional cost to the Owner prior to laying pipe. During excavation, material suitable for backfilling shall be stockpiled in an orderly manner, a sufficient distance from the edge of the excavation to avoid over loading and to prevent slides or cave-in. Trenching shall not be in more than three hundred (300') feet ahead of pipe laying.

### 3.05 INSTALLATION - PIPE

- A. Bring subgrade to the proper elevation along the length of pipe to be installed and grade to provide uniform support for the full length of the pipe.
- B. Provide bell holes at each joint to permit proper joint assembly and uniform pipe support.
- C. Begin pipe installation from the downstream end of the system.
- D. Provide mechanical pipe puller for joining pipes over 36 inches in diameter.
- E. Place bell or groove ends facing upstream in the system.
- F. Install pipe and seal joints watertight; join such that ends are fully entered and inner surfaces are flush and even.
- G. Wrap Type 2 and Type 3 joints with plastic filter cloth for a minimum of 12 inches on sides of joint, lapping a minimum of 10 inches. Secure cloth at end section of each pipe by means of a non-corroding plastic strap having a minimum breaking strength of 380 lbs., and secure the ends with a self-sealing buckle. Prior approval of this product by the Engineer will be required before installation.

### 3.06 BACKFILLING

- A. Conduits shall be inspected before backfill is placed and any found to be damaged or

out of required alignment or grade shall be removed and relaid or replaced, at the Contractor's expense; and any conduits damaged or out of the required alignment or grade due to backfill operations or other cause shall be removed and relaid or replaced, at the Contractor's expense. At the time of final acceptance, all conduits installed or extended by the Contractor shall be cleaned of all debris and soil to the invert elevation of the conduit.

- B. As soon as the joints are complete and checked, backfill material free of large lumps, clods, or rock shall be deposited evenly on both sides of the pipe in layers not exceeding eight inches (8") thick. Each layer shall be compacted by use of approved mechanical tampers to maximum density requirements in Section 3.07, determined in accordance with the requirements of AASHTO Method T-99. Backfilling shall proceed in this manner to a point twelve inches (12") above the top of the pipe.
- C. On surfaced streets or in areas designated by the Engineer to be surfaced, backfilling from a point twelve inches (12") above the top of the pipe to street grade shall be accomplished by depositing the backfill material in layers not exceeding eight inches (8") in thickness and tamping each layer with approved mechanical tampers to a maximum density shown in Subsection 3.07, determined in accordance with the requirements of AASHTO Method T-99. In the event the material excavated during the trenching operation has a high moisture content, this material shall be dried to backfilling. If unsuitable material for backfilling is encountered in a given location, suitable trench or roadway excavation from other locations on the project shall be used in the backfill operation. If part of the trench lies in an area designated to be surfaced and paralleling the centerline of the roadway, the total width of the trench shall be compacted as designated in this paragraph.
- D. In unsurfaced areas and where the pipe is too deep to be compacted in one foot (1') layers by the wheels of the heavy equipment, at the option of the Contractor with approval of the Engineer, the backfill above a point twelve inches (12") above the top of the pipe and two feet (2') below ground surface may be accomplished by blading the material into the trench and using water to tamp. Compaction of the last two feet (2') of backfill may be accomplished by driving heavy equipment over the trench. The Contractor shall fill to grade, all trenches in which settlement of backfill occurs for the duration of the Contract and maintenance period.
- E. The Contractor shall be required at his own expense, to remove all excess materials, debris or other obstructions from the streets or roads immediately after the backfilling has been completed. No cross streets, sidewalks or roads shall be wholly obstructed, except by special permission from the Engineer. If at any time, the Contractor neglects to remove such materials or obstructions and place streets, sidewalks, and roads in suitable condition for traffic within twenty-four (24) hours after having received written notice from the Engineer, the work may be done by the Owner, and the cost thereof charged to the Contractor and deducted from his final estimate. The Contractor shall repair or replace streets, sidewalks, roads and culverts to the satisfaction of the Engineer and parties concerned.
- F. All fences, markers, mail boxes, street signs or other temporary obstacles shall be removed by the Contractor and immediately replaced after the trench is backfilled, in their original position. The Contractor shall notify the Engineer and property owner at least twenty-four (24) hours in advance of any work done on easements or rights-of-way.
- G. It is expressly understood that the Contractor shall restore all easements and rights-of-way to a condition equal to its original condition, and in a condition satisfactory to

the property owners and the Engineer.

- H. Trenching, backfilling and hauling excess material as specified herein shall be considered as incidental to the work and will not be measured or paid for under these items.

### 3.07 SCHEDULE OF LOCATIONS

- A. The paragraphs below identify location and the minimum compacted density expressed as a percentage of maximum density and optimum moisture in comparison with that determined in accordance with DOTD Designation: TR418
- B. Under paved areas: 95 percent.
- C. Within five feet of paved areas: 90 percent.
- D. Under headlands and agricultural loading areas: 90 percent.
- E. Non-Load bearing areas: 85 percent.

**END OF SECTION**

## SECTION 02770

### REPLACEMENT OF STREETS, DRIVES, AND SIDEWALKS

#### PART I GENERAL

##### 1.01 SECTION INCLUDES

- A. Removal and replacement of streets, drives, and sidewalks necessary to complete the work.

##### 1.02 SAMPLES

- A. Frequency of testing for concrete surfacing will be determined by the Engineer.
- B. Frequency of testing for asphalt concrete mixtures will be determined by the Engineer, but not to exceed the following:
  - 1. One sample per 100 tons (or less) up to maximum of 5 samples for that portion of each lot placed in the project. Sample the top 4" of the finished section.
- C. Contractor shall provide samples for testing.

##### 1.03 QUALITY ASSURANCE

- A. Finish and materials shall be same as existing surface.

##### 1.04 UNIT PRICES

- A. Method of Measurement
  - 1. Replacement of streets, drives, and sidewalks shall be measured by the square yard. Design quantities may be adjusted to meet field conditions. Removal of existing surfacing and excavation will not be measured for payment. Formwork, compaction of subgrade, and tack coat for asphaltic pavement will not be measured for payment.
- B. Basis of Payment
  - 1. Payment of replacement of streets, drives, and sidewalks shall be paid for by the unit price bid per square yard. The payment shall constitute full compensation for removal of existing paving, backfill, compaction, subgrade preparation, finishing and curing, furnishing, hauling, and

installing of all materials, and for furnishing equipment, tools, labor, and other incidentals necessary to complete this item.

