CITY OF ZACHARY

SUBDIVISION DEVELOPMENT CONSTRUCTION STANDARDS

STANDARD SPECIFICATIONS

UPDATED DECEMBER 2023

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PART I

GENERAL PROVISIONS

SECTION 100
PREAMBLE

A. PURPOSE AND SCOPE

The City of Zachary Standard Plans and Specifications shall be used in association with all subdivision development and infrastructure work within the City of Zachary, and any deviations from such standards shall only be allowed with prior written approval by the City of Zachary.

The set of documents contained herein, in addition to the City of Zachary's Standard Details, is intended to be used as guidelines which do not purport to be all inclusive of all work associated with the engineering and construction of developments in the City of Zachary. Thus, in the event that a particular item is not included herein, the requirements for such item shall be left to the discretion of the City of Zachary's Designated Representative.

Additionally, all other Federal, State, and Local regulations shall apply, and in the case of a discrepancy, the more stringent requirement shall apply (unless otherwise waived by the City of Zachary).

B. LIMITATION OF LIABILITY BY THE CITY OF ZACHARY

None of the information contained herein or in the City of Zachary Standard Details shall relieve the design engineer or the engineer of record for the subdivision from meeting his professional obligations of proper design associated with public safety, long-term maintenance reliability of all infrastructure, and all other obligations thereto.

The subdivision Contractor is not relieved of his responsibility of constructing all infrastructure in accordance with the plans and specifications for the project (as approved by the City of Zachary) and these standards, as well as his responsibility of constructing high quality products which will provide long-term maintenance reliability.

C. VALIDITY

The more stringent requirement shall prevail in the event that a City of Zachary ordinance or part of an ordinance is in conflict with these standards.

The invalidity of any section, clause, sentence, or provision of this document shall not affect the validity of any other part of this document which can be given effect without such invalid part or parts.

D. CLARIFICATIONS

Anywhere that the word "Owner", "Engineer", or any derivative thereof is used, it shall be understood that such reference shall be substituted by City of Zachary.

Wherever these Specifications and the Standard Plans refer to the "Contractor", the responsibility of complying with the associated requirement understood to also be the "Developer's" responsibility. The City of Zachary shall have limited interactions with the Contractor (only as necessary to observe the work or stop any unapproved work), however, the Developer (or his Engineer or representative) shall be fully informed on the requirements of the City of Zachary Standards and shall be required to enforce compliance with such regulations before the Contractor.

E. SUPERVISION AND INSPECTION

The City of Zachary or its assigned representative(s) shall have access to the work at all times. The Contractor shall furnish all facilities for inspection at the construction site, shops or yards, and shall not cover up work requiring inspection until it has been approved. If work is covered up before being inspected, the Contractor shall be required remove such portions of the work as necessary to disclose the part in question.

The Contractor shall notify the City of Zachary at least 48 hours prior to commencing any work, or resuming work after shut downs, except for normal resumption of work following Saturdays, Sundays or holidays.

The Contractor shall provide proper supervision and sufficient labor and equipment to accomplish the work within the contract time.

The Contractor shall have on the work site at all times a superintendent capable of reading and understanding the plans and specifications and experienced in the type of work being performed.

The Contractor shall maintain a telephone for the duration of the contract, at the Contractor's expense, where the superintendent may be reached directly or by message at all times during and outside of working hours.

F. AUTHORITY OF THE CITY OF ZACHARY DESIGNATED REPRESENTATIVE

The City of Zachary's designated representative shall decide all questions which arise as to the acceptability of materials furnished and work performed, progress of work, interpretation of plans and specifications, and acceptable compliance with this set of documents and standard plans.

The City of Zachary's designated representative will have the authority to suspend the work wholly or in part due to failure of the Contractor to carry out provisions of the contract; for failure to carry out orders; or for such periods deemed necessary due to unsuitable weather.

The City of Zachary shall have subjective discretionary authority to require additional inspection, testing, and cleaning as it sees fit by whatever means it deems necessary.

G. DUTIES OF THE CITY OF ZACHARY'S ASSIGNED FIELD INSPECTOR

Duly authorized Inspectors employed by the City of Zachary will be authorized to inspect all work done and materials furnished. Such inspections may extend to any part of work and to the preparation, fabrication or manufacture of materials to be used. The Inspector will not be authorized to issue instructions contrary to plans and specifications, or to act as foreman for the Contractor.

H. UNACCEPTABLE AND UNAUTHORIZED WORK

1. GENERAL

Work not conforming to the requirements of the construction plans previously approved by the City of Zachary will be considered as unacceptable work.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness or other cause, found to exist during construction and at any time prior to completion of the warranty period as specified by the City of Zachary shall be removed and replaced in an acceptable manner.

