CITY OF LAKE CHARLES
LOUISIANA

STANDARD SPECIFICATIONS
for
INFRASTRUCTURE CONSTRUCTION

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THE CITY OF LAKE CHARLES, LA
STANDARD SPECIFICATIONS FOR INFRASTRUCTURE CONSTRUCTION

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SECTION 1
SANITARY SEWER COLLECTION SYSTEM

PART 1 GENERAL

1.01 SCOPE

A. The work covered by this specification consists of furnishing labor, materials and services for the construction of a gravity sanitary sewer collection system and shall consist of furnishing and installing sanitary sewer manholes, PVC pipe designated for gravity flow sanitary sewers, service lines and riser pipes, in accordance with these specifications, and in conformity with the lines and grades shown on the plans or established by the Engineer. This item includes furnishing, transporting, excavations, bracing, bedding, dewatering, laying, jointing, testing, backfilling, and surface cleanup.

B. All Sanitary Sewer collection systems shall be designed such that the absolute minimum extents of the collection system are to be installed beneath paved surfaces. The City of Lake Charles Waste Water Department reserves the right to grant waivers on the basis of special conditions; however, no sanitary sewer collection system designed completely beneath the paved surfaces will be accepted.

C. Proposed developments not scheduled to be dedicated to the City of Lake Charles shall have permanent medallions affixed to all manhole lids and ductile iron cleanout covers. Medallions shall be stamped with the words “PRIVATE SYSTEM” designating the system as a private system not to be maintained by the City of Lake Charles.

1.02 REFERENCES

A. All materials and designs shall conform to the requirements of these specifications. They shall be new, free from defects, and they shall conform to the following standards where these organizations have set standards:

1. Louisiana Department of Health (LDH)
2. American Society for Testing and Materials (ASTM)
3. American Concrete Institute (ACI)
4. Concrete Reinforcing Steel Institute (CRSI)
5. American National Standards Institute (ANSI)
6. American Water Works Association (AWWA)
7. The Society for Protective Coatings (SSPC)
8. National Sanitation Foundation (NSF)

B. The same manufacturer shall supply all like materials and equipment of the same class, unless specified to the contrary.

1.03 SUBMITTALS

A. Submittals shall be made available to the City of Lake Charles Wastewater Division at any time during construction, at the request of the department.

B. Accurate construction record documents shall be submitted to the City of Lake Charles Wastewater Division for approval prior to acceptance of the sanitary sewer system. Project record documents shall accurately record locations of pipe runs, service connections, manholes, and invert elevation.

1.04 ACCEPTANCE

A. For acceptance by the City of Lake Charles, the sanitary sewer collection system must be:

1. Pre-authorized for construction and subsequent public dedication as part of an approved development plan or preliminary subdivision plat;

2. Constructed to City standards and specifications established by the Wastewater Division;

3. Approved upon completion for conformity with standards and specifications by appropriate city personnel or representatives;

4. Subject to satisfactory maintenance guaranty, as determined by the City;

5. Located on acceptable rights-of-way or readily accessible maintenance easements to be granted to the City; and

6. Accurately depicted in record documents to be submitted.

1.05 WARRANTY

A. The Contractor shall guarantee all materials furnished by him free from inherent defects for a period of one year from date of final acceptance, with the exception of where more stringent warrantees are stated herein.

B. Any repairs, including labor, made necessary by inherent defects, shall be rendered without cost to the Owner within the guarantee period.

PART 2 PRODUCTS

2.01 GENERAL

A. Where a certain pipe material is specified on the plans, only that material can be used. All pipe material used between consecutive manholes in the sewer line, including fittings, service connections, plugs, etc., shall be of the same kind unless otherwise provided by the plans.

B. No gravity sewer collection line shall be less than 8-inches in diameter.

C. No sanitary sewer service line shall be less than 6-inches in diameter, and all services shall be provided with independent clean-outs of like size and pipe material. All sewer service lines shall serve a single residence, or a single building with no interconnectivity.

D. Sanitary sewer manholes shall be either an approved fiberglass manhole or pre-cast concrete manholes complete with a multi-component stress panel liner system.

E. Manholes located outside of paved surfaces shall be constructed to provide a rim elevation extending 3-inches above finished grade, including the sodded grass line, to prevent excess inflow during rain events.

2.02 GRAVITY SANITARY SEWER PIPE

A. Polyvinyl Chloride (PVC) Pipe and Fittings

1. Pipe (diameters 6-inch through 15-inch): 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. Pipe (diameters 18-inch through 27-inch): 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.

3. Joints: Push on type joint in accordance with ASTM D 3212; flexible elastomeric seals (gaskets) in accordance with ASTM F 477.

4. Fittings: Same material and cell classification as pipe.

5. PVC pipe and fittings shall be green in color.

B. Ductile Iron Pipe

1. Pipe shall be designed in accordance with ANSI Specification A21.50 (AWWA C-150) for 150 psi working pressure. Ductile iron pipe shall have a minimum tensile strength of 60,000 psi with minimum yield strength of 42,000 psi (per AWWA M-41). Design shall be done for external and internal pressures separately using the larger of the two for the net design thickness. Additional allowances shall be made for service allowance and casting tolerance per AWWA C150.

2. Pipe shall be manufactured in accordance with ANSI Specification A21.51 (AWWA C-151), latest revision.

3. All ductile iron pipe shall have a bituminous-coated exterior and ceramic epoxy lined interior, as well as, polyethylene wrap. The ceramic epoxy lining shall be a two component amine cured novalac epoxy of at least 87 percent solids. Lining material shall be Protecto 401 by Induron Coatings, Birmingham, AL or prior approved equal, and shall

be installed in accordance with the manufacturer's recommendations, but not less than a 40 mil DFT.

4. Polyethylene wrap shall be installed on all buried DI piping and fittings. Polyethylene encasement furnished under these Specifications shall conform to AWWA C-105 or ANSI A21.5. Film shall be Class "C" Black, with a minimum nominal thickness of 0.008 inches (8 mils).

5. UNRESTRAINED PIPE JOINTS: Ductile iron pipe joints shall be push-on rubber gasket type or rubber-gasket mechanical joint per AWWA C111 in unrestrained applications. Unrestrained pipe joints shall be by one of the following or an approved equal:

   a. "Tyton Joint Pipe" by US Pipe and Foundry Company.

   b. "Fastite Joint Pipe" by the American Cast Iron Pipe Company.

   c. "Tyton Joint Pipe" or "Fastite Joint Pipe" by McWane Company.

6. Ductile iron fittings for gravity systems shall be mechanical joint ductile Iron fittings manufactured in strict accordance with AWWA C153, AWWA C110 and AWWA C111. The rated working pressure shall be 350 psi for 24-inch and smaller and 250 psi for 30-in and larger. All fittings must be manufactured in the United States. All ductile iron fittings shall have a bituminous-coated exterior and ceramic epoxy lined interior, as well as, polyethylene wrap. The Epoxy ceramic lining shall be a two component amine cured novalac epoxy of at least 87 percent solids. Lining material shall be Protecto 401 by Induron Coatings, Birmingham, AL or prior approved equal, and shall be installed in accordance with the manufacturer's recommendations.

C. Differential Pipe Connections and In-Service Line Connections

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. Service connections made on active, or completed sewer lines, shall be shall be established with gas tight, root-proof and leak-proof sewer service tapping saddles and shall conform to ASTM D5926. Sewer saddles shall be Flexible Tap Saddles, as manufactured by Fernco Systems, T-Flex Sewer Saddles, as manufactured by Mission Rubber Company, or approved equal.

2.03 CASING FOR JACKING AND BORING

A. Unless otherwise required by the agency having jurisdiction, the casing shall be welded steel pipe meeting ASTM A53, Grade B, and have a minimum yield strength of 35,000 psi. The exterior of the casing pipe shall be coated with coal tar epoxy or bituminous asphalt. Minimum wall thickness shall be as shown in the following table:

Table for minimum wall thickness for steel casing pipe for E72 loading		
Carrier Pipe Nominal Diameter (inches)	Min. Casing Pipe Diameter (O.D.) (inches)	Nominal Thickness (inches)

6	12	0.344
8	16	0.375
10	20	0.407
12	24	0.469
14	27	0.505
16	30	0.505
18	30	0.505
20	36	0.595
24	36	0.595
30	42	0.625
36	48	0.688
42	60	0.844

2.04 CONCRETE MANHOLES

A. Concrete Manholes

1. All manholes shall consist of precast concrete sections, including integral base section, riser sections, conical sections, and shall conform to ASTM C 478 and the dimensions shown on the Drawings. Conical sections shall be designed to support cast iron frames and covers under AASHTO HS-20 loading. Axial length sections shall be selected to provide correct total height required with the fewest joints. All conical sections shall be eccentric.

2. Base for precast manholes may be either pre-cast or cast-in-place. Cast-in-place bases shall be used exclusively for manholes built over existing sewer lines only.

3. All concrete manholes shall be coated with a multi-component stress panel liner system as further detailed herein.

B. Joint Gaskets

1. All pre-cast manhole joints shall be sealed with flexible watertight gaskets conforming to ASTM C 990 or C443. Gaskets shall be “RAM-NEK” or “RUB-R-NEK” gasketing material, or approved equal, installed as specified by the manufacturer.

C. Pipe Penetration Gaskets

1. All pipe penetrations shall be installed with watertight resilient gasket conforming to ASTM C923.

2. Gaskets cast into the manhole shall be Dura-Seal III, as manufactured by Dura-Tech, Inc., or prior approved equal. Field installed gaskets shall be Kor-N-Seal Cavity O-Ring as manufactured by, NPC Inc., or approved equal, installed as specified by the manufacturer.

D. Bench and Inverts

1. For benches and inverts not integrally formed with the manhole base, 4000 psi concrete bench and inverts shall be field installed by the contractor. Benches and inverts formed with grout or mortar shall not be permitted.

E. Concrete Manhole Exterior Joint Sealant

1. Prior to backfilling, exterior joints shall be waterproofed as provided below.

2. Concrete manhole exterior joints shall be sealed with an external rubber sleeve similar to the Infi-Shield Gator Wrap as manufactured by Sealing Systems Inc. The seal shall be made of a stretchable, self-shrinking, intra-curing halogenated based rubber with a minimum thickness of 30 mils and 18-inch width. The back side of each unit shall be coated with a cross-linked re-enforced butyl adhesive. The butyl adhesive shall be non-hardening sealant with a minimum thickness of 30 mils. The seal shall be designed to stretch around the joint and then overlapped creating a cross-link and fused bond between the rubber and butyl adhesive. Gator Wrap forms a continuous rubber seal on a manhole joint which prevents water and soil from infiltrating through the manhole, catch basin or concrete pipe joint. The exterior joint sealants shall be installed per the manufacturer's recommendations.

F. Multi-Component Stress Panel Interior Liner System

1. The multi-component stress panel lining system, shall be designed for sanitary sewer applications, and shall utilize a mechanical anchoring system at all terminations. Surface preparation and liner installation shall be completed according to the manufacturer's recommendations and by a manufacturer certified installer.

2. The total thickness of the liner system shall be a minimum of 500-mils DFT.

3. The complete coating system shall include a 10-year limited warranty covering both materials and installation, beginning at the date of final acceptance.

4. The multi-component stress panel interior lining system shall be SpectraShield, as manufactured by CCI Spectrum, Inc., or approved equal.

5. The liner shall be affixed with or stamped with a permanent, easily legible completion date.

2.05 FIBERGLASS MANHOLES

A. Fiberglass Manholes

1. Provide prefabricated fiberglass manholes which conform in shape, size, dimensions, and details shown on Drawings. Unless modified by Drawings, use manhole sections conforming to ASTM D 3753.

2. Provide fiberglass manholes manufactured by one of the following suppliers:
   a. LFM Manufacturing, Giddings, Texas.
   b. Containment Solutions, Conroe, Texas

c. City approved equal

3. Mark date of manufacture and name or trademark of manufacturer in 1-inch high stenciled letters on inside of barrel.

4. Unless larger size is required, provide 48-inch-diameter barrel for fiberglass manholes. Provide wall section thickness for depth of manhole according to ASTM D 3753, but not less than 0.48 inches in thickness.

1. Provide fabricated reducer bonded at factory to form one continuous unit at top of manhole barrel to accept concrete grade rings and cast iron frame and cover. Reducer design shall be of sufficient strength to safely support HS-20 loading in accordance with AASHTO. Manway reducers shall be eccentric with respect to the centerline of the manhole riser section.

5. Fiberglass manholes shall have a fiberglass-reinforced bottom plate. Fiberglass stiffening ribs shall be used, where required, to provide sufficient stiffness to bottom plate. All bottom plates shall have an external anti-flotation flange extending 2.5-inches (min) beyond manhole outside diameter. The manhole bottom shall be 0.5-inches thick (minimum).

B. Reinforced Concrete Manhole Base Section

1. Fiberglass manholes shall be set in a cast-in-place reinforced concrete slab base. Concrete slab base should be a minimum of 12” thick for up to 48” diameter manholes (16” thickness for larger diameter manholes). Concrete slab should extend a minimum of 12” beyond manhole outside wall for manholes up to 20’ in depth (24” up to 35’ in depth). The minimum reinforcement for the concrete slab shall be #5 rebar at 8-inches on-center-each-way. The fiberglass reinforced bottom plate shall be imbedded 3.5-inches into the reinforced concrete slab.

C. Pipe Connections

1. Pipe connections shall be pipe stub-outs or boot-type connections. Installation of PVC or FRP stub-outs shall be performed by sanding, priming, and using a fiberglass-reinforced laminate to bond the stub-out to the manhole wall. The resin and fiberglass shall be the same type and grade as used in the fabrication of the manhole. Boot-type pipe connections shall Kor-N-Seal, Press-Seal, Inserta-Tee or approved equal. Where required, Manufacturer shall use a fiberglass-reinforced sleeve to accommodate boot connections.

2. Doghouse manhole pipe connections shall not be permitted when using fiberglass manholes. Where the installation requires dog-house installation methods a reinforced concrete manhole shall be required.

D. Manhole Bench and Invert

1. Fiberglass enclosed bench and invert shall be installed by the Manufacturer, Manufacturer's agent or approved equal. The invert will be formed using a corrosion resistant material and completely enclosed in 0.25-inches (min) of fiberglass laminate.

2. For benches and inverts not integrally formed with the manhole base, 4000 psi concrete bench and inverts shall be field installed by the contractor. Benches and inverts formed with grout or mortar shall not be permitted. Concrete bench and invert shall be field installed by the installing contractor in accordance with fiberglass manhole manufacturer's requirements and these specifications.

2.06 MANHOLE APPURTENANCES

A. Riser Rings

1. Riser rings shall be standard product, manufactured particularly for use in manhole construction, sized to fit the cones on which they are placed, and the wall thickness shall be not less than that of the cones.

2. Concrete riser rings shall be not less than two inches high, nor more than four inches high. Concrete riser rings shall be free from cracks, voids, and other defects and shall conform to ASTM C478. Joints shall be provided with exterior waterproofing system as provided below.

3. Cast iron riser rings shall conform to the latest edition of AASHTO M306. Cast iron riser rings shall be used for adjustment of manhole frame and cover of less than four (4) inches. Joints shall be provided with exterior waterproofing system as provided below.

4. Cast-iron riser rings shall be completely coated with an environmentally safe, water-based asphaltic coating which is non-toxic, non-flammable, colorless, and dries to a hard black finish. The coating shall be applied to the casting prior to the installation of the external waterproofing.

B. Manhole Frames and Covers

1. All manhole covers shall have the word "SEWER" cast into the top in letters approximately three inches high.

2. Manhole frames and covers shall be cast-iron, and conform to the design and dimensions shown on the Drawings and Standard Details. Grade shall be as designated in the Contract Drawings. Contact surfaces between frames and covers shall be machined to provide a uniform contact surface. When locking devices are specified, the CONTRACTOR shall submit Shop Drawings for approval by the ENGINEER.

3. For roadway applications the standard manhole frame and cover shall be East Jordan Iron Works Model V-1501 and Model V-1403, or approved equals.

4. For non-roadway applications the standard manhole frame and cover shall be East Jordan Iron Works 'Hinged Manhole Assembly, Catalog No. 24' ERGO (Product No. 00104175L02), or approved equal.

5. For watertight applications the standard sewer manhole frames and covers shall be East Jordan Iron Works Model V-2480-1, or approved equal.

6. Cast-iron frames and covers shall be completely coated with an environmentally safe, water-based asphaltic coating which is non-toxic, non-flammable, colorless, and dries to a hard black finish. The coating shall be applied to the casting prior to the installation of the external waterproofing.

C. Miscellaneous

1. Bentonite-Cement sealing plaster shall consist of two parts bentonite, one part Type 3 cement, and one part sand, with sufficient water to obtain workable consistency.

2. Mortar shall consist of one part Portland Cement to two parts clean, well-graded sand which will pass a No. 4 screen. Admixtures may be used not exceeding the following percentages of weight of cement; hydrated lime, 10%; diatomaceous earth or other inert material, 5%. Consistency of mortar shall be such that it will readily adhere to the surface. Mortar mixed for longer than thirty minutes shall not be used. A non-shrink mortar may be submitted for approval as a substitute.

3. Grout shall be non-shrink cementitous grout and shall meet or exceed the requirements of ASTM C1107, Grades B or C and CRD C-621. The grouts shall exhibit no shrinkage when tested in conformity with ASTM C827.

D. Manhole Inflow Protector Insert

1. The completed manhole inflow protector and its associated valve body and 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.

2. The manhole insert body shall be designed with six equally spaced re-enforcement ribs (1 1/2" wide, 1/2" deep, and 6 1/2" long) in the bottom and will support a minimum uniform load of 800 pounds. The insert body shall have a recessed area in the center of the bottom for protection of the valve body. The insert body shall be fabricated from Acrylonitrile Butadiene-Stryrene (ABS) high impact, high grade material specifications under ASTM D-256 method A, D-638, D-790, D-785, D-648 method A and D-635.

3. The insert shall be provided with a gasket made of closed cell neoprene and have a pressure sensitive adhesive on one side and be placed under the insert body rim by the manufacturer. The adhesive shall be compatible with the insert body material so as to form a long lasting bond in either wet or dry conditions of use.

4. The gas relief valve shall be designed to relieve at a pressure of 1 psi and have a water leak down rate not to exceed 5 gallons per 24 hours. The valve shall be installed by means of a threaded hole tapped in the center of the insert body by the manufacturer

5. The insert shall be provided with a corrosion resistant handle or lifting strap which do

not interfere with the installation of the manhole lid. The handle or lifting straps shall have a minimum combined 1100 pound tensile strength and shall be attached to the insert, by the manufacturer, with corrosion resistant fasteners.

6. Manhole inflow protector inserts shall be Rain Guard Model LFN-SV, as manufactured by L.F.M. Manufacturing, Inc. Giddings, Texas, or approved equal.

2.05 CLEANOUTS

A. Cleanouts at the ends of sanitary sewer lines shall be constructed of the same quality pipe material and size (6-inch) as the service line. Cleanouts shall consist of 6-inch pipe, fittings, threaded cleanout adapter, threaded cleanout plug.

B. All new cleanouts shall be installed within a new concrete box. All new clean out boxes shall be model no. C.H. 5/8”x3/4” Concrete Boxes manufactured by Southern Meter Box, Inc., or approved equal. Concrete meter boxes shall be provided with a solid cast iron lid marked SEWER and shall be model No. T. 5/8”x3/4” Lid as manufactured by Southern Meter Box Inc., or approved equal.

2.06 CONCRETE

A. Cement shall be Type II Portland Cement conforming to ASTM C 150.

B. Concrete for Manholes and cast in place manhole bases: 4500 psi minimum at 28 days, 6.2 sacks of cement minimum per cubic yard.

C. Concrete for benches and inverts not integrally formed with the manhole base: 4000 psi minimum at 28 days, 5.8 sacks of cement per cubic yard.

D. Concrete for Embedment: 3000 psi minimum at 28 days, 5.2 sacks of cement minimum per cubic yard.

E. Test for compressive strength of concrete in accordance with ASTM C 39.

2.07 MORTAR SAND

A. Mortar sand shall be a non-plastic siliceous material conforming to the following gradation limits:

Sieve Size	Percent Finer By Weight
No. 4	100
No. 8	95 to 100
No. 100	0 to 25
No. 200	0 to 10

B. The percentage of foreign matter shall not exceed the following limits:

1. Coal of Lignite 0.25 percent
2. Clay lumps 0.50 percent

2.08 FOUNDATION, BEDDING, AND BACKFILL MATERIALS

A. Foundation Material

1. Crushed limestone or crushed Portland cement concrete shall be used for structure foundations and pipe foundation amendments as detailed herein. Crushed limestone or crushed Portland Cement Concrete foundation material shall meet the following #610 gradations.

Sieve Size	Percent Finer By Weight
1 – ½ in	100
1 - in	90 to 100
3/4 - in	70 to 95
3/8 - in	50 to 80
No. 4	35 to 65
No. 10	25 to 50
No. 40	10 to 26
No. 200	4 to 12

B. Bedding and Embedment Material

1. Crushed limestone or crushed Portland cement concrete shall be used for pipe bedding to the depths and heights identified on the project details. Crushed limestone or crushed Portland Cement Concrete bedding material shall meet the following #57 gradations.

Sieve Size	Percent Finer By Weight
1 – ½ in	100
1 - in	90 to 100
1/2 - in	25 to 60
No. 4	0 to 10
No. 8	0 to 5
No. 200	0 to 1

C. Backfill Material

1. Usable Native Excavated Soils for Trench Back Fill outside of paved surfaces shall meet the following requirements.

   a. Usable native excavated soils shall have a maximum PI of 25 and maximum organic content of five (5) percent. Soils with a silt content of fifty (50) percent or greater and also a PI of ten (10) or less will not be allowed. Any select material used to supplement or replace usable excavated soil shall meet these requirements and must be approved by the Engineer. Soil shall be tested at the Engineer and the Owner's option. Usable excavated material may be neatly stockpiled at the site where designated by the Engineer provided there is an area available that will not interfere with the Owner's access nor inconvenience traffic adjoining property owners.

b. When excavated soils do not meet the above stated requirements they shall be removed from the site, at the contractors expense, and replaced with Select Backfill Material.

2. Sand Backfill Material

a. Sand backfill material shall be used for trench backfill when the utility line is to be installed beneath any paved surface. Sand for backfilling trenches and structures shall be non-plastic siliceous material and shall conform to the following gradation limits:

Sieve Size	Percent Finer By Weight
½ - in	100
No. 10	75 to 100
No. 200	0 to 10

PART 3 EXECUTION

3.01 GENERAL

A. Coordinate with other utility providers to the fullest extent possible complete maximum spacing from all utilities for ease of access.

B. Sanitary Sewer lines shall be installed with wall to wall clear separations of not less than 6-feet horizontally and 18-inches vertically from potable water lines. Where these separations are not able to be met, the line shall be encased in concrete.

C. Any materials damaged during installation shall be removed and discarded.

3.02 ALIGNMENT AND GRADE

A. Prior to excavation, the Engineer will provide alignment and location of manholes.

B. The Engineer will establish the location of all sewer lines to be constructed and will set bench marks at prominent points adjacent to the work. He will set stakes at each manhole, off-set markers at 50’ centers along the lines, and will develop and present to the Contractor all necessary cut sheets. The Contractor shall develop all grades, slopes, etc., there from and shall be responsible for the conformity of the work to the layout, cut sheets, elevation, etc., provided him.

C. Uncover, relay and backfill installed pipe where horizontal and vertical alignment is determined by Engineer, or the City, to be unacceptable or erroneous.

3.03 TRENCHING AND EXCAVATION

A. Excavation

1. Excavation shall include the removal, handling, re-handling, 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, and trench box. The work of excavation shall also include the responsibility of added expenses or other liability that may arise from quicksand, obstacles or conditions, foreseen or unforeseen, which may be encountered in the work. It includes clearing and the removal of pavements, curbs, sidewalks, shrubbery, and other obstructions not otherwise provided for.

B. Lines of Excavation

1. All excavation shall be made in such manner and to such widths as will give ample room for properly installing and inspecting the piping. All excavation necessary for laying pipe, constructing manholes, etc., shall be made to line and grade as indicated on the plans and as specified herein. Trenches shall be dug to the alignment and depth required and only so far ahead of the pipe laying as the Engineer will permit. The trench shall be braced and drained as may be required so that workmen may work therein safely and efficiently. A trench box may be used in lieu of sheeting and shoring.

2. Bottoms of trenches shall be excavated and formed to provide for pipe bedding or pipe foundations as hereinafter specified or as required by the plans or Special Provisions.

3. Bell holes, where necessary to make up the joints, shall be dug of sufficient size that the whole length of the pipe barrel be bedded as required, and to allow all of the joints to be properly made.

4. All excavation shall be open cuts with vertical sides except in special cases where the Engineer may permit sloping sides above a point two feet (2’) above the top of the pipe, or except where tunneling is permitted or required.

5. If tunnels are authorized or required, they shall be only as large as necessary for the installation of the pipe and as approved by the Engineer or as detailed on the plans.

6. The maximum width of trench or sewer pipe installation at a point two feet (2’) above the top of the pipe shall be the external diameter of the barrel of the pipe plus nine inches (9”) on each side of the pipe.

C. Methods of Excavation

1. The Engineer shall have the authority, at any time, to require the Contractor to discontinue the use of any excavating machine or other appliance which, in the Engineer’s judgment, is not adapted to the purpose for which it is used.

D. Dewatering

1. The trenches shall be maintained free of water at all times while work is in progress, and water shall not be allowed to flow over or rise upon earth foundations, pipe, concrete masonry, or other work, except as otherwise specified for bayou crossings and special "wet areas." The Contractor shall not open more trench than the available pumping facilities can dewater to the satisfaction of the Engineer.

2. The Contractor shall assume all responsibility for disposing of all water so as not to injure or interfere with normal drainage of the locality. In no case shall water pipe lines be used as drains for such water. The ends of water pipe lines shall be adequately and properly plugged during construction by the use of approved stoppers (a garbage bag is not an approved stopper), and all necessary precautions shall be taken to prevent the entrance of ground water, mud, sand, or any other objectionable materials into the pipe lines. If such materials enter the pipe lines, they shall be removed by the Contractor as soon as possible after discovery thereof.

3. The Contractor shall use due vigilance and care so that no water originating on his work or due to his work or which he is obligated to handle and dispose of under this contract shall discharge or be discharged on the work or into the trenches of another contractor unless a mutual agreement by the parties affected has been reached. Nothing in this section is to be construed as preventing the reasonable use by the Contractor of any ditch, channel, storm drain, or gutter which is designated and used for City or Parish drainage.

E. Maintenance of Excavation

1. The Contractor shall maintain all excavation in good order during the construction, so as not to hinder or injure the pipe laying, masonry, or other work. He shall take all reasonable precautions to prevent movement of the sides of such excavation, and shall remove at his own expense any material sliding into the excavation.

F. Sheeting and Bracing

1. The Contractor shall furnish and put in place such sheeting and bracing as may be required to support the sides of all trenches or other excavations and, where required, remove, or cut off, as directed, such sheeting at his own expense. A steel trench box, supplemented with additional sheeting, may be used in lieu of total sheeting and bracing.

G. Disposal of Excavated Material

1. All material excavated shall be placed so as to interfere as little as possible with public travel. In case the street is not wide enough to allow the dirt to be piled up without blocking the sidewalk, the Contractor shall, at his own expense, maintain an open passageway not less than two and one-half feet (2 ½') wide on the sidewalk and shall keep this passageway free from mud and slush.

2. The Contractor may deposit excavated materials directly in permanent position insofar as is consistent with the proper prosecution of the work. Materials that cannot be placed at once in permanent position shall be deposited in temporary storage piles. All this work shall be done with reasonable neatness and excavated materials shall not be carelessly strewn over the area.

3. Surplus excavated material over and above that required for backfilling, mounding over the pipe and making other fills and embankments to the finished lines and grades

indicated on the drawings shall be disposed of as directed by the Engineer. The Contractor shall be responsible for seeing that the material is dumped in an orderly manner within the limits designated. The surface of the dump shall be neatly graded to blend with the natural contours of the existing ground surface. If the City or Drainage Board has no use for the surplus material, it will be the responsibility of the Contractor to properly dispose of said surplus.

3.04 BEDDING

A. As soon as the excavation is complete to normal grade of the bottom of the trench, bedding shall be placed, compacted and graded to provide firm, uniform and continuous support for the pipe. Bell holes shall be excavated so that only the barrel of the pipe bears upon the bedding. The pipe shall be laid accurately to the lines and grades indicated on the Drawings. Blocking under the pipe will not be permitted. Bedding shall be placed evenly on each side of the pipe to mid diameter and hand tools shall be used to force the bedding under the haunches of the pipe and into the bell holes to give firm continuous support for the pipe.

B. Where the bottom of the excavation is not, in the opinion of the Engineer, of suitable material for the construction of required pipe foundation, the excavation shall be deepened and a limestone foundation shall be placed under the pipe as directed by the Engineer. This stone foundation is not to be included in the price bid for laying pipe and will be paid for as a separate item.

C. Where the Contractor exceeds the maximum trench width to the extent that excessive backfill loads are imposed on the pipe, or where the trench is over-excavated, as determined by the Engineer; the Contractor shall provide limestone or such additional pipe foundation as the Engineer may require without any additional compensation. Over-excavated trenches shall not be brought up to grade with excavated material.

3.05 MANHOLE INSTALLATION

A. Cast in place bases shall be constructed in a dry excavation on a six inch base of limestone foundation material compacted to 95% of the maximum density. Cast in place bases shall meet the requirements stated above. Concrete shall not be placed under water. Running water shall not be permitted over newly poured concrete. If base is cast-in-place, lowermost pre-cast unit shall be set in place at the time base is poured; additional precast units shall not be places until 24-hours after the base is poured. The excavation shall be kept dry until the concrete or mortar has developed sufficient strength to prevent rupture by groundwater pressure.

B. Precast bases sections shall be set on a level base of six inches of compacted (95% STP) No. 57 limestone, as shown in the Standard Details. Provisions shall be made to prevent flotation of the manhole.

C. Manhole inverts shall be formed as shown on the Drawings, either by laying pipe through and cutting out the top portion before completion of the base of the manholes, or by forming U-shaped channels in the concrete base section. Cut edges of pipe laid through the manhole shall be fully covered by 4000psi concrete when the manhole invert is complete. The finished invert shall be smooth and true to grade. No mortar or broken pieces of pipe shall be allowed to enter the sewers. Changes in direction of flow through the inlet shall be made to a true curve with as

large a radius as the size of the inlet will permit.

D. All lifting holes shall be plugged with Bentonite-Cement sealing plaster and sealed with a Miradri System patch, or approved equal, to a minimum of six inches from the edges of the opening, as required to prevent leakage.

E. After completion of the manhole, all plugs shall be completely removed from the sewers and all loose material shall be removed from the manhole.

F. Service connections shall not be installed into manholes unless otherwise shown on the Drawings or directed by the ENGINEER. Where service connections into manholes are allowed, the top of the service sewer pipe shall be 0.2 feet higher than the top of the downstream main sewer pipe. The manhole invert shall be channeled for the service connection sewers in the same manner as for main sewers.

G. Stubs for future construction shall consist of a section of pipe extending two feet outside the manhole wall, connected as shown on the Drawings and Standard Details. The manhole fillet shall be formed for future connection. The stubs shall be located as shown on the Drawings.

H. The top of manhole frame will be at the finished grade of pavement or at least 4-inches above the ground surface when not installed in pavement. In paved areas the frame and cover should match the slope and crown of the finished pavement.

I. Concrete riser rings shall be set in a full bed of mortar. Mortar shall be struck smooth on the inside of the manhole using a hard trowel followed by a sponge float. An epoxy system designed for metal-to-metal adhesion shall be used to connect individual cast iron riser rings and cast iron riser rings to the frame.

J. If inlet pipe enters the manhole two (2) feet above the manhole invert or higher, an internal or external drop line is required and shall comply with the drawings and Standard Details, unless otherwise stipulated by the City of Lake Charles Waste Water Department.