## **PART 2 PRODUCTS**

### 2.01 MATERIALS

- A. Concrete and incidentals necessary for construction shall be in accordance with DOTD Standard Specifications (2000 Edition)- Section 706-Concrete Walks, Drives and Incidental Paving.
- B. Asphalt concrete pavement shall be in accordance with DOTD Standard Specifications (2000 Edition)-Section 501, Type 3 and asphaltic tack coat in accordance with Section 504.

## **PART 3 EXECUTION**

### 3.01 PROTECTION

- A. Conduct operations to prevent damage to walks and drives not designated or authorized for removal.
- B. Remove and replace streets, drives, curbs, and walks, not designated or authorized for removal, which is damaged by construction operations. The removal and replacement shall be performed at no cost to the Owner.

### 3.02 PREPARATION

- A. Remove all temporary maintenance aggregate and debris from trench area.
- B. Excavation to required depth and width, removing and replacing unstable material at no direct pay.
- C. Remove necessary fill-crete to section as indicated on drawings.
- D. Shape subgrade and compact to a firm, even surface conforming to the section shown on the plans.
- E. Existing streets, drives, and walks shall be saw-cut to necessary limits.

### 3.03 FORMS

- A. Forms shall be of wood or metal and shall extend the full depth.

- B. Forms shall be straight, clean and of sufficient strength.
- C. Forms shall be braced for proper alignment at all times.

### 3.04 SUBGRADE

- A. Thoroughly moisten subgrade prior to placing concrete.
- B. Coat subgrade and pavement surfaces that will receive asphaltic concrete pavement with an even distribution of asphaltic tack coat.

### 3.05 PLACING AND FINISHING

- A. Concrete:
  - 1. Concrete shall be deposited on subgrade, strike off to required thickness, and tamp sufficiently to bring mortar to the surface.
  - 2. Finish surface with a wood float or steel trowel, followed by brushing to a slightly rough finish.
  - 3. Joints and edges shall be rounded with an edging tool having a ¼” radius.
- B. Asphaltic Concrete Pavement:
  - 1. Spreading, finishing and compaction of asphaltic concrete shall leave the surface reasonably smooth and level with, or slightly above, the edge of existing pavement.
  - 2. Match existing pavement crown or develop crown to facilitate proper drainage and assure a rideable surface.
  - 3. Patching to be completed or trenches to be filled and compacted by end of the day’s operations to maintain through traffic.

### 3.06 JOINTS

- A. Expansion Joints:
  - 1. Fill joints with ½ ” thick preformed expansion joint filler.
  - 2. Install at maximum 100 foot intervals and between intersecting paving and any fixed structure.

3. Extend for full width and depth of paving.
- B. Dummy or Contraction Joints:
1. Form with jointing tool or other acceptable means.
  2. Extend into concrete ¼” and shall be approximately 1/8”.
  3. Space in walks shall be equal to the width of walk.
  4. A longitudinal joint shall be formed along the centerline of drives more than 16’ wide and transverse joints of drives equal to the width but not greater than 16’.
- C. Construction Joints:
1. Construction joints shall be formed around manholes, utility poles, etc., extending into pavement and ¼” thick preformed expansion joint filler shall be installed in these joints.
- D. Tie-ins of existing concrete shall be made by full depth sawing at no direct pay.

### 3.07 CURING

- A. Roadway pavement surface shall be uniformly sprayed with white pigmented curing compound immediately after completion of surface finishing.
- B. Curing shall be maintained continuously for 72 hours.
- C. Have available at the site sufficient material to cover the last hour’s pour against the effects of rain.

### 3.08 PAVEMENT STRIPING AND RAISED PAVEMENT REFLECTORS

- A. Striping and raised pavement reflectors removed during construction shall be replaced with new material at similar spacing as existing.

**END OF SECTION**

**SECTION 02830**  
**FENCES AND GATES**

**PART 1      GENERAL**

1.01 SECTION INCLUDES

- A. This work consists of constructing or rebuilding fences and gates in accordance with these specifications and in conformity with lines and grades shown in the Drawings or established by the Engineer.

1.02 REFERENCES

- A. ASTM A 90 – Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
- B. ASTM A 116 – Zinc-Coated (Galvanized) Iron or Steel Farm-Field and Railroad Right of Way Wire Fencing.
- C. ASTM A 120 – Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses.
- D. ASTM A 121 – Zinc-Coated (Galvanized) Steel Barbed Wire.
- E. ASTM A 123 – Zinc (Hot-Galvanized) Coatings on Products.
- F. ASTM A 392 – Zinc-Coated Steel Chain-Link Fence Fabric.
- G. ASTM A 525 – Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
- H. ASTM A 702 – Hot-Rolled Steel Fence Posts and Assemblies for Field and Line-Type Fencing.
- I. ASTM B 211 – Aluminum – Alloy, Bars, Rods and Wire.
- J. AASHTO M 181 – Chain-Link Fence.
- K. DOTD Louisiana Standard Specifications for Roads and Bridges (LSSRB), 2000 Edition, Section 705 – Fences.
- L. DOTD LSSRB Section 901 – Portland Cement Concrete (Class R).

M. DOTD LSSRB Section 1010 – Fence and Guard Rail.

### 1.03 QUALITY ASSURANCE

- A. All dimensions and gauges of material are subject to accepted industry tolerance standards.
- B. All materials will be subject to inspection for acceptance as to condition at any time during the work. Any material found not to be in compliance with the Specifications shall be removed and replaced at the Contractor's expense.
- C. The fencing shall have uniform properties throughout the installation and shall be supplied by a single manufacturer. Fencing exhibiting unacceptable variation shall be subject to rejection and replacement at the Contractor's expense.

### 1.04 UNIT PRICES

- A. Method of Measurement:
  - 1. New Fence: Measured by the linear foot between outside of end posts for each continuous run of fence, exclusive of gates.
  - 2. Single Gate: Measured per each single gate installed of the type indicated.
  - 3. Double Gate: Measured per each double gate installed of the type indicated.
- B. Basis of Payment:
  - 1. New Fence: Payment shall be by the linear foot.
  - 2. Single Gate: Paid for by the single gate.
  - 3. Double Gate: Paid for by the double gate.
  - 4. Payment for each item shall constitute full compensation for all labor, material, supervision, equipment, and other appurtenances necessary to complete the installation of the item in accordance with these Specifications and as shown on the Drawings.