2. SEWER LINES

The Developer acknowledges his continuing obligation during the Subdivision Maintenance Period for Closed Circuit Television (CCTV) Footage of all gravity sewer mains to be provided to the City showing no damage caused by water, gas, electrical, telephone, fiber and/or or cable installations to said gravity sewer mains.

3. ALL PUBLIC UTILITIES

a. Provide "as-built" electronic files (Autocad, GIS, or equal) of all water, gas, and sewer utilities.

b. Provide GPS (Latitude and Longitude) points for all underground valves.

c. Gas mains shall be pressure tested in accordance with the Specifications and following Pipeline Safety Regulations. Originals of all pressure charts shall be labeled clearly describing which lines they pertain to and shall be submitted to the City.

d. Manufacturer's submittals for all system components shall be provided to the City at the preconstruction conference.

e. All Gas main and service lines shall be purged and air tested.

f. All tracer wires shall be tested.

4. STORM WATER STORAGE PONDS

a. The Developer acknowledges his continuing obligation during the Subdivision Maintenance Period for furnishing all of the materials, labor, and equipment necessary to perform an As-Built Survey of the drainage pond bottom.

b. Cross Sections spaced at a maximum of fifty feet (50') and perpendicular to the pond centerline shall be obtained. The volume formed by this grid shall be calculated using the average end area method in both directions. The two volumes shall be averaged to yield the storage capacity of the pond. The volume of storage capacity shall be calculated in cubic yards. The pond's design volume shall be compared to the actual surveyed volume. In the event that the storage volume has decreased, it shall be the Developer's responsibility to perform construction activities at his expense as required to restore the design storage volume.

c. Acceptable surveys shall be done under the supervision of a Licensed Professional Land Surveyor and approved by said Engineer. Survey drawings shall be signed and sealed by the surveyor. Survey data shall reference the North American Datum of 1983 (NAD 83), Louisiana South Zone, U.S. Survey Foot for horizontal control, and the North American Vertical Datum of 1988 (NAVD 88), U.S. Survey Foot for vertical control. All surveys shall be conducted using the 2-inch accuracy standard and shall be done by any means necessary to obtain elevations of a submerged surface.

I. MAINTENANCE OF WORK

The Contractor shall maintain the work during the construction and until final acceptance by the City of Zachary.

Particular attention shall be given to drainage, both permanent and temporary. It shall be the

Contractor's full responsibility to follow all applicable Best Management Practices as related to Storm water Pollution Prevention and to obtain all required permits from the Louisiana Department of Environmental Quality (and any other Federal, State or Local Agency as applicable). If required by those agencies, the Contractor shall develop and maintain on site a Storm water Pollution Prevention Plan. All such permits and/or plans shall be provided at no cost to the City of Zachary.

The Contractor shall use all possible precautionary measures to avoid damage or loss that might result from accumulations and concentrations or drainage waters, and material carried by such waters, and such drainage shall be diverted or dispersed when necessary to prevent damage to excavation, embankments, surfacing, structures or property. Where adequate outfalls are not available, the Contractor shall bear the cost of pumping water until the work is completed and accepted.

If the Contractor's work is ordered suspended and it affects other residents of the City, the Contractor shall maintain the work as provided herein, and provide such ingress and egress for local residents as necessary during the period of suspended work or until the contract has been declared in default. If the Contractor fails to remedy unsatisfactory maintenance within 24 hours after receipt of such notice by the City of Zachary, the City of Zachary may perform the maintenance work and charge the developer for such costs.

J. ACCEPTANCE OF WORK (NO PARTIAL ACCEPTANCE SHALL BE ALLOWED)

The Developer and/or Contractor shall be required to maintain all improvements shown in the Subdivision Construction Plans for a period of 36 months after approval by the City of Zachary, a maintenance agreement and a maintenance bond shall be required. See Section 101 for Minimum Maintenance Agreement Requirements.

K. TRAFFIC SIGN AND PAVEMENT MARKINGS

All traffic signs and pavement markings shall be installed and placed in accordance with the latest version of the Manual on Uniform Traffic Control Devices (MUTCD).

L. DUTIES OF DEVELOPER OR DEVELOPER'S DESIGNATED REPRESENTATIVE

It shall be the Developer's responsibility to engage the services of any and all specialty professionals licensed in the State of Louisiana at his expense as required to prepare the subdivision construction plans and to ensure that all infrastructure to be dedicated for public maintenance is constructed in accordance with the City of Zachary construction standard specifications and details.

M. SUBMITTALS

1. The Contractor shall submit to the City of Zachary at the preconstruction meeting, a list of materials to be furnished and the names of the suppliers.