K. Exterior joints shall be sealed with an exterior joint waterproofing system and shall be installed as recommended by the system manufacturer.

L. The specified manhole interior lining system shall be FIELD APPLIED and shall be installed as recommended by the system manufacturer.

M. All manholes will be visually inspected by the ENGINEER; there shall be no evidence of leakage of water into any manhole from outside sources or any imperfections which may allow such leakage.

N. Manholes installed in pavement shall be provided with a cast-in-place concrete collar extending 1-foot out from the edge of the manhole rim.

O. Manholes located outside of paved surfaces shall be constructed to provide a rim elevation extending 3-inches above finished grade, including the sodded grass line.

P. Watertight manhole inserts shall be installed in all manholes, in accordance with manufacturer's

specifications, following the completion of the manhole installation.

3.06 PIPE INSTALLATION

A. Laying Pipe

1. All pipe shall be laid with the use of a laser. Pipe shall be laid in the trench on bedding or cradle as called for on the plans or as ordered by the Engineer. After the sewer is completed, the interior surface on the bottom thereof shall conform accurately to the grade and alignment indicated on the plans or directed by the Project Engineer. At any stage of construction of a straight stretch between any two consecutive manholes, the starting end of the pipe shall be clearly visible on looking through the pipe from the other end, with full cross section of the interior of the pipe in clear view. Any pipe which is not true in alignment or which has shown settlement after laying, shall be taken up and re-layed at the Contractor's expense.

2. Before being set in place, each section of pipe shall be thoroughly cleaned and freed of dirt. All bells shall be laid on the upstream end.

3. Whenever pipe laying is stopped, either for the night or for any other cause, the end of the pipe shall be securely closed to prevent the entrance of water, mud or other matter, and shall be secured in such manner as to prevent the pipe from being dislodged by movement of backfill. While pipe laying is in progress, the Contractor shall keep the trench clear of water.

4. Wye and tee branches shall be placed in the sewer lines at points indicated by the Engineer. Riser pipe and service lines shall be laid at points and to grades indicated by the Engineer. Riser pipe shall be encased in crushed limestone as shown on the plans. Service lines will be laid in accordance with the requirements for sewer pipe. The ends of all service lines and other points for future connections are to be capped with a suitable watertight cap as manufactured for use with the type of pipe being used.

B. Jointing Pipe and Fittings

3. Thoroughly clean the bell or coupling end and the plain end of the pipe and apply the joint lubricant liberally, shove the plain end of the pipe into the bell and coupling end of the pipe until the pipe hits the bevel of the bell, fitting or coupling.

C. Service Cleanouts

1. All sewer services shall be provided with a 6-inch clean-out and serve only one (1) building structure; combined sewer services shall not be allowed.

2. Cleanouts shall be constructed such that the frame shall be jointed to the riser pipe so that groundwater will be prevented from entering the sewer. Cleanouts shall be tested for water tightness along with the sewers to which they are connected.

3.07 CONNECTION TO EXISTING MANHOLE

A. CONTRACTOR shall remove or plug existing pipe as applicable, drill hole at new location required for installation of sewer under this contract, install pipe, seal the pipe penetration, form channeled inverts, install drop connections as required, and backfill as require.

B. Connection to existing manholes shall be made in such a manner that the modified manhole is equal to a new manhole in appearance and performance. A channel, approximately two inches larger all around than the connecting pipe, shall be cut into the existing manhole base. The new pipe shall be connected as shown on the Drawings and Standard Details. The rough-cut channel shall be finished to its final smooth and uniform shape with mortar. The existing sewer(s) shall be maintained in service and the fresh concrete and mortar surface shall be protected from the flowing sewage for a minimum of 24 hours.

C. Connections to existing manholes shall be plugged upon establishment, to dis-allow the flow of sanitary sewer into the City of Lake Charles' collection system, until the new system has been inspected and accepted by the City of Lake Charles Waste Water department. Under no circumstances shall the plug be removed by prior to the acceptance by City of Lake Charles.

3.08 BACKFILL

A. General

1. No backfilling of trenches shall be done until the pipe work to be covered has been inspected. Where any sheeting or bracing is withdrawn as backfilling progresses, all voids or spaces left thereby shall be carefully and thoroughly filled and compacted with proper tools.

2. The Engineer shall have the right to reject compaction methods and/or equipment, which do not produce satisfactory results.

3. Material for backfill shall contain no rubble, trash, broken concrete, asphalt or other objectionable materials.

4. All backfill operations shall be subject to the approval of the Engineer. The Contractor shall be responsible for the stability of all backfill made under the contract until one year after final acceptance of the work and shall bear the expense of replacing any portions which have become displaced due to carelessness or negligent work on the part of the Contractor or to damages, resulting from natural causes, such as storms, and not attributable, in the opinion of the Engineer, to unavoidable movements on the ground upon which the backfill is made.

5. Backfilling trenches for sewer pipes shall start as soon as the Engineer considers the joints to be satisfactory. Sand shall be carefully placed in six inch (6") layers in the trench so as not to move the pipe or dislodge any of the jointing material and thoroughly, but carefully compacted under or to the level as directed by the Engineer, and around the pipe to 12" over the top of the pipe. The utmost care shall be taken not to disturb the pipe by stepping on or near it or by throwing earth upon it from the bank above, or not to shift a pipe from its proper position by careless or unskilled ramming around it or by unequal filling on the sides.

6. Equal and similar care shall be exercised in filling up above the top of the sewer pipe.

B. Compaction

1. Where a trench is in a highway or city street right of way, backfill for the balance of the trench above a point one foot (1') above the top of the sewer shall be compacted by placing in layers of not more than eight inches (8") thickness and compacting with mechanical tampers or by any satisfactory method or methods that will obtain density hereinafter specified. The density of compacted material in each layer of backfill shall not be less than ninety percent (95%) of the maximum density as measured by Method A of AASHO Designation T-180 (Modified AASHO Test). The Contractor shall maintain the backfill for a period of one year after final acceptance and shall restore any backfill that fails and repair any pavement or other structures, which may be damaged as a result of backfill failure.

2. Where a trench is in open ground and not in a highway or street right of way, the balance of the trench above a point one foot (1') above the top of the sewer may be filled and compacted by approved equipment or mechanical tampers to obtain density equal to that of the adjacent undisturbed soil, and the surface mounded over the top to provide for some after-settlement. About two months after completion of this type of backfilling, the Contractor shall go over the trench again with a roller, refill to the surface of the ground, and re-roll or tamp to a satisfactory condition. The final surface shall be left in a condition equal to that originally found at the start of the work.

3. In those portions of the backfill which are adjacent to structures, or are for other reasons, inaccessible to the equipment used, the Contractor shall use mechanical tampers approved by the Engineer to obtain the specified density. Backfill shall be carefully placed so as to be equally distributed on all sides of the structure and so as not to damage the structure in any way.

4. Laboratory services for backfill density shall be performed by a commercial laboratory approved by the Engineer, but paid for by the Contractor. If settlement occurs the trenches shall be refilled, compacted, and made to conform to the original ground surface. The Contractor shall maintain the trenches in good and safe condition until final acceptance of work by the Owner, and he will be held responsible for any accident or damage to persons or property during the period of construction and for one year following the date of acceptance.

5. The Contractor shall maintain the backfill for a period of one year after final acceptance and shall restore any backfill that fails and repair any pavement or other structures which may be damaged as a result of backfill failure.

6. Pavement repair shall otherwise be in accordance with the City of Lake Charles Paving Specifications.

C. Clean-Up and Removal of Excess Materials

1. The Contractor shall not, without the permission of the Engineer, remove from the line of work any earth excavated therefrom which may be suitable for backfilling or

surfacing until the excavation has been refilled and surfaced.

2. As soon as the backfilling of any excavation is completed, the Contractor must at once begin the removal of all surplus dirt except that actually necessary to provide for the settlement of all filling unless otherwise provided in the Special Provisions. He shall also remove all pipe and other material placed or left on the street by him except material needed for the replacement of the paving. The street shall be opened up and made passable for traffic and the City of Lake Charles shall be notified in writing to that effect at once. Following the above work, the repairing and complete restoration of the street surface, bridges, crossing all places affected by the work shall be done as promptly as possible.

3.09 JACKING AND BORING

A. Where pipe lines are permitted or required to be jacked under roadways or other locations (with or without a sleeve pipe), the sleeve pipe or pipe line shall be installed by means of a boring machine or auger and hydraulic jack, or by other means satisfactory to the Engineer. In the event subsurface operation results in injury or damage to the pavement, repairs to this pavement shall be made by the Contractor at no additional cost to the owner. In the event the paving cracks on either side of the pipe line, or is otherwise disturbed or broken due to the Contractor's operations, he shall repair or replace same at his own expense without further compensation.

B. Where the boring location crosses a State or Federal highway, installation of the casing shall also be in accordance with all the requirements of the D.O.T.D. project permit issued for that location and the Contractor shall bid accordingly.

C. Any pipeline installed through a casing shall be installed according to manufacturer's recommendation, including, but not limited to, the following:

1. Pipe line properly supported on skid

2. Sand bedding of pipe line in casing

3. Properly sealing ends of casing pipe

3.10 TESTING

A. Pipe Testing

1. All pipe may be inspected and representative tests made at the place of manufacture by representatives of the City of Lake Charles to verify conformity with the specifications. A close check will be made for correct dimensions in the joint. Pipe may be inspected and tested prior to delivery to the site of the work and shall be checked for joint tolerances on the site prior to laying. The City of Lake Charles, at its discretion, may select at random any number lengths of pipe up to one length per hundred lengths from each run of pipe to the routine tests made under ASTM or AWWA specifications. The results of these special tests will be a prime factor in the acceptance or rejection of any given run of pipe.

B. Infiltration Testing

1. At no point in new sanitary sewer line shall the leakage of ground water into the system exceed an amount calculated on the basis of 250 gallons per day per mile per inch of diameter of sewer mains contributing at the flow at the point in question. THE FULL LENGTH OF ALL SEWER PIPE WILL BE TESTED FOR INFILTRATION.

C. Leakage Testing

1. After the line between manholes has been properly cleaned and backfilled, plugs shall be placed in either end of the line and inflated. Low-pressure air shall be introduced into the sealed line to a pressure of 4 psig and allowed to stabilize (a minimum of two [2] minutes) to a minimum pressure of 3.5 psig. If the time required to drop the air pressure to 2.5 psig is less than the time scheduled as follows for the various diameters, then the test has failed. The test may be concluded if the pressure does not fall to 2.5 psig in the time scheduled.

2. Minimum holding time required for pressure to drop from 3.5 psig to 2.5 psig shall be 10 min. for 12” and 4 min. for 8” diameter sewer pipe.

3. If the ground water table is above the top of the sewer pipe, the test pressure shall be adjusted upward to give a net pressure differential of 3.5 psig.

4. Any obvious excessive leaks in the system shall be repaired immediately upon discovery. Costs for repairing faulty work, including re-excavating and re-backfilling and for making tests, shall be included in the price bid for installing sewers.

D. Deflection Testing

1. Pipe shall not exceed a deflection of more than 5%. After pipe has been backfilled for at least 30 days, a mandrel sized at 95% of the inside pipe diameter shall be pulled through pipe for verification testing.

E. Manhole Testing

1. At least 25% of the completed manholes, as selected by the ENGINEER, shall be tested for water-tightness by the CONTRACTOR. The test shall be made, with all connecting pipes plugged, by filling the manhole with clean water to within two inches of the bottom of the cast iron frame. The leakage rate shall not exceed three gallons per day per foot of depth, or fifty gallons per day, whichever is less, over a test period of not less than two hours when the water table is not an adverse factor. For every manhole that fails to meet the test, four additional manholes shall be tested.

2. If the water table is an adverse factor, the manhole shall be pumped completely dry, all pipes plugged, and then be checked for infiltration. The leakage rate shall not exceed three gallons per day per foot of depth, or fifty gallons per day, whichever is less, over a test period of not less than two hours.

3. The CONTRACTOR shall repair all imperfections and leaks disclosed by either visual

inspection or testing. The method of repair shall be subject to the ENGINEER's approval.

END OF SECTION

SECTION 2
SANITARY SEWER FORCEMAINS

PART 1 GENERAL

1.01 SCOPE

A. The work covered by this specification consists of furnishing labor, materials and services for the construction of a sanitary sewer forcemain and shall consist of furnishing and installing sanitary sewer forcemain pipe and appurtenances, in accordance with these specifications, and in conformity with the lines and grades shown on the plans or established by the Engineer. This item includes furnishing and transporting materials, excavating, bracing, bedding, dewatering, laying, jointing, testing, backfilling, and surface cleanup.

B. Tracer wire shall be provided along the entire length of the forcemain as further detailed herein.

C. All Sanitary Sewer forcemains shall be designed such that the absolute minimum extents of the forcemain are to be installed beneath paved surfaces. The City of Lake Charles Waste Water Department reserves the right to grant waivers on the basis of special conditions; however, no sanitary sewer forcemain designed completely beneath the paved surfaces will be accepted.

1.02 REFERENCES

A. All materials, designs, and construction shall conform to the latest revisions of the following standards where these organizations have set standards:

1. American Society for Testing and Materials (ASTM)
2. American Concrete Institute (ACI)
3. Concrete Reinforcing Steel Institute (CRSI)
4. American National Standards Institute (ANSI)
5. American Water Works Association (AWWA)
6. The Society for Protective Coatings (SSPC)
7. National Sanitation Foundation (NSF)

1.03 SUBMITTALS

A. Submittals shall be made available to the City of Lake Charles Wastewater Division at any time during construction, at the request of the department.

B. Accurate construction record documents shall be submitted to the City of Lake Charles Wastewater Division for approval prior to acceptance of the sanitary sewer system. Project

record documents shall accurately record locations of pipe runs, service connections, manholes, and invert elevation within rights-of-way or permanent easements.

C. The same manufacturer shall supply all like materials and equipment of the same class, unless specified to the contrary. They shall be new, free from defects.

1.04 ACCEPTANCE

A. For acceptance by the City of Lake Charles, the sanitary sewer forcemain must be:

1. Pre-authorized for construction and subsequent public dedication as part of an approved development plan or preliminary subdivision plat;

2. Constructed to City standards and specifications established by the Wastewater Division;

3. Approved upon completion for conformity with standards and specifications by appropriate city personnel or representatives;

4. Subject to satisfactory maintenance guaranty, as determined by the City; and

5. Located within acceptable rights-of-way or readily accessible maintenance easements to be granted to the City;

6. Accurately depicted in record documents to be submitted.

1.05 WARRANTY

A. The Contractor shall guarantee all materials furnished by him free from inherent defects for a period of one year from date of final acceptance, with the exception of where more stringent warrantees are stated herein.

B. Any repairs, including labor, made necessary by inherent defects, shall be rendered without cost to the Owner within the guarantee period.

PART 2 PRODUCTS

2.01 GENERAL

A. Where a certain pipe material is specified on the plans, only that material can be used. All materials shall be new and in good condition.

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 SANITARY SEWER FORCEMAIN PIPE

A. Polyvinyl Chloride (PVC) Pipe:

1. Pipe (diameters 4-inch through 12-inch): AWWA C900, SDR 18, 235 psi pressure, NSF approved, 12454 B PVC compound conforming to ASTM Resin Specification D1784.

2. Pipe (diameters 14-inch through 24-inch): AWWA C905, SDR18 DIPS, 235 psi rating, NSF approved, 12454 B PVC compound conforming to ASTM Resin Specification D1784.

3. Pipe shall be new, homogeneous throughout, free of voids, cracks, inclusions, and other defects, uniform as commercially practical in color, density, and other physical properties.

4. All pipe shall be suitable for use as pressure conduit. Provisions must be made for expansion and contraction at each joint with an elastomeric ring. The bell shall consist of an integral wall section with a locked-in, solid cross section elastomeric ring which meets the requirements of ASTM A3139 and ASTM F477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C900. Installation shall be according to manufacturer's specifications.

5. All PVC pipe joints located within the limits of restrained joint sections, as well as those joints underneath existing or proposed pavement, shall be provided with restraining harnesses or approved integral restrained push on joints. Restraint harnesses shall be Series 2800 Megalug® restraint harness, manufactured by EBAA Iron, Inc., or approved equal.

6. PVC pipe shall be supplied in standard nominal laying lengths of 20 feet. The color of pipe shall be green. The pipe shall be marked with the size, material code, dimension ratio (DR), AWWA pressure class and AWWA designation.

7. Fittings for PVC pipe shall be ductile iron and conform to Section 2.03.

B. Ductile Iron (DI) Pipe

1. Pipe shall be designed in accordance with ANSI Specification A21.50 (AWWA C-150) for 150 psi working pressure. Ductile iron pipe shall have a minimum tensile strength of 60,000 psi with minimum yield strength of 42,000 psi (per AWWA M-41). Design shall be done for external and internal pressures separately using the larger of the two for the net design thickness. Additional allowances shall be made for service allowance and casting tolerance per AWWA C150. Pipe shall be manufactured in accordance with ANSI Specification A21.51 (AWWA C-151), latest revision.

2. The pipe interior shall be ceramic epoxy lined. The ceramic epoxy lining shall be a two component amine cured novalac epoxy of at least 87 percent solids. Lining material shall

be Protecto 401 by Induron Coatings, Birmingham, AL, or prior approved equal, and shall be installed in accordance with the manufacturer's recommendations, but not less than a 40 mil DFT.

3. The exterior of the pipe shall be coated, with an asphaltic coating 3 mil minimum thickness in accordance with ANSI Specification A21.51 (AWWA C151), latest revision.

4. All ductile iron pipe shall be installed with polyethylene encasement conforming to AWWA C105, installed in accordance with the manufacturer's recommendations. 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.

5. UNRESTRAINED PIPE JOINTS: Ductile iron pipe joints shall be push-on rubber gasket type or rubber-gasket mechanical joint per AWWA C111 in unrestrained applications. Unrestrained pipe joints shall be by one of the following or an approved equal:

   a. "Tyton Joint Pipe" by US Pipe and Foundry Company.

   b. "Fastite Joint Pipe" by the American Cast Iron Pipe Company.

   c. "Tyton Joint Pipe" or "Fastite Joint Pipe" by McWane Company.

6. RESTRAINED PIPE JOINTS: All ductile iron pipe joints located within the limits of restrained joint sections shall be provided with restraining harnesses or approved integral restrained push on joints. Location of restrained joints shall be subject to the approval of the Engineer and direct payment will be made per each restrained joint, regardless of the method of restraint. Restraints for ductile iron pipe joints shall be push on rubber gasket with integral proprietary restrained joint or a mechanical restraint harness manufactured for ductile iron push on joint pipe. Restraint harnesses shall be Series 1700 Megalug® restraint harness, manufactured by EBAA Iron, Inc., or approved equal. Restrained push on joints shall be by one of the following or an approved equal:

   a. "TR Flex" or "HP Lock" by US Pipe and Foundry Company.

   b. "Flex Ring (positive locking style)" by the American Cast Iron Pipe Company.

   c. "TR Flex" by McWane Company.

7. Fittings for ductile iron pipe shall be ductile iron and conform to Section 2.03.

8. Ductile iron pipe shall be manufactured in the United States by American Cast Iron Pipe Company, McWane Company, U.S. Pipe and Foundry Company, or approved equal.

C. High Density Polyethylene Pipe (HDPE Pipe):

1. HDPE Pipe shall be AWWA C906, DIPS, SDR11, PE 3408 High Density, DIPS, Cell Classification 345434C, in accordance with ASTM D3350.

2. HDPE sewer force main pipe shall have a green colored stripe along the entire exterior length of the pipe.

3. Transition Fittings shall be a mechanical joint adapter (Harvey Adapter) fabricated from HDPE pipe conforming to ASTM 3350. The adapter shall have a pre-positioned stainless steel stiffener and shall offer full axial restraint, by means of a restraining gland.

4. Butt-fusion of pipes and fittings shall be performed in accordance with the pipe manufacturer's recommendations as to equipment and technique. Fusion shall be accomplished by personnel certified as fusion technicians by a manufacturer of HDPE pipe and/or fusing equipment.

5. Fittings for HDPE pipe shall be ductile iron and conform to Section 2.03.

2.03 FITTINGS

A. Mechanical joint ductile Iron fittings shall be used for HDPE, PVC, and Ductile Iron Forcemains downstream of the valve vault.

B. Ductile iron fittings shall be standard body ANSI A21.10/AWWA C110 or compact body ANSI A21.53/AWWA C153, as required by the construction documents. The rated working pressure shall be 350 psi for 24-inch and smaller and 250 psi for 30-in and larger.

C. The fitting interior shall be ceramic epoxy lined. The ceramic epoxy lining shall be a two component amine cured novalac epoxy of at least 87 percent solids. Lining material shall be Protecto 401 by Induron Coatings, Birmingham, AL, or prior approved equal, and shall be installed in accordance with the manufacturer's recommendations, but not less than a 40 mil DFT.

D. The exterior of the fitting shall be coated, with an asphaltic coating 3 mil minimum thickness in accordance with ANSI Specification A21.51 (AWWA C151), latest revision.

E. All mechanical joint fittings shall be installed with restraining glands in addition to concrete thrust blocks. Restraining glands shall be Series 1300C by Uniflange; Megalug Series 1100 PV or Series 2000PV by EBAA Iron Sales, Inc, or approved equal.

F. All ductile iron fittings shall be installed with polyethylene encasement conforming AWWA C105, installed in accordance with the manufacturer's recommendations. 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.

G. Bolts and nuts shall be alloy steel (Corten Type).

3.03 RESTRAINT HARNESS

A. All pipe joints located within the limits of restrained joint sections shall be provided with restraining harnesses or approved integral restrained push on joints. Location of restrained joints shall be subject to the approval of the Engineer. Restraints for joints shall be push on

rubber gasket with integral proprietary restrained joint or a mechanical restraint harness manufactured for push on joint pipe. Restraint harnesses shall be Series 1700 or Series 2800 Megalug® restraint harness, manufactured by EBAA Iron, Inc., or approved equal.

B. Bolts and nuts shall be alloy steel (Corten Type).

2.05 CASING FOR JACKING AND BORING

A. Unless otherwise required by the agency having jurisdiction, the casing shall be welded steel pipe meeting ASTM A53, Grade B, and have a minimum yield strength of 35,000 psi. The exterior of the casing pipe shall be coated with coal tar epoxy or bituminous asphalt. Minimum wall thickness shall be as shown in the following table:

Table for minimum wall thickness for steel casing pipe for E72 loading		
Carrier Pipe Nominal Diameter (inches)	Min. Casing Pipe Diameter (O.D.) (inches)	Nominal Thickness (inches)
6	12	0.344
8	16	0.375
10	20	0.407
12	24	0.469
14	27	0.505
16	30	0.505
18	30	0.505
20	36	0.595
24	36	0.595
30	42	0.625
36	48	0.688
42	60	0.844

2.06 TRACER WIRE

A. Tracer wire for horizontal directional drilling operations shall be 8 gauge, Copper Clad Steel, extruded with a 45 mil (minimum) HDPE coating, .219 inches (minimum) O.D. Rated break load 2,785 lbs., 30 volt, 21% IACS. The outside color of the wire shall meet the APWA color code of the buried utility line. Tracer wire shall be Pro-Trace HDD-CCS PE45 as manufactured by Pro-Line Safety Products Co., or Engineer approved equal.

B. Tracer wire for direct bury shall be 8 gauge, Copper Clad Steel, extruded with a 45 mil (minimum) HDPE coating, .219 inches (minimum) O.D. Rated break load 713 lbs., 30 volt, 21% IACS. The outside color of the wire shall meet the APWA color code of the buried utility line. Tracer wire shall be Pro-Trace HF-CCS PE45 as manufactured by Pro-Line Safety Products Co., or Engineer approved equal.

C. The wire shall be held in place by tacking it to the top of the pipe using duct tape at approx. 10 foot centers and shall be continuous for the entire length of the water line. Sufficient slack shall be provided at each valve location in order that the wire can be pulled up into the valve box for easy access.

D. Attach wire to all fixtures and appurtenances to ensure continuous flow of electrical current.

E. Splices in detection wire shall be installed per the manufacturer's directions.

2.07 COUPLINGS

A. Sleeve type couplings shall be Dresser Style 38, 138 or equal.

2.08 CONCRETE

A. Concrete for thrust blocks and pads shall be 3000 psi at twenty eight (28) days. Concrete shall be ready mix; not Sakrete.

2.09 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.

2.10 COMBINATION AIR VALVES

A. Combination air valves shall be installed on high points along the forcemain length, as well as, those locations, where in the opinion of the Engineer air may become trapped in the forcemain.

B. Combination air valves shall be of the size specified by the Engineer and shall be as manufactured ARI, Golden Anderson, or approved equal.

C. Air Valves shall be installed in a Pre-Cast Concrete manhole in accordance with the City of Lake Charles specifications for concrete manholes, or similar structure approved by the City of Lake Charles Waste Water Department. The concrete structure shall be lined with a multi-component stress panel interior lining system.

2.11 FOUNDATION, BEDDING, AND BACKFILL MATERIAL

A. Foundation Material

1. Crushed limestone or crushed Portland cement concrete shall be used for structure foundations and pipe foundation amendments as detailed herein. Crushed limestone or crushed Portland Cement Concrete foundation material shall meet the following #610 gradations.

Sieve Size	**Percent Finer By Weight**
1 – ½ in	100
1 - in	90 to 100
3/4 - in	70 to 95
3/8 - in	50 to 80
No. 4	35 to 65
No. 10	25 to 50
No. 40	10 to 26
No. 200	4 to 12

B. Bedding and Embedment Material

a. Sand shall be used for bedding and initial backfill of the forcemain as further detailed herein. Sand for embedment shall be non-plastic siliceous material and shall conform to the following gradation limits:

Sieve Size	Percent Finer By Weight
½ - in	100
No. 10	75 to 100
No. 200	0 to 10

C. Backfill Materials

1. Usable Native Excavated Soils shall be used for trench back fill when the entirety of the trench is located more than five (5) feet from the edge of the roadway or paved surface. Usable native excavated materials shall meet the following requirements.

a. Usable native excavated soils shall have a maximum PI of 25 and maximum organic content of five (5) percent. Soils with a silt content of fifty (50) percent or greater and also a PI of ten (10) or less will not be allowed. Any select material used to supplement or replace usable excavated soil shall meet these requirements and must be approved by the Engineer. Soil shall be tested at the Engineer and the Owner's option. Usable excavated material may be neatly stockpiled at the site where designated by the Engineer provided there is an area available that will not interfere with the Owner's access nor inconvenience traffic adjoining property owners.

b. When excavated soils do not meet the above stated requirements they shall be removed from the site, at the contractors expense, and replaced with Select or Sand Backfill Material.

2. Select or Sand Backfill Material shall be used for trench backfill when any portion of the trench is to be installed within five (5) feet from the edge of the roadway or paved surface.

a. Sand for backfilling trenches and structures shall be non-plastic siliceous material and shall conform to the following gradation limits:

Sieve Size	Percent Finer By Weight
½ - in	100
No. 10	75 to 100
No. 200	0 to 10

b. Select backfill material shall be natural soils with a maximum PI of 20, maximum Liquid Limit of 35, and a maximum organic content of 5 percent. Soils with a silt content of 50 percent or greater and also a PI of 10 or less shall not be allowed.

3. Crushed limestone or Crushed Portland Cement Concrete Backfill

a. Crushed limestone or crushed Portland Cement Concrete backfill material shall be used for trench backfill when the trench is to be installed beneath any paved surface, or as directed by the Engineer. Crushed limestone or crushed Portland Cement Concrete backfill material shall meet the requirements set forth above for Foundation material.

PART 3 EXECUTION

3.01 GENERAL

A. Coordinate with other utility providers to the fullest extent possible complete maximum spacing from all utilities for ease of access.

B. Forcemains shall be installed with wall to wall clear separations of not less than 6-feet horizontally and 18-inches vertically from potable water lines. Where these separations are not able to be met, the line shall be encased in concrete.

C. Any materials damaged during installation shall be removed and discarded.

3.02 ALIGNMENT AND GRADE

A. The contractor shall use a chalk line to assist in alignment of the pipe line.

B. Whenever obstructions not shown on the plans are encountered, and the Engineer deems it necessary to change alignment to expedite the work, if the change in plans result in a change of the amount of work by the Contractor, such altered work will be allowed the Contractor on the basis of bid unit prices or extra work order, whichever the case may be.

C. The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures, both known and unknown may be determined, and he shall be held responsible for the repair of such structures when broken or otherwise damaged because of carelessness on his part. Unless specifically ordered by the Engineer, the minimum coverage of this pipe line shall be forty-eight inches (48").

3.03 TRENCHING AND EXCAVATION

A. Excavation

1. Excavation shall include the removal, handling, re-handling, 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, and trench box. The work of excavation shall also include the responsibility of added expenses or other liability that may arise from quicksand, obstacles or conditions, foreseen or unforeseen, which may be encountered in the work. It includes clearing and the removal of pavements, curbs, sidewalks, shrubbery, and other obstructions not otherwise provided for.

B. Lines of Excavation

1. The trench shall be dug so that the pipe can be laid to the alignment and depth required and it shall be excavated no more than 500 feet in advance of pipe laying. All excavation shall be made in such manner and to such widths as will give ample room for properly installing and inspecting the piping. All excavation necessary for laying pipe, constructing manholes, etc., shall be made to line and grade as indicated on the plans and as specified herein. Trenches shall be dug to the alignment and depth required and only so far ahead of the pipe laying as the Engineer will permit. The trench shall be braced and drained as may be required so that workmen may work therein safely and efficiently. A trench box may be used in lieu of sheeting and shoring.

2. Bottoms of trenches shall be excavated and formed to provide for pipe bedding or pipe foundations as hereinafter specified or as required by the plans or Special Provisions.

3. Bell holes, where necessary to make up the joints, shall be dug of sufficient size that the whole length of the pipe barrel be bedded as required, and to allow all of the joints to be properly made.

4. All excavation shall be open cuts with vertical sides except in special cases where the Engineer may permit sloping sides above a point two feet (2') above the top of the pipe, or except where tunneling is permitted or required.

5. If tunnels are authorized or required, they shall be only as large as necessary for the installation of the pipe and as approved by the Engineer or as detailed on the plans.

6. The maximum width of trench or sewer pipe installation at a point two feet (2') above the top of the pipe shall be the external diameter of the barrel of the pipe plus nine inches (9") on each side of the pipe.

C. Methods of Excavation

1. The Engineer shall have the authority, at any time, to require the Contractor to discontinue the use of any excavating machine or other appliance which, in the Engineer's judgment, is not adapted to the purpose for which it is used.

D. Dewatering

1. The trenches shall be maintained free of water at all times while work is in progress, and water shall not be allowed to flow over or rise upon earth foundations, pipe, concrete masonry, or other work, except as otherwise specified for bayou crossings and special "wet areas." The Contractor shall not open more trench than the available pumping facilities can dewater to the satisfaction of the Engineer.

2. The Contractor shall assume all responsibility for disposing of all water so as not to injure or interfere with normal drainage of the locality. In no case shall water pipe lines be used as drains for such water. The ends of water pipe lines shall be adequately and properly plugged during construction by the use of approved stoppers (a garbage bag is not an approved stopper), and all necessary precautions shall be taken to prevent the entrance of ground water, mud, sand, or any other objectionable materials into the pipe

lines. If such materials enter the pipe lines, they shall be removed by the Contractor as soon as possible after discovery thereof.

3. The Contractor shall use due vigilance and care so that no water originating on his work or due to his work or which he is obligated to handle and dispose of under this contract shall discharge or be discharged on the work or into the trenches of another contractor unless a mutual agreement by the parties affected has been reached. Nothing in this section is to be construed as preventing the reasonable use by the Contractor of any ditch, channel, storm drain, or gutter which is designated and used for City or Parish drainage.

E. Maintenance of Excavation

1. The Contractor shall maintain all excavation in good order during the construction, so as not to hinder or injure the pipe laying, masonry, or other work. He shall take all reasonable precautions to prevent movement of the sides of such excavation, and shall remove at his own expense any material sliding into the excavation.