## **PART 2 PRODUCTS**

### 2.01 MATERIALS

A. Chain Link Fencing:

1. Chain link fabric shall be either aluminum coated conforming to the requirements of ASTM-A491-74 or hot galvanized conforming to the requirements of ASTM-A392-74, Class 2 coating. Fabric shall be woven from 9 gauge (coated size) wire in a 2-inch mesh. Fabric shall be knuckled at one selvage and twisted and barbed at the other selvage.
2. Posts and rails shall be roll formed, open seam, self draining shapes, hot dip galvanized in conformance to the requirements of ASTM-A123-73 or galvanized standard weight pipe conforming to the requirements of ASTM-A120-73.
3. Line posts shall be C-Section roll formed from steel conforming to ASTM-A570-72, Grade E, 2.25" x 1.70" with minimum bending strength of 316 pounds under a 6-foot cantilever load, or 2 3/8" O.D. standard weight galvanized pipe with minimum bending strength of 201 pounds under a 6-foot cantilever load.
4. Top and brace rails shall be roll formed section of 1.625" x 1.25" channel shaped rail with minimum vertical bending strength of 192 pounds on 10-foot span or 1.66" O.D. standard weight galvanized pipe with minimum vertical bending strength of 202 pounds on 10-foot span. Top rail couplings 6 inches minimum in length shall be spaced at maximum 21-foot centers and 9 gauge minimum fabric tie wires shall be spaced at 24-inch maximum centers.
5. All end, corner, and pull posts and gate posts for gate leaves 6'0" wide and less shall be roll formed section 3.5" x 3.5" with minimum bending strength of 453 pounds on 6-foot cantilever load or 2 7/8" O.D. galvanized standard weight pipe with minimum bending strength of 381 pounds on 6-foot cantilever load.
6. Gate posts for gate leaves over 6'0" wide shall be standard weight pipe complying with ASTM-A120 of diameters as recommended by the gate manufacturer.
7. Attachment of chain link fabric to roll formed terminals shall be made by weaving directly into integral lock loops formed in the post.
8. Attachment of chain link fabric to tubular terminal posts shall be made with minimum 1/4" x 3/4" tension bar and 12 ga. x 1" wide clamps using minimum 3/8" diameter carriage bolts.

9. Gate frames shall be tubular shaped, 1.90 inch outside diameter with welded or steel fitted corners. Braces and trusses shall be furnished when necessary.
10. Hardware shall be of adequate design and strength to provide satisfactory operation of gate.
11. All gate components shall be galvanized or aluminum coated as specified herein for fencing components.
12. Locking hasps with locks keyed to the LUS Sewer Department master shall be furnished on gates.
13. All fittings shall be pressed steel or malleable iron and shall be hot dip galvanized conforming to the requirements of ASTM-A153-73.
14. Tie wires shall be minimum 9 gauge aluminum or 11 gauge galvanized steel.
15. Line and terminal posts to be of sufficient lengths to allow for approximate 36-inch settings into concrete footings. Diameter of footings to be 10 inches for line post, and 12 inches for terminal posts.
16. All dimensions and gauges of material are subject to accepted industry tolerance standards.
17. Concealment slatting shall be installed in chain link fence where indicated on the Plans to create a visual barrier. Slatting shall be designed and manufactured specifically for vertical insertion in chain link fencing fabric and shall self-lock in place in the fabric. The slatting shall have a 25 year limited warranty provided by the manufacturer against color fading and breakage of components.

B. Wood Fencing:

1. Lumber: The fencing lumber shall be #1 Grade Cedar at a standard 1" thick x 6" width dimension, unless otherwise stated on plans. Boards shall be fastened with 10d screw shank galvanized nails.
2. Rails: Wood fence rails shall be a maximum of 7.5 feet in length and a standard 2" x 4" in size. There shall be a minimum of three (3) rails between posts. Rails shall be No. 1 grade, treated pine placed 6" from the top and bottom as well as in the center of the fence. Rails shall be attached to posts by 1/4" by 4" long galvanized bolts.

3. Posts:
  - a. Line posts shall be galvanized 2" diameter tubular steel; galvanizing shall be in accordance with ASTM A-120-73. Line posts shall be placed no farther than 8' O.C. Footings shall be a minimum 2 1/2' in depth and 12" in diameter with 2500 p.s.i. concrete used as encasement.
  - b. Corner posts shall be galvanized 2 1/2" diameter tubular steel while gate posts shall be galvanized 4" diameter tubular steel. Footings and concrete shall be the same as the line posts.
  - c. If treated wood posts are approved for use, 4" x 4" size posts shall be used for line posts and 4" x 6" treated wood posts shall be used for corner posts.
4. Hardware: All fittings shall be galvanized steel conforming to the requirements of ASTM A-153-73.
5. Gates:
  - a. Gates frames shall be tubular shaped galvanized steel with welded or steel fitted corners.
  - b. Hardware shall be of adequate design and strength to provide satisfactory operation of gate.
  - c. All gate components shall be galvanized or aluminum coated as specified herein for fencing components.
  - d. Locking hasps with locks keyed to the L.U.S. Sewer Department master shall be furnished on gates.

C. Concrete:

1. Concrete for setting posts shall be Class R concrete in accordance with DOTD Standard Specification Section 901.

## **PART 3 EXECUTION**

### **3.01 GENERAL CONSTRUCTION REQUIREMENTS**

- A. All clearing and grubbing necessary for fence installation shall be performed prior to laying out of fence.

- B. The Contractor's operation shall be confined to the area adjacent to right-of-way lines and construction servitudes.
- C. Where breaks in a run of fencing are required, and at intersections with existing fences, appropriate adjustment in post spacing shall be made for the type closure indicated.
- D. Wood posts shall be placed with small end up. When posts, braces, or anchors are to be embedded in concrete, the contractor shall install temporary braces as required to hold posts in proper position until concrete has set sufficiently to hold posts. No material shall be installed on posts or strain placed on bracing set in concrete for 72 hours after concrete has been placed.
- E. Tops of posts shall be set to required grade and alignment. Cutting of wood post tops will be allowed only when approved. Cut ends shall be treated with two applications of the same type preservative used for post treatment. Wire shall be stretched taut.
- F. Ground rods shall be installed along each segment of new or rebuilt fence, regardless of type fence post used, at maximum 500 foot intervals. Ground rod installation will not be measured for payment.

### 3.02 REBUILT FENCE

- A. When specified, the Contractor shall take down, move back and rebuild existing fence. Fence shall be rebuilt in the same manner as specified for new fence. Rebuilt ornamental fence, picket fence, or other special type fence shall be equal in all respects to existing fence.

### 3.03 GATES

- A. Gates shall be of rigid construction and after erection shall not show any sag or warp.

### 3.04 CHAIN LINK FENCE AND GATES

- A. Concrete Post Anchorage:
  - 1. Posts shall be anchored in Class R concrete footings.
  - 2. Hand mixing of concrete shall be permitted for small quantities.
  - 3. Tops of footings shall extend slightly above ground and shall be steel troweled to a smooth finish sloped to drain away from posts.