2. The Contractor shall submit complete detailed shop drawings of all pipes and fittings.

3. The Contractor shall submit and shall comply with the pipe manufacturer's recommendations for handling, storing and installing pipe and fittings.

4. The Contractor shall submit pipe manufacturer's certification of compliance that meet or exceed these standards.

SECTION 101
MINIMUM MAINTENANCE AGREEMENT REQUIREMENTS

STATE OF LOUISIANA
PARISH OF EAST BATON ROUGE
CITY OF ZACHARY

THIS AGREEMENT made and entered into this _____ day of _____, _____ by and between_____, hereinafter designated as "Owner" _____, hereinafter designated as "Contractor", and the **City of Zachary**, herein represented by_____, Mayor.

WITNESSETH:
WHEREAS, the Owner has subdivided_____, and has received approval and acceptance from the Director of the Department of Public Works for subdivision improvements constructed therein; and

WHEREAS, Contractor, pursuant to a Contract with Owner, furnished and installed subdivision Improvements consisting of streets, drainage, water, gas, and sanitary sewer facilities, and

WHEREAS, the Owner is required to maintain certain improvements for a period of thirty-six (36) months; and

WHEREAS, a bond in the minimum amount of 10% of all subdivision construction costs shall be provided to the City of Zachary before Final Plat Approval; and

NOW, THEREFORE, it is hereby agreed by and between the Owner, Contractor, and City of Zachary that the Owner hereby agrees that they shall keep all streets, drainage, water facilities, natural gas facilities, and sanitary sewer facilities and related work constructed by Contractor in the Subdivision in good condition and shall make such repairs to any defect in materials, workmanship, and damages caused by utility companies, contractors and/or sewage stoppages as may develop or be discovered when called upon to do so by the Director of the Department of Public Works.

It is agreed that this agreement shall be in full force and effect for a period of thirty-six (36) months from the _____ day of _____, _____.

IN WITNESS WHEREOF, these presents have been signed in the presence of the undersigned competent witnesses, at Zachary, Louisiana on this _____ day of _____, _____.

OWNER

_____

CONTRACTOR

_____

WITNESS TO OWNER AND CONTRACTOR

_____

_____

CITY OF ZACHARY

_____
Mayor

SECTION 102
SUBDIVISION CONSTRUCTION PLANS CHECKLIST

The following checklist shall be made an integral part of the *SUBDIVISION DEVELOPMENT CONSTRUCTION STANDARDS* and shall provide minimum guidelines for compliance with the City of Zachary standards, policies, and subdivision regulations and does not relieve the design engineer from full compliance with applicable City standards, policies, and subdivision regulations which may not be contained in this checklist. All applicable items must be addressed. Submit 3 sets of construction plans.

Construction Plans shall be submitted to the City of Zachary individually for each phase of the work being completed. If Construction of a particular phase has not commended within 1 year from date of approval, a new submittal is required for that particular phase.

Completed Checklist must be Submitted with Construction Plans.

Name of Subdivision: _____Filing: _____Phase:_____

Certification: This is to certify that these construction plans have been prepared in accordance with the requirements of this checklist.

Engineer: _____
Name Signature

Developer: _____
Name Phone Number

Date of Preliminary Plat Approval: _____

I. COVER SHEET:

A. Name of subdivision

B. Type of subdivision (check one): _____ Residential; _____ Commercial; _____ Industrial; or _____ PUD

C. Name of engineer, signature, and seal

D. Space provided for the signatures of the Subdivision Developer's Engineer, City of Zachary's Designated Representative and the Mayor of the City of Zachary.

E. Index to sheets — all plan/profile sheets to be indexed by street name

F. Vicinity Map

G. Notes:

1. All work shall conform to the standard specifications of the City of Zachary.
2. The Developer/Contractor shall be required to maintain all improvements shown herein for a period of 36 months after approval by the City of Zachary, and a maintenance agreement & maintenance bond shall be required.
3. The approval of these plans applies to the construction features only as required by the Subdivision Ordinance and the City of Zachary.
4. No Street in this Subdivision is to be opened to traffic until the proper intersection control signs have been installed by the developer. It shall be the Developer/Contractor's responsibility to deny access to all streets prior to acceptance by the City of Zachary. Construction signage and barricades shall be in accordance with the manual of uniform traffic construction devices (UCTCD).
5. Prior to commencement of any work herein, the Contractor shall contact the City of Zachary (225-654-1902). The City of Zachary will provide a date for scheduling of the pre-construction meeting.
6. Where underground electrical utility service is provided for the subdivision, the following note shall be added to the title page and the final plat: "The owner of each lot will furnish an electric servitude from the source of supply to his meter location for receipt of electric service on the lot."
7. A Storm Water Discharge Notice of Intent (N.O.I.) and Storm Water Pollution Prevention Plan (S.W.P.P.) shall be prepared and a copy provided to the City of Zachary prior to construction.
8. All State, Federal, and Local Permits are the responsibility of the Developer and shall be obtained prior to construction.