F. Sheeting and Bracing

1. The Contractor shall furnish and put in place such sheeting and bracing as may be required to support the sides of all trenches or other excavations and, where required, remove, or cut off, as directed, such sheeting at his own expense. A steel trench box, supplemented with additional sheeting, may be used in lieu of total sheeting and bracing.

G. Disposal of Excavated Material

1. All material excavated shall be placed so as to interfere as little as possible with public travel. In case the street is not wide enough to allow the dirt to be piled up without blocking the sidewalk, the Contractor shall, at his own expense, maintain an open passageway not less than two and one-half feet (2 ½') wide on the sidewalk and shall keep this passageway free from mud and slush.

2. The Contractor may deposit excavated materials directly in permanent position insofar as is consistent with the proper prosecution of the work. Materials that cannot be placed at once in permanent position shall be deposited in temporary storage piles. All this work shall be done with reasonable neatness and excavated materials shall not be carelessly strewn over the area.

3. Surplus excavated material over and above that required for backfilling, mounding over the pipe and making other fills and embankments to the finished lines and grades indicated on the drawings shall be disposed of as directed by the Engineer. The Contractor shall be responsible for seeing that the material is dumped in an orderly manner within the limits designated. The surface of the dump shall be neatly graded to blend with the natural contours of the existing ground surface. If the City or Drainage Board has no use for the surplus material, it will be the responsibility of the Contractor to properly dispose of said surplus.

3.04 BEDDING

A. As soon as the excavation is complete to normal grade of the bottom of the trench, bedding shall be placed, compacted and graded to provide firm, uniform and continuous support for the pipe. Bell holes shall be excavated so that only the barrel of the pipe bears upon the bedding. The pipe shall be laid accurately to the lines and grades indicated on the Drawings. Blocking under the pipe will not be permitted. Bedding shall be placed evenly on each side of the pipe to mid diameter and hand tools shall be used to force the bedding under the haunches of the pipe and into the bell holes to give firm continuous support for the pipe.

B. Where the bottom of the excavation is not, in the opinion of the Engineer, of suitable material for the construction of required pipe foundation, the excavation shall be deepened and a limestone foundation shall be placed under the pipe as directed by the Engineer. This stone foundation is not to be included in the price bid for laying pipe and will be paid for as a separate item.

C. Where the Contractor exceeds the maximum trench width to the extent that excessive backfill loads are imposed on the pipe, or where the trench is over-excavated, as determined by the Engineer; the Contractor shall provide limestone or such additional pipe foundation as the Engineer may require without any additional compensation. Over-excavated trenches shall not be brought up to grade with excavated material.

3.05 PIPE INSTALLATION

A. The pipe shall be installed on a uniform pipe foundation over its entire length.

B. Thoroughly clean the bell or coupling end and the plain end of the pipe and apply the joint lubricant liberally, shove the plain end of the pipe into the bell and coupling end of the pipe until the pipe hits the bevel of the bell, fitting or coupling.

C. When work is not in progress, the ends of the pipe and fittings shall be plugged so foreign material cannot enter pipe.

D. Provide bell holes at each joint to permit proper joint assembly and uniform pipe support.

E. 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, AWWA C600, and AWWA M55.

F. The trench shall provide continuous support for the pipe without voids or soft spots under the pipe.

G. Concrete thrust block, as well as, restraining glands 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.

H. 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.

I. High points in the forcemain shall me minimized during the course of the installation. Where high points cannot be avoided or are the product of obstruction crossings, combination air valves shall be installed in these locations.

3.06 AIR VALVE INSTALLATION

A. Air Valves shall be installed in a Pre-Cast Concrete manhole in accordance with the City of Lake Charles specifications for concrete manholes, or similar structure approved by the City of Lake Charles Waste Water Department. The concrete structure shall be lined with a multi-component stress panel interior lining system.

B. The air valve shall be installed in accordance with the manufacturer's printed instructions.

C. The air valve shall be oriented in the vault for easy access and maintenance.

D. The manhole shall be installed on a foundation of 6-inches of No. 57 Limestone.

3.07 LEAKAGE TESTING:

A. All pipe lines shall be hydrostatically tested as specified herein and as otherwise required to demonstrate that they will successfully withstand 100 psi operating pressure without leakage in excess of the specified maximum in any test section of the pipe line, all as approved by the Engineer.

B. For leakage tests of pipe lines the air shall be completely expelled from the section of pipe line to be tested, and the test shall be made at a hydrostatic pressure of not less than 100 psi for a duration of not less than two (2) hours, during which the leakage shall not exceed one (1) gallon per inch of nominal diameter per mile of pipe per hour. In all cases, the test period shall be of sufficient duration to permit proper examination of pipe joints and other items in the test section of pipe line.

C. All pipe, joints, fittings, valves, and other items found to be cracked, leaking or otherwise defective, shall be removed and replaced, and the pipe lines shall be retested until the test requirements have been complied with.

3.08 BACKFILL

A. General

1. No backfilling of trenches shall be done until the pipe work to be covered has been inspected. Where any sheeting or bracing is withdrawn as backfilling progresses, all voids or spaces left thereby shall be carefully and thoroughly filled and compacted with proper tools.

2. The Engineer shall have the right to reject compaction methods and/or equipment, which do not produce satisfactory results.

3. Material for backfill shall contain no rubble, trash, broken concrete, asphalt or other objectionable materials.

4. All backfill operations shall be subject to the approval of the Engineer. The Contractor shall be responsible for the stability of all backfill made under the contract until one year after final acceptance of the work and shall bear the expense of replacing any portions which have become displaced due to carelessness or negligent work on the part of the Contractor or to damages, resulting from natural causes, such as storms, and not attributable, in the opinion of the Engineer, to unavoidable movements on the ground upon which the backfill is made.

5. Backfilling trenches for sewer pipes shall start as soon as the Engineer considers the joints to be satisfactory. Sand shall be carefully placed in six inch (6") layers in the trench so as not to move the pipe or dislodge any of the jointing material and thoroughly, but carefully compacted under or to the level as directed by the Engineer, and around the pipe to 12" over the top of the pipe. The utmost care shall be taken not to disturb the pipe by stepping on or near it or by throwing earth upon it from the bank above, or not to shift a pipe from its proper position by careless or unskilled ramming around it or by unequal filling on the sides.

6. Equal and similar care shall be exercised in filling up above the top of the sewer pipe.

B. Compaction

1. Where a trench is in a highway or city street right of way, backfill for the balance of the trench above a point one foot (1') above the top of the sewer shall be compacted by placing in layers of not more than eight inches (8") thickness and compacting with mechanical tampers or by any satisfactory method or methods that will obtain density hereinafter specified. The density of compacted material in each layer of backfill shall not be less than ninety percent (95%) of the maximum density as measured by Method A of AASHO Designation T-180 (Modified AASHO Test). The Contractor shall maintain the backfill for a period of one year after final acceptance and shall restore any backfill that fails and repair any pavement or other structures, which may be damaged as a result of backfill failure.

2. Where a trench is in open ground and not in a highway or street right of way, the balance of the trench above a point one foot (1') above the top of the sewer may be filled and compacted by approved equipment or mechanical tampers to obtain density equal to that of the adjacent undisturbed soil, and the surface mounded over the top to provide for some after-settlement. About two months after completion of this type of backfilling, the Contractor shall go over the trench again with a roller, refill to the surface of the ground, and re-roll or tamp to a satisfactory condition. The final surface shall be left in a condition equal to that originally found at the start of the work.

3. In those portions of the backfill which are adjacent to structures, or are for other reasons, inaccessible to the equipment used, the Contractor shall use mechanical tampers approved by the Engineer to obtain the specified density. Backfill shall be carefully placed so as to be equally distributed on all sides of the structure and so as not to damage the structure in any way.

4. Laboratory services for backfill density shall be performed by a commercial laboratory

approved by the Engineer, but paid for by the Contractor. If settlement occurs the trenches shall be refilled, compacted, and made to conform to the original ground surface. The Contractor shall maintain the trenches in good and safe condition until final acceptance of work by the Owner, and he will be held responsible for any accident or damage to persons or property during the period of construction and for one year following the date of acceptance.

5. The Contractor shall maintain the backfill for a period of one year after final acceptance and shall restore any backfill that fails and repair any pavement or other structures which may be damaged as a result of backfill failure.

6. Pavement repair shall otherwise be in accordance with the City of Lake Charles Paving Specifications.

C. Clean-Up and Removal of Excess Materials

1. The Contractor shall not, without the permission of the Engineer, remove from the line of work any earth excavated therefrom which may be suitable for backfilling or surfacing until the excavation has been refilled and surfaced.

2. As soon as the backfilling of any excavation is completed, the Contractor must at once begin the removal of all surplus dirt except that actually necessary to provide for the settlement of all filling unless otherwise provided in the Special Provisions. He shall also remove all pipe and other material placed or left on the street by him except material needed for the replacement of the paving. The street shall be opened up and made passable for traffic and the City of Lake Charles shall be notified in writing to that effect at once. Following the above work, the repairing and complete restoration of the street surface, bridges, crossing all places affected by the work shall be done as promptly as possible.

3.09 JACKING AND BORING

A. Where pipe lines are permitted or required to be jacked under roadways or other locations (with or without a sleeve pipe), the sleeve pipe or pipe line shall be installed by means of a boring machine or auger and hydraulic jack, or by other means satisfactory to the Engineer. In the event subsurface operation results in injury or damage to the pavement, repairs to this pavement shall be made by the Contractor at no additional cost to the owner. In the event the paving cracks on either side of the pipe line, or is otherwise disturbed or broken due to the Contractor's operations, he shall repair or replace same at his own expense without further compensation.

B. Where the boring location crosses a State or Federal highway, installation of the casing shall also be in accordance with all the requirements of the D.O.T.D. project permit issued for that location, and the Contractor shall bid accordingly.

C. Any pipeline installed through a casing shall be installed according to manufacturer's recommendation, including, but not limited to, the following:

1. Pipe line properly supported on skid

2. Sand bedding of pipe line in casing

3. Properly sealing ends of casing pipe

3.10 DIRECTIONAL DRILLING

A. The drilling shall be performed by a company with sufficient experience and expertise to perform the work in conformance with the drawings and these specifications. The contractor is responsible for all cleanup and disposal of debris, cuttings, soil, etc. and shall perform this portion of the work in an environmentally sound manner.

B. The Contractor shall clean up and dispose of excess drilling mud associated with the boring process. The mud shall be disposed of in a timely manner. All driveways, pavement, and walkways shall be cleaned at the end of each day. Excess mud in the roadside ditches shall be managed so as not to block drainage during the process of the work. This cleanup shall proceed with the work and not be left for the end of the project.

3.11 FORCEMAIN CONNECTIONS TO MANHOLES

A. Connect force main to manholes at locations indicated on the Drawings.

B. Provide watertight connector at force main tie-in.

C. The interior lining of existing receiving manhole shall be repaired per the manufacturers' recommendations. The interior of all new receiving manholes shall be lined with a multi-component stress panel interior liner system. Receiving manholes currently not installed with the specified lining system, shall be lined at the expense of the Contractor.

END OF SECTION

SECTION 3
WATER DISTRIBUTION SYSTEM

PART 1 GENERAL

1.01 SCOPE

A. The work covered by this specification consists of furnishing labor, materials and services for the construction of water distribution lines complete with all necessary pipe, fittings, adapters, valves, valve boxes, thrust blocks, fire hydrants, service connections, meter boxes, complete and operable, pressure tested and disinfected. The requirements of these specifications shall govern any proposed connections to existing water infrastructure owned and operated by the City of Lake Charles. All work shall be in accordance with requirements of the Owner and Engineer. This item includes furnishing and transporting materials, excavating, bracing, bedding, dewatering, laying, jointing, testing, backfilling, and surface cleanup.

B. All distribution systems shall be designed such that the absolute minimum extents of the distribution system are to be installed beneath paved surfaces. The City of Lake Charles Water Department reserves the right to grant waivers on the basis of special conditions; however, no water distribution system designed completely beneath the paved surfaces will be accepted. Any and all joints and fittings installed beneath paved services shall be fully restrained.

C. Tracer wire shall be provided along the entire length of the water main, as well as all service lines, as further detailed herein.

1.02 REFERENCES

A. All materials and designs shall conform to the requirements of these specifications. They shall be new, free from defects, and they shall conform to the following standards where these organizations have set standards:

1. Louisiana Department of Health (LDH)
2. American Society for Testing and Materials (ASTM)
3. American Concrete Institute (ACI)
4. Concrete Reinforcing Steel Institute (CRSI)
5. American National Standards Institute (ANSI)
6. American Water Works Association (AWWA)

B. The same manufacturer shall supply all like materials and equipment of the same class, unless specified to the contrary.

1.03 SUBMITTALS

A. Submittals shall be made available to the City of Lake Charles Water Division during at any time during construction, at the request of the department.

B. Accurate construction record documents shall be submitted to the City of Lake Charles Water Division for approval prior to acceptance of the water distribution system. Project record documents shall accurately record locations of pipe runs, service connections, isolation valves, and air release valves.

1.04 ACCEPTANCE

A. For acceptance of the by the City of Lake Charles, the water distribution system must be:

1. Pre-authorized for construction and subsequent public dedication as part of an approved development plan or preliminary subdivision plat;

2. Constructed to City standards and specifications established by the Water Division;

3. Approved upon completion for conformity with standards and specifications by appropriate city personnel or representatives;

4. Subject to satisfactory maintenance guaranty, as determined by the City; and

5. Located on acceptable rights-of-way or readily accessible maintenance easements to be granted to the City.

6. Accurately depicted in record documents to be submitted

1.06 WARRANTY

A. The Contractor shall guarantee all materials furnished by him free from inherent defects for a period of one year from date of final acceptance, with the exception of where more stringent warrantees are stated herein.

B. Any repairs, including labor, made necessary by inherent defects, shall be rendered without cost to the Owner within the guarantee period.

PART 2 PRODUCTS

2.01 GENERAL

A. Where a certain pipe material is specified on the plans, only that material can be used. All materials shall be new and in good condition.

B. No water distribution line shall be less than 8-inches in diameter.

C. No water service line shall be less than 1-inch in diameter. All water service taps to the main shall service a single residence, or a single building with no interconnectivity.

2.02 WATER DISTRIBUTION PIPE

A. Polyvinyl Chloride (PVC) Pipe

1. Pipe (diameters 4-inch through 12-inch): AWWA C900, SDR 18, 235 psi pressure, NSF approved, 12454 B PVC compound conforming to ASTM Resin Specification D1784.

2. Pipe (diameters 14-inch through 24-inch): AWWA C905, SDR18 DIPS, 235 psi rating, NSF approved, 12454 B PVC compound conforming to ASTM Resin Specification D1784.

3. Pipe shall be new, homogeneous throughout, free of voids, cracks, inclusions, and other defects, uniform as commercially practical in color, density, and other physical properties.

4. All pipe shall be suitable for use as pressure conduit. Provisions must be made for expansion and contraction at each joint with an elastomeric ring. The bell shall consist of an integral wall section with a locked-in, solid cross section elastomeric ring which meets the requirements of ASTM A3139 and ASTM F477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C900. Installation shall be according to manufacturer's specifications.

5. All PVC pipe joints located within the limits of restrained joint sections, as well as those joints underneath existing or proposed pavement, shall be provided with restraining harnesses or approved integral restrained push on joints. Restraint harnesses shall be Series 2800 Megalug® restraint harness, manufactured by EBAA Iron, Inc., or approved equal.

6. PVC pipe shall be supplied in standard nominal laying lengths of 20 feet. The color of pipe shall be blue. The pipe shall be marked with the size, material code, dimension ratio (DR), AWWA pressure class and AWWA designation.

7. Fittings for PVC pipe shall be ductile iron and conform to Section 2.03.

B. Ductile Iron (DI) Pipe

1. Pipe shall be designed in accordance with ANSI Specification A21.50 (AWWA C-150) for 150 psi working pressure. Ductile iron pipe shall have a minimum tensile strength of 60,000 psi with minimum yield strength of 42,000 psi (per AWWA M-41). Design shall be done for external and internal pressures separately using the larger of the two for the net design thickness. Additional allowances shall be made for service allowance and casting tolerance per AWWA C150. Pipe shall be manufactured in accordance with ANSI Specification A21.51 (AWWA C-151), latest revision.

2. The pipe interior shall be standard cement lined and seal coated with an asphaltic coating in accordance with ANSI Specification A21.4 (AWWA C104) and ANSI A21.16, latest revision.

3. The exterior of the pipe shall be coated, with an asphaltic coating 3 mil minimum thickness in accordance with ANSI Specification A21.51 (AWWA C151), latest revision.

4. All ductile iron pipe shall be installed with polyethylene encasement conforming to AWWA C105, installed in accordance with the manufacturer's recommendations. 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.

5. UNRESTRAINED PIPE JOINTS: Ductile iron pipe joints shall be push-on rubber gasket type or rubber-gasket mechanical joint per AWWA C111 in unrestrained applications. Unrestrained pipe joints shall be by one of the following or an approved equal:

   a. “Tyton Joint Pipe” by US Pipe and Foundry Company.

   b. “Fastite Joint Pipe” by the American Cast Iron Pipe Company.

   c. “Tyton Joint Pipe” or “Fastite Joint Pipe” by McWane Company.

6. RESTRAINED PIPE JOINTS: All ductile iron pipe joints located within the limits of restrained joint sections shall be provided with restraining harnesses or approved integral restrained push on joints. Location of restrained joints shall be subject to the approval of the Engineer and direct payment will be made per each restrained joint, regardless of the method of restraint. Restraints for ductile iron pipe joints shall be push on rubber gasket with integral proprietary restrained joint or a mechanical restraint harness manufactured for ductile iron push on joint pipe. Restraint harnesses shall be Series 1700 Megalug® restraint harness, manufactured by EBAA Iron, Inc., or approved equal. Restrained push on joints shall be by one of the following or an approved equal:

   a. "TR Flex" or “HP Lock” by US Pipe and Foundry Company.

   b. "Flex Ring (positive locking style)" by the American Cast Iron Pipe Company.

   c. "TR Flex" by McWane Company.

7. Fittings for ductile iron pipe shall be ductile iron and conform to Section 2.03.

8. Ductile iron pipe shall be manufactured in the United States by American Cast Iron Pipe Company, McWane Company, U.S. Pipe and Foundry Company, or approved equal.

C. High Density Polyethylene Pipe (HDPE Pipe)

1. HDPE Pipe shall be AWWA C906, DIPS, SDR11, PE 3408 High Density, DIPS, Cell Classification 345434C, in accordance with ASTM D3350.

2. The pipe shall have a blue stripe.

3. Transition Fittings shall be a mechanical joint adapter (Harvey Adapter) fabricated from HDPE pipe conforming to ASTM 3350. The adapter shall have a pre-positioned stainless steel stiffener and shall offer full axial restraint as manufactured by JCM Industries, or approved equal.

4. Butt-fusion of pipes and fittings shall be performed in accordance with the pipe manufacturer's recommendations as to equipment and technique. Fusion shall be accomplished by personnel certified as fusion technicians by a manufacturer of HDPE pipe and/or fusing equipment.

5. Fittings for HDPE pipe shall be ductile iron and conform to Section 2.03.

2.03 FITTINGS

A. Mechanical joint ductile Iron fittings shall be used for HDPE, PVC, and Ductile Iron Water Mains.

B. Ductile iron fittings shall be standard body ANSI A21.10/AWWA C110 or compact body ANSI A21.53/AWWA C153, as required by the construction documents. The rated working pressure shall be 350 psi for 24-inch and smaller and 250 psi for 30-in and larger.

C. The fitting interior shall be double cement lined and seal coated with an asphaltic coating in accordance with ANSI Specification A21.4 (AWWA C104) and ANSI A21.16, latest revision.

D. The exterior of the fitting shall be coated, with an asphaltic coating approximately 1 mil thick in accordance with ANSI Specification A21.51 (AWWA C151), latest revision.

E. All mechanical joint fittings shall be installed with restraining glands in addition to concrete thrust blocks. Restraining glands shall be Series 1300C by Uniflange; Megalug Series 1100 PV or Series 2000PV by EBAA Iron Sales, Inc, or approved equal.

F. All ductile iron fittings shall be installed with polyethylene encasement conforming AWWA C105, installed in accordance with the manufacturer's recommendations. 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.

G. Bolts and nuts shall be alloy steel (Corten Type).

2.04 RESTRAINT HARNESS

A. All pipe joints located within the limits of restrained joint sections shall be provided with restraining harnesses or approved integral restrained push on joints. Location of restrained joints shall be subject to the approval of the Engineer. Restraints for joints shall be push on rubber gasket with integral proprietary restrained joint or a mechanical restraint harness manufactured for push on joint pipe. Restraint harnesses shall be Series 1700 or Series 2800 Megalug® restraint harness, manufactured by EBAA Iron, Inc., or approved equal.

B. Bolts and nuts shall be alloy steel (Corten Type).

2.05 RESILIENT SEATED GATE VALVES

A. Resilient wedge gate valves shall meet or exceed all applicable requirements of ANSI/AWWA C515 or ANSI/AWWA C509 standards, latest revision. They shall be UL listed, FM approved and certified to ANSI/NSF 61 and ANSI/NSF 372.

B. Valve type shall be non-rising stem (NRS), dual seal between gate and body, smooth closing gate and one piece cast-iron wedge with integral lugs. Valves shall have standard o-ring seals, two o-ring seals shall be set above the stem thrust collar and one below.

C. Valves shall have Type 304 stainless steel bolts and nuts for the stuffing box and bonnet.

D. The internal and external ferrous components of the valve shall be fusion bonded epoxy coated meeting ANSI/AWWA C550 Standard. Coating shall be applied prior to assembly to assure coverage of all exposed areas.

E. Valves shall have the manufacturer's name, size of the valve, and working pressure cast into the exterior of the valve.

F. Valves for buried service shall be mechanical joint as per AWWA C111 and shall be provided with a 2" square operating nut as standard. Buried gate valves shall be installed in the vertical position, unless otherwise directed by the Engineer and approved by the City of Lake Charles. Buried gate valves installed in the horizontal position shall have guides and/or rollers to the support the gate. Valves for buried service shall have an arrow cast on the ductile iron operating nut showing opening direction; direction to open shall be counter-clockwise. Bolts and nuts for direct bury mechanical joint assembly shall be alloy steel (Corten Type).

G. Valves for above grade service in meter vaults shall have flanged ends conforming to the AWWA C500, class 125. Above grade service valves shell be provided with a hand wheel showing opening direction; direction to open shall be counter-clockwise. Bolts and nuts for flange to flange assembly shall be low carbon steel conforming to ASTM A193, Grade B7.

H. Valves in buried service shall be Mueller Series A-2360 (AWWA C-509) or A-2361(AWWA C-515), American Flow Control Series 2500 (AWWA 515) or M&H Style 4067-01.

2.06 VALVE BOXES

A. Each buried gate valve shall be provided with a cast iron valve box and cover. Valve box shall be of the two-piece or three-piece screw sleeve adjustable type, suitable for the various line depths. The interior and exterior components of the valve box shall be bituminous coated. All valve boxes shall be provided with cast iron covers on which the word "WATER" shall be cast into the top. Valve box shall be Tyler Series 6850 or Series 6860, Sigma Corp. Model No. VB-262, or approved equal.

B. A 24-inch round, pre-cast concrete pad shall be provided on all valve boxes installed outside of paved surfaces. Round valve box pads shall be as manufactured by Southern Meter Box, Inc., or approved equal.

2.07 CASING FOR JACKING AND BORING

A. Unless otherwise required by the agency having jurisdiction, the casing shall be welded steel pipe meeting ASTM A53, Grade B, and have a minimum yield strength of 35,000 psi. The exterior of the casing pipe shall be coated with coal tar epoxy or bituminous asphalt. Minimum wall thickness shall be as shown in the following table:

Table for minimum wall thickness for steel casing pipe for E72 loading		
Carrier Pipe Nominal Diameter (inches)	Min. Casing Pipe Diameter (O.D.) (inches)	Nominal Thickness (inches)
6	12	0.344
8	16	0.375
10	20	0.407
12	24	0.469
14	27	0.505
16	30	0.505
18	30	0.505
20	36	0.595
24	36	0.595
30	42	0.625
36	48	0.688
42	60	0.844

2.08 TRACER WIRE

A. Tracer wire for horizontal directional drilling operations shall be 8 gauge, Copper Clad Steel, extruded with a 45 mil (minimum) HDPE coating, .219 inches (minimum) O.D. Rated break load 2,785 lbs., 30 volt, 21% IACS. The outside color of the wire shall meet the APWA color code of the buried utility line. Tracer wire shall be Pro-Trace HDD-CCS PE45 as manufactured by Pro-Line Safety Products Co., or approved equal.

B. Tracer wire for direct bury shall be 12 gauge, Copper Clad Steel, extruded with a 45 mil (minimum) HDPE coating, .219 inches (minimum) O.D. Rated break load 713 lbs., 30 volt, 21% IACS. The outside color of the wire shall meet the APWA color code of the buried utility line. Tracer wire shall be Pro-Trace HF-CCS PE45 as manufactured by Pro-Line Safety Products Co., or approved equal.

C. The wire shall be held in place by tacking it to the top of the pipe using duct tape at approx. 10 foot centers and shall be continuous for the entire length of the water line. Sufficient slack shall be provided at each valve location in order that the wire can be pulled up into the valve box for easy access.

D. Attach wire to all fixtures and appurtenances to ensure continuous flow of electrical current.

E. Splices in detection wire shall be installed in a per the manufacturer's directions.

2.09 HYDRANTS

A. Fire hydrants shall be 3-way type, 5-1/4" valve opening, 6" mechanical joint shoe for a 4'-0" bury (or for the bury as called for in the proposal). Hydrants shall be standard AWWA Type, complete 2-1/2" hose nozzles and 4-1/2" Pumper nozzle, with Lake Charles special threads. The Contractor shall note that the finished elevation of the fire hydrant shall be so that it provides a minimum of 18 inches clear between the finished grade and the bottom of the pumper nozzle.

B. Hydrants shall Mueller Centurion model A-423, as manufactured by Mueller Company; American

Darling model B-84-B, as manufactured by American Cast Iron Pipe Company; M&H Model 129, as manufactured by M&H Valve Company; or approved equal.

2.10 TAPPING SLEEVES AND VALVES

A. Tapping sleeves shall be stainless steel and be provided with SST flanges. Tapping sleeves shall be ROMAC Stainless Steel Tapping Sleeve (SST), as manufactured by Romac Industries, Inc.; Ford All Stainless Tapping Sleeve (FAST), as manufactured by the Ford Meter Box Company, Inc., or approved equal. Tapping sleeves shall be provided with 304 Stainless Steel bolts, nuts and washers.

B. Tapping valves for 3-inch lines and larger shall be Resilient Seated Wedged Tapping valves with Flanged by Mechanical Joint Ends conforming to AWWA C509 or C515 as applicable. Tapping valves for 2-inch service lines shall be Resilient Seated Wedged Tapping valves with threaded ends compatible with the specified service saddles. Tapping valves shall be provided with a minimum 3/8-inch NPT pipe plug on the bonnet of the valve body for field testing. Tapping valves shall be Mueller Model T-2360-16 Resilient Wedge Tapping Valves as manufactured by Mueller Co.; American Series 2500 Resilient Wedge Tapping Valve, or approved equal. Tapping sleeves shall be provided with 304 Stainless Steel bolts, nuts and washers.

C. All tapping valves shall be provided with valve boxes as specified in part 2.06 of these standard specifications.

2.11 CONCRETE

A. Concrete for thrust blocks and pads shall be 3000 psi at twenty eight (28) days. Concrete shall be ready mix; Sakrete will not be acceptable.

2.12 COMBINATION AIR VALVES

A. Combination air valves shall be installed on high points along the water main, as well as, those locations, where in the opinion of the Engineer air may become trapped in the water main.

B. Combination air valves shall be Golden Anderson, Figure 950, as manufactured by Golden Anderson Industries, or approved equal.

C. Air Valves shall be installed in a Pre-Cast Concrete manhole in accordance with the City of Lake Charles specifications for concrete manholes.

2.13 SERVICE SADDLES

A. Service Saddles shall be ductile iron with a finish coat of fused nylon approx. 10-12 mils thick for service line sizes up to 2-inches. The straps, nuts, and bolts shall be stainless steel. Service saddles shall be one of the following as manufactured by ROMAC with I.P. threads, or approved equal.

1. 101NS for 1-inch taps on 12-inch and smaller PVC mains

2. 202NS for 1-inch taps on 14-inch and larger PVC mains

3. 202NS for 2-inch taps on all PVC main sizes

4. 101N-H for 1-inch taps on 12-inch and smaller HDPE mains

5. 202N-H for 1-inch taps on 14-inch and larger HDPE mains

6. 202N-H for 2-inch taps on all HDPE main sizes

B. Taps for service lines greater than 2-inches shall be completed with stainless steel tapping sleeves and tapping valves as specified in part 2.10 of these standard specifications.

2.14 CORPORATION STOPS

A. Corporation stops for 1-inch diameter service lines shall be provided with AWWA taper threaded inlet and compression connection for CTS tubbing outlet. Corporation stops shall be Mueller (CC) Thread Cat. #H-15008; Ford Meter Box Company Cat #F-1000-CC, or approved equal.

2.15 CURB STOPS

A. Curb stops shall be provided for all 1-inch and smaller service connections. Curb stops shall be 1-inch and manufactured with either compression connections or pack joints for 1-inch CTS OD tubing on both ends. Curb stops shall be Mueller Mark II Oriseal Cat# H15209, Ford Ball Valve Curb Stops Cat# B41-344-NL-W, or approved equal.

2.16 SERVICE LINE

A. Service pipe shall be high density polyethylene (HDPE), SDR9. Service pipe shall be 1" diameter minimum and shall be provide in CTS outside diameter sizing. Pipe shall meet the requirements of AWWA C-901, "Polyethylene Pressure Pipe, Tubing and Fittings, 1/2" through 3" for Water." CTS sized pipe shall have service identification stripes of longitudinal blue color stripes co-extruded into the pipe outside surface. Striping printed on the pipe exterior shall not be acceptable. All service pipe shall be installed with tracer wire. Stainless steel insert stiffeners shall be used where connections are made.

2.17 COMPRESSION COUPLINGS

A. Compression couplings shall be as manufactured by Rockwell Type 411 or Type 441, or JCM #212, or equal, with stainless steel bolts. PVC couplings are not allowed.

2.18 ADAPTERS AND FITTINGS

A. All adapters and fittings shall be bronze or brass. Galvanized adapters or fittings are not allowed.

2.19 LINE SETTERS

A. Linesetters , for 3/4" x 5/8" meters shall be Ford Meter Box Company Model LSVH 48-243W-AWT, 1" CTS inlet and 3/4" male swivel outlet, or approved equal.

B. Coppersetters for 1-1/2" meters shall be Ford Meter Box Company Model VH76-12B-11-66, or approved equal.

C. Coppersetters for 2" meters shall be Ford Meter Box Company Model VH77-12B-11-77, or approved equal.

2.20 METER BOXES

A. All new water meter boxes shall be pre-cast concrete with cast iron lid and cast iron reader as manufactured by Southern Meter Box, Inc. or Old Castle Precast, Inc. Meter boxes shall be of the make and model as provided below.

1. Southern Meter Box Company

   a. ¾-inch x 5/8-inch meter and linesetter (C.H.1-1/2" with T.H. 1-1/2" Lid)

   b. 1-1/2-inch meter and coppersetter (C.H. 2" with T.H. 2" Lid)

2. Old Castle Precast, Inc.

   a. ¾-inch x 5/8-inch meter and linesetter (B16 Box with B16CG Lid)

   b. 1-1/2-inch meter and coppersetter (B30 Box with B30CG Lid)

   c. 2-inch meter and coppersetter (B36 Box with B36CG Lid)

2.21 METERS

A. All water meters shall be provided by the City of Lake Charles Water Division, unless otherwise approved by the Water Division.