4. Posts shall be centered in footings.
5. Excess excavation from footings shall be disposed of in a satisfactory manner.

B. Fence Erection:

1. Pull posts shall be placed not more than 200 feet apart in straight runs and at each vertical angle greater than 20 degrees. Corner posts shall be placed at each horizontal angle greater than 20 degrees. Corner and pull posts shall have a horizontal brace and tie rod on each side of posts. The horizontal brace and tie rod shall be connected to adjacent line posts.
2. Posts shall be permanently positioned, anchorages firmly set, and top rail or tension wires satisfactorily secured to posts before fabric is placed. Ends of fabric shall be secured by stretcher bars threaded through loops of fabric and secured to posts by clamps with bolts and nuts.
3. Fabric shall be placed by securing one end and applying sufficient tension to remove all slack before making attachments elsewhere. The degree of tensioning shall be commensurate with air temperatures at time of installation to prevent undue sagging or tensioning of fabric due to changing temperature. Fabric shall be fastened to line posts at approximately equal spaces and to top rail and bottom tension wire with tie wires or bands as specified.

C. Gate Erection:

1. Gate installation shall include gate frames, stretcher bars, filler fabric, latches, stops, locking devices, padlocks, hinges, gate posts with braces, tie rods, turnbuckles, caps, and all fittings as specified or required for complete installation.
2. Clamps for attaching hardware shall be tightened.
3. Bottom of gates shall clear the ground at least 3 inches at all points in its swing. The Contractor shall grade the area if necessary to meet this requirement.
4. Stops with latches or other approved means for holding the gate open shall be provided, placed to prevent damage to gate or fence by over swing.
5. Unless otherwise directed, stops shall be provided at the centerline of fence to arrest the swing of a closed gate.

D. Repair of Protective Coatings:

1. After completion of fence and gate installation, any damaged protective coatings shall be satisfactorily repaired by approved methods.

E. Concealment Slatting:

1. If called for in the Plans, the Contractor shall install concealment slatting in chain link fencing fabric of the color and type installed.
2. Slatting shall be installed according to manufacturer's recommendations.
3. Damaged slatting shall be replaced at the Contractor's expense.

### 3.05 WOOD FENCING

A. Posts: Line posts shall be placed on centers not exceeding 8'. Posts shall be anchored according to Section 3.04.A.

B. Fence Erection:

1. Horizontal 2" x 4" rails shall be bolted to posts.
2. Lumber shall be accurately cut and framed to a close fit in such a manner that the joints will have an even bearing over the entire contact surface.
3. Abutting runners shall be connected with galvanized steel connectors.
4. Galvanized, rib shank nails shall be used to secure the fence boards to the railings.
5. Fencing boards that are deemed unacceptable by the Engineer, whether by poor workmanship and poor quality, shall be replaced at the Contractor's expense.

**END OF SECTION**

**SECTION 02920**  
**HYDROSEEDING**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Preparation of Ground Surface.
- B. Hydroseeding
- C. Water
- D. Maintenance

1.02 DEFINITIONS

- A. Noxious Weeds: Noxious weeds are interpreted to mean the list of weeds, except Bermuda, which have been adopted by the Louisiana Seed Commission as being noxious in Louisiana.

1.03 COORDINATION

- A. Coordinate work in this Section with other construction operations to minimize damage to seeded areas.
- B. Apply hydroseeding as soon as practical in order to avoid unnecessary erosion at the site.

1.04 MAINTENANCE

- A. Maintain hydroseeded areas immediately after application until grass is well established and exhibits a vigorous growing condition.
- B. If grass is well established and exhibits a vigorous growing condition prior to final acceptance, maintain until time of final acceptance.

1.05 UNIT PRICES

- A. Method of Measurement and Payment:
  - 1. Hydroseeding: Measured by the acre actually applied.

2. Water: Water for Hydroseeding will not be measured for payment.

B. Basis of Payment:

1. Hydroseeding: Paid for at the contract unit price per acre actually applied as directed by the Engineer.

**PART 2 PRODUCTS**

2.01 MATERIALS AND PACKAGING

A. Seed:

1. Conform to all requirements, rules, and regulations of Louisiana Revised Statutes. The minimum percentage of pure live seed and the maximum percentage of weed seed to be as follows:

<u>Kind</u>	<u>Min. Percent of Pure Live Seed (Purity times Germination Including Hard Seed)</u>	<u>Max. Percent of Weed Seed</u>
Hulled Bermuda	83	1
Carpet Grass	76	2
Dixie Crimson Clover	78	1
Kentucky 31 Fescue	80	1

2. Furnish from previous season's crop (the last crop year for the crop kind in question).

3. Limit noxious weed seeds as prescribed in the regulations, but in no case shall they exceed 500 seeds per pound.

B. Fertilizer:

1. Provide commercial type conforming to the commercial fertilizer laws in effect as regulated by the Louisiana Department of Agriculture.

2. Fertilizer used shall have specified chemical composition indicated by a 3-number sequence representing minimum percentages by weight, respectively of nitrogen (N), available phosphoric acid (P<sub>2</sub>O<sub>5</sub>) and soluble potash (K<sub>2</sub>O).

3. Allowable chemical compositions: 8-8-8, 12-12-12, 13-13-13, 16-16-16, 26-6-9.
- C. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

### **PART 3 EXECUTION**

#### 3.01 INSPECTION

- A. Engineer or his authorized representative shall receive verification of quality of seeds and type of fertilizer.
- B. Verify that prepared soil base is ready to receive the work of this Section.

#### 3.02 PREPARATION OF GROUND SURFACE

- A. Prepare ground surface areas by removing foreign materials, stones, waste materials, weeds, and undesirable plants and their roots. Remove contaminated soils.
- B. Grade to eliminate uneven areas, soft or low spots, and to ensure proper drainage. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- C. Finish grade and rake to an even and properly compacted condition.
- D. Prepare seed beds by disking, harrowing, or other approved methods to a minimum depth of 3 inches and thoroughly pulverize for the 3 inch preparation depth.