H. Bench Mark Data: Elevation and Source

I. List of waivers and data of Preliminary Plat approval

J. Date of Construction plan submittal (This date must be updated with each resubmittal)

II. TYPICAL SECTION SHEET:

A. Name of subdivision and filling number

B. Name of engineer, signature and seal

C. Utility Space Allocation Plan

D. Typical cross section (minimum requirements shall be confirmed based on results of soil analysis to be provided by the Developer):

1. Minimum cross slope 2.5%

2. Residential Developments:

a. Street Sections shall be either Asphalt or Concrete

b. 27-foot back of curb to back of curb in a 60-foot right-of-way

b. 5-foot by 4-Inch Sidewalk in a 6-foot Sidewalk Servitude

c. 10-foot Utility Servitude

E. See Standard Detail Sheet 5A and Standard Detail Sheet 10. All curb locations shall be proof rolled after lime treatment and before pouring concrete.

III. WATERSHED MAP:

A. Name of subdivision

B. Name of engineer, signature and seal

C. North Arrow and Scale

D. Quantify onsite and offsite drainage areas. Calculated flow (Storm Water runoff "Q" CFS) shall be given for each area.

E. Provide flow velocities for each pipe in drainage table

F. Disclose any offsite drainage areas that flow into the proposed development and the manner in which it will be addressed. Offsite flow shall be accommodated on site by use of swale ditches or pipe systems to intercept the sheet flow and direct it to the appropriate outfall. Provisions must be made to adequately take care of adjacent watershed areas. All drainage structures must be

sufficient for the drainage of the adjacent watershed after complete development of the total area, and for future needs; however, the developer shall be required to dig or to open necessary drains only of sufficient depth to cover present drainage needs.

G. Drainage Impact Study and Hydraulic Model of the internal pipe network for 10yr, 25yr, 50yr, and 100yr storm events shall be provided to the City of Zachary for review. Reference Section 601 for additional requirements.

H. List Base Flood Elevation, Highest Known Inundation Level, Lowest Street Elevation, and Lowest Proposed Slab Elevation.

I. Design Storm for interior structures = 25-Year

J. Design Storm for Detention Ponds and Final Outfall = 100-Year.

IV. STORM DRAINAGE LAYOUT:

A. Name of subdivision

B. Name of engineers, signature and seal

C. Existing and Proposed spot elevations and contours

D. North arrow and Scale

E. Legend

F. Lot numbers

G. Profiles of all streets and culverts

H. Adjacent properties

I. 10yr, 25yr, 50yr, and 100yr Water surface at outfalls

J. Inlet designations

K. Inlet spacing (maximum = 300 feet between inlets and between inlets and high points). Double inlets required at sags. Inlets shall not be placed on or near property line. Inlets shall not be placed at driveways.

L. All drainage inlets shall connect to the subsurface drainage by junction box structure. There shall be no direct connection of yard drains to the trunk line.

M. Overall Grading of Development and individual house construction shall be such that no rear or side drainage collection systems are required. No low areas shall be allowed behind curb.

N. Servitudes: There shall be no combined servitudes. Label servitudes as either drainage (Minimum 25 feet), utility (Minimum 25 feet), offsite sewer connection (Minimum 35 feet), sidewalk (Minimum 6 feet). All Servitude widths shall be approved by the City of Zachary.

O. Pipe sizes, lengths and type. Minimum pipe sizes shall be 15 inches (Calculations must be submitted with plans).

P. All Public drainage systems shall be sub-surface and shall be constructed of ASTM C-76, Class II Reinforced Concrete Pipe with o-ring gasket joints. All drainage pipe joints shall be wrapped.

Q. No conflict boxes shall be used when all new utilities are being constructed. Conflict boxes may be used to accommodate previously existing sewer lines only where approved by the City of Zachary.

R. See Standard Detail Sheet 12 and 701-01 through 702-97 (see Standard Details Cover Page).

V. EXISTING DRAINAGE DITCHES (IF APPLICABLE):

A. Subdivision name and filing number

B. Name of engineer, signature and seal

C. In the event that the Proposed Development includes an existing drainage ditch which originates within the limits of the subdivision, or if the existing ditch is a continuation of an existing ditch immediately upstream from the Development, then the existing drainage ditch shall be improved by the Development.