2.22 FOUNDATION, BEDDING AND BACKFILL MATERIAL

A. Foundation Material

1. Crushed limestone or crushed Portland cement concrete shall be used for structure foundations and pipe foundation amendments as detailed herein. Crushed limestone or crushed Portland Cement Concrete foundation material shall meet the following #610 gradations.

Sieve Size	Percent Finer By Weight
1 – ½ in	100
1 - in	90 to 100
3/4 - in	70 to 95
3/8 - in	50 to 80
No. 4	35 to 65
No. 10	25 to 50
No. 40	10 to 26
No. 200	4 to 12

B. Bedding and Embedment Material

a. Sand shall be used for bedding and initial backfill of the watermain and services as further detailed herein. Sand for embedment shall be non-plastic siliceous material and shall conform to the following gradation limits:

Sieve Size	Percent Finer By Weight
½ - in	100
No. 10	75 to 100
No. 200	0 to 10

C. Backfill Materials

1. Usable Native Excavated Soils shall be used for trench back fill when the entirety of the trench is located more than five (5) feet from the edge of the roadway or paved surface. Usable native excavated materials shall meet the following requirements.

a. Usable native excavated soils shall have a maximum PI of 25 and maximum organic content of five (5) percent. Soils with a silt content of fifty (50) percent or greater and also a PI of ten (10) or less will not be allowed. Any select material used to supplement or replace usable excavated soil shall meet these requirements and must be approved by the Engineer. Soil shall be tested at the Engineer and the Owner's option. Usable excavated material may be neatly stockpiled at the site where designated by the Engineer provided there is an area available that will not interfere with the Owner's access nor inconvenience traffic adjoining property owners.

b. When excavated soils do not meet the above stated requirements they shall be removed from the site, at the contractors expense, and replaced with Select or Sand Backfill Material.

2. Select or Sand Backfill Material shall be used for trench backfill when any portion of the trench is to be installed within five (5) feet from the edge of the roadway or paved surface.

a. Sand for backfilling trenches and structures shall be non-plastic siliceous material and shall conform to the following gradation limits:

Sieve Size	Percent Finer By Weight
½ - in	100
No. 10	75 to 100
No. 200	0 to 10

b. Select backfill material shall be natural soils with a maximum PI of 20, maximum Liquid Limit of 35, and a maximum organic content of 5 percent. Soils with a silt content of 50 percent or greater and also a PI of 10 or less shall not be allowed.

3. Crushed limestone or Crushed Portland Cement Concrete Backfill

a. Crushed limestone or crushed Portland Cement Concrete backfill material shall be used for trench backfill when the trench is to be installed beneath any paved surface, or as directed by the Engineer. Crushed limestone or crushed Portland Cement Concrete backfill material shall meet the requirements set forth above for Foundation material.

PART 3 EXECUTION

3.01 GENERAL

A. Coordinate with other utility providers to the fullest extent possible complete maximum spacing from all utilities for ease of access following installation.

B. Any materials damaged during installation shall be removed and discarded.

3.02 ALIGNMENT AND GRADE

A. The contractor shall use a chalk line to assist in alignment of the pipe line.

B. Whenever obstructions not shown on the plans are encountered, and the Engineer deems it necessary to change alignment to expedite the work, if the change in plans result in a change of the amount of work by the Contractor, such altered work will be allowed the Contractor on the basis of bid unit prices or extra work order, whichever the case may be.

C. The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures, both known and unknown, may be determined, and he shall be held responsible for the repair of such structures when broken or otherwise damaged because of carelessness on his part. Unless specifically ordered by the Engineer, the minimum coverage of this pipe line shall be forty-eight inches (48").

3.03 TRENCHING AND EXCAVATION

A. Excavation

1. Excavation shall include the removal, handling, re-handling, 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, and trench box. The work of excavation shall also include the responsibility of added expenses or other liability that may arise from quicksand, obstacles or conditions, foreseen or unforeseen, which may be encountered in the work. It includes clearing and the removal of pavements, curbs, sidewalks, shrubbery, and other obstructions not otherwise provided for.

2. The trench shall be dug so that the pipe can be laid to the alignment and depth required and it shall be excavated no more than 500 feet in advance of pipe laying. If necessary, the trench shall be braced such that the men may work therein safely and efficiently. The trenches shall be free of water at the time of pipe laying. The minimum width of the unbraced trench shall be 18 inches or one foot greater than the outside diameter of the

pipe, whichever is greater. The pipe shall be laid on stable soil, free from rocks, clods, or sharp-edged objects. Any part of the trench excavated below grade shall be backfilled to grade with thoroughly compacted material approved by the Engineer. The maximum deflection per length of pipe shall be as recommended by the pipe manufacturer.

B. Methods of Excavation

1. The Engineer shall have the authority, at any time, to require the Contractor to discontinue the use of any excavating machine or other appliance which, in the Engineer's judgment, is not adapted to the purpose for which it is used.

C. Dewatering

1. The trenches shall be maintained free of water at all times while work is in progress, and water shall not be allowed to flow over or rise upon earth foundations, pipe, concrete masonry, or other work, except as otherwise specified for bayou crossings and special "wet areas." The Contractor shall not open more trench than the available pumping facilities can dewater to the satisfaction of the Engineer.

2. The Contractor shall assume all responsibility for disposing of all water so as not to injure or interfere with normal drainage of the locality. In no case shall water pipe lines be used as drains for such water. The ends of water pipe lines shall be adequately and properly plugged during construction by the use of approved stoppers (a garbage bag is not an approved stopper), and all necessary precautions shall be taken to prevent the entrance of ground water, mud, sand, or any other objectionable materials into the pipe lines. If such materials enter the pipe lines, they shall be removed by the Contractor as soon as possible after discovery thereof.

D. Maintenance of Excavation

1. The Contractor shall maintain all excavation in good order during the construction, so as not to hinder or injure the pipe laying, masonry, or other work. He shall take all reasonable precautions to prevent movement of the sides of such excavation, and shall remove at his own expense any material sliding into the excavation.

E. Sheeting and Bracing

1. The Contractor shall furnish and put in place such sheeting and bracing as may be required to support the sides of all trenches or other excavations and, where required, remove, or cut off, as directed, such sheeting at his own expense. A steel trench box, supplemented with additional sheeting, may be used in lieu of total sheeting and bracing.

F. Disposal of Excavated Material

1. All material excavated shall be placed so as to interfere as little as possible with public travel. In case the street is not wide enough to allow the dirt to be piled up without blocking the sidewalk, the Contractor shall, at his own expense, maintain an open passageway not less than two and one-half feet (2 ½') wide on the sidewalk and shall keep this passageway free from mud and slush.

2. The Contractor may deposit excavated materials directly in permanent position insofar as is consistent with the proper prosecution of the work. Materials that cannot be placed at once in permanent position shall be deposited in temporary storage piles. All this work shall be done with reasonable neatness and excavated materials shall not be carelessly strewn over the area.

3. Surplus excavated material over and above that required for backfilling, mounding over the pipe and making other fills and embankments to the finished lines and grades indicated on the drawings shall be disposed of as directed by the Engineer. The Contractor shall be responsible for seeing that the material is dumped in an orderly manner within the limits designated. The surface of the dump shall be neatly graded to blend with the natural contours of the existing ground surface. If the City or Drainage Board has no use for the surplus material, it will be the responsibility of the Contractor to properly dispose of said surplus.

3.04 BEDDING

A. Once the excavation is complete to the required grade of the bottom of the trench, sand bedding shall be placed, compacted and graded to provide firm, uniform and continuous support for the pipe. Bell holes shall be excavated so that only the barrel of the pipe bears upon the bedding. The pipe shall be laid accurately to the lines and grades indicated on the Drawings. Blocking under the pipe will not be permitted. Bedding shall be placed evenly on each side of the pipe to the springline and hand tools shall be used to force the bedding under the haunches of the pipe and into the bell holes to give firm continuous support for the pipe.

B. Where the bottom of the excavation is not, in the opinion of the Engineer, of suitable material for the construction of required pipe foundation, the excavation shall be deepened by a minimum of 6-inches and a limestone foundation shall be placed under the pipe as directed by the Engineer. This stone foundation is not to be included in the price bid for laying pipe and will be paid for as a separate item.

C. Where the Contractor exceeds the maximum trench width to the extent that excessive backfill loads are imposed on the pipe, or where the trench is over-excavated, as determined by the Engineer; the Contractor shall provide limestone or such additional pipe foundation as the Engineer may require without any additional compensation. Over-excavated trenches shall not be brought up to grade with excavated material.

3.05 PIPE INSTALLATION

A. Thoroughly clean interior of pipe before lowering into the trench while keeping pipe interior free of foreign matter during laying operations.

B. When work is not in progress, the ends of the pipe and fittings shall be plugged so foreign material cannot enter pipe.

C. Provide bell holes at each joint to permit proper joint assembly and uniform pipe support.

D. 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."

E. The trench shall provide continuous support for the pipe without voids or soft spots under the pipe.

F. 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.

G. 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.

H. 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.

I. 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 City of Lake Charles Water Division exclusively.

J. 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).

K. 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.

L. Assembly of fittings and other preparatory work shall be done in advance to reduce the off time and to keep interruption to a minimum.

3.06 SETTING VALVES

A. Valves, fittings, plugs, caps, etc., shall be set and jointed to pipe in the manner specified in the preceding paragraphs for cleaning, laying, and jointing pipe.

B. Valve boxes shall be provided for every valve except as shown on the plans. Before placing in the trench, all valves shall be carefully inspected for possible damage.

C. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve, with the box cover flush with the surface of the finished pavement, or such other level as may be directed.

3.07 AIR VALVE INSTALLATION

A. Combination air valves shall be installed in a Pre-Cast concrete manhole in accordance with the City of Lake Charles manhole specifications.

B. The air valve shall be installed in accordance with the manufacturer's printed instructions.

C. The air valve shall be oriented in the vault for easy access and maintenance.

D. The manhole shall be installed on a foundation of 6-inches of No. 57 Limestone.

3.08 LEAKAGE TESTING:

A. All pipe lines shall be tested as specified herein and as otherwise required to demonstrate that they will successfully withstand 150 psi operating pressure without leakage in excess of the specified maximum in any test section of the pipe line, all as approved by the Engineer.

B. Whenever conditions will permit, in the opinion of the Engineer, the pipe lines shall be tested before the pipe joints are backfilled. All uncovered joints shall be examined during the tests and all visible leaks shall be entirely stopped. Joints which leak shall be re-made and re-tested until found to be satisfactory.

C. Water used for testing shall be reasonably clean and free from oil, silt, mud, sticks, vegetable matter, and other objectionable materials. All water required for testing shall be furnished by the Owner.

D. Corporation stops shall be provided at high places on the pipe line for expelling air from the line, except at the high points where air valves may be indicated on the plans. Also, one corporation stop shall be furnished and installed for each test pump location. No direct payment.

E. When a section of pipe line of a length deemed suitable by the Engineer is ready for testing, it shall be given the specified leakage test and, if defects are discovered, it shall be retested after replacement of all defective items found therein. On the water distribution system, where practicable, the test length preferably shall not exceed 2,000 feet, and it shall not exceed 4,000 feet unless specifically approved by the Engineer due to the location of valves or other pipe line conditions.

F. For leakage tests of pipe lines, prior to meters, the air shall be completely expelled from the section of pipe line to be tested, and the test shall be made at a hydrostatic pressure of not less than 150 psi for a duration of not less than four (4) hours, during which the leakage shall not exceed one (1) gallon per inch of nominal diameter per mile of pipe per hour. In all cases, the test period shall be of sufficient duration to permit proper examination of pipe joints and other items in the test section of pipe line.

G. For leakage tests of plumbing lines, lines which proceed the meter, the air shall be completely expelled from the section of pipe line to be tested, and the test shall be made at a hydrostatic pressure of not less than 150 psi for a duration of not less than four (4) hours, during which the leakage shall not exceed one (1) gallon per inch of nominal diameter per mile of pipe per hour. In all cases, the test period shall be of sufficient duration to permit proper examination of pipe joints and other items in the test section of pipe line.

H. All pipe, joints, fittings, valves, hydrants, and other items found to be cracked, leaking or otherwise defective, shall be removed and replaced, and the pipe lines shall be retested until the test requirements have been complied with.

3.09 BACKFILL

A. After the pipe lines have been laid and approved, the trenches shall be backfilled with sand up to a foot above the top of the pipe. All trenches shall be backfilled by hand from the bottom of the trench to the springline of the pipe. The sand shall be carefully deposited on both sides of the pipe at the same time and thoroughly tamped and rammed under and around the pipe until enough fill has been placed to provide a cover of at least one foot above the pipe bells. The remainder of the backfill shall be with fine, loose, selected materials free from clods, clumps, sticks, stones, and foreign matter.

B. When the new water line is placed within public road right-of-way by open cut method, the trench shall be backfilled to grade by approved methods and uniformly compacted in 12" lifts to 95% Standard Proctor (ASTM D698), and tested at a minimum rate of two (2) tests per 100 feet of trench. When the new water line is placed by open cut method, within State or Federal road right-of-way or servitudes, the trench shall be backfilled according to Article 701.08, "Backfilling," of the LA. DOTD Standard Specifications for Roads and Bridges, latest revision. When the new water line is installed by open cut within easements or servitudes not directly influenced by vehicle movement, the backfilled density shall meet that of the adjacent soil, subject to Engineer's approval.

C. Laboratory services for backfill density shall be performed by a commercial laboratory approved by the Engineer. If settlement occurs the trenches shall be refilled, compacted, and made to conform to the original ground surface. The Contractor shall maintain the trenches in good and safe condition until final acceptance of work by the Owner, and he will be held responsible for any accident or damage to persons or property during the period of construction and for one year following the date of acceptance.

D. The Contractor shall maintain the backfill for a period of one year after final acceptance and shall restore any backfill that fails and repair any pavement or other structures which may be damaged as a result of backfill failure.

E. Pavement repair shall otherwise be in accordance with the City of Lake Charles Paving Specifications.

3.10 JACKING AND BORING

A. Where pipe lines are permitted or required to be jacked under roadways or other locations (with or without a sleeve pipe), the sleeve pipe or pipe line shall be installed by means of a boring machine or auger and hydraulic jack, or by other means satisfactory to the Engineer. In the event subsurface operation results in injury or damage to the pavement, repairs to this pavement shall be made by the Contractor at no additional cost to the owner. In the event the paving cracks on either side of the pipe line, or is otherwise disturbed or broken due to the Contractor’s operations, he shall repair or replace same at his own expense without further compensation.

B. Where the boring location crosses a State or Federal highway, installation of the casing shall also be in accordance with all the requirements of the D.O.T.D. project permit issued for that location and the Contractor shall bid accordingly.

C. Any pipeline installed through a casing will be installed according to manufacturer’s

recommendation, including, but not limited to, the following:

1. Pipe line properly supported on skid

2. Sand bedding of pipe line in casing

3. Properly sealing ends of casing pipe

3.11 DIRECTIONAL DRILLING:

A. The drilling shall be performed by a company with sufficient experience and expertise to perform the work in conformance with the drawings and these specifications. The contractor is responsible for all cleanup and disposal of debris, cuttings, soil, etc., and shall perform this portion of the work in an environmentally sound manner.

B. The Contractor shall clean up and dispose of excess drilling mud associated with the boring process. The mud shall be disposed of in a timely manner. All driveways, pavement, and walkways shall be cleaned at the end of each day. Excess mud in the roadside ditches shall be managed so as not to block drainage during the process of the work. This cleanup shall proceed with the work and not be left for the end of the project.

3.12 DISINFECTION

A. After satisfactory tests have been performed and before being placed in service, all pipe lines shall be disinfected. The expense involved shall be borne by the Contractor except for the water required which shall be furnished by the Owner from the waterworks system without charge to the Contractor.

B. Disinfecting the water mains shall be done according to the provisions of AWWA C651-86. This work shall be performed in segments of the pipe line in accordance with a schedule to be submitted by the Contractor and approved by the Engineer before any work is commenced. As segments are disinfected and put into service after the Louisiana State Board of Health approval, periodic samples shall be taken from completed sections as an added safety precaution until completion of the entire project.

C. The City of Lake Charles Water Division Laboratory is certified by the State Health Department to sample the new water lines for purposes of determining that the new lines are free from contamination by coliform bacteria. There is not a fee for this service, and Contractors can contact the City of Lake Charles Laboratory at 491-1599, or the laboratory directly at 491-1554 to coordinate the sampling. The line will not be accepted and placed in service until clear samples are received.

D. Samples shall be taken from corporation stops installed in the lines as directed by the Engineer, and installed for the sole purpose of testing the lines.

E. After thorough flushing, sufficient available chlorine shall be added to the water in the line to show a minimum residual of 50 PPM. This chlorinated water shall then be drawn off from each deadend until an orthotolidin test shows a strong indication of chlorine. As the water is drawn off and new water added, this new water shall be chlorinated. After all points show an indication of chlorine, the chlorinated water shall remain in the system for twenty-four (24) hours, after which

period it shall be flushed out with potable water. Should subsequent bacteriological tests show any pipe lines to be contaminated, the chlorination process shall be repeated in such pipe lines until satisfactory results of tests are obtained. No water from any pipe line shall be used for human consumption until bacteriological tests indicated that the water is entirely free of bacterial contamination.

F. Chlorine in liquid gas form, calcium hypochlorite, chlorinated lime, or sodium hypochlorite may be used, but the Engineer's approval of the material and procedure shall be given before any work is commenced.

END OF SECTION

SECTION 4
STORM DRAINAGE COLLECTION SYSTEM

PART 1 GENERAL

1.01 SCOPE

A. The work covered by this specification consists of furnishing all labor, supervision, materials, equipment, tools, and supplies necessary for the installation of, pipe culverts, pipe arch culverts, storm drains and sewers, herein referred to as "conduit", and drainage structures in accordance with these specifications and in conformity with the lines and grades shown on the plans or established by the Engineer.

B. All work in this section shall be in accordance with the Louisiana Standard Specifications for Roads & Bridges, 2006 Edition, except as modified herein. When the term "Department" is utilized it shall mean "Engineer".

C. Where a certain pipe material and size is specified on the plans, only that material and size can be used. All pipe material used between consecutive structures in the storm sewer line shall be of the same kind unless otherwise provided by the plans.

1.02 REFERENCES

A. All materials and designs shall conform to the requirements of these specifications. They shall be new, free from defects, and they shall conform to the following standards where these organizations have set standards:

1. American Society for Testing and Materials (ASTM)
2. American Concrete Institute (ACI)
3. Concrete Reinforcing Steel Institute (CRSI)
4. American National Standards Institute (ANSI)
5. The Society for Protective Coatings (SSPC)
6. Louisiana Department of Transportation and Development (LADOTD)

B. The same manufacturer shall supply all like materials of the same class, unless specified to the contrary.

1.03 SUBMITTALS

A. Submittals and test reports shall be made available to the City of Lake Charles Engineering Department at any time during construction, at the request of the department.

B. Accurate construction record documents shall be submitted to the City of Lake Charles Engineering Department for approval prior to acceptance of the storm drainage collection system. Project record documents shall accurately record locations of pipe runs, manholes, and collection boxes with as-built invert elevations within rights-of-way or permanent easements.

1.04 ACCEPTANCE

A. For acceptance by the City of Lake Charles, the storm drainage collection system must be:

1. Pre-authorized for construction and subsequent public dedication as part of an approved development plan or preliminary subdivision plat;

2. Constructed to City standards and specifications described herein;

3. Approved upon completion for conformity with standards and specifications by appropriate city personnel or representatives;

4. Subject to satisfactory maintenance guaranty, as determined by the City; and

5. Located within acceptable rights-of-way to be dedicated to the City;

6. Accurately depicted in record documents to be submitted to the City.

1.05 QUALITY ASSURANCE

A. Laboratory Services: Laboratory services shall be performed by a commercial laboratory approved by and paid by the Engineer.

B. Duties: The laboratory will review the Contractor furnished design mix to determine compliance with these specifications. The laboratory will inspect and test all materials entering concrete, analyze aggregate for quality, durability, grading and free water content, take representative specimens of ingredients and mixes, and make test cylinders and measure compressive strength of same. The laboratory shall check the moisture content of aggregate and control the mix. It is the intent of these specifications to have batch plant and job site laboratory control. Job site laboratory control shall include job mixing, handling, and placing of concrete.

C. Test Procedures: All test specimens shall be taken and laboratory tests conducted in conformance with the latest standard test procedure of the ASTM, as amended to date of contract, and when not covered therein shall be sampled and tested in accordance with the "Standard Specifications for Roads and Bridges" of the Louisiana Department of Highways, 2006 Edition, with subsequent revisions to date of contract. All tests not covered by the above shall be performed as specified by the Engineer.

D. Test Reports: The laboratory shall furnish promptly to the Contractor and the Engineer written reports covering the results of all tests and inspections made.

E. Test Cylinders: A minimum of two (2) sets of four (4) cylinders each will be made for each day's pour for over 25 cubic yards, and one (1) set will be required for 25 cubic yards or less. Of each set of test cylinders, two (2) will be tested for compressive strength at the age of seven (7) days;

and two (2) will be tested at the age of twenty-eight (28) days. If any cylinder fails to meet the specified strength requirements, the Owner shall have the right to require changes in proportions, require additional curing time, and/or take other measures for enforcement of strength requirements.

F. Contractor's Responsibility: It shall be the responsibility of the Contractor to provide the concrete mix design, to produce concrete of the strength, durability, workability and finish specified, submit the mix design for approval, furnish representative material for specimens in quantities required by the testing laboratory; cooperate and assist in taking samples of materials for testing.

1.06 WARRANTY

A. The Contractor shall guarantee all materials furnished by him free from inherent defects for a period of one year from date of final acceptance, with the exception of where more stringent warrantees are stated herein.

B. Any repairs, including labor, made necessary by inherent defects, shall be rendered without cost to the City within the guarantee period.

PART 2 PRODUCTS

2.01 MATERIALS

A. All storm drainage materials shall conform to the following sections of Louisiana Standard Specifications for Roads and Bridges, 2006 Edition, except as modified by these specifications. All materials provided under this specification must be qualified under the LADOTD MATT SYSTEM.

1.	Portland Cement Concrete:	901
2.	Aggregates:	1003
3.	Reinforced Concrete Pipe:	1006.03
4.	Reinforced Concrete Pipe Arch:	1006.04
5.	Concrete Pipe Joints:	1006.05
6.	Gasket Materials:	1006.06
7.	Plastic Pipe:	1006.07
8.	Plastic Yard Drain Pipe:	1006.09
9.	Coal Tar Epoxy	1008.04
10.	Reinforcing Steel:	1009
11.	Curing Materials:	1011.01

12.	Precast Reinforced Drainage Units	1016
13.	Water	1018.01
14.	Frames, Grate and Manhole Covers	1018.04
15.	Form Release Agent:	1018.25
16.	Geotextile Fabric	1019

2.02 CULVERTS AND STORM DRAINS

A. Culverts and storm drains provided under this specification shall be in accordance with the Section 701 of the Louisiana Standard Specifications for Roads and Bridges, 2006 Edition, with the following amendments.

B. Reinforced Concrete Pipe

1. Reinforced-Concrete Pipe shall comply with ASTM C 76 (ASTM C 76M). Pipe shall be Class III, Wall B, for O-Ring gasketed joints.

2. Reinforced Concrete Arch Pipe shall comply with ASTMC 506. Pipe shall be class A-III.

3. Pre-Cast Reinforced Concrete Box Culverts shall comply with ASTM C 1433, Table 1.

4. Joints:

   a. RCP: Joints shall be Type III bell and spigot end joints, as specified in subsection 1006.05(c) of LADOTD Standard Specifications, meeting the requirements of ASTM C 443.

   b. RCPA: Joints shall be Type III, as specified in subsection 1006.05(c) of LADOTD Standard Specifications, meeting the requirements of ASTM C 443.

   c. Pre-Cast Reinforced Concrete Box Culvert: Joints shall meet the requirements of ASTM C 990

5. Pre-Cast Concrete Culvert Gaskets:

   a. RCP: Rubber gaskets meeting the requirements of AASHTO M315 and ASTM C 443, Type A; lubricant as specified by manufacturer.

   b. RCPA: Rubber gaskets meeting the requirements of AASHTO M315 and ASTM C 443, Type A; lubricant as specified by manufacturer.

   c. Pre-Cast Reinforced Box Culvert: Pre-formed flexible joint sealant meeting the requirements of AASHTO M 198 and ASTM C 990.

C. Plastic Pipe

1. Plastic pipe shall be Ribbed Polyvinyl Chloride Pipe (RPVCP) as specified in subsection 1006.07(a) of the LADOTD Standard Specifications.

2. Plastic pipe shall only be allowed for use as side drains and only when outside of pavement.

3. Joints for plastic pipe shall be Type III, as specified in subsection 1006.07(d) of LADOTD Standard Specifications

2.03 MANHOLES, JUNCTION BOXES, CATCH BASINS, AND END TREATMENTS

A. Storm drainage manholes, junction boxes, catch basins, and end treatments provided under this specification shall be in accordance with the Section 702 of the Louisiana Standard Specifications for Roads and Bridges, 2006 Edition, with the following amendments.

1. Curb inlets shall be provided with an LADOTD Type H Cast Iron Cover, Grate and Frame with the inscription "City of Lake Charles" in the center and "DUMP NO WASTE", "DRAINS TO LAKE" shall be inscribed on the perimeter.

2. Drop inlets shall be provided with an LADOTD Type E Steel Grate Frame and LADOTD Type C Riveted Reticuline Drain Grate.

3. Manholes shall be provided with LADOTD Type K Cast Iron Frame and Cover with the word "DRAIN" inscribed in the middle.

4. Structure Channels, Benches, and Concrete Collars: Factory or field formed from concrete.

    a. Include channels and benches in manholes.

        1) Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

            i. Invert Slope: 1 percent through manhole.

        2) Benches: Concrete, sloped to drain into channel.

            i. Slope: 8 percent.

    b. Include channels in catch basins.

        1) Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

            i. Invert Slope: 1 percent through catch basin.

5. ALL pre-cast storm drain structures shall be built with oversized pipe penetrations to allow for a minimum 12-inch concrete collar.

2.04 CONCRETE MIX DESIGN

A. Portland Cement Concrete provided under this specification shall be Minor Structure Class "M" concrete in accordance with the Section 901 of the Louisiana Standard Specifications for Roads and Bridges, 2006 Edition.

2.05 NONPRESSURE TYPE PIPE COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Concrete Pipes: ASTM C 443 (ASTM C 443M), rubber.

2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.

3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

2.06 FOUNDATION, BEDDING, AND BACKFILL MATERIAL

A. Foundation Material

1. Crushed limestone or crushed Portland cement concrete shall be used for structure foundations and pipe foundation amendments as detailed herein.

Sieve Size	Percent Finer By Weight
1 – ½ in	100
1 - in	90 to 100
3/4 - in	70 to 95
3/8 - in	50 to 80
No. 4	35 to 65
No. 10	25 to 50
No. 40	10 to 26
No. 200	4 to 12

B. Bedding Material

1. Crushed limestone or crushed Portland cement concrete shall be used for pipe bedding to the depths and heights identified on the project details. Crushed limestone or crushed Portland Cement Concrete bedding material shall meet the requirements set forth above for Foundation material.

C. Backfill Material

1. Usable Native Excavated Soils shall be used for trench back fill when the entirety of the trench is located more than five (5) feet from the edge of the roadway or paved surface. Usable native excavated materials shall meet the following requirements.

    a. Usable native excavated soils shall have a maximum PI of 25 and maximum organic content of five (5) percent. Soils with a silt content of fifty (50) percent or greater and also a PI of ten (10) or less will not be allowed. Any select material used to supplement or replace usable excavated soil shall meet these requirements and must be approved by the Engineer. Soil shall be tested at the Engineer and the Owner's option. Usable excavated material may be neatly stockpiled at the site where designated by the Engineer provided there is an area available that will not interfere with the Owner's access nor inconvenience traffic adjoining property owners.

    b. When excavated soils do not meet the above stated requirements they shall be removed from the site, at the contractors expense, and replaced with Select Backfill Material.

2. Sand Backfill Material

    a. Sand backfill material shall be used for trench backfill when any portion of the trench is to be installed within five (5) feet from the edge of the roadway or paved surface. Sand for backfilling trenches and structures shall be non-plastic siliceous material and shall conform to the following gradation limits:

Sieve Size	**Percent Finer By Weight**
½ - in	100
No. 10	75 to 100
No. 200	0 to 10

3. Crushed limestone or Crushed Portland Cement Concrete Backfill

    a. Crushed limestone or crushed Portland Cement Concrete backfill material shall be used for trench backfill when the trench is to be installed beneath any paved surface, or as directed by the Engineer. Crushed limestone or crushed Portland Cement Concrete backfill material shall meet the requirements set forth above for Foundation material.

PART 3 EXECUTION

3.1 GENERAL

A. Storm Sewer lines shall be installed with wall to wall clear separations of not less than 6-feet horizontally and 18-inches vertically from potable water lines. Where these separations are not able to be met, the line shall be encased in concrete.

3.02 INSTALLATION OF CULVERTS AND STORM DRAINS

A. Construction requirements including, but not limited to excavation, forming pipe bed, laying pipe, joining pipe, backfilling, placement of bedding, storm inspection, and cleaning of storm drain pipes shall be in conformance with Sections 701 and 726 respectively, of the Louisiana Standard Specifications for Roads and Bridges, 2006 Edition, except as amended herein.

3.03 INSTALLATION OF MANHOLES, JUNCTION BOXES, CATCH BASINS AND END TREATMENTS

A. Construction requirements including, but not limited to the construction, bedding, placement, and backfill of manholes, junction boxes, catch basins and end treatments shall be in conformance with Sections 702 and 726 of the Louisiana Standard Specifications for Roads and Bridges, 2006 Edition, except as amended herein.

END OF SECTION

SECTION 5

PORTLAND CEMENT CONCRETE PAVEMENT

PART 1 GENERAL

1.01 SCOPE

A. The work covered by this specification consists of furnishing all labor, supervision, materials, equipment, tools, and supplies necessary for constructing a pavement composed of Portland Cement concrete, with reinforcement as specified, on a prepared subgrade or base course in accordance with these specifications and in conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans or established by the Engineer.

B. All work in this section shall be in accordance with the Louisiana Standard Specifications for Roads & Bridges, 2006 Edition, except as modified herein. When the term “Department” is utilized it shall mean “Engineer”.

1.02 REFERENCES

A. All materials, designs, and construction shall conform to the latest revisions of the following standards where these organizations have set standards:

1. American Society for Testing and Materials (ASTM)
2. American Concrete Institute (ACI)
3. Concrete Reinforcing Steel Institute (CRSI)
4. American Welding Society (AWS)
5. Federal Specifications (FS)
6. Louisiana Department of Transportation and Development (LADOTD)

1.03 SUBMITTALS

A. Submittals and test reports shall be made available to the City of Lake Charles Engineering Department at any time during construction, at the request of the department.

B. Accurate construction record documents shall be submitted to the City of Lake Charles Engineering Department for approval prior to acceptance of the concrete roads. Project record documents shall accurately record locations of pavement features within rights-of-way or maintenance easements.

1.04 ACCEPTANCE

A. For acceptance by the City of Lake Charles, the concrete roads must be:

1. Pre-authorized for construction and subsequent public dedication as part of an approved development plan or preliminary subdivision plat;

2. Constructed to City standards and specifications described herein;

3. Approved upon completion for conformity with standards and specifications by appropriate city personnel or representatives;

4. Subject to satisfactory maintenance guaranty, as determined by the City; and

5. Located within acceptable rights-of-way to be dedicated to the City;

6. Accurately depicted in record documents to be submitted to the City.

1.05 QUALITY ASSURANCE

A. Laboratory Services: Laboratory services shall be performed by a commercial laboratory approved by and paid by the Engineer.