#### 3.03 HYDROSEEDING

- A. Mulch for Hydroseeding shall be "HYDRO 2000", manufactured by CONWED, Inc. or "REFIBER WOOD w/TAC", manufactured by Wood Recycling, Inc. A minimum of 1800 pounds per acre (dry weight) of mulch material shall be applied.
- B. Distribute seed, fertilizer, mulch, water and tackifier in one operation.
- C. Apply seeded slurry at the rates of:
  1. March thru September

Hulled Bermuda	70lbs./acre
Fertilizer (13-13-13)	300 lbs./acre
“or”	
Hulled Bermuda	35 lbs./acre
Kentucky 31 Fescue	35 lbs./acre
Fertilizer (13-13-13)	300 lbs./acre

2. September thru March

Rye Grass	50 lbs./acre
Unhulled Bermuda	70 lbs./acre
Fertilizer (13-13-13)	300 lbs./acre
“or”	
Rye Grass	50 lbs./acre
Unhulled Bermuda	35 lbs./acre
Kentucky 31 Fescue	35 lbs./acre
Fertilizer (13-13-13)	300 lbs./acre

- D. “Fiber Plus” Tackifier at the rate of 30 pounds per acre shall be utilized on areas where slopes are greater than 2:1 or as directed by Engineer.
- E. Distribute in two intersecting directions, with a hydraulic seeder.
- F. In highly erodible soil areas, contractor shall use an approved erosion control matting in conjunction with hydroseeding.

3.04 MAINTENANCE

- A. If vigorous growth occurs before final acceptance, cut grass at regular intervals to maintain at a maximum height 2 ½ inches. Do not cut more than 1/3 of grass blade at any one mowing.
- B. Water on a regular basis to promote growth and to prevent grass and soil from drying out. Water at other times as directed by the Engineer.
- C. Immediately reseed areas which show bare spots.
- D. Repair to re-establish the grade and reseed surfaces which have become gullied due to erosion.

3.05 SCHEDULE

- A. Hydroseed ground surface areas within the Site as follows:
  - 1. Areas within limits of construction as designated in the Drawings.

- B. Hydroseed ground surface areas affected outside the limits of construction by construction operations.

**END OF SECTION**

**SECTION 03050**

**FILL-CRETE**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Fill-Crete for backfilling of trenches.

1.02 UNIT PRICES

- A. Method of Measurement:

- 1. Fill-Crete: Measured by the in-place cubic yard as set forth by the limits designated in the Drawings.
- 2. Design quantities will only be adjusted if the Engineer authorizes changes to adjust to field conditions or if design changes are made. Fill-crete required due to unauthorized excess trench excavation shall not be measured for payment.

- B. Basis of Payment:

- 1. Fill-Crete: Paid for by the in-place cubic yard which includes furnishing and placing all materials.

**PART 2 PRODUCTS**

2.01 MATERIALS

- A. Portland Cement: Portland Cement shall conform to ASTM Designation: C150.
- B. Sand: Sand shall conform to ASTM Designation C33. The percentages of foreign matter shall not exceed the following values:

**PERCENT**

Coal or Lignite	0.25
Clay Lumps	3.0

Sand shall conform to the following gradation:

<u>SIEVE SIZE</u>	<u>PERCENT PASSING (BY WEIGHT)</u>
3/8"	100
No. 4	95 to 100
No. 16	45 to 90
No. 50	7 to 30
No. 100	0 to 7
No. 200	0 to 3

C. Water: Water shall be clean and not detrimental to concrete.

## 2.02 FILL-CRETE MIX

A. Mix cement, sand and water in the following proportions to yield one (1) cubic yard of mixture:

Portland Cement	-	188 lbs.
Sand	-	3,010 lbs.
Water	-	46.2 gal.

## PART 3 EXECUTION

### 3.01 PROTECTION

A. Protect adjacent structures and surfaces during fill-crete placement operations.

### 3.02 BACKFILLING

A. Fill-crete shall be used to entirely backfill trenches cut through roadways and in areas directed by the Engineer to the limits designated in the Drawings.

### 3.03 SCHEDULE

A. Place fill-crete at locations and to the limits designated in the Drawings and in areas directed by the Engineer.

**END OF SECTION**

**SECTION 11100**  
**CONSTRUCTION VIDEO**

**PART 1 GENERAL**

1.01 WORK INCLUDED

- A. Furnishing video at locations designated herein.

1.02 UNIT PRICES

- A. Method of Measurement
  - 1. Measurement will be by the lump sum.
- B. Basis of Payment
  - 1. Paid for at the contract lump sum price.

**PART 2 PRODUCTS**

Not Used

**PART 3 EXECUTION**

3.01 GENERAL REQUIREMENTS

- A. Video
  - 1. Video to be taken prior to beginning construction.
  - 2. Video to include all surface features of construction area and shall include, but not be limited to the following items: roadways, pavements, curbs, driveways, sidewalks, culverts, headwalls, buildings, landscaping, trees and fences.
  - 3. Identify by audio and visual each parcel with project name, property owner, street name, approximate location, date and time. An identifying device shall be used to indicate the address of each driveway.
  - 4. Video shall be of the digital MPEG format and shall produce sharp, clear pictures.

5. DVD shall be indexed with the project name, street names and location.

**END OF SECTION**

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## SECTION 16000

### ELECTRICAL AND CONTROL

#### PART 1 GENERAL

##### 1.01 GENERAL

- A. The General Conditions are a part of this specification and the Contractor shall consult them in detail for instructions pertaining to his work. He shall also consult all other sections to determine if any other work is to be performed.
- B. All work shall be done in accordance with the 2002 National Electrical Code and with local and state ordinances governing this class of work.
- C. The current Lafayette Utilities System (LUS) Material Specifications shall govern.
- D. The Contractor shall comply with the Standards and Procedures of LUS.

##### 1.02 SCOPE OF WORK

- A. Provide and install all conduit with conduit seals as indicated on the riser diagram.
- B. Install, connect and place in operation with following equipment:
  - 1. Pump motor power and control cables.
- C. Install, connect and place in operation the following equipment furnished by LUS:
  - 1. Pump Control Panel.
  - 2. Ultrasonic level transducer.
  - 3. Tip float switches
  - 4. Other type of level transducer, if required.
  - 5. UPS, Radio and Yagi antenna, if applicable.
- D. Provide and install all other cable.
- E. Provide and install the hot dip galvanized (after fabrication) steel equipment support frame.
- F. Provide and install the fusible safety switch, or circuit breaker, the non-fusible double throw switch 4 pole as specified on the drawings, and the generator power receptacle.

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- G. Provide and install the 7.5 kVA dry type transformer (480 VAC service only).
- H. Provide and install the area lighting fixture and switch.
- I. Provide and install the NEMA-4X junction boxes (JB-1, JB-2 & JB-3) with breather adjacent to wet well.
- J. Install the meter can provided by the utility company. Provide and install the service conductors, [service pole] and grounding. Coordinate the service installation with the power company. Refer to LUS Electric Services Manual.
- K. If required, provide and install the antenna support pole, mast and grounding.
- L. If required, provide and install the conduit for the radio coaxial cable.