F. Box Culverts or a permanent and impervious channel liner shall be provided along the entirety of the Development.

G. It shall be the responsibility of the Subdivision Developer's Engineer of Record to field verify the location, size, depths and capacity of the City of Zachary's existing drainage ditch that is proposed to be affected by the development. Calculations and documentation substantiating the pre and post capacity of the existing drainage ditch to be affected by the development shall be provided by a Professional Engineer Licensed in the State of Louisiana. This report shall be stamped and

shall be provided to the City of Zachary for review. All offsite drainage connections shall be included.

H. Provide plan and profile of box culverts or improved ditch. Show natural ground, invert, hydraulic grade line for 10yr, 25yr, 50yr, and 100yr storm events, and design flow in box culvert or improved ditch (100-Year Design Storm shall be used).

I. Provide Typical Section. Improved ditch side slopes shall be no steeper than 4:1, unless otherwise determined by a Geotechnical Engineering Study. Geotechnical Professional Engineer shall be licensed in the State of Louisiana. A stamped report shall be provided to the City of Zachary for review.

J. Public Servitude of Access shall be provided for all improved previously existing ditches (minimum 20 feet from top of bank to top of bank on improved open ditches or 35 feet for enclosed Box Culverts).

VI. SANITARY SEWER LAYOUT:

A. Name of subdivision

B. Name of engineer, signature and seal

C. North arrow and Scale

D. Legend

E. Lot numbers

F. Servitudes: There shall be no combined servitudes. Label servitudes as either drainage (Minimum 25 feet), utility (Minimum 25 feet), offsite sewer connection (Minimum 35 feet), sidewalk (Minimum 6 feet). All Servitude widths shall be approved by the City of Zachary.

G. Pipe sizes and grades (8” Minimum Pipe Diameter / 0.40 Minimum Slope / Maximum 150 lots on an 8" line)

H. Manhole designation, top elevation, and invert elevation for each manhole

I. Individual Wyes for each lot. No wyes to be stubbed out of manholes except for a manhole at the upstream end of the system.

J. Manhole spacing no greater than 350 feet

K. Manhole covers shall not be allowed in streets, sidewalks, and driveways

L. No sewer lines shall be allowed in rear or side servitudes without a public road access. If offsite sewer connection is required, minimum 35-foot sewer servitude shall be required.

M. Provisions shall be made for every lot in the development to be served by a public gravity collection system (no individual pump stations allowed). Maximum collection system depth is 14-feet, after which a pump station shall be required.

N. Location of pump station and force main, if applicable shall be shown and shall be approved by the City of Zachary.

O. Check for conflicts with storm drain system

P. It shall be the responsibility of the Subdivision Developer's Engineer of Record to field verify the location, size, depths and capacity of the City of Zachary's existing sewer system where the proposed development is to tie-in, and to provide calculations and documentation substantiating the capacity of the existing sanitary sewer system to receive the peak flow from the proposed subdivision. The existing City of Zachary's Sewer System Capacity at the tie-in point, as well as the proposed development's Peak Flow Rate, shall be shown separately. This information shall be provided to the City of Zachary for review. All offsite sewer connections shall be disclosed to the City of Zachary.

Q. Sewer plans shall be submitted to Louisiana Department of Health and Hospitals (DHH) for approval. Provide copy of DHH approval letter to the City of Zachary.

R. See Standard Detail Sheets 4, 5 and 6.

VII. SANITARY SEWER PROFILES:

A. Subdivision name and filing number

B. Name of engineer, signature and seal

C. Natural ground

D. Size, length, and grade of all lines.

E. Manhole designation, stationing, and inverts

F. Drop inlets shall be shown where required (i.e. at all changes in elevation greater than 24")

VIII. PLAN AND PROFILE SHEETS:

A. Subdivision, filing number and street name on each sheet

B. Name of engineer, signature and seal

C. Graphic Scale (1" = 20' plan,'1" = 2' profile)

D. North Arrow

E. Lot numbers

F. Inlet and manhole designations (on both plan and profile)

G. Check for conflicts between sewer and storm drain lines

H. Identify type of street construction on each sheet (Plan only)

I. Top curb and invert elevations of all inlets on plan

J. Street centerline elevation: See Section 601 for street elevation requirements associated with flood elevations.

K. Streets in Flood Zone A — No offsite landfill material shall be used to elevate any street greater than 24 inches except pursuant to written authorization by the City of Zachary.