B. Duties: The laboratory will review the Contractor furnished design mix to determine compliance with these specifications. The laboratory will inspect and test all materials entering concrete, analyze aggregate for quality, durability, grading and free water content, take representative specimens of ingredients and mixes, and make test cylinders and measure compressive strength of same. The laboratory shall check the moisture content of aggregate and control the mix. It is the intent of these specifications to have batch plant and job site laboratory control. Job site laboratory control shall include job mixing, handling, and placing of concrete.

C. Test Procedures: All test specimens shall be taken and laboratory tests conducted in conformance with the latest standard test procedure of the ASTM, as amended to date of contract, and when not covered therein shall be sampled and tested in accordance with the "Standard Specifications for Roads and Bridges" of the Louisiana Department of Highways, 2006 Edition, with subsequent revisions to date of contract. All tests not covered by the above shall be performed as specified by the Engineer.

D. Test Reports: The laboratory shall furnish promptly to the Contractor and the Engineer written reports covering the results of all tests and inspections made.

E. Test Cylinders: A minimum of two (2) sets of four (4) cylinders each will be made for each day's pour for over 25 cubic yards, and one (1) set will be required for 25 cubic yards or less. Of each set of test cylinders, two (2) will be tested for compressive strength at the age of seven (7) days; and two (2) will be tested at the age of twenty-eight (28) days. If any cylinder fails to meet the specified strength requirements, the Owner shall have the right to require changes in proportions, require additional curing time, and/or take other measures for enforcement of strength requirements.

F. Contractor's Responsibility: It shall be the responsibility of the Contractor to provide the concrete mix design, to produce concrete of the strength, durability, workability and finish specified, submit the mix design for approval, furnish representative material for specimens in quantities required by the testing laboratory; cooperate and assist in taking samples of materials for testing.

1.06 WARRANTY

A. The Contractor shall guarantee all materials furnished by him free from inherent defects for a period of one year from date of final acceptance, with the exception of where more stringent warrantees are stated herein.

B. Any repairs, including labor, made necessary by inherent defects, shall be rendered without cost to the City within the guarantee period.

PART 2 PRODUCTS

2.01 MATERIALS

A. Portland cement concrete pavement materials shall conform to the following sections of Louisiana Standard Specifications for Roads and Bridges, 2006 Edition, except as modified by these specifications. All materials provided under this specification must be qualified under the LADOTD MATT SYSTEM.

1.	Portland Cement Concrete:	901
2.	Aggregates:	1003
3.	Joint Fillers:	1005.01
4.	Joint Sealants:	1005.02
5.	Joint Seals:	1005.03
6.	Reinforcing Steel:	1009
7.	Curing Materials:	1011.01
8.	Water	1018.01
9.	Form Release Agent:	1018.25

2.02 CONCRETE MIX DESIGN

A. Portland Cement Concrete pavement provided under this specification shall be Type “B” pavement in accordance with the Section 901 of the Louisiana Standard Specifications for Roads and Bridges, 2006 Edition, with the following amendments.

1. Concrete shall be non-air entrained.

2. Minimum Cement Content (lb/CY) shall be 545 lbs (5.8 Sack mix).

2.03 REINFORCED PORTLAND CEMENT CONCRETE PAVEMENT

A. Pavement provided under this specification shall be reinforced concrete pavement.

B. Reinforcement for reinforced Portland cement concrete pavement shall be 6”x6” W4 – W4 Welded Steel Wire Fabric.

2.04 REINFORCING STEEL

A. Reinforcing steel provided under this specification shall be in accordance with the Section 1009 of the Louisiana Standard Specifications for Roads and Bridges, 2006 Edition, with the following amendments.

1. Flat sheets of welded steel wire fabric mesh will be required, rolled mesh will not be acceptable.

2. Wire for Zig Zag high chairs shall meet the requirements of ASTM A 185 and shall be a minimum of 6 gauge.

PART 3 EXECUTION

3.01 PREPARATION

A. Construct subgrade in conformity with lines and grades shown on drawings and as specified in Section 601 of the Louisiana Standard Specifications for Roads and Bridges, 2006 Edition

B. Do not disturb previously prepared subgrades and subbase course. Where loose soils are encountered beneath pavements, scarify, moisture condition and properly re-compact soils.

3.02 PLACING WELDED STEEL WIRE FABRIC

A. Welded steel wire fabric shall be placed 2-1/2 inches beneath the finished surface of the 6-inch pavement and 3-1/2 inches beneath the surface of 8-inch pavement. Welded Steel Wire Fabric shall be supported on zig zag chairs of the size required to provide 2-1/2 or 3-1/2 inches of cover from the finished surface of the pavement depending upon the required pavement thickness.

B. At all places where the continuity of reinforcement is required, adjacent sheets of the fabric shall be properly lapped. The transverse and longitudinal wires of the fabric shall be lapped not less than twelve (12) inches.

C. Welded steel wire fabric shall not extend across either transverse or longitudinal joints.

3.02 CONCRETE PAVING

A. Construction requirements including, but not limited to forming, placing and finishing concrete, joints and curing shall be in conformance with Section 601 of the Louisiana Standard Specifications for Roads and Bridges, 2006 Edition, except as amended herein.

END OF SECTION

SECTION 6

PORTLAND CEMENT CONCRETE CURB AND GUTTERS, WALKS, DRIVES AND INCIDENTAL PAVING

PART 1 GENERAL

1.01 SCOPE

A. The work covered by this specification consists of furnishing all labor, supervision, materials, equipment, tools, and supplies necessary for constructing Portland Cement concrete curb and gutter, walks, drives and incidental paving as specified, on a prepared subgrade or base course in accordance with these specifications and in close conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans or established by the Engineer.

B. All work in this section shall be in accordance with the Louisiana Standard Specifications for Roads & Bridges, 2006 Edition, except as modified herein. When the term “Department” is utilized it shall mean “Engineer”.

1.02 REFERENCES

A. All materials, designs, and construction shall conform to the latest revisions of the following standards where these organizations have set standards:

1. American Society for Testing and Materials (ASTM)
2. American Concrete Institute (ACI)
3. Concrete Reinforcing Steel Institute (CRSI)
4. American Welding Society (AWS)
5. Federal Specifications (FS)
6. Louisiana Department of Transportation and Development (LADOTD)

1.03 SUBMITTALS

A. Submittals and test reports shall be made available to the City of Lake Charles Engineering Department at any time during construction, at the request of the department.

B. Accurate construction record documents shall be submitted to the City of Lake Charles Engineering Department for approval prior to acceptance of the improvements. Project record documents shall accurately record locations of sidewalks within rights-of-way or maintenance easements.

1.04 ACCEPTANCE

A. For acceptance by the City of Lake Charles, the Portland Cement concrete curb and gutter, walks, drives and incidental paving must be:

1. Pre-authorized for construction and subsequent public dedication as part of an

approved development plan or preliminary subdivision plat;

2. Constructed to City standards and specifications described herein;

3. Approved upon completion for conformity with standards and specifications by appropriate city personnel or representatives;

4. Subject to satisfactory maintenance guaranty, as determined by the City; and

5. Located within acceptable rights-of-way to be granted to the City;

6. Accurately depicted in record documents to be submitted.

1.05 QUALITY ASSURANCE

A. Quality Assurance services, duties, test procedures, and test reports shall be in compliance with Section 5 – Portland Cement Concrete Pavement of these Standard specifications.

B. All sidewalk construction shall be constructed to the lines and grades shown on the Drawings. All sidewalks shall be constructed in full compliance with the American with Disabilities Act of 1990, 42 U.S.C. 12101 et seq. Prior to acceptance, the slopes of sidewalks and pedestrian ramps shall be measured to verify conformance with the previously stated standards.

1.06 WARRANTY

A. The Contractor shall guarantee all materials furnished by him free from inherent defects for a period of one year from date of final acceptance, with the exception of where more stringent warrantees are stated herein.

B. Any repairs, including labor, made necessary by inherent defects, shall be rendered without cost to the Owner within the guarantee period.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete curb and gutters, sidewalks, drives, and incidental paving materials shall conform to the following sections of Louisiana Standard Specifications for Roads and Bridges, 2006 Edition, except as modified by these specifications. All materials provided under this specification must be qualified under the LADOTD MATT SYSTEM.

1.	Portland Cement Concrete:	901
2.	Aggregates:	1003
3.	Joint Fillers:	1005.01
4.	Joint Sealants:	1005.02

5.	Joint Seals:	1005.03
6.	Reinforcing Steel:	1009
7.	Curing Materials:	1011.01
8.	Water	1018.01
9.	Form Release Agent:	1018.25

2.02 MIX DESIGNS

A. Concrete curb and gutters and drives paving shall be Type "B" pavement in accordance with the Section 901 of the Louisiana Standard Specifications for Roads and Bridges, 2006 Edition, with the following amendments.

1. Concrete shall be non-air entrained.

2. Minimum Cement Content (lb/CY) shall be 545 lbs (5.8 Sack mix).

B. Concrete walks and incidental paving shall be Type "M" pavement in accordance with the Section 901 of the Louisiana Standard Specifications for Roads and Bridges, 2006 Edition.

2.03 PORTLAND CEMENT CONCRETE WALKS

A. Typical Portland cement concrete walks shall be four (4) inches thick and constructed with plain non-reinforced concrete.

2.04 REINFORCED PORTLAND CEMENT CONCRETE WALKS

A. Walks to be placed at intersections, driveways, and at handicap ramps shall be six (6) inches thick and constructed with reinforced concrete. Six (6) inch thick reinforced walks shall extend back eight (8) feet from the curb in any direction at intersections before transitioning to the standard four (4) inch section.

B. Reinforcement for reinforced Portland cement concrete walks shall be 6"x6" W4 – W4 Welded Steel Wire Fabric.

2.05 REINFORCING STEEL

A. Reinforcing steel provided under this specification shall be in accordance with the Section 1009 of the Louisiana Standard Specifications for Roads and Bridges, 2006 Edition, with the following amendments.

1. Flat sheets of welded steel wire fabric mesh will be required, rolled mesh will not be acceptable.

2. Wire for Zig Zag high chairs shall meet the requirements of ASTM A 185 and shall be a minimum of 6 gauge.

2.06 TRUNCATED DOME DETECTABLE WARNING SURFACE (TTDW)

A. Truncated Dome Detectable Warning Surface shall be installed within the walks at all street intersections.

B. Truncated Dome shall be Armor Tile Cast in Place Tactile Detectable Warning Surface, or approved equal. Truncated domes shall be dark grey (Federal Color No. 36118).

PART 3 EXECUTION

3.01 PREPARATION

A. Construct subgrade in conformity with lines and grades shown on drawings and as specified in Section 706 and 707 of the Louisiana Standard Specifications for Roads and Bridges, 2006 Edition.

B. Do not disturb previously prepared subgrades and subbase course. Where loose soils are encountered beneath pavements, scarify, moisture condition and properly re-compact soils.

3.02 PLACING WELDED STEEL WIRE FABRIC

A. Welded steel wire fabric shall be placed 2-1/2 inches beneath the finished surface of the pavement. Welded Steel Wire Fabric shall be supported on zig zag chairs of the size required to provide 2-1/2 inches of cover from the finished surface of the pavement.

B. At all places where the continuity of reinforcement is required, adjacent sheets of the fabric shall be properly lapped. The transverse and longitudinal wires of the fabric shall be lapped not less than twelve (12) inches.

C. Welded steel wire fabric shall not extend across either transverse or longitudinal joints.

3.03 CONCRETE SIDEWALKS AND INCIDENTAL PAVING

A. Construction requirements including, but not limited to, subgrade preparation, forming, placing and finishing concrete, joints and curing shall be in conformance with Section 706 of the Louisiana Standard Specifications for Roads and Bridges, 2006 Edition, except as amended herein.

1. Expansion joints shall be installed at maximum 50-foot intervals.

2. The grade or slope along the length of the walk shall be as near parallel to the street gradient as practical. The maximum longitudinal slope shall be 5%, except where a variance from street grade has been approved by the City Engineer. The design cross slope be 1%; with the intention of enforcing a 2% maximum with absolutely no tolerance for exceeding 2%, due to Federal ADA requirements. This maximum cross slope standard also applies when the walk crosses drives and shall slope toward the street.

3.04 WHEELCHAIR ACCESSIBLE CURB RAMP PAVING

A. Wheelchair accessible curb ramps shall be constructed at all street crossings. Design slope of ramps shall be 5% in any direction with an absolute maximum slope 8.33%. The minimum allowable thickness for wheelchair accessible curb ramps shall be six inches and the concrete shall be reinforced. Curbs at ramp locations must provide a gradual transition from gutter line to back of curb, not exceeding 1/2 inch in height or slopes of greater than one inch per foot. Side slopes of ramps shall not exceed one inch per foot where such side slopes are in the normal path of pedestrians on adjacent portions of sidewalk. If the street curb has not been constructed to receive the sidewalk ramp, the sidewalk constructor shall remove a section of the curb and reconstruct as required.

B. All curb Ramps shall be constructed with a Truncated Dome Detectable Warning Surface of the type specified on the plans.

3.05 CONCRETE CURBS AND GUTTERS

A. Construction requirements including, but not limited to, subgrade preparation, joints, placing and finishing concrete, backfilling and curing shall be in accordance with Section 707 of the Louisiana Standard Specifications for Roads and Bridges, 2006 Edition, except as amended herein.

1. Curbs shall be monolithic to the pavement and shall be formed and poured concurrently with the pavement. Pinned on curbs will not be acceptable.

2. The following testing shall be provided in addition to that specified in Section 707:

    a. Test face, top, back and flow line of curb and gutter with a 10 foot straightedge or curbed template, longitudinally along surface.

    b. Correct deviations in excess of 1/4 inch.

    c. Gutters:

        i. Water test gutters having a slope of 0.8 foot per 100 feet or less, and where unusual or special conditions indicate gutter may not drain satisfactorily.

        ii. Water testing consists of establishing flow in length of gutter to be tested by supplying water from a hydrant, tank truck or other source.

        iii. One hour after supply of water is shut off, inspect gutter for evident of ponding or improper shape.

        iv. In the event water is found ponded in gutter to a depth greater than ½ inch, or on the adjacent pavement, correct defect or defects in a manner acceptable to the Engineer.

d. Remove and replace sections of work deficient in depth or not conforming to drawings or specifications.

END OF SECTION

SECTION 7
ASPHALTIC CONCRETE PAVEMENT

PART 1 GENERAL

1.01 SCOPE

A. The work covered by this specification consists of furnishing all labor, supervision, materials, equipment, tools, and supplies necessary for constructing a pavement composed of Asphaltic Concrete on a prepared subgrade or base course in accordance with these specifications and in conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans or established by the Engineer.

B. The following Bituminous Pavement Specifications are to be used in lieu of section 501-504 of the LA DOTD Standard Specifications. These specifications are provided by the Louisiana Asphalt Pavement Association, whose expertise shall be relied upon in interpreting them. However, the City Engineer shall make the final determination concerning any conflicts arising from the use of these specifications.

1.02 REFERENCES

A. All materials, designs, and construction shall conform to the latest revisions of the following standards where these organizations have set standards:

1. American Society for Testing and Materials (ASTM)
2. American Association of State Highway and Transportation Officials (AASHTO)
3. Federal Specifications (FS)
4. Louisiana Asphalt Pavement Association (LAPA)
5. Louisiana Department of Transportation and Development (LADOTD)

1.03 SUBMITTALS

A. Submittals and test reports shall be made available to the City of Lake Charles Engineering Department at any time during construction, at the request of the department.

B. Accurate construction record documents shall be submitted to the City of Lake Charles Engineering Department for approval, prior to acceptance of the asphaltic concrete roads. Project record documents shall accurately record locations of pavement features within rights-of-way or maintenance easements.

1.04 ACCEPTANCE

A. For acceptance by the City of Lake Charles, the asphaltic concrete roads must be:

1. Pre-authorized for construction and subsequent public dedication as part of an approved development plan or preliminary subdivision plat;

2. Constructed to City standards and specifications described herein;

3. Approved upon completion for conformity with standards and specifications by appropriate city personnel or representatives;

4. Subject to satisfactory maintenance guaranty, as determined by the City; and

5. Located within acceptable rights-of-way to be dedicated to the City;

6. Accurately depicted in record documents to be submitted to the City.

1.05 WARRANTY

A. The Contractor shall guarantee all materials furnished by him free from inherent defects for a period of one year from date of final acceptance, with the exception of where more stringent warrantees are stated herein.

B. Any repairs, including labor, made necessary by inherent defects, shall be rendered without cost to the City within the guarantee period.

1.06 EQUIPMENT

A. All equipment necessary for the proper preparation of the subgrade, asphalt production, the laying and finishing of the pavement shall be on the project, in satisfactory working condition, and shall have been inspected and approved by the Engineer before paving operations will be permitted to begin. All equipment shall meet the specific requirements hereinafter set forth. The contractor shall maintain all equipment in satisfactory working condition throughout the construction of the project.

B. All equipment, asphalt, plant, paver, rollers, trucks, etc., used shall be certified in accordance with current Louisiana Department of Transportation and Development procedures.

C. The central mixing plant shall be equipped with an asphalt working tank meeting LADOTD specifications. In addition, there shall be an asphalt storage tank of sufficient capacity to hold enough asphalt for one full day's operation of the plant. The storage tank shall have adequate heating and circulating equipment and insulation to maintain proper uniform temperature.

1.07 QUALITY ASSURANCE

A. Laboratory Services: Laboratory services shall be performed by a commercial laboratory approved by and paid by the Engineer.

B. Duties: The laboratory will review the Contractor furnished design mix to determine compliance with these specifications. The laboratory will inspect and test all materials entering asphalt mix, analyze aggregate for quality, durability, grading and free water content, take representative

specimens of ingredients and mixes. The laboratory shall check the moisture content of aggregate and control the mix. It is the intent of these specifications to have plant and job site laboratory control. Job site laboratory control shall include job mixing, handling, and placing of concrete.

C. Test Procedures: All test specimens shall be taken and laboratory tests conducted in conformance with the latest standard test procedure of the ASTM, as amended to date of contract, and when not covered therein shall be sampled and tested in accordance with the "Standard Specifications for Roads and Bridges" of the Louisiana Department of Highways, 2006 Edition, with subsequent revisions to date of contract. All tests not covered by the above shall be performed as specified by the Engineer.

D. Test Reports: The laboratory shall furnish promptly to the City, Contractor, and the Engineer written reports covering the results of all tests and inspections made.

E. Test Samples: For all projects, 1 sample shall be taken for Marshall Properties testing for each 250 tons or portion thereof produced and 1 sample taken for extracted gradation testing for each 500 tons or portion thereof produced. Five (5) samples shall be taken for determination of pavement density and thickness, with the sampling distribution to be determined by the Engineer.

F. Contractor's Responsibility: It shall be the responsibility of the Contractor to provide the asphaltic concrete mix design, to produce asphaltic concrete of the strength, durability, workability and finish specified, submit the mix design for approval, furnish representative material for specimens in quantities required by the testing laboratory; cooperate and assist in taking samples of materials for testing.

PART 2 PRODUCTS

2.01 GENERAL

A. These specifications are applicable to asphaltic wearing, binder and base course mixtures of the plant mix type.

B. The mixture shall consist of aggregates and asphalt with additives, combined in such proportions as to meet the requirements in Table 1 of this Section.

C. The Contractor shall keep accurate records, including proof of deliveries of all materials for use in asphaltic concrete mixtures. Copies of these records shall be furnished to the City upon request. Each transport load of Asphalt Cement and/or Polymer Modified Asphalt Cement shall be accompanied by a Certificate of Compliance, signed by the material supplier, which shall state that the materials involved comply with specifications. The fact that the material used on the basis of a certificate of compliance shall not relieve the Contractor of responsibility for incorporating material in the work, which conforms to the plans and specifications. Materials to be used must be listed on the current Louisiana Department of Transportation and Development (LaDOTD) Qualified Products List (QPL).

2.02 ASPHALT

A. Asphalt cement Grade AC 30 shall be used, except as otherwise specified herein. Asphalt cement shall conform to the provisions of Subsection 1002.01 of the Louisiana Standard Specifications for Roads and Bridges 2006 Edition and to following Table.

Property	Test Method	Specifications
Penetration, 25°C (77°F), 1OOg, 5 Sec.	AASHTO T 49	55+[2]
Viscosity, 135°C (275°F), SSF3	ASTM E 102	175+
Viscosity, 135°C (275°F), cSt	AASHTO T 201	350+
Viscosity, 60°C (140°F), poises	AASHTO T 202	3000±600
Solubility in Trichloroethylene, %	AASHTO T 44	99.0+
Flash Point, COC, °C (°F)	AASHTO T 48	232 (450)+
Tests on Residue from Thin Film Oven Test:		
Viscosity, 60°C (140°F), poises	AASHTO T 202	12000-
Ductility, 25°C (77°F), 5 cm/min.	AASHTO T 51	100+
Spot Test (Standard Naphtha Solvent)	AASHTO T 102	Neg.

1. All values are inclusive.

2. For samples obtained at point of delivery, the penetration requirement shall be 50+.

3. For samples obtained at point of delivery, the viscosity at 275°F may be determined using ASTM E 102.

4. Storage or working tank temperature will not exceed 325°F.

2.03 POLYMER MODIFIED ASPHALT CEMENT

A. Polymer modified asphalt cement shall consist of an asphalt cement to which a minimum of 3% by weight polymer has been added. The resulting material shall be homogeneous and smooth without detectable strands of polymer and shall meet the following requirements:

Property	Test Method	Specifications
Penetration, 25°C (77°F), 1OOg, 5 Sec.	ASTM D5	Min 50 Max 75
Viscosity, 275°F, cSt	ASTM D2171	Max 2000
Viscosity, 140°F, Poise	ASTM D2171	Min 4000
Flash Point, °F	ASTM D92	Min 450
Solubility in Trichloroethylene, %	ASTM D2042	Min 99.0
Separation of Polymer		

325°F, 48 hours, difference in R & B from top to bottom sample, °F:		Max 4
Ring and Ball Softening Point, °F:	ASTM D36	Min 130
Ductility, 25°C (77°F), 5 cm/min.	AASHTO T 51	100+
Spot Test (Standard Naphtha Solvent)	AASHTO T 102	Neg.

Test for Elasticity	Specifications
Force Ratio (f2/fl,39.2°F, 5 cm/min., 30 cm	Min. 0.3

Tests on Residue from rolling thin film oven test	Specifications
Penetration Retention, %	Min. 50
Elastic Recovery, 77%, 10cm elongation, %	Min 60

2.04 ADDITIVES

A. Silicone

1. Silicone additives, when needed, shall be dispersed into the asphalt by methods and in concentrations given in the QPL.

B. Anti-Strip

1. An anti-strip additive, added at a minimum rate of 0.3% by weight of asphalt cement, shall be thoroughly mixed with the asphalt cement at the plant. This mixture shall yield a Tensile Strength Ration (TSR) equal to or greater than 80 percent as determined by ASTM-D4867-88 including footnote No. 5 (Freeze- Thaw), and shall show stripping of less than 5%. Testing shall be conducted at the beginning of each project and any time the Contractor changes material source. Random tests may be performed during the project.

C. Hydrated Lime

1. When required to meet mix design requirements, hydrated lime shall be added to the mix at the minimum rate of 1.0% by weight of aggregates. A separate bin and feeder shall be provided. Hydrated lime shall be added to the aggregates prior to mixing with asphalt.

2.05 EMULSIFIED POLYMERIZED ASPHALTIC TACK

A. Emulsified Polymerized Asphalt Tack Coat shall consist of a base asphalt cement modified with polymers, which shall then be emulsified. The Emulsified Polymerized Asphalt Tack Coat shall meet the following requirements:

Property	Test Method	Specifications
Viscosity, SSF, at 50°C	AASHTO T 59	100 - 400
Storage Stability Text, 24 hr. %	AASHTO T 59	1-
Settlement, 5 day, %	AASHTO T 59	5-
Classification Test	AASHTO T 59	Pass
Particle Chart Test	AASHTO T 59	Pos.
Sieve Test, Retained on No. 20, %	AASHTO T 59	0.1-
Distillation:		
Oil distilate by vol of emulsion, %	AASHTO T 59	3-
Residue from distilation, %	AASHTO T 59	65+
Test on Residue:		
Penetration, 25°C, 100 g, 5 sec	AASHTO T 49	100 - 200
Ductility, 25°C, 5cm/min, cm	AASHTO T 51_2	125+
Ductility, 4°C, 5cm/min, cm	AASHTO T 51_2	30+
Softening Point (Ring&Ball), °C	AASHTO T 51	38 - 52
Solubility, in Trichloroethylene, %	AASHTO T 44	97.5+
Tensile Stress, 4°C, 500 mm/min at 800 elongation, kg/cm^2	ASTM D 412_2	2.0+
Elastic Recovery, 10°C, 5cm/min, after 20 cm elongation, %	DOTD TR 322_2	58+

1. The addition of latex, rubber or other additives to emulsified polymerized asphalt will not be allowed.

2. The residue asphalt for running ductility tests, tensile stress test and elastic recovery test shall be obtained by means of residue by evaporation (oven) rather than residue by distillation (Aluminum-allow Still). The material supplier shall certify by independent testing that the Tensile Stress requirements have been attained.

2.07 AGGREGATES

A. Aggregates for all asphalt mixtures shall be crushed gravel, slag, or stone approved for wearing courses and conforming to the provisions of Subsection 1003.06 of the Louisiana Standard Specifications for Roads and Bridges 2006 Edition. At the Contractor's option, a maximum of 20% limestone screenings that have a minimum of Number 4 skid rating may be used in all mixes.

B. If the Contractor starts a project using a certain aggregate, the Contractor shall complete the project using that aggregate.

2.08 DESIGN AND QUALITY CONTROL MIXTURES

A. General

1. The Contractor shall be responsible for design, production, transportation and laydown of mixtures. All work shall meet the requirements of this Section and be

subject to acceptance by the Engineer.

2. The Contractor shall exercise quality control over materials and their assembly, design, processing, production, hauling, laydown and associated equipment. Quality control is defined as the constant monitoring of equipment, materials and processes to ensure the mixtures produced and laid are uniform, are within control limits, and meet requirements in Tables 1 and 2 of this Section and other specification requirements. If these specifications are not being met and satisfactory control adjustments are not being made, operations shall be discontinued until proper adjustments and uniform operations are established. Control shall be accomplished by a program independent of, but correlated with a designated testing laboratory and shall verify that all requirements of the job mix are being achieved and that necessary adjustments provide specification results.

3. The Contractor shall conduct such test as are necessary, in addition to the required tests, to design, control and place mixtures within specifications.

4. When the plant is in operation, the Contractor shall have a LADOTD Certified Asphaltic Concrete Technician at the plant or job site who is capable of designing asphaltic concrete mixes, conducting any test or analysis necessary to put the plant into operation and producing a mixture meeting specifications. Daily plant operations shall not begin unless the LADOTD Certified Asphaltic Concrete Technician is at the plant.

B. Job Mix Formula

1. The Contractor shall design the mixtures for optimum asphalt content and comply with requirements of DOTD TR-303, Method A: however, Method B may be used when approved. The job mix formula shall be submitted for approval to the Engineer seven (7) days prior to start of production. No mixture shall be produced until the job mix formula has been approved. The job mix formula will allow the full range of gradation mix tolerances within the mix type specification limits.

2. All mix types with letter “P” in the type designation are to be manufactured using Polymer Modified Asphalt Cement.

3. When aggregates with a water absorption value greater than 2.0% or an asphalt absorption value greater than 0.5%, determined by AASHTO T-84 or DOTD TR-320 respectively, are used in the mixture, the Contractor shall increase the initial optimum asphalt cement content to compensate for the asphalt cement absorbed by the aggregates.

4. The plant shall be so operated as to produce on a continuing basis a mixture conforming to the approved job mix formula, the requirements in Table 1 of this Section and other specification requirements. When this is not the case, the Contractor shall begin making satisfactory adjustments or cease operations.

5. Whenever polymer asphalt is required and for all wearing course mixes, reclaimed asphaltic concrete shall not be permitted in the job mix formula.

6. New aggregates shall be dried and heated to a sufficiently high temperature to produce a mixture with a discharge temperature of at least 290 degrees Fahrenheit. Maximum discharge temperature of asphaltic concrete produced will not exceed 325 degrees Fahrenheit.

7. At least 30% of the total aggregates by weight for Type 91HV and 91HVP mixes shall have a Skid Resistant Rating of I, or at least 50% by weight of the total aggregate shall have a friction rating of II, not more than 10% of these materials shall pass the no. 10 sieve.

C. Aggregate Moisture Content

1. No mix shall be produced when the moisture content of a sample of combined aggregates, taken from the belt feeding the drum/dryer, is equal to or exceeds 8%. The finished asphaltic concrete mixture will be tested for moisture content which must not exceed 0.5%.

TABLE 1
REQUIREMENTS FOR ASPHALTIC CONCRETE MIXTURES

U.S. Sieve % Passing	Type 90 SD	Type 90 WC 90 WCP	Type 90 BC 90 BCP	Type 90 BB 90 BBP	Type 91 HV+ 91 HVP+	Mix Tolerance
l "	100	100	100	80-100	100	+/- 6
3/4"	98-100	95-100	85-100	-	95-100	+/- 6
1/2"	90-100	90-100	70-100	-	80-95	+/- 6
3/8"	70-100	70-100	60-100	-	70-88	+/- 6
No. 4	50-75	50-75	40-70	35-70	50-75	+/- 6
No. 10	32-55	32-55	28-50	-	28-55	+/- 6
No. 40	16-33	16-33	16-33	16-40	14-30	+/- 5
No. 80	10-20	10-20	10-20	-	8-20	+/- 4
No. 200	6-12	6-12	6-12	4-15	3-10	+/- 2
Extracted Asphalt, %	-	-	-	-	-	+/- 0.4
Mix Temperature*	-	-	-	-	-	+/- 10° F
% Cr. Retained on No. 4**	70 Min.	90 Min.	70 Min.	As Needed	90 Min.	
Marshall Stability (Lbs) No. of Blows, Avg. of 4 Test	50	75	75	75	75	
Design	1200	1700	1600	1200	2200	
Minimum	1000	1500	1400	1000	2000	
Indv. Test (min.)	800	1300	1200	800	1800	

Marshall Flow (1/100")	8-18	6-15	5-15	15 Max	6-15
% Voids	2-4	3-5	3-5	3-5	3-5
% VFA	75-85	70-85	70-80	70-80	70-85

* Mix Temperature – (290^{o}F - 325^{o}F) Determined by Job Mix Formula
** As determined by DOTD TR-306

PART 3 EXECUTION

3.01 GENERAL

A. Approved materials shall be installed per their respective sections of the latest edition of the Louisiana Standard Specifications for Roads and Bridges, accept as modified herein.

3.02 WEATHER LIMITATIONS

A. Asphaltic concrete mixtures shall not be applied on a wet surface or when the ambient temperature is below 50 degrees Fahrenheit, except that material in transit or a maximum of 50 tons in the surge bins at the time plant operation is discontinued may be laid; however, mixtures laid shall perform satisfactorily and meet specification requirements. Inclement weather will be sufficient reason to terminate or not begin production.

B. If materials are placed in thicknesses of 2-1/2" or greater, these temperature limitations shall not apply provided all other specification requirements are met.

3.03 SURFACE PREPARATION

A. The surface to be covered shall be approved by the Engineer prior to placing mixtures. The Contractor shall maintain the surface until covered.

B. Cleaning

1. The surface to be covered shall be swept clean of dust, dirt, caked clay and loose material by revolving brooms or other mechanical sweepers supplemented with hand equipment as directed. When mixtures are to be placed on portland cement concrete pavement or overlaid portland cement concrete pavement, the Contractor shall remove excess joint filler from the surface by an approved burning method. The Contractor shall remove any existing raised pavement makers prior to asphaltic concrete overlay operation. All areas to be paved that have vegetation encroachment will be sterilized with an approved soil sterilizer.

C. Applying Liquid Asphaltic Materials

1. Existing Pavement Surfaces: Before constructing each course, an approved asphaltic tack coat shall be applied. The Contractor shall protect the tack coat and spot patch as required.