### 1.03 VARIOUS RESPONSIBILITIES

- A. The pumps are being furnished by the Contractor under the Section 02535 “Detailed Specifications for Submersible Sewage Pump Station”. The pump control panel, [the radio/UPS system and Yagi antenna], tip float switches (non-mercury) and the ultrasonic level transducer are being furnished by the Owner, LUS.
- B. LUS will furnish a new pump control panel recently manufactured and tested and a new level transducer.
- C. The Contractor is responsible for proper operation of all of these components after installation as well as their operation as a complete integrated system.
- D. The Contractor shall furnish and install all hardware, brackets, supports, cable, etc. necessary for a complete installation.
- E. The Contractor (with assistance of the pump supplier and manufacturer) will be expected to assume the responsibility for proper pump operation with the control panel and integration of the various parts of the system.
- F. The Contractor shall test and check out the completed system and shall troubleshoot problems during start-up and check-out, as necessary. LUS will be available for consultation and assistance.
- G. Refer to the Section 02535 “Detailed Specifications for Submersible Sewage Pump Station” for additional information.

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#### 1.04 SUBMITTALS – SHOP DRAWINGS

- A. Submit shop drawings for the Engineer's approval prior to proceeding with the work and within thirty (30) days of awarding of the contract. Included and in particular are shop drawings for the area lighting luminaire, generator receptacle, [transformer] and the fusible double throw (on-off-on) switch. The contractor shall submit all other such drawings as the Engineer may require. Review and approval of any drawings by the Engineer shall not release the Contractor from responsibility from errors and omissions in such drawings. Wiring configuration drawings shall adhere to the Plan details.

#### 1.05 SUBMITTALS – FINAL DOCUMENTATION

- A Prior to acceptance of the project, three copies of all shop drawings, descriptive data, schematics, printed installation instructions, operating and maintenance instructions and parts lists for the pump control panel shall be neatly bound in three (3) hard-cover D-ring binders and turned over to the Engineer.

#### 1.06 REFERENCES

- A. Standards of the following organizations and the individual standards named shall be followed as though they were part of this Specification (unless otherwise noted):

- Underwriters Laboratories Inc. (UL)
- Southern Standard Building Code
- State Fire Marshall's Act
- Institute of Electrical and Electronic Engineers
- National Board of Fire Underwriters
- National Electrical Code
- National Electrical Manufacturers Association
- Edison Electric Institute
- Insulated Power Cable Engineers Association
- American National Standards Institute
- American Society for Testing Materials
- National Electrical Safety Code
- National Fire Protection Association
- Applicable Rules and Regulations of the local utility companies providing services.

#### 1.07 REGULATORY REQUIREMENTS

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A. Observe and comply with all applicable federal, state and local laws, municipal ordinances, codes and the rules and regulations of all authorities having jurisdiction over construction of the project.

B. Adhere to the following standards, where applicable:

NEMA ICS-1-1983 General Standards for Industrial Control and Systems  
NEMA ICS-2-1983 Industrial Control Devices, Controllers and Assemblies  
NEMA ICS-3-1983 Industrial Systems  
NEMA ICS-4-1983 Terminal Blocks for Industrial Use  
NEMA ICS-6-1983 Enclosures for Industrial Control and Systems  
NFPA 70E Electrical Safety Requirements for Employee Workplaces  
NFPA 79 Electrical Standards for Industrial Machinery  
NFPA 328 Flammable and Combustible Liquids and Gasses in Manholes, Sewers  
And Similar Underground Structures  
NFPA 820 Standard for Fire Protection in Wastewater Treatment and Collection  
Facilities  
ANSI B 286-74 (R-1985) Copper Conductors for Use in Hookup Wire for  
Electronic Equipment  
IEEE 74-1958 Standard Test Code for Industrial Control  
ISA RP60.1 Control Center Facilities  
DIN (Deutsches Institut fur Normung – German National Standard)

#### 1.08 ELECTRICAL SERVICE

A. Provide and install the service as called for in the Plans. The Contractor shall consult with the power company when preparing the bid. All equipment, materials, metering, labor and utility charges shall be included in his bid. No additional compensation will be allowed after bid opening for any failure on the part of the contractor with respect to service acquisition.

#### 1.09 REJECTED WORK AND MATERIAL

A. Should the Contractor introduce any materials different from the type and quality described in the specifications or shown on the plans, it must be immediately removed from the premises when requested by the Engineer.

#### 1.10 WARRANTY

A. Contractor for this work shall be required to keep the work installed by him in repair and perfect working order for one (1) year from the date of final acceptance of the project.

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## 1.11 HAZARDOUS AREAS

- A. Be aware that certain areas of the pump station are considered Class I, Division 1, Group C & D “hazardous” areas as defined in the National Electrical Code. Special wiring techniques, materials and equipment must be used in such areas. The Contractor is referred to Articles 500 and 501 of the 2002 NEC for detailed requirements for electrical work in hazardous areas. All equipment used in hazardous areas must be suitable for use in such areas.

## PART 2 PRODUCTS

### 2.01 MATERIALS AND APPROVALS

- A. Base the proposal on materials as specified herein. Specific mention of a manufacturer or trade name is not intended to indicate preference but to indicate a type and standard of quality. However, where the term “prior approved equal” is used, any substitutions for materials specified herein must be submitted to the Engineer for approval seven (7) days prior to the bid date. Where the term “or approved equal” is used, the substitute product is subject to the Engineer’s approval when the shop drawings are submitted. Where the term “or equal” is used, the substitute product shall be equal to that specified and subject to the Engineer’s approval but shop drawings are not required.

### 2.02 RACEWAYS AND FITTINGS

- A. Galvanized Rigid Steel Conduit: This conduit shall be galvanized inside and outside by the hot-dip or electro-galvanize processes (ANSI-C80.1 and UL-6).
- B. PVC Conduit: This conduit shall be rigid schedule 40 or 80 PVC (as specified on the plans) conduit rated 90°C and UL listed (NEMA TC 2 and UL-651).
- C. Rigid Aluminum Conduit: This conduit shall be manufactured of 6063 alloy in temper designation T-1 (ANSI-C80.5 and UL-6).
- D. All wiring is to be installed in conduit.
- E. All outdoor conduit connections to junction boxes, conduit fittings, outlets, disconnect switches, etc. must be watertight.

### 2.03 CONDUCTORS AND WIRING

- A. All conductors shall be stranded copper.