L. Length, slope, and size of all sanitary sewer lines (on both plan and profile)

M. Length, size, slope, and design flow on all storm drain pipes (on both plan and profile)

N. Street grades (0.4% minimum)

O. Existing and proposed ground in profile

P. Hydraulic grade line. Show the slope and the design water surface value at all drainage manholes and inlets. Design Storm for interior structures = 25-Year. Design Storm for Detention Ponds and Final Outfall = 100-Year.

Q. Radius at all intersections: 50’ Minimum

R. Provide curve data where required

S. Sidewalks (4-inch thick x 5-foot wide in 6-foot sidewalk servitudes) shall be shown on the plans, be included as part of the development of the subdivision, and shall be completed prior to final plat acceptance.

T. No catch basins, manholes, sewer cleanouts, or utility pedestals shall be allowed in streets, driveways, and sidewalks.

U. T-Turnaround (where approved) Minimum pavement size shall be 80 feet by 20 feet and Minimum Radius shall be 50 feet with the type of construction the same as the adjacent street.

V. Cul-de-sac (Turning circle): Minimum inside turning radius of 35 feet, with curb and gutter pavement 24 feet from back to back of curbs.

W. Show all water and gas utilities on plan view.

IX. WATER AND GAS UTILITY PLANS AND DETAILS:

A. Fire Hydrant Location: Plans must be submitted to the City of Zachary and approved by the Chief of the Fire Department or his designated representative for review and written approval.

B. Water and Gas valves not in sidewalk or driveways.

C. Contractor laying Gas line must be certified with the City of Zachary. Signed OQ Certification and abnormal pipeline condition procedure must be provided to the City of Zachary.

D. It shall be the responsibility of the Subdivision Developer's Engineer of Record to field verify the location, size, and capacity of the City of Zachary's existing water and gas systems where the proposed development is to tie-in, and to provide calculations and documentation substantiating the capacity of the existing systems. This information shall be provided to the City of Zachary for review. Any improvements to the existing system as required to accommodate the Development shall be the Developer's responsibility.

E. Water Plans shall be submitted to Louisiana Department of Health and Hospitals (DHH) for approval. Provide copy of DHH approval letter to the City of Zachary.

F. See Standard Detail Sheets 2, 3 and 6.

X. PUMP STATION DETAILS (WHERE APPLICABLE):

A. Subdivision name and filing number

B. Name of engineer, signature and seal

C. It shall be the responsibility of the Subdivision Developer's Engineer of Record to field verify the location, size, depths and capacity of the City of Zachary's existing sewer system where the proposed pump station is to tie-in, and to provide calculations and documentation substantiating the existing sanitary sewer system's capacity to receive the peak flow from the proposed subdivision. The existing City of Zachary's Sewer System Capacity at the tie-in point, as well as the Proposed Pump Station's Peak Influent Flow Rate from the development, shall be shown separately. This information along with the Proposed Pump Station's System Curve and Pump Curve shall be provided to the City of Zachary for review. All offsite force main connections shall be disclosed to the City of Zachary. Design flow (in GPM) and Total Dynamic Head (TDH) at the design flow shall be clearly indicated on all calculations and curves.

D. Proposed Pump size and model number shall be shown and manufacturer shall be as approved.

E. Show Motor size and speed

F. Show piping sizes

G. Show slab elevation

H. Show ground elevation

I. Show top elevation

J. Show wet well diameter, invert, invert of all incoming pipes, low water elevation, high water elevation

K. Show location of electrical control panel, and disclose the energy provider. Power supply to the Pump Station shall be the responsibility of the Subdivision Developer. Power to the pump station must be completed prior to final plat approval.

L. Pump station site plan shall be provided with concrete access drive, fence and hose bib (with back flow prevention).

M. Sewer pump station plans shall be submitted to Louisiana Department of Health and Hospitals (DHH) for approval. Provide copy of DHH approval letter to the City of Zachary.

N. See Standard Detail Sheets 7 through 9.

XI. SIGNING & TRAFFIC CONTROL PLAN:

A. Street signs — 2 City of Zachary approved signs at all intersections and all private servitude drives serving more than 5 lots.

B. Traffic intersection control signs

XII. BRIDGE DETAIL SHEET (NO TIMBER BRIDGES SHALL BE ALLOWED):

A. Cast-in-Place concrete deck with concrete piles and caps

B. Precast concrete deck with concrete piles and caps

C. Elevation of lowest bridge deck member must clear the 100-Year Flood Elevation or Inundation, whichever is greater.

D. Adequate bridge opening is required

E. All bridges required for the Development shall be designed by a Professional Engineer Licensed in the State of Louisiana (stamped drawings shall be provided). A Hydraulic and Hydrologic (H&H) Study shall be performed by a Professional Engineer Licensed in the State of Louisiana, and a copy of the Study shall be provided to the City of Zachary for review.