2. Raw Aggregate Base Course and Raw Embankment Surfaces: The Contractor shall apply prime coat to unprimed surfaces, or protect in-place prime coat and spot patch as required with asphaltic prime coat.

3. Cement and Lime Stabilized or Treated Embankment and Base Course Surfaces: The Contractor shall apply curing membrane if none is in place, or protect the in- place curing membrane and spot patch as required, with asphaltic material.

4. Other Surfaces: Contact surfaces of curbs, gutters, manholes, longitudinal edges and joints, and other structures shall be painted with a uniform coating of asphaltic tack coat before placing asphaltic mixtures.

5. Restoration of Existing Pavement Surface and/or Base: All irregularities, depressions or failures in the existing pavement surface and/or base shall be repaired prior to the placement of any hot-mix asphaltic concrete wearing course surface. In general, surface defects shall be repaired by removing all loose or defective material to sound pavement, and replacing with approved hot-mix asphaltic concrete patching material conforming to Table 1. The hot-mix leveling mixture shall be thoroughly compacted to produce a tight surface conforming to produce a tight surface conforming to the adjacent pavement area.

3.04 JOINT CONSTRUCTION

A. Longitudinal joints shall be constructed by overlapping the paver approximately 2" onto the adjacent pass. Prior to rolling, the overlapped mix shall be pushed back, without scattering loose material over the uncompacted mat, to form a vertical edge above the joint. The vertical edge shall then be compacted by rolling to form a smooth, sealed joint. Longitudinal joints in 1 layer shall offset those in the layer below by approximately 3"; however, the joint in the top layer shall be offset 3" to 6" from the centerline of pavement if the roadway comprises 2 lanes of width, or offset 3" to 6" from lane lines if the roadway is more than 2 lanes.

B. Transverse joints shall be butt joints formed by cutting back on the previously placed mixture to expose the full depth of the course. Transverse joints in succeeding courses shall be offset at least 2 feet. Asphaltic tack coat shall be placed on contact surfaces of transverse joint before mixture is placed against them.

3.05 HAULING, SPREADING AND FINISHING

A. Mixtures shall be transported from plant to paver at a temperature no cooler than 10 degrees Fahrenheit below the lower limit of the approved job mix formula. No load shall be sent out so late in the day as to prevent completion of spreading and compaction of the mixture during daylight, unless artificial lighting has been approved.

B. Each course of asphaltic mixture shall be placed in accordance with the specified lift thickness. If no lift thickness is specified, binder and wearing course mixtures shall be placed in lifts not exceeding 2" thick, unless thicker lifts are permitted. Base course mixtures shall be placed in

lifts of such thickness that all specification requirements are met.

C. With the Engineer's approval, blade graders may be used to fill isolated depressions in the initial layer.

D. Coordination of Production

1. The Contractor shall coordinate and manage plant production, transportation of mix and laying operations to achieve a high quality pavement and shall have sufficient hauling vehicles to insure reasonably continuous plant and roadway operations. The Engineer may order a halt to operations if sufficient hauling vehicles are not available. If less than the optimum number of hauling vehicles are available and it is determined that satisfactory quality can be obtained, the Contractor will be permitted to work provided plant production and hauling vehicles are coordinated to minimize the adverse effect of idle time between loads.

E. Paving Operations

1. Transfer of mixture from haul truck to pavement may be made by direct unloading into the spreader hopper or by use of approved mechanical loading devices. Delivery of material to the paver shall be at a uniform rate and in an amount within the capacity of paving and compacting equipment. Equipment shall be so designed and operated that the finishing machine will place mixtures to required line, grade and surface finish without resorting to hand finishing. Equipment which leaves tracks or indented areas which cannot be corrected in normal operations or fails to produce a satisfactory surface shall not be used. Operation of equipment resulting in accumulation of material and subsequent shedding of accumulated materials into the mixture will not be permitted.

2. All mixtures shall flow though the spreader hopper. Mixtures dropped in front of the spreader shall be either lifted into the hopper or rejected and cast aside.

3. Longitudinal joint and edges shall be constructed along lines established by the Contractor for the paver to follow. The paver shall be positioned and operated to closely follow the established line. Irregularities in alignment shall be corrected by trimming directly behind the paver.

4. After the first load of material has been spread, the texture of the unrolled surface shall be checked to determine its uniformity. The adjustment of screed, tamping bars, feed screws, hopper feed, etc. shall be checked frequently and adjusted as required to assure uniform spreading of the mix to proper line and grade and adequate compaction. If segregation of materials occurs, spreading operations shall be suspended until the cause is determined and corrected.

5. Surface irregularities shall be corrected directly behind the paver. Excess material forming high spots shall be removed. Indented areas shall be filled and finished

smooth. Hand placement for surface repair will be permitted. Material shall not be cast over the surface.

6. If spreading and finishing operations are interrupted to such extent that the mixture remaining in trucks, paver, spreader hopper or on the roadway cools to such extent that it cannot be laid, finished or compacted to the same degree of smoothness and with the same texture and density as the uncooled mixture, the cooled mixture shall be removed and replaced at the Contractor's expense.

7. Mechanical Pavers

   a. Thirty (30) Foot (Minimum) Traveling Stringline: The initial paving strip of each layer of mixture shall be constructed using the traveling stringline and automatic slope control method; however, if permitted, the portion of mixtures required to level isolated depressions in the initial layer may be placed without automatic screed control. After the initial paving strip of each layer is finished and compacted, adjacent paving strips shall be laid to the grade of the initial paving strip using a shoe device or traveling stringline to control grade and a slope control device to control cross slope.

      i. If directed, the traveling stringline shall be used to control grade of adjacent paving strips on all layers. On multi-lane pavements, the sequence of lane construction will be subject to approval.

      ii. If both outside edges of paving strip being placed are flush with previously placed material, the slope control device shall not be used. A grade sensor is required for each side of the paver.

      iii. In superelevated curves, the cross slope shall be changed from that specified for tangents to the specified for superelevation in gradual increments as the paver is in motion so a smooth transition in grade is obtained. The change in cross slope shall be accomplished within the transition distance specified.

   b. Erected Stringline: The initial paving strip of the first layer of mixture shall be constructed using an erected stringline referenced to grade established by the Engineer; however, if permitted, mixtures required to level isolated depressions may be placed without automatic screed control.

      i. Subsequent layers may be constructed by use of the traveling stringline, provided surface and grade tolerances are met on the previous layer.

      ii. Only 1 grade sensor and the slope control devices are necessary for normal crown and tangents. Super elevated curves will require the use of 2 grade sensors and 2 erected stringlines to obtain proper grade and slope; however, if the automatic screed control device is equipped with

a dial or other device which can be conveniently used to change the cross slope in small increments, super elevated curves may be constructed using this device and 1 erected stringline.

iii. After the initial paving strip of the first layer is finished and compacted, adjacent paving strips shall be laid in accordance with heading (1) above.

c. Without Automatic Screed Control: When permitted, pavers without automatic screed control may be used for pavement patching, pavement widening, paved drives and turnouts.

8. Hand Spreading:

a. Where the use of mechanical finishing equipment is not practical, the mix may be spread and finished by hand to the satisfaction of the Engineer. Mixtures shall not be cast from the truck to the grade. During spreading operations, material shall be thoroughly loose and uniformly distributed. Material that has formed into lumps and does not break down readily will be rejected. The surface shall be checked before rolling and irregularities corrected.

9. Curb and Gutter and Integral Curb:

a. On streets having curb and gutter or integral curb where the Asphaltic concrete is to extend to the curb, the cross slope shall be broken to provide an additional 1/2'' drop at the curb line. The break point shall occur between 2 and 4 feet from the curb line. The exact break point shall be agreed upon by the Engineer and the Contractor, considering the capabilities of the type of equipment to be used for laydown.

3.06 COMPACTION

A. After placement, mixtures shall be uniformly compacted, by rolling while still hot, to a minimum 95% density.

B. When polymer asphalt cement is not specified in the mixture a pneumatic tire roller may be used for intermediate rolling; however, when the ambient temperature is below 60 degrees Fahrenheit, it must be used. With polymer asphalt pneumatic rollers will not be permitted. The use of roller which results in excessive crushing of aggregate will not be permitted.

C. The rolling pattern established by the Contractor shall be conducted by experienced operators in consistent sequences and by uniform methods that will obtain specified density and smoothness. Individual roller passes shall uniformly overlap preceding passes to ensure complete coverage of the paving area. The speed and operation of rollers shall be such that no displacement or tearing of the mat occurs. Non-vibrating steel wheel rollers shall be operated with drive wheels toward the paver. Any displacement or tearing of the mat shall be immediately corrected. Finish rolling shall be accomplished with a non-vibrating steel roller until roller marks

have been eliminated.

D. To prevent adhesion of mixture, wheels of steel wheel rollers shall be kept properly moistened, but excess water will not be permitted. Pneumatic tire rollers shall be operated in such manner that tires will retain adequate heat to prevent mix from adhering to tires. The pneumatic tire roller shall be operated at a contact pressure which will result in a uniform, tightly-knit surface. The pneumatic tire roller shall be kept approximately 6" from unsupported edges of the paving strip; however, when more than 1 paving strip is down, the adjacent paving strip shall be overlapped approximately 6 inches.

E. If continuous roller operation is discontinued, rollers shall be moved to cooled areas of the mat, where they will not leave surface indentions.

F. Vibratory rollers may be used provided they do not impair the stability of the pavement structures of underlying layers. If mix is placed on newly constructed cement or lime stabilized or treated base, sub-base or working table, vibratory rollers shall not be used for at least 7 days after such stabilization or treatment.

G. Along forms, curbs, headers, wall and at other places inaccessible to rollers, mixtures shall be uniformly compacted to the satisfaction of the Engineer with hot hand tampers, mechanical tampers, or other approved methods.

H. Surface mixtures after compaction shall be smooth and true to cross slope and grade within the tolerances specified. Mixtures that become loose, broken, contaminated or otherwise defective shall be removed and replaced with fresh hot mixture compacted to conform with the surrounding mixture.

I. Newly finished pavements shall be protected from traffic until they have sufficiently hardened.

J. Newly finished pavements, after finish rolling, shall have uniform, tightly-knit surface free of cracks, tears or other deficiencies. Ripples in the mat surface will not be accepted. All deficiencies shall be corrected at the Contractor's expense and the Contractor shall adjust his operations to correct the problem. This may require the Contractor to adjust the mix or furnish additional or different equipment.

3.07 PAVEMENT SAMPLES

A. The Contractor shall furnish samples cut from the complete work. The removed pavement shall be replaced with new mixture and refinished within 24 hours. No additional compensation will be allowed for furnishing test samples and replacing the areas with new pavement. Samples shall be taken by the Contractor in the presence of Engineer's representative from areas selected by the Engineer. However, cores less than 1-1/2" thick shall not be used as pavement density. Samples shall be cores approximately 4" in diameter taken by an approved core drill.

B. Core holes must be filled the next work day after being cut. Core holes must be dry and tack coat applied prior to filling. The mix used for filling must be the same as where the core was

made. The core hole will be overfilled and then rodded 25 times. The mix in the hole will be shaped and crowned 1/4" higher than the roadway surface. The mix in the core hole will compacted with a 10 lb. hammer. Mix in the hole will be considered compacted after receiving a minimum of 25 blows with the hammer. After compactions, the core hole top must be equal to or slightly higher than the roadway surface.

C. In the event that the Contractor fails to satisfactorily fill and refinish test sample holes within 24 hours, the Engineer may suspend all other operations on the project until such time as the test holes have been satisfactorily filled and refinished.

3.08 SURFACE FINISH REQUIREMENTS

A. Testing for surface tolerances as outlined in Table 2 of this section will be the responsibility of the Engineer of Record. The Contractor shall furnish the Engineer assistance, as directed, in pulling the rolling straightedge. Control checks will be the responsibility of the Contractor. The Contractor shall furnish a 10-foot rolling straightedge for longitudinal testing and a 10- foot metal static straightedge for traverse testing, both of which shall be acceptable to the Engineer. The rolling straightedge shall be calibrated and used in accordance with DOTD TR-603 and TR-618.

B. For the purpose of the surface finish requirement, the wearing course is defined as the last course placed and the binder course is defined as the last course placed prior to the wearing course. The surface finishes for binder and wearing courses shall meet the requirements as specified in Table 2 of the this section.

TABLE 2
SURFACE FINISH VARIATION (INCHES)

	Longitudinal*	Transverse	Cross Slope**	Grade
Wearing Course	1/8	1/8	3/8	1/2
Binder Course	1/4	1/4	1/2	1/2

*Longitudinal measure based on a 10-foot rolling straightedge
**Cross Slope measure based on 10-feet

1. Longitudinal Surface Finish

   a. The finished surface will be tested by the Engineer in the longitudinal direction for conformance to surface finish requirements in Table 2 of this section. One path in each lane will be selected at random and tested.

   b. Longitudinal variations in binder course surfaces shall be subject to the provisions of Table 2 of this section. Any surface finish deficiency that exceeds 3/8" shall be corrected in accordance with item 5 of this subsection. Longitudinal variations in the final wearing surface will be subject to provisions of Subsection 3.10.2.a.i. Surface finish deficiencies exceeding 1/4" shall be corrected in accordance with item 5 of this subsection. After corrections have been made, the mix laid that day will be subject to the provisions of Subsection 3.10.2.a.i.

2. Transverse Surface Finish

a. The transverse surface finish shall be so controlled that the values shown in Table 2 will not be exceeded. The surface for binder and wearing courses will be tested at selected locations by the Engineer in the transverse direction for conformance to surface finish requirements of Table 2 of this Section. Corrections shall be made as directed in accordance with item 5 of this subsection.

3. Cross Slope

a. The cross slope shall be so controlled that the values shown in Table 2 of this section will not be exceeded. Cross slope variations allowed in Table 2 shall apply to each lane constructed. Tests shall be run at selected locations, using a stringline, slope board or other comparable method

4. Grade

a. Grade variations shall be so controlled that the tolerance shown in Table 2 of this section will not be exceeded. Tests for conformance shall be run at selected locations, using a stringline or other comparable method.

b. If the pavement is consistently above or below the established grade for reasonable long segment, the Engineer may, for the purpose of determining conformance to the tolerance, use a new grade approximately parallel to the established grade; in which case, any required transition in grade or vertical curve at each extremity of the segment shall be in accordance with the base design requirements. Grade tolerances shall apply to only 1 longitudinal line, such as the centerline or the outside edge of pavement. Corrections shall be made in accordance with item 5 of this subsection.

5. Correction of Deficient Areas

a. Deficiencies to be corrected in the final wearing course shall be corrected by milling, removing, and replacing, or furnishing and placing a supplemental layer of wearing course mixture at least l " thick for the full width of the roadway; all in a satisfactory manner at the Contractor's expense. Deficiencies to be corrected in a satisfactory manner at the Contractor's expense. Deficiencies to be corrected in binder courses shall be corrected in a satisfactory manner at the Contractor's expense. Corrections shall be made before subsequent courses are constructed.

b. With the written permission of the Project Engineer, deficiencies in Longitudinal and/or Transverse Surface Finish may be corrected by heating and re-rolling the surface. Devices used to heat the asphaltic concrete shall not

expose the surface to open flame.

3.09 DIMENSIONAL REQUIREMENTS

A. Thickness

1. Thickness of mixtures will be determined by random coring. Under thickness shall not exceed 1/4". For all mixtures except the final surface course, areas with under thickness in excess of the 1/4" shall be corrected to plan thickness at the Contractor's expense by furnishing and placing additional mixture. For all mixtures except the final surface course, areas with under thickness in excess of the 1/4" shall be corrected to plan thickness at the Contractor's expense by furnishing and placing a supplemental layer of wearing course mixture at least 1-1/2" thick over the entire area for the full width of the roadway.

B. Width

1. The width of completed courses will be determined in accordance with DOTD TR-602. Underwidths shall be corrected to plan width at the Contractor's expense by furnishing and placing additional mixture.

3.10 ACCEPTANCE REQUIREMENT

A. All inspection procedures, including sampling and testing, form the basis for acceptance of the asphaltic concrete. Sampling and testing shall be accomplished following a stratified sampling plan; times and locations shall be set by the Engineer. The location of the area to be cored will be determined by the use of "random number tables" transversely and longitudinally in each subsection of each lot. The procedure used will be in accordance with Louisiana Department of Transportation and Development publication entitled, "Application of End Result Specifications for Asphaltic Concrete." Any section of pavement that is obviously deficient shall be satisfactorily corrected or replaced.

B. Acceptance testing for Marshall Stability and aggregate gradation will be conducted on the mix laid each day on the project. Also acceptance testing for pavement density, surface tolerance and dimensional tolerances will be conducted on mix produced and laid for the City each day.

C. Pavement density and surface tolerance requirements will not be applied for short irregular sections, such as drives, aprons and turnouts; however, mix shall be placed in such manner as to provide a neat, uniform appearance and shall be compacted by satisfactory methods.

D. For all projects, 1 sample shall be taken for Marshall Properties testing for each 250 tons or portion thereof produced and 1 sample taken for extracted gradation testing for each 500 tons or portion thereof produced. Five (5) samples shall be taken for determination of pavement density, with the sampling distribution to be determined by the Engineer.

1. Inspection

   a. Mix exhibiting deficiencies before placement, such segregation, contamination, lump non-uniform coating, excessive temperature variations or other deficiencies, apparent on visual inspection, shall not be placed.

   b. Mix exhibiting deficiencies during placement, such as segregation, contamination, alignment deviations, variations in surface texture and appearance or other deficiencies, apparent on visual inspections, will not be accepted. Poor construction practices such as handwork, improper joint construction, or other deficiencies, apparent on visual inspection, will not be accepted.

   c. Deficiencies revealed by visual inspection after placement and before final acceptance shall be corrected at the Contractor's expense.

   d. If requested by the Contractor, the acceptability of fixtures or work rejected by visual inspection of the inspector will be evaluated by tests, measurements and/or visual inspection by the Engineer.

2. Sampling and Testing:

   a. The City will review the test results from the tests outlined in these specifications to ensure that the asphaltic concrete conforms to City standards, which includes mix design limits, typical sections, material values, surface deviations and verification of control testing. Deviations from specified tolerances will not be accepted. If a sample or test indicates a deviation from the specified tolerance, the Contractor shall take immediate corrective action, or operations shall be discontinued.

      i. Marshall Stability: When individual tests or the average of tests representing the mix produced and laid for the City is outside acceptance limits shown in Table 1 of this Section, the City shall have the right to reject the completed works.

      ii. Aggregate Gradation: Testing for aggregate gradation will be conducted by the Contractor's technician. Gradation testing shall be performed for each 500 tons or portion thereof produced per day.

      iii. Pavement Density: Upon completion of compaction, 5 pavement samples shall be obtained in accordance with subsection 501.09 within 24 hours after placement. If this falls on the day the Contractor's crews are not working, sampling will be done the following working day. If the Contractor does not obtain the roadway samples as outlined, the Engineer may deduct 5% of the contract price of asphaltic concrete for

the day or days run, where samples are late or lacking. The density requirement for the average of 5 samples 95% density, determined in accordance with DOTD TR-304.

iv. Surface Smoothness: Testing for surface smoothness will be required on the final wearing surface. The surface will be tested longitudinally with a 10-foot rolling straightedge within the time period prescribed in Heading iii above. The rolling straightedge shall be furnished by the Contractor. Surface corrections shall be made in accordance with Subsection 3.08. The requirements for surface tolerance shall be as shown in Table 2 of this section.

END OF SECTION

SECTION 8
SANITARY SEWER LIFT STATIONS

PART 1 GENERAL

1.01 SCOPE

A. The work covered by this specification consists of furnishing labor, materials and services for the construction of a sanitary sewer lift station, complete with all piping, electrical, pumps, fence, painting, landscaping, the required valves, valve box, wet well, ultrasonic level controls, excavating, backfilling, finished site work, etc., and any other items necessary to provide a complete system which functions properly.

B. It is the intent of the specifications that the Contractor furnish and install all facilities necessary for the complete and operable systems for the project whether described in detail or not, except for those items specifically stated as presently existing or furnished and/or installed by Owners or by others.

C. All stations shall have a minimum of two pumps of equal capacity. The pumps shall be solids handling, submersible type centrifugal pumps capable of meeting the design flow. The pump manufacturer shall be responsible for supplying the pump, motor, discharge elbow, anchor bolts, guide rails, and all miscellaneous stainless steel hardware required to place the submersible pump within the wet well. Submersible pumps shall be removable for inspection or service without entering the wet well. Access hatches shall be provided for wet well and valve vault access and shall be lockable with recessed hatch.

D. The lift station piping shall allow an emergency bypass of the lift station wet well. In general, this involves placing a tee with a valve and quick connects on the discharge side of the shutoff valves.

E. Each pump shall have an individual discharge pipe complete with flanged coupling adaptor, check valve, and shut off valve.

F. Lift station sites shall be designed with a concrete driveway apron to access the site. The entirety of the site shall be paved with concrete pavement. Site fencing shall be installed on top of or within the limits of the site paving.

1.02 REFERENCES

A. All materials, equipment, and designs shall conform to the requirements of these specifications. They shall be new, free from defects, and they shall conform to the following standards where these organizations have set standards:

1. Louisiana Department of Health and Hospitals (LADHH)

2. American Society for Testing and Materials (ASTM)

3. American Concrete Institute (ACI)

4. Concrete Reinforcing Steel Institute (CRSI)

5. American Welding Society (AWS)

6. Fiberglass Tank and Pipe Institute

7. American National Standards Institute (ANSI)

8. American Water Works Association (AWWA)

9. The Society for Protective Coatings (SSPC)

10. Hydraulic Institute (HI)

B. The same manufacturer shall supply all like materials and equipment of the same class, unless specified to the contrary.

C. All products shall bear UL labels where standards have been set for listing.

1.03 SUBMITTALS

A. Submit four (4) sets of shop drawings or cuts, diagrams, performance curves, and engineering data for the items to be furnished under this section. Two (2) sets are to be submitted to the Owner, and if City of Lake Charles' acceptance is required, two (2) sets are to be submitted to the Wastewater Division.

B. Submittals shall not only cover the major components (pumps, motors, etc.), but individual devices as well (piping valves, wet well materials of construction, access hatches, etc.).

C. Submittals shall be provided for the Operation and Maintenance Manuals prior to final issuance of these documents.

1.04 ACCEPTANCE

A. For acceptance of the lift station by the City of Lake Charles, the lift station:

1. Must be complete with a SCADA system.

2. Must be satisfactorily operated by the City's Wastewater Division for a period of one year. During this one year trial period, all repairs, replacements, parts, labor, and service will be at the expense of the Owner. At the end of one year of satisfactory service, the Superintendent, or representative, of the Wastewater Division will recommend that the City formally accept the lift station.

3. Must be accepted through a formal transfer of ownership which is specifically approved by ordinance or controlled through the subdivision review and approval process.

B. In order to be considered for acceptance by the City, a privately built sewer lift station must be:

1. Pre-authorized for construction and subsequent public dedication as part of an

approved development plan or preliminary subdivision plat;

2. Constructed to City standards and specifications established by the Wastewater Division;

3. Approved upon completion for conformity with standards and specifications by appropriate city personnel or representatives.

4. Accurately depicted in construction record documents submitted to and approved by the City of Lake Charles Wastewater Division.

5. Subject to satisfactory maintenance guaranty or pre-acceptance operating test period, as determined by the City.

6. Located on acceptable rights-of-way or readily accessible maintenance easements to be granted to the City.

C. It is the intent of the City to minimize the number of lift stations transferred to the City, and any such facilities which serve only one development should be designed to remain in private ownership and operation. If transfer of such a limited service lift station to the City is necessary to assure satisfactory operation and protection of public health, the transfer instruments shall require compensation of subsequent city operating costs by the user(s) of the facility.

1.05 MAINTENANCE AND OPERATING INSTRUCTIONS

A. The contractor shall prepare a hardback binder of all mechanical equipment furnished by him on the project. The binder shall include shop drawings and operating and maintenance instructions of such equipment. Information shall be printed or typewritten, neatly folded to approximately 8-1/2 x 11 size and filed or bound in as many sturdy manila folders as required to contain the materials. Each binder shall be properly identified. Upon completion of the binder, the Contractor shall turn two (2) copies over to the owner and two (2) copies to the Wastewater Division, if City acceptance of the lift station is required.

1.06 WARRANTY

A. The Contractor shall guarantee all equipment furnished by him free from inherent mechanical, structural, and electrical defects for a period of one year from date of final acceptance.

B. Any replacement of parts, or adjustments, including labor, made necessary by inherent mechanical, structural, or electrical defects, shall be rendered without cost to the Owner within the guarantee period.

C. The pump manufacturer shall guarantee for one year, from date of final acceptance, that all equipment supplied will be free of defects in design, material or workmanship. Said guarantee shall be furnished to the owner in writing. In the event a component fails to perform as specified or is proven defective during the first year, a replacement part shall be provided without cost to the Owner. This warranty covers all electrical and mechanical equipment supplied.

D. In order to assure proper performance and compatibility of interacting components within the intent of the specifications, the pumps, control panel, and warranty shall be supplied by the

same manufacturer.

PART 2 PRODUCTS

2.01 PUMPS

A. Pumps shall be non-clog submersible, or approved equal, capable of passing a minimum 3" diameter solid. The selected pumps should be able to pump at a minimum efficiency of 60%. In addition, the engineer shall verify that the NPSH available is always at least 5' greater than the NPSH required.

B. Furnish and install one (1) duplex pump station. System shall include two submersible pumps with hydraulic sealing flanges; pump rail guides; stainless steel guide rails; pump mounting plates with discharge elbow and rail supports; aluminum access frame with covers, and guide rail supports; stainless steel pump lifting cables with hooks; wiring bracket; and Nema 4X pad lockable weatherproof enclosure.

C. Pumps shall be designed to pump unscreened raw sewage and pass a minimum 3 inch solid. Impellers shall be hydraulically and dynamically balanced and shall be two port non-clog type. Pumps shall be fitted with replaceable wear rings and have two mechanical seals with oil chamber between the seals. Rotating seal faces shall be carbon and stationary faces shall be ceramic.

D. Pumps shall be equipped with a minimum of twenty feet of power and/or control cord respectively.

E. Discharge of each pump shall be equipped with a hydraulically sealed leak proof flanged discharge.

F. All metal seal parts and fasteners shall be 303 stainless steel. The seal chamber shall be fitted with electrode probe and signal box to indicate water in seal chambers.

G. Accepted pump manufacturers: Hydromatic, Fairbanks Nijhuis, Flygt, and ABS. Other manufacturers must be approved by the Wastewater Division prior to acceptance by the City.

2.02 PUMP MOTOR

A. Pump motor shall be of the sealed submersible type for 3 phase electrical power. The motor shall be designed for continuous duty capable of minimum of ten (10) starts per hour.

B. Motor shall be supplied with heat sensing unit attached to motor windings to stop motor in the event it overheats. Motors shall not be overloaded at any point on the curve and shall have the rotative speeds as scheduled on the drawings. Motor shall also be provided with seal fail sensor.

C. The submersible motor shall be FM Listed for class 1, Division 1, Group C & D explosion proof location as defined by the National Electric Code.

2.03 DISCHARGE ELBOW AND GUIDERAILS

A. The pump base and guide rail system shall include 2-125 pound flanged cast iron discharge elbows, 2-cast iron connecting flange assemblies, 2-stainless steel guide connectors, 2-stainless steel upper guide brackets, 2-Stainless Steel pump lifting cables, 1-Stainless Steel float mounting bracket and 4-stainless steel guide rails.

2.04 DUCTILE IRON PIPE AND FITTINGS

A. Piping shall be sized so that the maximum discharge velocity does not exceed eight feet per second.

B. All exposed piping shall be flanged ductile iron and shall be new and unused. Ductile iron pipe shall be manufactured in accordance with A.N.S.I. A21.51 and designed in accordance with A.N.S.I. A21.50 minimum Class 50 or Class 53 for flanged piping.

C. Ductile iron fittings shall be compact unless otherwise specified and conform to AWWA Standard C-153. Fittings shall also meet ANSI 21.10, 250 psi rating.

D. Flange gaskets shall be 3.2mm (1/8") thick acrylic or aramid fibers bound with nitrile for all sizes of pipe. Gaskets shall be full-face type with pre-punched holes.

E. All ductile iron pipe shall have a ceramic epoxy interior lining. The Epoxy ceramic lining shall be a two component amine cured novalac epoxy of at least 87 percent solids. Lining material shall be Protecto 401 by Induron Coatings, Birmingham, AL, or prior approved equal, and shall be installed in accordance with the manufacturer’s recommendations.

F. Flanged pipe and fittings within the wetwell and valve vault shall be supported in order to avoid excessive stress to flanges and to allow for routine maintenance.

G. Exterior surfaces of exposed ductile iron pipe and fittings shall be coated as provided in Section 2.14 below.

H. Direct buried ductile iron pipe and fittings shall be installed with a polyethylene encasement. Polyethylene encasement shall conform to AWWA C-105 or ANSI A21.5. Film shall be Class “C”-Black, with a minimum nominal thickness of 0.008 inches (8 mils).

2.05 VALVES

A. Unless otherwise noted, valves shall be manually actuated; non-buried valves shall have an operating wheel, handle or lever mounted on the operator; buried valves and those with operating nuts shall have a non-rising stem with an AWWA 2-inch nut. At least two tee handles shall be provided for all operating nuts.

B. Each operating device shall have cast on it the word "OPEN" or "CLOSE" and an arrow indicating the direction of operation.

C. Air-Cushioned Swing Check Valves

1. The check valve shall prevent backflow of the pumped liquid on normal pump shut off or power failure, at zero velocity, and be watertight.

2. Air-Cushioned Swing Check valves for raw sewage shall be flanged and shall be as manufactured by Golden Anderson, Val-Matic, or approved equal.

D. Plug Valves

1. Plug valves shall be provided for pump and forcemain isolation. Plug valve shall be designed for buried service or exposed service depending upon the installation location.

2. Plug valves for raw sewage shall be as manufactured by Golden Anderson, or approved equal.

E. Flapper Valves

1. Flapper valves shall be installed on the valve vault drain line in the location where the line enters the wet well.

2. Flapper valves shall be Tide Flex Check Valves, as manufactured by TideFlex Technogies, or approved equal.

2.06 PIPE PENETRATIONS

A. All penetrations into the lift station wet well and valve vault shall be water-proof.

B. Where the valve vault and the wet well are to be constructed using cast in place reinforced concrete, it is recommended that pipe penetrations use manufactured wall pipe or other approved method.

C. Where the valve vault and the wet well are to be constructed using pre-cast structures, the pipe penetrations shall be provided with a modular seal, as manufactured by link-seal or approved equal.

D. Where electrical conduit must pass through concrete walls, use wall sleeves or core through walls and provide waterproof and gas proof seals using link seals, or other approved method.

2.07 EMERGENCY BY-PASS CONNECTIONS

A. The lift station piping shall be provided with emergency bypass of the lift station wetwell.

B. The emergency bypass shall consist of a buried isolation valve located on the discharge forcemain downstream of the valve vault, a buried TEE with an above grade mounted isolation valve and quick connect.

C. The emergency by-pass connection shall be provided in a location convenient approved by the Engineer and suitable for ease of connection. Quick Connect Couplings shall be Dover Corporation, OPW Division Model PF-C coupler with Model 634A plug.

2.08 FLEXIBLE CONNECTIONS

A. A flexible connection, consisting of a flange coupling adaptor, shall be installed on each pump's discharge piping between the valve vault wall and the check valve in order to allow for removal

and maintenance of valves and fittings.

2.09 HARDWARE

A. Hardware used within the wetwell, to include pipe supports, pump guide rails, pump lifting chains, pipe fasteners, anchor bolts, clasps, etc., shall be stainless steel.

B. All bolts for flanged shall be corrosion resistant cast iron alloy such as USALLOY by U.S. Pipe, CORTIN by U.S. Steel, or approved equal. Fittings are to be polyethylene lined as specified herein.