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- B. Motor circuit power conductors shall be Exane-insulated (or equal) type cable. All other conductors shall have THWN/THHN 600-V insulation. The minimum wire size shall be 14 AWG. The power conductors are to be sized according to the NEC, using rate motor FLA and voltages, along with additional voltage drop requirements.
- C. Signal cable (carrying 4-20 mA currents) shall be a twisted and shielded pair of 18 AWG insulated copper conductors. Furnish Belden No. 1120A or prior approved equal.

#### 2.04 DOUBLE THROW SWITCH

- A. The double throw switch shall be non-fusible, shall have a cover interlock and shall be capable of being padlocked in the top, bottom and neutral positions. The switch shall be signed to select one of two sources for a single load. The switch shall be NEMA-3R and shall be furnished with the current rating, voltage rating and number of poles required in the plans. The switch must be UL listed, suitable for use as service equipment, heavy-duty rated and shall be as manufactured by Siemens, Cutler-Hammer / Westinghouse or prior approved equal.

#### 2.05 SAFETY SWITCHES

- A. Safety switches shall be fusible or non-fusible and rated 240VAC or 480 VAC, as required, and noted on the plans.
- B. Fusible and non-fusible safety switches shall be quick-make, quick-break, with cover interlock and padlocking provisions, and shall be UL approved as rain-tight and NEMA-3R or as otherwise specified in the Plans. Approved manufacturers are Siemens and Cutler-Hammer / Westinghouse.

#### 2.06 AREA LUMINAIRE

- A. The area luminaire shall be an Appleton p/n VPAN10125G, Cooper Crouse-Hinds or approved equal. The luminaire shall be provided with a 200-W, 130-VAC A-23 lamp.

#### 2.07 CONDUIT SEALS

- A. Conduit seals shall be furnished where called for in the Plans. Seals shall be the type EYS as manufactured by Cooper Crouse-Hinds or Appleton and shall be installed with an explosion-proof union directly below boxes. Sealing compound shall be "Apelco" or "Chico A".

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## 2.08 CONCRETE

- A. Where concrete is required it shall be 3000 psi minimum (standard aggregate) and shall be in accordance with American Concrete Institute (ACI) standards. All reinforcing (if required) shall be in accordance with ASTM A615 (GR40).

## 2.09 DRY TYPE TRANSFORMER

- A. Furnish and install a 7.5-kVA dry type transformer, if the service is 480VAC. The transformer shall be connected for a 480 VAC primary and a 120/240 VAC (single-phase) secondary. The transformer shall be NEMA-3R. Approved manufacturers include Siemens and Cutler-Hammer / Westinghouse.

## 2.10 CABLE SUPPORT GRIPS

- A. Properly sized cable support grips shall be provided for cables, which enter the wet well. The cable support grips shall be "Kellems Grip" as manufactured by Hubbell, p/n 07401023 / 07401025 (or equal). The Kellems shall be stainless steel.

## 2.11 CORD GRIP CONNECTORS

- A. Cord grip connectors shall be Cooper Crouse-Hinds type CGB or Appleton CG. The neoprene bushing shall fit tightly around the cord after being compressed and shall exclude gasses and moisture.

## 2.12 GENERATOR PLUG

- A. Generator service plug shall be Appleton or approved equal. The model number plug for this project shall be as follows:

[100 A plug – Appleton #ACJA 1044-150RS]

[200 A plug – Appleton #AJA 20034-250RS]

## 2.13 JUNCTION BOX AND BREATHER VENT

- A. Breather shall be Cooper Crouse-Hinds c/n ECD16 or approved equal. Breather to be ½-inch N.P.T. conduit fitting, made of brass with brass cap. Conduit end to be threaded type.
- B. Junction Box, JB-1, is to be 16x16x8-inch. JB-2 and JB-3 shall be 6x6x6-inch. All are to be NEMA 4X aluminum (with backplate) as manufactured by Hoffman or

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approved equal. The junction boxes are to be mounted with the hinge at the top. A padlock hasp is to be provided. The terminal blocks are to be as described in Section 16000-2.15.

#### 2.14 DIN MOUNTING RAILS

- A. LUS Material Specification 33005000 – DIN (Deutsches Institut für Normung – German National Standard) mounting rails to be Phoenix Contact 08-01-73-3, Entrelec 173-220.05 or approved equal.

#### 2.15 TERMINAL BLOCKS

- A. High Density 600 V, LUS Material Specification 33005100 – rated for 50 A. Universal foot for mounting on DIN rails, 8 mm width to accommodate 18-8 AWG wire. Phoenix Contact 30-05-01-5, Entrelec 115-118.11, plus accessory parts, or approved equal.
- B. Double Grounding, LUS Material Specification 33005130 – to be 6.2 mm wide and used for grounding purposes. Universal ground conductor foot for mounting on DIN rails and accommodates 22-10 AWG wire. Phoenix Contact 27-75-18-4 or approved equal.

#### 2.16 SERVICE [AND ANTENNA SUPPORT] POLE

- A. If applicable, a creosote-treated southern pine wooden pole shall be furnished at the location shown in the plans. The pole shall be Class 4 or better and shall meet the requirements of the power company. Install the galvanized pipe antenna mast as shown in the plans and in the accordance with the instructions of LUS. Pole length shall be 55 ft. The service pole may also serve as the antenna pole.

## **PART 2 EXECUTION**

### 3.01 INSTALLATION

- A. All electrical and control equipment installed or connected by Contractor shall be in strict accordance with the instructions of the manufacturer and with the requirements of LUS.

### 3.02 STANDARDS OF MATERIALS AND WORKMANSHIP

- A. All work shall present a neat and finished appearance when completed and shall be executed in a workmanlike manner. All materials furnished by the Contractor shall be

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new and listed by the Underwriters Laboratories Inc. (UL) as conforming to its standards. Equipment shall meet NEMA standards wherever such standards have been established.

### 3.03 SCHEDULE OF WORK

- A. Check for information regarding the number of days available to complete the work.
- B. Coordinate the work with the work of other trades to avoid conflicts during construction.

### 3.04 SITE INSPECTION

- A. Visit the site and become familiar with the difficulties that may be encountered in execution of the work.

### 3.05 INSPECTION, TESTING AND START-UP

- A. After completion of the work, the Contractor shall conduct an operating test for approval in the presence of the Engineer or his representative. At this time it shall be demonstrated that the equipment operates in accordance with this specification.
- B. Accurately measure the current of each phase of each pump motor, while the pump is in operation. Measure the currents using a clip-on ammeter in rapid succession, so that the pump motor load will be approximately the same for each reading. The readings shall be submitted to the Engineer.
- C. Record the name plate of each pump motor and submit the information to the Engineer.
- D. Record the setting of the overload relays. This information shall be submitted to the Engineer.
- E. Record the level settings of the "Low Water Cut Off" tip float, the "Stop All Pumps" level setting, the "Start Lead Pump" level setting, the "Start Lag Pump" level setting and the "High Level Alarm" tip float level setting. This information shall be submitted to the Engineer.
- F. Instruct the Owner's operating personnel during startup and separate operating tests of the system.
- G. Submit O&M Manuals to the Engineer.