XIII. MISCELLANEOUS:

A. At the location of any privately owned improvements, a permanent sign shall be placed stating the limits of public maintenance within the Development.

B. Include Storm Water Pollution Prevention Plan and Signed Cert. of Compliance Letter for SWPP and ESCP.

C. Proof of Plans from DEQ — Permit # or letter from DEQ or Cert. Return Receipt (Notice of Intent)

D. ALL UTILITIES, including but not limited to, Potable Water Distribution, Natural Gas Distribution, Sanitary Sewer Collection, Electrical Infrastructure, Television Cable Infrastructure, Internet Infrastructure, and Telephone Infrastructure shall be completed prior to final plat acceptance.

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SECTION 103
ABBREVIATIONS AND DEFINITIONS

PART 1 - GENERAL

When the following abbreviations and terms are used in the specifications or on the plans, they are to be construed the same as the respective expressions represented:

1.01 ABBREVIATIONS

ABBREVIATIONS	WORD OR WORDS
AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
AC	Asphalt Concrete
ACI	American Concrete Institute
AGC	Associated General Contractors of America, Inc.
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASLA	American Society of Landscape Architects
ASME	American Society of Mechanical Engineers
ASPH	Asphalt
ASTM	American Society for Testing and Materials
AWG	American Wire Gage
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BBL	Barrel
BC	Back of Curb
B/L OR BL	Base Line
BM	Bench Mark
CB	Catch Basin
C.C. OR C/C	Center to Center
CI	Cast Iron or Curb Inlet
CIP	Cast-Iron Pipe
C/L OR CL	Center Line
CMP	Corrugated Metal Pipe
COL	Column
CONC	Concrete
CWT	Hundredweight (100 US pounds)
CY OR CU. YD	Cubic Yard

DI	Ductile Iron
DOTD	Louisiana Department of Transportation and Development
DPW	City-Parish Department of Public Works
ELEV.	Elevation
FAA	Federal Aviation Administration, Department of Transportation
FH	Fire Hydrant
FHWA	Federal Highway Administration, Department of Transportation
FL	Flow Line
FT	Foot or Feet
GALV.	Galvanized
GAL.	US Gallon
GR	Grade or Gram
H	Height, High or Horizontal
HOR	Horizontal
ID	Inside Diameter
IMSA	International Municipal Signal Association
INV	Invert
IPCEA	Insulated Power Cable Engineers Association
IP	Iron Pipe
ITE	Institute of Traffic Engineers
LB	US Pound
LF OR LIN. FT.	Linear Foot of Linear Feet
LIN	Linear
LL	Liquid Limit
LONG	Longitudinal
MAX	Maximum
Mh	Manhole
M	Thousand
m	Meter
MFBM	Thousand Feet, Board Measure
MGAL	Thousand Gallons
Min	Minutes or Minimum
Mon	Monument
MUTCD	Manual on Uniform Traffic Control Devices
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NOAA	National Oceanic and Atmospheric
OC	On Center
OD	Outside Diameter
OSHA	Occupational Safety and Health Administration
Oz	Ounce
PC	Portland Cement or Point of Curvature
PE	Polyethylene
PI	Plasticity Index or Point of Intersection
PL	Plastic Limit

ppm	Parts per Million
psf	Pounds per Square Foot
psi	Pounds per Square Inch
Pt	Point of Tangency
PVC	Polyvinyl Chloride or Point of Vertical Curvature
PVI	Point of Vertical Intersection
PVT	Point of Vertical Tangency
Pvmt	Pavement
QPL	Qualified Products List, Louisiana Department of Transportation and Development
R	Radius
RC	Reinforced Concrete
RCCP	Reinforced Concrete Culvert Pipe
RCP	Reinforced Concrete Pipe
RCPA	Reinforced Concrete Pipe Arch
Rdwy	Roadway
Ret. Wall	Retaining Wall
RMA	Rubber Manufacturers Association
R/W OR R.O.W.	Right of Way
s	Slope
SAE	Society of Automotive Engineers
San	Sanitary
San. S. or SS	Sanitary Sewer
SEC	Section or Seconds
SF OR SQ. FT.	Square Foot
SPEC	Specifications
SSPC	Steel Structures Painting Council
ST	Street
STA	Station
STD	Standard
SUBS	Subsection
SY OR SQ. YD.	Square Yard
T	Tangent
UL	Underwriter's Laboratories, Inc.
U.S.C. & G.S.	United States Coast and Geodetic Survey
U.S.G.S.	United States Geological Survey
VC	Vitrified Clay or Vertical Curve
Vert	Vertical
W.I.	Wrought Iron

Abbreviations and Symbols used on plans for steel construction conform to those given in the AISC Steel Construction Manual.