2.10 WET WELL

A. Pumps and equipment shall be installed in a concrete wet well, complete with padlockable access hatches.

B. Pre-cast reinforced concrete wet well riser sections shall conform to ASTM C-76, Class Ill, Wall B.

C. Wet-well riser section joints shall be made with gasketed joints. Gaskets shall conform to ASTM C-443.

D. Concrete wet-well walls and ceiling shall be coated as specified in Part 2.13 of these specifications.

E. Construct the top and bottom slabs of the wet well using a minimum of 560 lbs of cement per cu. yd., 4000 psi @ 28 day compressive strength concrete with not more than 15% fly ash substitution. Reinforce top slab with #5 bars at 6" o.c. each way, top and bottom. Reinforce bottom slab with one layer of #5 @ 6" o.c. each way in top. Reinforce opening around access match opening with 16 #5 bars placed diagonally in pairs around opening, 4 pairs in top and 4 pairs in bottom. Space pair 6" o.c. horizontally.

F. Exterior Waterproofing

1. Prior to backfilling exterior joints shall be waterproofed as provided below.

2. Wet well exterior joints shall be sealed with an external rubber sleeve similar to the Infi-Shield Gator Wrap as manufactured by Sealing Systems Inc. The seal shall be made of a Stretchable, Self-Shrinking, Intra-Curing Halogenated based rubber with a minimum thickness of 30 mils and 12-inch width. The back side of each unit shall be coated with a cross-linked re-enforced butyl adhesive. The butyl adhesive shall be non-hardening sealant with a minimum thickness of 30 mils. The seal shall be designed to stretch around the joint and then overlapped creating a cross-link and fused bond between the rubber and butyl adhesive. Gator Wrap forms a continuous rubber seal on a manhole joint which prevents water and soil from infiltrating through the manhole, catch basin or concrete pipe joint. The exterior joint sealants shall be installed per the manufacturer’s recommendations.

2.11 VALVE VAULT

A. Valve manifold shall be installed in a concrete valve vault, complete with a padlockable access

hatch. Valve vault shall be sized to accommodate 8-inch of clearance between all inside walls and valves/fittings.

B. Construct valve box using a minimum of 560 lbs of cement per cu. yd., 4000 psi @ 28 days compressive strength concrete with not more than 15% fly ash substitution. Reinforce valve box walls, top and bottom slabs with one layer of #4 @ 8" o.c. each way.

C. Construct bottom slab 12" below bottom of force main fittings. Provide a minimum of 6" clear from wall to face of force main flanges. Provide 12" clear from sidewalls of box to pump discharge lines.

D. Valve box top slab to be complete with an access hatch, with a minimum 30" x 48" clear opening.

E. Locate access cover and frame to provide access to check valves and plug valves for operation and maintenance.

F. The slope of the valve vault floor shall drain all water to a discharge pipe penetration which will drain back to the wet well. Drain line shall be schedule 80 PVC and shall incorporate a duckbill style check valve to prevent sewer gases from entering the valve vault.

G. Concrete valve vault walls and ceiling shall be coated as specified in Part 2.13 of these specifications.

2.12 ACCESS HATCHES

A. Access hatches shall have single or double leaf doors as indicated by the Drawings. The doors shall be 1/4-in aluminum diamond pattern plate with welded stiffeners, as necessary, to withstand a live load of 300 lbs/sq ft with a maximum deflection of 1/150th of the span. Hatches shall have a 1/4-in aluminum channel frame with a perimeter anchor flange or strap anchors for concrete embedment around the perimeter. Unless otherwise noted on the Drawings, use pivot torsion bars for counterbalance or spring operators for easy operation along with automatic door hold open. Hardware shall be durable and corrosion resistant with Type 316 stainless steel hardware used throughout. Provide removable lock handle. Finish shall be the factory mill finish for aluminum doors and frames with bituminous coating on the exterior of the frames in contact with concrete. Hatches shall be watertight and have a 1-1/2-in drainage coupling to the channel frame. Access hatches shall be Types as indicated on the Drawings by Bilco Company, New Haven, CT or equal.

B. In instances where The City of Lake Charles Waste Water Department, determines that waterproof hatches shall be required they shall be of the make and quality stated above and shall expel water when fully submerged.

2.13 CONCRETE INTERIOR COATING

A. The interior concrete wet well and valve vault, including ceilings, shall receive a multi-component stress panel lining system, using a mechanical anchoring system at all terminations.

B. The liner shall be installed according to the manufacturer's recommendations.

C. The interior lining system shall be SpectraShield, as manufactured by CCI Spectrum, Inc., or approved equal.

2.14 FERROUS METALS COATING

A. Surfaces of equipment and ferrous surfaces submerged or exposed including, but not limited to, ductile iron piping, fittings, valves and pumps shall be coated with a two part epoxy coating system applied to at least 16 mils dry film thickness.

B. Two part epoxy coating system shall be Carboline 890, as manufactured by Carboline Coatings Company, or approved equal.

2.15 SITE PAVING

A. Concrete paving for site access driveway and the interior site paving shall be 6-inch reinforced concrete paving complying with Section 5 Portland Cement Concrete Paving of these standard specifications.

PART 3 EXECUTION

3.01 GENERAL

A. Coordinate with other trades, equipment and systems to the fullest extent possible.

B. Take all necessary measurements in the field to determine the exact dimensions for all work and the required sizes of all equipment under this contract. All pertinent data and dimensions shall be verified.

C. All valves and appurtenances shall be installed in the locations shown, true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the Engineer before they are installed.

D. Standard factory testing shall be performed on the equipment provided in this section.

3.02 TRENCHING AND EXCAVATION

A. Excavation

1. Excavation shall include the removal, handling, re-handling, 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, and trench box. The work of excavation shall also include the responsibility of added expenses or other liability that may arise from quicksand, obstacles or conditions, foreseen or unforeseen, which may be encountered in the work. It includes clearing and the removal of pavements, curbs, sidewalks, shrubbery, and other obstructions not otherwise provided for.

B. Dewatering

1. The Contractor shall at all times during construction provide proper and satisfactory means and devices for the exclusion of water or removal of all water entering the

excavation and shall remove all such water as fast as it may collect in such a manner as shall not interfere with the prosecution of the work.

2. No water shall be diverted into any operating sewer line.

3. The Contractor shall use due vigilance and care so that no water originating on his work or due to his work or which he is obligated to handle and dispose of under this contract shall discharge or be discharged on the work or into the trenches of another contractor unless a mutual agreement by the parties affected has been reached. Nothing in this section is to be construed as preventing the reasonable use by the Contractor of any ditch, channel, storm drain, or gutter which is designated and used for City or Parish drainage.

4. The Contractor shall keep the completed sewer lines free of water at all times and until final acceptance.

C. Maintenance of Excavation

1. The Contractor shall maintain all excavation in good order during the construction, so as not to hinder or injure the pipe laying, masonry, or other work. He shall take all reasonable precautions to prevent movement of the sides of such excavation, and shall remove at his own expense any material sliding into the excavation.

D. Sheeting and Bracing

1. The Contractor shall furnish and put in place such sheeting and bracing as may be required to support the sides of all trenches or other excavations and, where required, remove, or cut off, as directed, such sheeting at his own expense. A steel trench box, supplemented with additional sheeting, may be used in lieu of total sheeting and bracing.

E. Disposal of Excavated Material

1. All material excavated shall be placed so as to interfere as little as possible with public travel. In case the street is not wide enough to allow the dirt to be piled up without blocking the sidewalk, the Contractor shall, at his own expense, maintain an open passageway not less than two and one-half feet (2 ½') wide on the sidewalk and shall keep this passageway free from mud and slush.

2. The Contractor may deposit excavated materials directly in permanent position insofar as is consistent with the proper prosecution of the work. Materials that cannot be placed at once in permanent position shall be deposited in temporary storage piles. All this work shall be done with reasonable neatness and excavated materials shall not be carelessly strewn over the area.

3. Surplus excavated material over and above that required for backfilling, mounding over the pipe and making other fills and embankments to the finished lines and grades indicated on the drawings shall be disposed of as directed by the Engineer. The Contractor shall be responsible for seeing that the material is dumped in an orderly manner within the limits designated. The surface of the dump shall be neatly graded to

blend with the natural contours of the existing ground surface. If the City or Drainage Board has no use for the surplus material, it will be the responsibility of the Contractor to properly dispose of said surplus.

3.03 WET WELL AND VALVE VAULT INSTALLATION

A. Concrete wet wells and valve vaults shall be installed on a structural base, as designed by the Engineer of Record. All construction shall be conducted in a dry excavation. Running water shall not be permitted over newly poured concrete. The excavation shall be kept dry until the concrete or mortar has developed sufficient strength to prevent rupture by groundwater pressure.

3.04 BACKFILL

A. General

1. No backfilling of trenches shall be done until the pipe work to be covered has been inspected. Where any sheeting or bracing is withdrawn as backfilling progresses, all voids or spaces left thereby shall be carefully and thoroughly filled and compacted with proper tools.

2. Material for backfill shall contain no rubble, trash, broken concrete, asphalt or other objectionable materials.

3. The Contractor shall be responsible for the stability of all backfill made under the contract until one year after final acceptance of the work and shall bear the expense of replacing any portions which have become displaced due to carelessness or negligent work on the part of the Contractor.

4. Sand shall be carefully placed in six inch (6") layers in the trench so as not to move the pipe or dislodge any of the jointing material and thoroughly, but carefully compacted under or to the level as directed by the Engineer, and around the pipe to 12" over the top of the pipe. The utmost care shall be taken not to disturb the pipe by stepping on or near it or by throwing earth upon it from the bank above, or not to shift a pipe from its proper position by careless or unskilled ramming around it or by unequal filling on the sides.

5. Equal and similar care shall be exercised in filling up above the top of the sewer pipe.

B. Compaction

1. Where a trench is in a highway or city street right of way, backfill for the balance of the trench above a point one foot (1') above the top of the sewer shall be compacted by placing in layers of not more than eight inches (8") thickness and compacting with mechanical tampers or by any satisfactory method or methods that will obtain density hereinafter specified. The density of compacted material in each layer of backfill shall not be less than ninety percent (95%) of the maximum density as measured by Method A of AASHO Designation T-180 (Modified AASHO Test).

2. Where a trench is in open ground and not in a highway or street right of way, the

balance of the trench above a point one foot (1') above the top of the sewer may be filled and compacted by approved equipment or mechanical tampers to obtain density equal to that of the adjacent undisturbed soil, and the surface mounded over the top to provide for some after-settlement. About two months after completion of this type of backfilling, the Contractor shall go over the trench again with a roller, refill to the surface of the ground, and re-roll or tamp to a satisfactory condition. The final surface shall be left in a condition equal to that originally found at the start of the work.

3. In those portions of the backfill which are adjacent to structures, or are for other reasons, inaccessible to the equipment used, the Contractor shall use mechanical tampers approved by the Engineer to obtain the specified density. Backfill shall be carefully placed so as to be equally distributed on all sides of the structure and so as not to damage the structure in any way.

4. Pavement repair shall otherwise be in accordance with Section 6 – Portland Cement Concrete Roads.

5. The Contractor shall maintain the backfill for a period of one year after final acceptance and shall restore any backfill that fails and repair any pavement or other structures which may be damaged as a result of backfill failure.

C. Clean-Up and Removal of Excess Materials

1. The Contractor shall not, without the permission of the Engineer, remove from the line of work any earth excavated therefrom which may be suitable for backfilling or surfacing until the excavation has been refilled and surfaced.

2. As soon as the backfilling of any excavation is completed, the Contractor must at once begin the removal of all surplus dirt except that actually necessary to provide for the settlement of all filling unless otherwise provided in the Special Provisions. He shall also remove all pipe and other material placed or left on the street by him except material needed for the replacement of the paving. The street shall be opened up and made passable for traffic and the City of Lake Charles shall be notified in writing to that effect at once. Following the above work, the repairing and complete restoration of the street surface, bridges, crossing all places affected by the work shall be done as promptly as possible.

3.05 PIPE INSTALLATION

A. General

1. All piping and fittings shall be installed true to alignment and rigidly supported. Anchorage shall be provided where required. Any damage to linings shall be repaired to the satisfaction of the Engineer before the pipe is installed. Each length of pipe shall be cleaned out before installation.

2. Ductile iron pipe and fittings shall be installed in accordance with requirements of AWWA C600.

B. Jointing

1. Flanged joints shall be made using gaskets, bolts, bolt studs with a nut on each end, or studs with nuts where the flange is tapped. The number and size of bolts shall conform to the same ANSI Standard as the flanges.

2. Bolts in flanged joints or mechanical joints shall be tightened alternately and evenly.

C. All pipe and appurtenances connected to equipment or structures shall be supported in such a manner as to prevent any strain being imposed. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, submit a certification stating that such requirements have been complied with.

D. Sleeves of proper size shall be installed for all pipes passing through floors or walls. Sleeves shall be installed as shown on the Drawings. Where indicated on the Drawings or required for liquid or gas-tightness, the pipe shall be sealed with a mechanical seal similar to Link-Seal as manufactured by Thunderline Corporation or equal.

E. Sleeves and wall pipes shall have thrust collars located at the mid-depth of wall.

F. Concrete inserts for hangers and supports shall be furnished and installed as recommended by the manufacturer as shown on the Drawings or as specified herein. The inserts shall be set in accordance with the requirements of the piping layout and their locations verified from approved piping layout drawings and the structural drawings.

3.06 PUMP AND EQUIPMENT INSTALLATION

A. Installation shall be in strict accordance with the manufacturer's instructions and recommendations in the locations shown on the Drawings. Anchor bolts shall be set in accordance with the manufacturer's recommendations and setting plans.

B. Qualified supervisory services, including manufacturers' engineering representatives, shall be provided for a minimum of 2 man-days to insure that the work is done in a manner fully approved by the respective equipment manufacturer. The pump manufacturer's representatives shall specifically supervise the installation and alignment of the pump with the driver, the grouting, and the alignment of the connection piping and the installation of the field-installed mechanical seal. If there are difficulties in the start-up or operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no cost to the Owner. Services of the manufacturer's representatives and training shall be provided when the first pump is started, with follow-up visits upon start-up of each subsequent pump.

C. Connection of piping to pumps shall be done in presence of the Engineer. All piping connections to the pump shall be done without bending and/or twisting the piping to mate with the pump flange connections.

D. A certificate from each equipment manufacturer shall be submitted stating that the installation of his/her equipment is satisfactory, that the equipment is ready for operation and that the operating personnel have been suitably instructed in the operation, lubrication and care of each unit.

3.07 FIELD TESTS AND START-UP

A. A representative of the pump manufacturer is required to be present when pumps are first put in operation, in order to verify that the pumps operate property within specified operating limits and to provide the Owner, and when applicable, the City of Lake Charles, Wastewater Division, a letter stating such.

B. In the presence of the Engineer, such tests as necessary to indicate that the pumps, motors, and variable speed drives generally conform to the efficiencies and operating conditions specified shall be performed. A ten-day operating period of the pumps will be required before acceptance. If a pump performance does not meet the Specifications, corrective measures shall be taken or the pump shall be removed and replaced with a pump which satisfies the conditions specified. All test procedures shall be in accordance with Hydraulic Institute Standards certified results of tests shall be submitted.

C. After installation, all valves and appurtenances shall be tested at least 1 hour at the working pressure corresponding to the class of pipe, unless a different test pressure is specified. If any joint proves to be defective, it shall be repaired to the satisfaction of the Engineer.

END OF SECTION

SECTION 9

SANITARY SEWER LIFT STATIONS – ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE

A. The work covered by this specification consists of furnishing all labor, supervision, materials, equipment, tools, and supplies necessary for performing the electrical work required by this project, including, but not limited to, electrical power, controls, and grounding for the new lift station pumps.

B. It is the intent of the specifications that the Contractor furnish and install all electrical facilities necessary for the complete and operable systems for the project, whether described in detail or not, except for those items specifically stated as presently existing or furnished and/or installed by Owners or by others.

1.02 REFERENCES

A. All materials and equipment shall conform to the requirements of the Contract Documents. They shall be new, free from defects, and they shall conform to the following standards where these organizations have set standards:

1. Underwriters Laboratories, Inc. (UL)

2. National Electrical Manufacturer's Association (NEMA)

3. American National Standards Association (ANSI)

4. Insulated Cable Engineers Association (ICEA)

B. The same manufacturer shall supply all material and equipment of the same class, unless specified to the contrary.

C. All products shall bear UL labels where standards have been set for listing.

1.03 SUBMITTALS

A. Submit drawings on all equipment for the Engineer’s approval. Include schematic diagrams, layout drawings, and component list, as well as current, voltage and short circuit ratings.

1.04 ACCEPTANCE

A. For acceptance of the lift station electrical components by the City of Lake Charles, the lift station shall meet the requirements stated in Section 8 - Sanitary Sewer Lift Station.

1.05 GUARANTEE

A. The Contractor shall guarantee all equipment and wiring furnished by him free from inherent mechanical and electrical defects for a period of one year from date of final acceptance.

B. Any replacement of parts, or adjustments, including labor, made necessary by inherent mechanical or electrical defects, shall be rendered without cost to the Owner within the guarantee period.

PART 2 PRODUCTS

2.01 3 PHASE DUPLEX AND TRIPLEX PUMP CONTROL PANELS WITH ACROSS THE LINE MOTOR STARTERS

A. The control panels shall be supplied by the manufacturer of the pumps. This is necessary to insure system compatibility and that warranty requirements are met. This contractor shall verify that these panels are included with the system indicated; otherwise, he shall be responsible for furnishing them and he shall bear all problems associated with incompatibility and warranty claim. Unless more stringent requirements are required in other sections or articles of these specifications, all control panels shall be manufactured by an Underwriters Laboratory (UL) Certified 508A panel manufacturer. Provide UL Certification number with submittals. Control panels shall be custom designed and manufactured using industrial rated individual components with high power surge capability. Commercial panels using printed circuit board technology for major components is not acceptable. Control panels shall be in accordance with the City's standard control panels as described below.

B. Duplex and Triplex panels shall contain the following equipment at a minimum:

1. Nema 4x Fiberglass enclosure (Owners standard) – Hoffman enclosure equipped with the Control Assembly Mitigation/Maintenance Option (CAM0). No equipment shall be mounted on the outer door.
2. Main distribution block for cable quantities and sizes shown on drawings
3. Thermo-magnetic circuit breakers (Square D – City standard) for each motor
4. NEMA rated across the line motor starters (Square D 8536 – City standard) with adjustable overloads. Individual heater packs are not acceptable.
5. 22mm HOA switches and LED run indicator lights for pumps
6. TVSS, UL 1449 listed (Square D type SDSA – City standard)
7. Phase monitor
8. 480-120v control power transformer with 3 fuses (for 480 volt panels)
9. Auxiliary circuit breakers to feed loads as indicated on the drawings
10. Adjustable resistance detector seal fail relays for submersible type pumps
11. Auxiliary dry contacts as required. See SCADA requirements.
12. Milltronics Hydroranger 200 ultrasonic level detector with sensor to fit in sensor pipe (City standard). Unit to be programmed to alternate pumps. Mount on inner door.
13. Stagger pumps on with minimum 3 seconds separation
14. Control panel door alarm switch

15. Class 1 Division 1 optical float switches rated at 15 million operations for transducer backup.
16. Adjustable time delay relay to allow the high level float to start and run pumps as described below for a set period of time, then stop the pumps. Cycle shall repeat when the level again rises to the high level float. This shall be arranged to be operator selectable in lieu of depending on the emergency off float to stop the pumps during emergency operating conditions. Pumps shall auto-reset after the level returns to normal.
17. Thermal switches in motor shall stop the pump and allow restart after automatically resetting.
18. Seal fail in motor shall indicate only and not stop the pump.

C. Duplex operation – Pumps shall operate in standard lead, lag operation. All pumps running shall pump to the stop level. In the event of a transducer failure, and at high level, both pumps shall start and pump to the stop level.

D. Triplex operation – Pumps shall operate in standard lead, lag 1, lag 2, operation. All pumps running shall pump to the stop level. In the event of a transducer failure, and at high level, 2 or 3 pumps (selectable) shall start and pump to the stop level.

E. Panels shall enclose and be wired for all motor branch components, circuit breakers, switches, pilot lights, relays, and other AC and DC control components as shown on diagrams and as required to perform functions as described in this and other sections of the specifications. Terminal strips shall be provided for connection of all external wiring. Terminal strips shall be heavy-duty types with barriers between points. Nameplates shall have white letters on black laminated phenolic plastic background glued to enclosure. Each enclosure shall be protected with Hoffman or equal corrosion inhibitors.

F. Control equipment shall be 22mm Square D, or approved equal as follows:

1. Push Buttons – Flush Button, Momentary Contact
2. Selector Switches – Standard Operator, Maintained Contact
3. Toggle Switches – Maintained Contact
4. Pilot Lights – LED

G. Total project spare parts shall be furnished as follows:

1. Four (4) of each size control and power fuses
2. Six (6) of each size indication lamps
3. One (1) of each size control transformer

H. Deliver spare parts to Owner, have Owner sign for them and supply copy of document to the Engineer.

2.02 SCADA SYSTEM

A. SCADA system shall be the City's standard by Louisiana Radio.

B. The monitor and control panel shall collect and forward equipment status to the central control room via radio, modem to be included. The panel shall contain, as a minimum, 8 digital inputs that may be field converted to outputs, 8 analog inputs capable of powering and accepting 4-20 mA signals, main circuit fuses, lightning arresting device, surge protection for protecting the full system from transient voltage surges caused by switching and utility regulation. The system shall provide a separate power supply for analog and control loops. An un-interruptible power supply capable of supporting the system for 24 hours shall be provided.

C. External wiring brought into the control panel shall be terminated on permanent, clearly marked contact blocks. All internal wiring shall have wire markers for identification. All equipment shall be housed in a lockable, gasketed, NEMA 4X Fiberglass weatherproof, and dustproof enclosure with continuous hinge. Penetrations to the enclosure shall be equipped with Myers Scru-Tite hubs to maintain the weatherproof integrity.

D. Signals to be monitored:

1. Power failure
2. High water alarm
3. Door switches for radio and pump panel
4. Pump amperage
5. Wet well level
6. Pump floor water alarm (2)
7. Operating on back-up floats

E. The monitoring system is to be complete with a Broad Directional Antenna. Mount antenna as directed by SCADA vendor. Antenna MUST BE MOUNTED AWAY FROM VENT PIPE. Contractor shall furnish the services of a Service Technician to assist in placing the system in operation. City Wastewater Electricians can provide information to contractor if further information is needed. Contact 337-491-8607, Wastewater Electrical Department for the City of Lake Charles.

F. The complete monitoring and control system is to be guaranteed by the General Contractor, materials and workmanship, for the required legal period or a minimum of one year; said guarantee shall be furnished to owner in writing.

2.03 ELECTRICAL SERVICE EQUIPMENT

A. Meter isolation disconnect switches up to 400 amps shall be as follows:

1. Amps – as shown on drawings
2. Voltage – as shown on drawings
3. Poles – 3
4. Type -Heavy duty, HP rated for all installed pumps operating simultaneously per the NEC
5. Short circuit rating – as shown on drawings
6. Enclosure - NEMA 3R painted steel

B. Main circuit breakers up to 400 amps shall be as follows:

1. Amps – as shown on drawings
2. Voltage – as shown on drawings
3. Poles – 3
4. Interrupting rating – as shown on drawings
5. Enclosure – NEMA 3R painted steel
6. Service entrance rated

C. Manual transfer switches up to 400 amps shall be as follows:

1. Amps – as shown on drawings
2. Voltage – as shown on drawings
3. Poles – 3PDT
4. Type - Heavy duty, HP rated for all installed pumps operating simultaneously per the NEC
5. Short circuit rating – as shown on drawings
6. Enclosure - NEMA 3R painted steel
7. Install 2” Myers hub in bottom of switch to pass portable generator cables. Install a plug in the hub to keep out insects

D. Conduit shall be as follows:

1. Above ground – Rigid schedule 40 aluminum
2. Below ground – Schedule 40 PVC
3. Below ground conduit that enters wet wells – PVC coated inside and out rigid aluminum
4. Utility underground service conduit – as required by Power Company

E. Wire and Cable shall be as follows:

1. All conductors shall be copper, shall conform to applicable ASTM Specifications as to conductivity, and shall be free from kinks and defects when installed.

2. All conductors shall be insulated unless specifically stated otherwise. Insulation shall be 600 volt 75 degree C THW, THWN, or XHHW for Wet and Dry locations.

3. All conductors and cables shall be specifically approved for use intended.

F. Junction Boxes:

1. Contractor shall furnish and install junction boxes as required in the raceway system for proper installation of the conductors and as shown on the drawings.

2. All boxes shall be sized in accordance with National Electrical code requirements.

3. A hinged door NEMA 4X stainless steel junction box shall be installed to receive the pump cables and other cable from the wet well.

4. Seal-off fittings shall be installed between the junction box and the control panel.

PART 3 EXECUTION

3.01 CUTTING, PATCHING AND FURRING

A. All cutting, patching and furring will be done by the General Contractor. However, the Subcontractor shall be responsible for timely and proper locations of openings to be left and shall advise the General Contractor of the same. If the Subcontractor fails to comply with the procedures and finds it necessary to cut openings in a finished portion of the structure, he will do so at his own expense, and all openings so cut must be left in a complete, finished manner.

3.02 EXCAVATING AND BACKFILLING

A. Excavation and backfilling required for the installation of electrical conduits shall be performed by the electrical contractor. He shall be responsible for the timely placement of conduit beneath concrete pavement. Placement of conduit beneath previously poured concrete pavement shall be done by the "jacked," "pushed," or "bored" methods.

3.03 INSTALLATION AND STORAGE

A. The Contractor shall store and install all equipment per the manufacturer's instructions and the Contract drawings.

B. After panel is installed, the conduits from the panel to the wet well shall be immediately sealed to prevent moisture and gasses from entering the panel. Permanent seals shall be by seal-off fittings in accordance with NEC Article 501 and NFPA Standard 820 for hazardous atmospheres.

3.04 EQUIPMENT IDENTIFICATION

A. All circuit breakers, starters and transformers shall be identified by an engraved bakelite nameplate attached to the enclosure by brass screws. Engraved letters shall be ¼" high.

3.05 METHODS OF WIRING

A. All circuits shall be run in conduit unless specifically stated otherwise. Cables not in conduit and subjected to tension shall be properly supported by the use of Kellems, or equal cable grips.

B. Contractor shall furnish and install all conduit clamps, LI-bolts, supports, and miscellaneous hardware required for proper installation and support of the electrical equipment.

C. Feeder conductors shall be continuous from point of origin to point of termination without splices.

D. Wiring shall be identified at all terminal points with Brady wire markers or other approved permanent type markers.

E. Where conduit enters sheet metal enclosures, Myers Hubs are required.

F. No splices or taps will be permitted in power or control circuits except at terminals on control devices, and on terminal boards in junction boxes or equipment, or as indicated on the drawings.

G. Power and control circuit terminations at equipment, devices, and terminal boards shall be made with spade type crimp connections.

3.06 GROUNDING

A. All electrical equipment and other facilities and devices shall be grounded as required by the National Electrical Code, as shown on the drawings and as further specified herein.

B. This conduit system is not considered a suitable ground path; for this reason, a ground wire network shall be used.

C. Ground rods shall be ¾" x 10' long "Copperweld" ground rods.

D. Equipment grounding conductors shall be sized per Table 250-95 NEC.

E. Grounding bushings shall be of the insulated type.

F. Bonding jumpers shall be used around concentric or eccentric knockouts on service equipment.

3.07 MAIN SERVICE & METERING

A. It shall be the responsibility of the Contractor to supply power to the site of the lift station. In the event power to the station is underground and no service pole available or desired by Owner, provisions shall be made on the control panel bracket to support the required electrical equipment.

B. The Entergy meter and C.T. enclosure, together with the main and disconnect switch or breaker, shall be mounted on a meter pole near the Entergy power pole, as shown on the drawings.

C. Contractor shall furnish and install all necessary brackets, supports and fasteners.

D. Contractor shall provide the service conduit and conductors as called for on the drawing(s).

E. The installation shall be in accordance with Entergy requirements including any requirements for soft starting motor starters at particular installations and payments to Entergy for their line modifications, extensions and other expenses that they may require.

3.08 TESTING

A. Before connection of any apparatus, contractor shall test all insulated wires, cables and buses to assure that the system is free of short circuits and undesirable grounds and is ready for operation. Contractor shall provide all necessary testing equipment for making tests. Cost of the tests shall be borne by the Contractor. Contractor shall notify Owner in advance of tests. All cables failing tests shall be replaced.

B. Motors shall be mechanically and electrically checked and tested before starting. Motors shall be meggered. Size of overload relays and circuit breakers for proper motor and feeder protection shall be checked. After each motor is started, the following is to be checked and recorded:

1. Line current
2. Current balance an three phases

C. Ampere readings for each phase of each motor at "No Load" and "Full Load" operating conditions shall be recorded and a copy of the data turned over to the owner.

D. Standard factory testing shall be performed on the equipment provided in this section.

END OF SECTION

SECTION 10

SANITARY SEWER LIFT STATIONS – FENCES AND GATES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The work covered by this specification consists furnishing materials and constructing new chain link fences and gates in accordance with the details included herein and as shown on the plans. The class of fence to be erected six foot (6') chain link fencing, provided with privacy slats, as indicated on the plans for the sewer lift station.

B. Provide a 10 foot wide, 2 leaf, padlockable gate that accesses the lift stations' submersible pumps from the driveway or street side.

1.02 REFERENCES STANDARDS

A. All materials and equipment shall conform to the requirements of the Contract Documents. They shall be new, free from defects, and they shall conform to the following standards where these organizations have set standards:

1. American Society for Testing and Materials (ASTM)

2. Federal Specifications

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.03 ACCEPTANCE

A. For acceptance of the lift station fencing by the City of Lake Charles the fencing shall meet or exceed the requirements stated in herein.

PART 2 PRODUCTS

2.01 GENERAL

A. The fence shall be the product of a manufacturer who has demonstrated by actual installations of a similar nature that its product is of the type required. The Contractor shall include all supplemental parts necessary or required for a complete and satisfactory installation within the true meaning and intent of the drawings. All runs of the fence shall present the same general appearance and the product of one manufacturer only will be accepted, except for items which do not influence the appearance of the completed fence. No used, re-rolled, or open-seam steel shall be permitted in posts, gate frames, rails, or braces.

2.02 FABRIC

A. The chain link fabric shall conform to Federal Specification RR F 191/1D. The chain link fabric shall be Type I. The fabric shall be 11 gauge core wire, woven in a 2-inch mesh and be hot dipped galvanized after weaving, and be in accordance with ASTM A392. The height of fabric shall be 72-inches. Top and bottom selvages shall have a twisted barbed finish, barbs to be formed by cutting wire on a bias. Fabric shall be fastened to intermediate posts with No. 6 aluminum fabric wire spaced approximately 15-inches apart and to top rail with 9 gauge wires spaced approximately 18-inches apart. The fabric shall be securely fastened to all terminal and gate posts with 1/4-in by 3/4-in stretcher bars with No. 11 gauge pressed steel bands spaced approximately 12-inches apart. Stretcher bars for security fencing shall be 3/8-in by 3/16-in. All bands, wires and tension bars shall conform to Federal Specification RR F 191/4D.

2.03 POSTS, RAILS, AND BRACES

A. Posts, rails and braces shall conform to Federal Specification RR F 191/3D and be fabricated of Class I (round steel sections), Grade A (hot dipped galvanized), seamless steel pipe, in accordance with ASTM A53 (Schedule 40), and be of the following sizes:

1. Corner and Terminal Posts: 5P4 (2.875-inch o.d.)

2. Line Posts: SP3 (2.375-inch o.d.)

3. Rails and Braces: SP1 (1.66-inch o.d.)

4. Spacing of posts shall not exceed 10-feet.

2.04 ACCESSORIES

A. Accessories shall conform to Federal Specification RR F 191/4D, shall be hot dipped galvanized in accordance with ASTM A123 or A153. In addition to wire ties and clips, brace bands, tension bands and bars, tension wire and truss rods (all of which are described herein), accessories shall include the following:

1. Caps for all exposed ends of posts.

2. Top rail and brace ends or other suitable means of connection.

3. Top rail sleeves to allow for expansion and contraction of the top rail.

4. Bottom tension wire shall be 7 gauge galvanized steel wire. Fabric shall be attached to tension wire with 11 gauge galvanized steel hog rings spaced no more than 24-inches on center.