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3.06 CLEAN-UP

- A. Clean the premises of all debris before leaving the site at the end of the day.
- B. Any damage to adjacent surfaces or other materials caused by the Contractor shall be satisfactorily repaired.

3.07 GROUNDING

- A. A 5-ohm (maximum) resistance to Earth ground is required. Refer to the Plans for additional information. The Contractor shall install additional ground rods, if required.

3.08 IDENTIFICATION

- A. All wires shall be marked at each point of termination with sleeve-type wire markers with the same designation used on the pump control panel drawings.

**End of Section**

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## SECTION 16900

### CONTROL EQUIPMENT

#### PART 1 GENERAL

##### 1.01 REQUIREMENTS

- A. The Owner will furnish the pump control panel, radio/UPS system and antenna (if required), level transducer and the two (2) non-mercury tip-float type level sensors. These are to be installed and terminated by the Contractor. The control panel manufacturer will provide start-up and technical assistance, as needed, to the Owner and Contractor. The Owner believes that the pump control panel will provide all operational and protective features necessary for reliable, safe and effective operation of the station pumps. However, it is the ultimate responsibility of the Contractor to verify that the pump control panel furnished by the Owner fulfills all requirements and is in all ways suitable for use with the pumps furnished by the Contractor.
- B. The pump control panel was designed and specified by LUS and constructed by an independent control panel manufacturer. Copies of the plans and specifications used to build the pump control panel are available for review by the Contractor and for prospective pump suppliers.
- C. By bidding this project, the Contractor certifies that the pump supplier and manufacturer of the pumps have reviewed the plans and specifications used to build the pump control panel furnished by LUS and that the control panel is in all ways acceptable for use with the pumps furnished and all warranties will be honored.
- D. The pump control panel will be newly manufactured and tested. The level transducer and non-mercury tip-float switches shall be new.
- E. All equipment being furnished by LUS will be furnished in a timely manner so as not to delay the project.
- F. It is the Contractor's responsibility to make the various pump suppliers and manufacturers aware of the conditions mentioned above and to obtain their assurances that they have reviewed and are willing to abide by these conditions.

##### 1.02 Measurement and Payment

- A. Compensation for furnishing, installing, testing, adjusting and guaranteeing all items described or implied in this Section of the Specifications will be included in payment of the

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Contract Lump Sum Price Item, "Sewage Pump Station", which is described in Section 02535 of these Specifications. Such payment shall constitute full compensation for materials, equipment, tools, labor, supervision and incidentals and the performance of all work necessary to furnish and install all items described in this Section of the Specifications and shown on the Plans.

## **PART 2 PRODUCTS**

Not used this section.

## **PART 3 EXECUTION**

### 3.01 Installation

- A. Equipment described herein shall be installed in accordance with the Plans, with Section 02535 of these Specifications, and with manufacturers' recommendations.

**End of Section**

OWNER'S ENGINEER/ARCHITECT  
INSPECTION GUIDE – WATER

1. Visually verify that all materials meet specifications.
2. Test tapping saddle prior to connection.
3. Witness tap and/or connection to supply main. Measure tapping coupon to insure proper size.
4. Visually inspect all installed fittings, fire hydrants, valves, restraints, blocking, tracing wire, piping, and other required project appurtenances prior to backfill.
5. Witness test pressure.
6. Conduct final inspection upon completion of landscaping and paving to ensure installation are at proper grade.

OWNER'S ENGINEER/ARCHITECT  
INSPECTION GUIDE – WASTEWATER GRAVITY LINES

1. Visually verify that all materials meet specifications.
2. Witness connection to existing manholes. Manhole penetrations must be cored prior to sewer main installation and installed with a water stop.
3. Verify that sewer mains are installed at the approved slope.
4. Visually inspect all pipe materials, fittings, trench and pipe embedment, alignment, service connections and other required project appurtenances prior to backfill.
5. Witness low pressure air test. If additional utilities are installed in the proximity of the installed sewer lines, after the completed air test, then a second air test will need to be set up with Lafayette Utilities System, Wastewater Division. This will determine if the additional utilities has damage the sewer facilities during their installations.
6. Coordinate video inspection of mainlines after sufficient cleaning, with Lafayette Utilities System, Wastewater Collection Division.
7. Inspect manhole installations for groundwater infiltration. Visually verify that all pipe penetration and sections joints have been suitably sealed and that manhole inverts are correctly formed and level with the pipe grade.
8. Conduct final inspection upon completion of final grade and paving to ensure installations are at proper grade.

OWNER'S ENGINEER/ARCHITECT  
INSPECTION GUIDE – LIFT STATION

1. Verify that gate and fence is properly constructed. (Gate minimum width – 12 feet, fence minimum height – 6 feet)
2. Verify that a proper driveway is provided to the site. (Minimum width – 10 feet)
3. Verify that site is level, with a minimum of 8 inches of limestone and meets Lafayette Utilities System Lift Station site detail requirements.
4. Verify that wet-well and valve pit is constructed properly and is leak tight. Top grade of wet-well and valve pit is a minimum of one foot above final site grade.
5. Verify that valve pit is sloped properly and does not hold water. Verify that drain pipe between valve pit and wet-well is installed with required check valve.
6. Verify that pumps operate properly without leaks, vibrations or cavitations and can be pulled without restrictions.
7. All metal materials properly corrosion proofed and/or coated against rusting.
8. Verify that floats are properly installed and set correctly.
9. Verify that required 4 foot elevation exist between incoming line and top of wet-well pumps.
10. Verify that required gate valves and check valves are open and installed in the proper position.
11. Verify that vacuum and pressure gauges are installed properly.
12. Verify that required vent is installed with a rust proof screen.
13. Verify that electrical control panel meets NEMA type 3 panel rating.
14. Verify that electrical equipment is properly and safely installed.
15. Verify that the electrical system was installed as shown on the plans and meets the National Code for Class I Division and all applicable local codes.
16. Inspect pressure test of force main. Line should hold 100 psi for one hour.

17. Witness the force main connections to existing manhole. The force main connection should direct the flow of sewer into the out going manhole invert. Install as shown on LUS sewer detail drawing.