2.05 GATES

A. Gate and hardware shall conform to Federal Specification RR F 191/2D. Gates shall be

constructed of Class I, Grade A seamless steel pipe, size SP1, plus additional intermediate members when required and meeting the requirements of RR F 191/3D. Structural members of gates, which are in contact, shall be fully welded by a method that will procure a continuous weld on all sides and faces of joints at exposed edges. Surplus welding material shall be removed and all welding shall be done prior to galvanizing. Gate fabric shall be of the type, mesh, gauge, color and salvage as that specified above for fabric. Install fabric with stretcher bars at vertical edges and tie wires at top and bottom edges. Attach stretcher bars to gate frames at not more than 12-inches o.c.

2.06 GATE HARDWARE

A. Hinges, latches, stops and keepers shall be hot dipped galvanized in accordance with ASTM A153.

B. Hinges shall be pressed steel or malleable iron, sized to suit gate, non- lift off type and offset to permit 180 degree gate opening. Provide one pair of hinges for each leaf (up to 12-ft high).

C. Latch shall be forked type to permit operation from either side of gate. Provide padlock eye as integral part of latch.

D. Keeper shall automatically engage the gate leaf and hold it in the open position until manually released.

E. Stop, consisting of drop rod, shall be provided to hold the inactive leaf. Steel sleeves shall be provided to engage the drop rod. Provide locking device and padlock eyes as an integral part of latch, requiring one padlock for locking both gate leaves.

2.07 PRIVACY SLATS

A. Plastic fencing slats manufactured from 97 percent recycled plastic containing 97 percent post-consumer recycled plastic.

B. Slats shall be green in color and shall be 3.5-inches shorter than the overall fence height.

C. Slats shall be bottom lock design.

2.08 CONCRETE

A. Concrete shall be ASTM C 94; type II Portland Cement; 2500 psi at 28 days; 3-inch (75 mm) slump; 3/4-inch (20 mm) maximum size aggregate.

PART 3 EXECUTION

3.01 GENERAL

A. The fence shall be constructed in accordance with the details on the plans and as specified herein using new materials, and all work shall be performed in a workmanlike manner. The finished fence shall be plumb, taut, true to line and ground contour, and complete in every detail. When directed, the Contractor shall be required to stake down the chain link fence at

several points between posts.

3.02 INSTALLING POSTS

A. All posts shall be spaced not more than 10 feet apart. Terminal (end, corner, pull and brace) and gate posts shall be set in 36-inch deep by 12-inch diameter concrete bases. All line posts shall be set in 30- inch deep by 9-inch diameter concrete bases. The top of the concrete bases shall be slightly above the ground; trowel finished, and sloped to drain away from the posts. All post settings shall be done carefully so that all posts shall be vertical and in true alignment and rigidly secured in position.

B. Brace all terminal posts horizontally with sections used for top rail. The top rail shall extend through all line posts to form a continuous brace from end to end of each stretch of fence, be securely fastened at the end of each run, and have joints made with expansion sleeve couplings not less than 6 inches long.

C. If the ground is not level, the upgrade gate post shall be set first to get the proper height for the downgrade gate post. The concrete bases for end, corner, pull, brace, and gate posts shall be placed first and allowed to cure for 7 days. Stretcher bar bands and truss bands as specified on the plans shall be spread and slipped on end, corner, pull, brace, and gate posts as the next operation. Post tops are then inserted on all other posts.

D. Fence posts mounted to concrete deck shall be installed with Stainless Steel anchors, non-shrink grout and a galvanized plate.

3.03 INSTALLING TOP RAILS

A. To begin the installation, a length of top rail shall be run through the first couple of post tops; a rail clamp shall be assembled on the end, corner, or gate post, as the case may be. The end of the rail already placed shall be butted into the clamp and fastened. The top rail shall be installed along the run of the fence and the various sections joined with sleeve couplings. The rail shall be clamped in the end, corner, or gate post at the end of the run of the installation of top rail.

3.04 INSTALLING BRACES

A. All horizontal braces shall be attached together with truss rods at all terminal (end, corner, and pull) and gate posts to the brace posts as shown on the plans.

3.05 INSTALLING FABRIC

A. The fabric shall be unrolled on the outside of the fence line with the bottom edge of the fabric against the posts. The various rolls shall be spliced by bringing the ends close together and weaving in a picket in such a way that it will engage both of the roll ends and catch with each twist each separate mesh on the end pickets of both rolls of fabric. The fabric shall be raised and tied loosely to the top rail with a temporary tie wire at intervals of about 20 feet.

B. At end, corner, or gate posts, the stretcher bar shall be slipped through the end picket of the fabric

and the stretcher bar bands at the same time. Then the bolts in the stretcher bar bands shall be tightened. Additional rolls of fabric shall be spliced and placed as the erection progresses along the fence.

C. The fabric shall be attached to the line posts with No. 6 gauge galvanized wire clips securely clinched to the back of the line posts. The fastenings shall be spaced not more than 14-inch on centers for line posts. The topmost clip shall be placed on the line post as near the top of the fabric as possible and the lowest clip as near the bottom of the fabric as possible.

D. Standard chain link fence stretching equipment shall be provided for stretching the fabric before tying it to the rails and posts.

E. Privacy slats are to be installed at the completion of fabric installation and shall be woven into the fabric, per the manufacturer recommendations. Damaged or cracked slats shall be replaced at the Contractors expense.

3.06 INSTALLING GATES

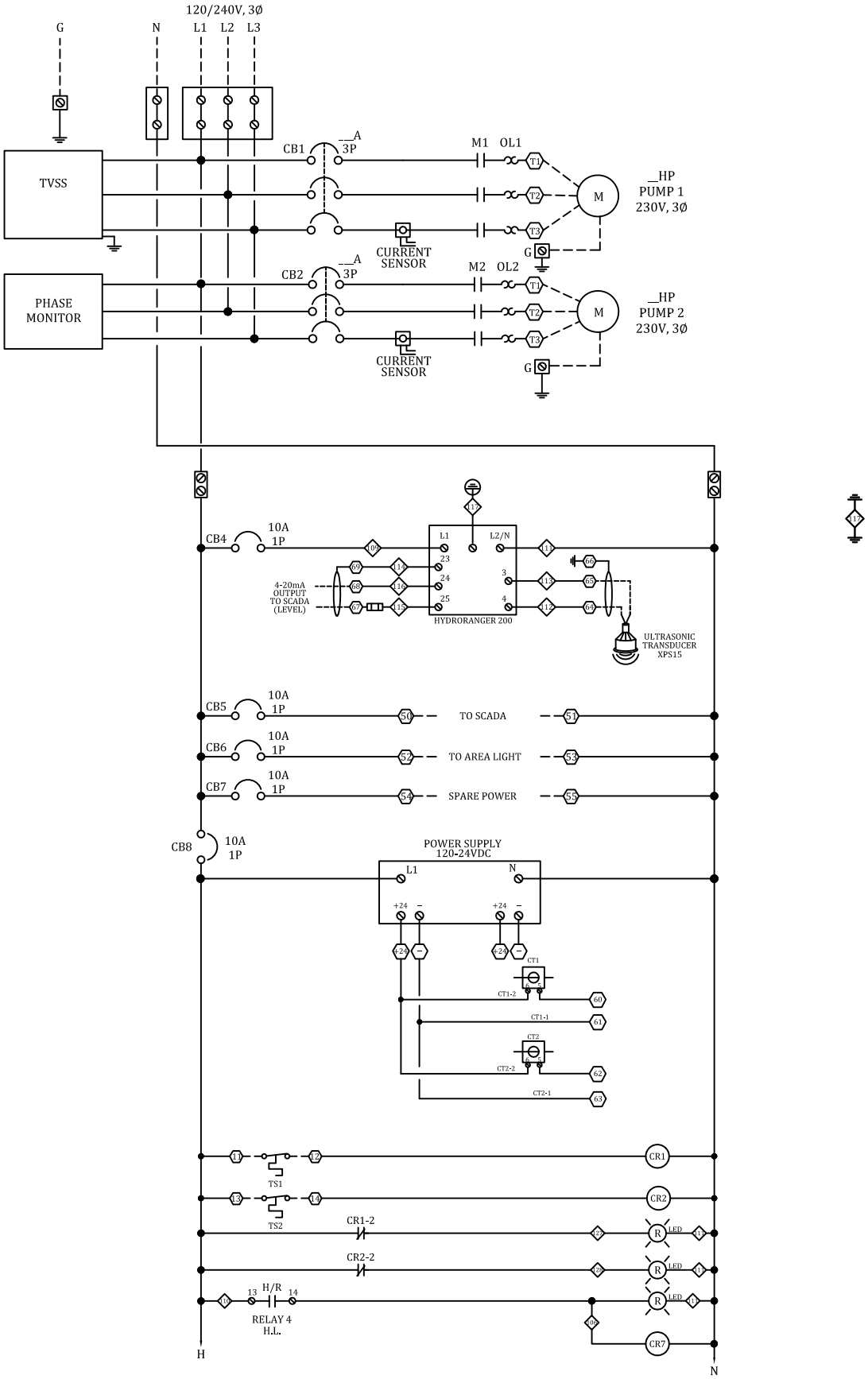
A. The gates shall be hung on gate fittings and installed in the following manner. The lower hinge (ball and socket type) shall be placed on top of the concrete footing in which the gate post is set; the concrete in the footing shall extend up to the bottom of the lower hinge. The sockets for the cane or foot bolts shall be set in concrete so that the plunger pin will fit perfectly in the socket when the gate is in a closed position. Gates shall be erected to swing away from the lift station, and shall be provided with gate stops as properly required. All hardware shall be thoroughly secured, properly adjusted, and left in perfect working order. Hinges and diagonal bracing in gates shall be adjusted so that the gates will be hand level.

3.07 CLEAN-UP

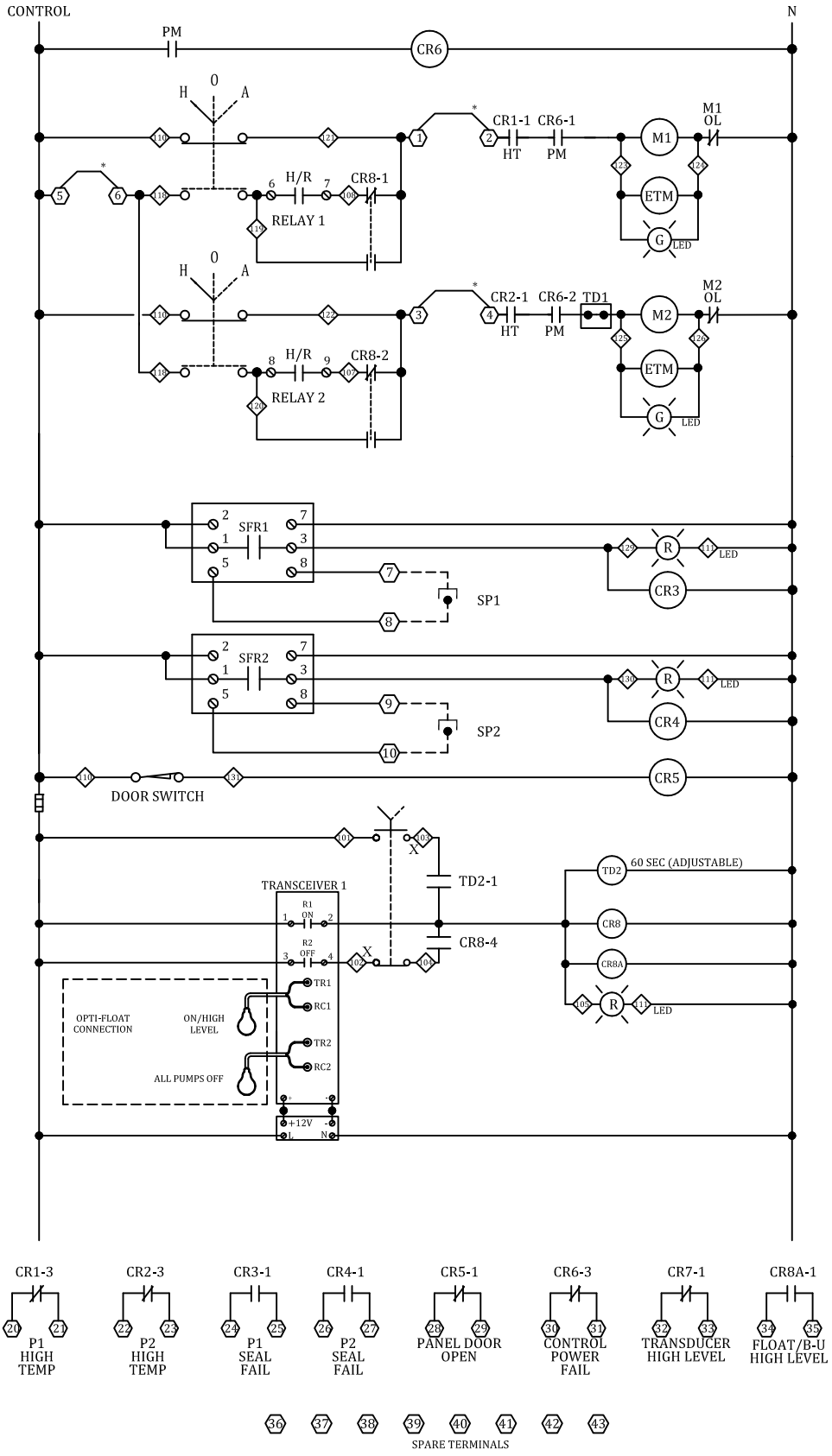
A. The Contractor shall remove from the vicinity of the completed work all tools, buildings, equipment, etc., used during construction.

END OF SECTION

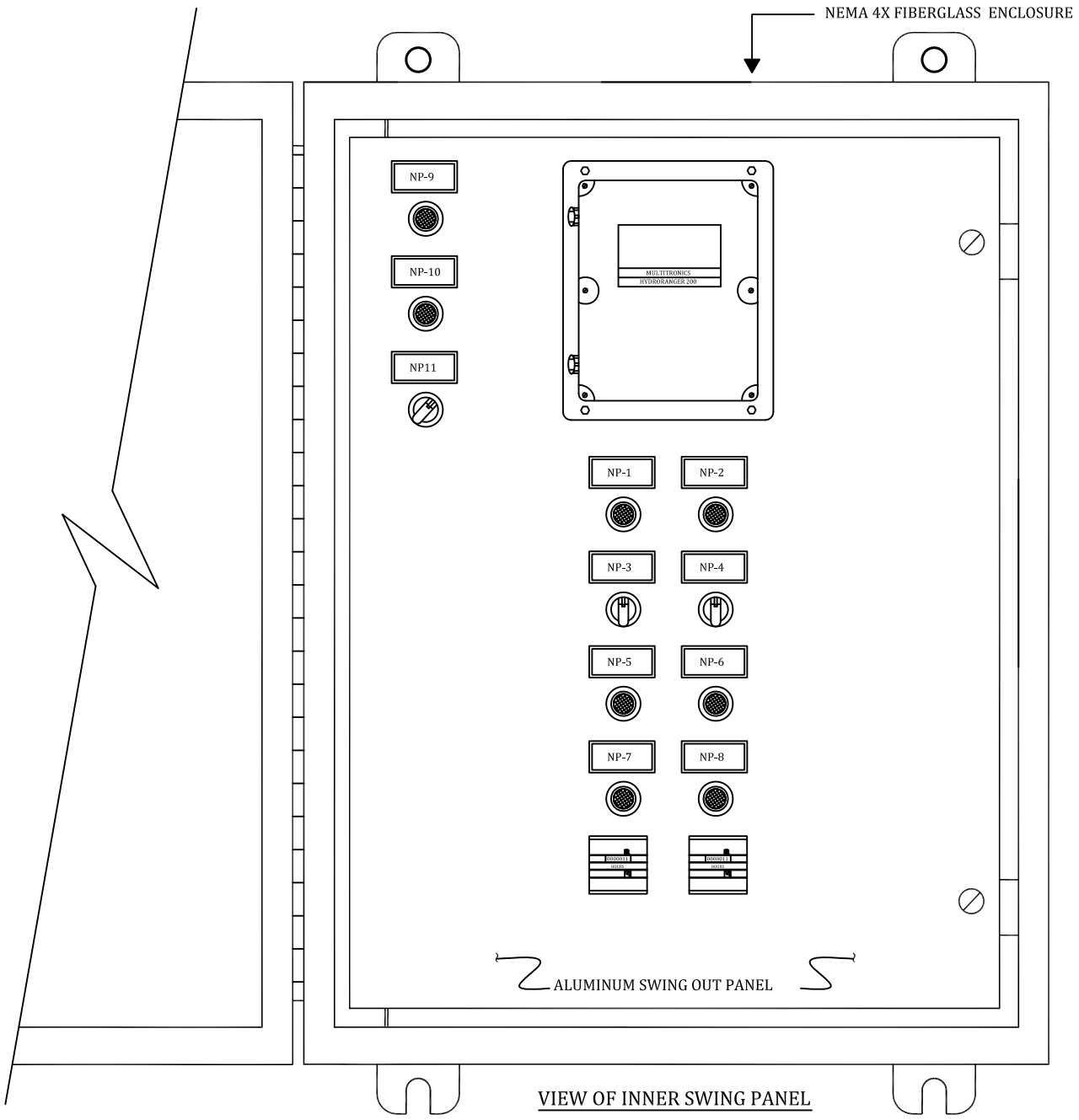
CITY OF LAKE CHARLES
STANDARD 120/240,3Ø
DUPLEX PUMP
CONTROL PANEL



	Drawing Title: POWER DIAGRAM
DATE 1/23/15	DUPLEX SHOWN, TRIPLEX SIMILAR
	Project Title: STANDARD 120/240V,3Ø DUPLEX PUMP CONTROL PANEL
SHEET 1 of 3	CITY OF LAKE CHARLES



	Drawing Title CONTROL DIAGRAM	
DATE 1/23/15		
	Project Title STANDARD 120/240V,3ø DUPLEX PUMP CONTROL PANEL	CITY OF LAKE CHARLES
SHEET 2 of 3		

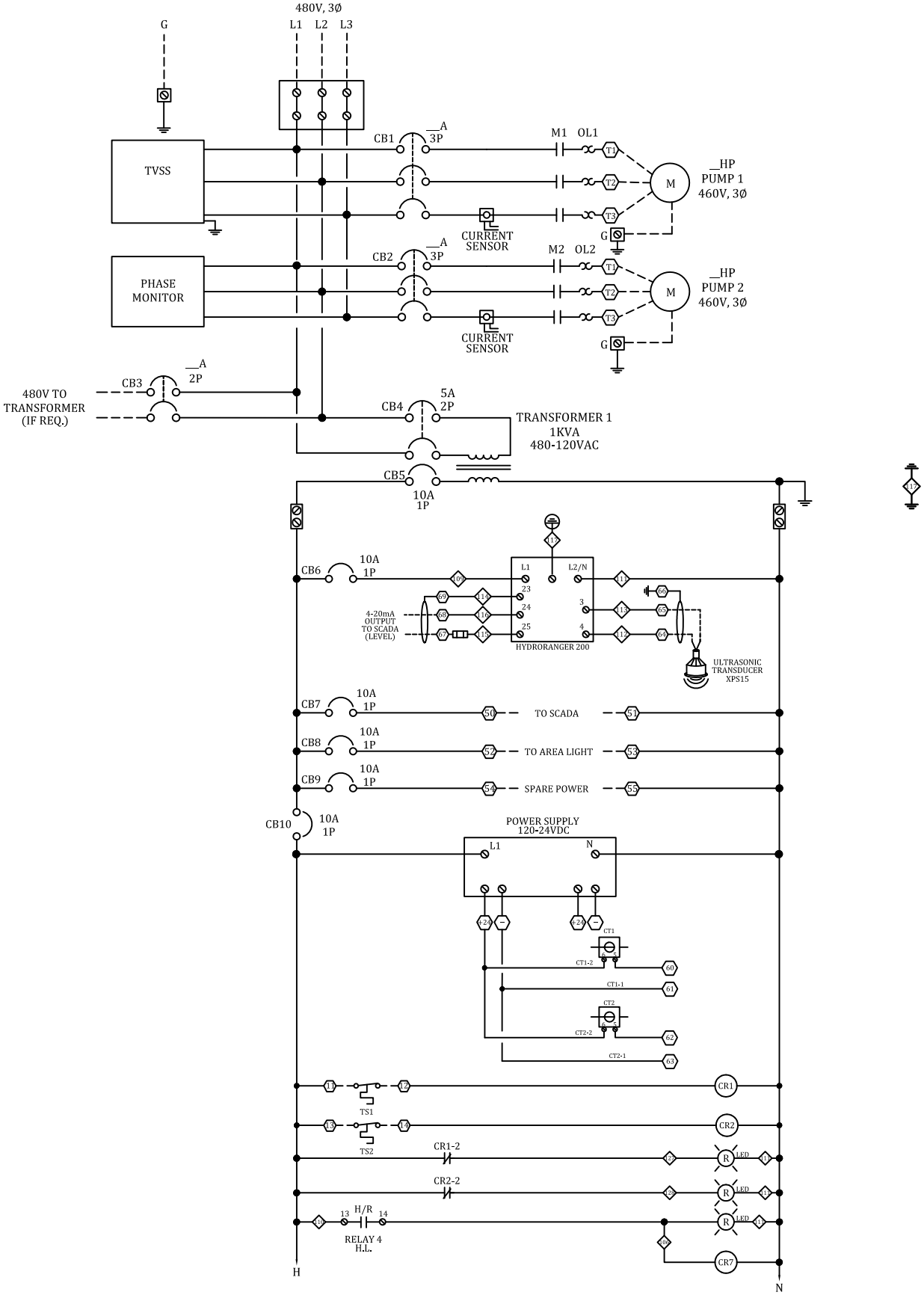


VIEW OF INNER SWING PANEL

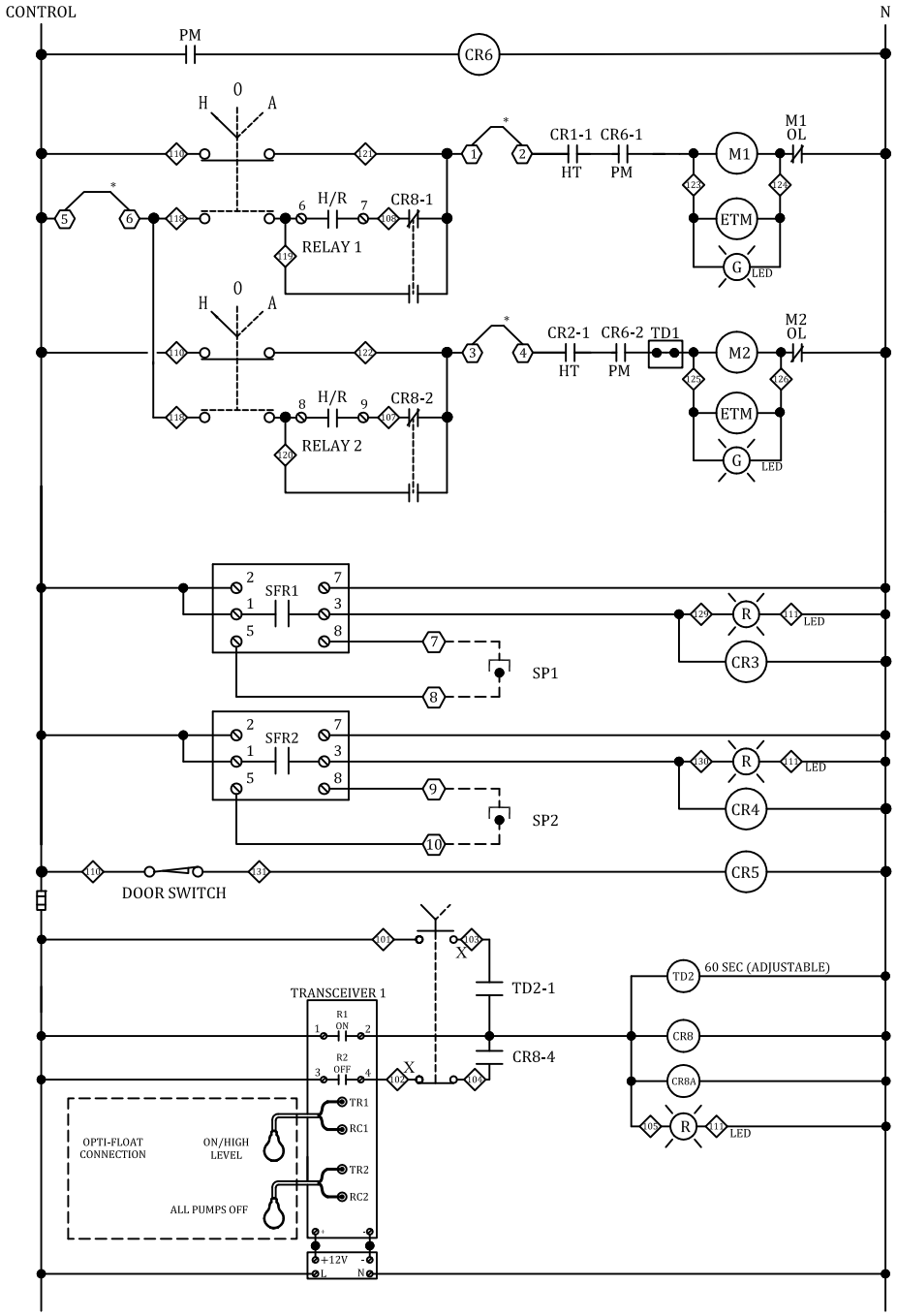
NOTE:
SEWER GASSES WILL DESTROY COMPONENTS IN PANEL.
PROPER SEALS MUST BE INSTALLED EXTERNAL TO THE
PANEL TO PREVENT ENTRY OF GASSES.

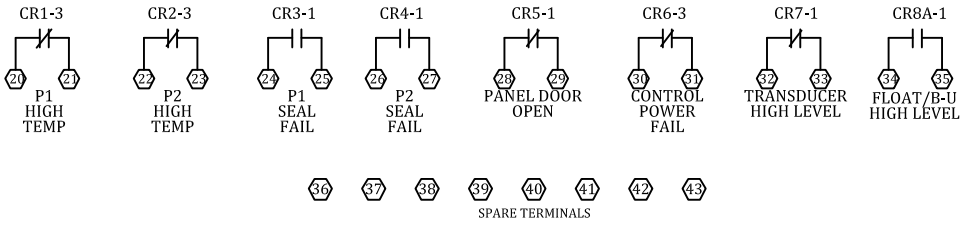
	Drawing Title ENCLOSURE
DATE 1/23/15	Project Title STANDARD 120/240V,3ø DUPLEX PUMP CONTROL PANEL
SHEET 3 of 3	CITY OF LAKE CHARLES

CITY OF LAKE CHARLES
STANDARD 480V/3Ø
DUPLEX PUMP
CONTROL PANEL

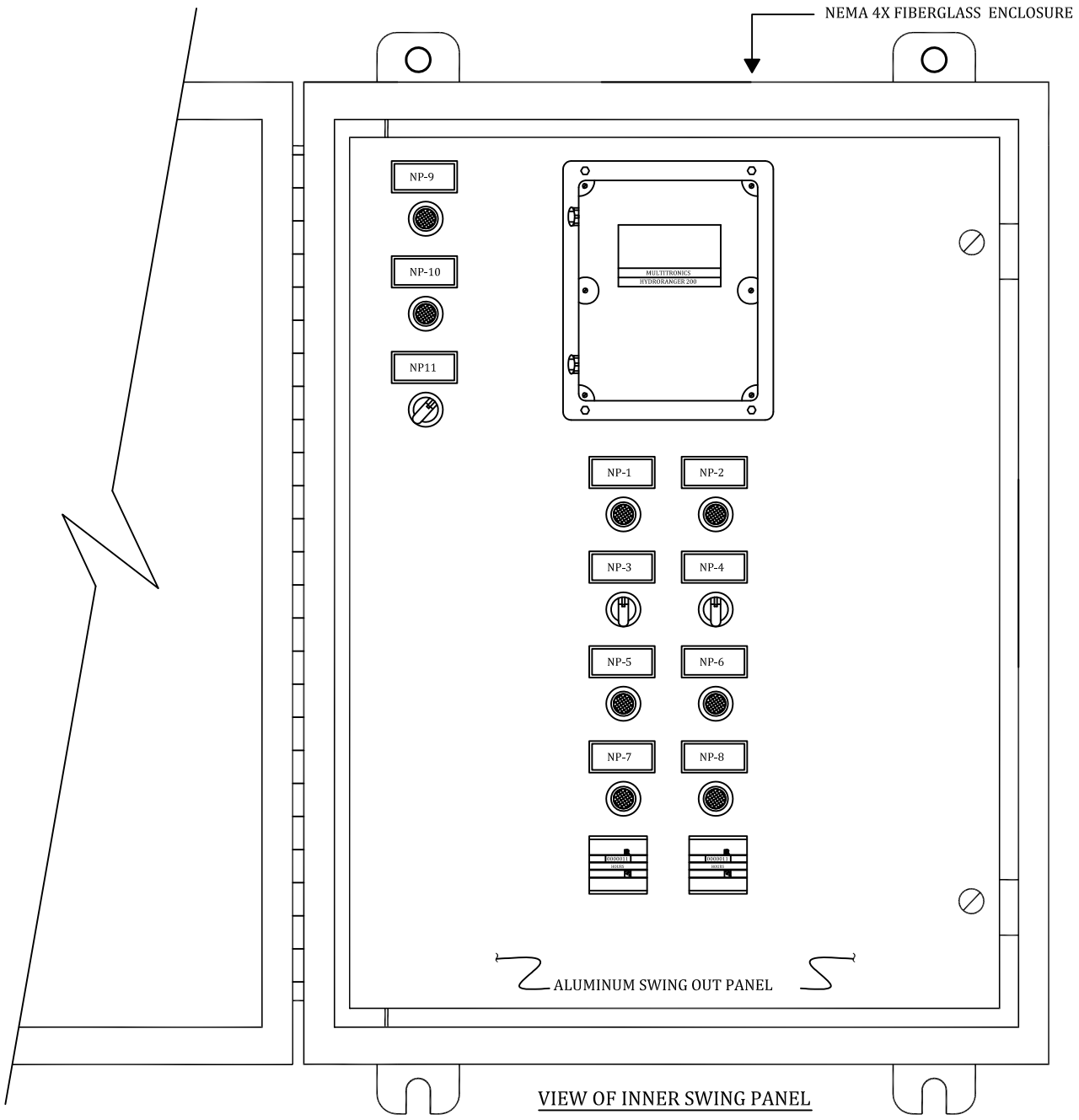


	Drawing Title POWER DIAGRAM
DATE 1/23/15	DUPLEX SHOWN, TRIPLEX SIMILAR
	Project Title STANDARD 480V/3Ø DUPLEX PUMP CONTROL PANEL
SHEET 1 of 3	CITY OF LAKE CHARLES





	Drawing Title: CONTROL DIAGRAM
DATE 1/23/15	
	Project Title: STANDARD 480V/3ø DUPLEX PUMP CONTROL PANEL
SHEET 2 of 3	CITY OF LAKE CHARLES



VIEW OF INNER SWING PANEL

NOTE:
SEWER GASSES WILL DESTROY COMPONENTS IN PANEL.
PROPER SEALS MUST BE INSTALLED EXTERNAL TO THE
PANEL TO PREVENT ENTRY OF GASSES.

	Drawing Title ENCLOSURE
DATE 1/23/15	Project Title STANDARD 480V/3ø DUPLEX PUMP CONTROL PANEL
SHEET 3 of 3	CITY OF LAKE CHARLES