PART II

WATER SYSTEM

SECTION 201
WATER PIPING, MATERIALS AND STRUCTURES

PART 1 - GENERAL

A. REQUIREMENTS INCLUDED

The work covered by this section consists of all labor, materials, equipment, and incidentals necessary to completely furnish, install, test, and clean all water piping, valves, fittings, hydrants, services and accessories indicated on the drawings and/or specified herein including all appurtenances necessary to make the water system complete and fully operational.

B. REFERENCED STANDARDS

1. American Petroleum Institute (API), 5L Specification for Line Pipe.

2. American Railroad Engineering Association Manual for Railroad Engineering.

3. American Standards Association

    a. ASA B16.1, American National Standard for Cast Iron Flanged Fittings and Flanges.

4. American Society of Testing Materials

    a. ASTM A120, Standard Specification for Black and Hot Dipped Zinc Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses.

    b. ASTM A338, Standard Specification for Malleable Iron Flanges, Pipe Fittings and Valve Parts for Railroad, Marine, and other Heavy Duty Service at Temperatures up to 650 Degrees F.

    c. ASTM B88, Standard Specification for Seamless Copper Water Tube.

    d. ASTM C127, Standard Test for Thermal Conductivity of materials by Means of the Guarded Hot Plate.

    e. ASTM D256, Standard Test for Impact Resistance of Plastics and Electrical Insulating Materials.

    f. ASTM D635, Standard Test for Flammability of Self Supporting Plastics.

    g. ASTM D638, Standard Test for Tensile Properties of Plastic.

    h. ASTM D648, Standard Test Deflection Temperature of Plastics under Flexural Load.

    i. ASTM D696, Standard Test for Coefficient of Linear Thermal Expansion of Plastics.

    j. ASTM D746, Standard Test of Brittleness Temperature of Plastics by Means of a Cantilever Beam.

    k. ASTM D792, Standard Test for Specific Gravity and Density of Plastics by Displacement.

    l. ASTM D1238, Measuring Flow Rates of Thermoplastics by Extrusion Platometer.

m. ASTM D1248, Standard Specification for Polyethylene Plastic Molding and Extrusion Materials.

n. ASTM D1525, Standard Test for Vicat Softening Point of Plastics.

o. ASTM D1693, Standard Test for Environmental Stress¬ Cracking of Ethylene Plastic.

p. ASTM D1784, Standard Specification for Rigid Poly (Vinyl Chloride) Compounds and Chlorinated Poly (Vinyl Chloride) Compounds.

q. ASTM D2240, Standard Test for Indentation Hardness of Rubber and Plastics by Means of a Durometer.

r. ASTM D2241, Standard Specification for Poly (Vinyl Chloride)(CPVC) Plastic Pipe (SDRPR).

s. ASTM D2837, Obtaining Hydrostatic Design Basis for ThermoPlastic Pipe Materials.

5. American Water Works Association

a. AWWA C101, American National Standard for Thickness Design of Cast Iron Pipe (ASA 21.1).

b. AWWA C104, American National Standard for Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water (ASA 21.4).

c. AWWA C106, American National Standard for Gray Iron Pipe Centrifugally Cast in Metal Molds, for Water and Other Liquids (ASA 21.6).

d. AWWA C108, American National Standard for Cast Iron Pipe Centrifugally Cast in Sand lined Molds, for Water or Other Liquids (ASA 21.8).

e. AWWA C110, American National Standard for Gray Iron and Ductile Iron Fittings 3" through 48", for Water and Other Liquids (ASA A21.10)

f. AWWA C111, American National Standard for Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings (ASA A21.11).

g. AWWA C150, American National Standard for the Thickness Design of Ductile Iron Pipe (ASA A21.50).

h. AWWA C151, American National Standard for Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand lined Molds, for Water or Other Liquids (ASA A21.51).

i. AWWA C153, Short Body Full Flow Ductile Iron Fittings 3" through 24" for Water and Other Liquids (AAS A21.10).

j. AWWA C500, Standard for Gate Valves, 3" through 48" NPS, for Water and Sewage Systems.

k. AWWA C502, Standard for Dry Barrel Fire Hydrants.

l. AWWA C504, Standard for Rubber seated Butterfly Valves.

m. AWWA C600, American National Standard for Installation of Gray and Ductile Cast Iron Water Mains and Appurtenances.

n. AWWA C601, Standard for Disinfecting Water Mains.

o. AWWA C700, Standard for Cold water Meters Displacement Type.

p. AWWA C800, Standard for Threads for Underground Service Line Fittings with Appendix on Collected Standards for Service Line Material.

q. AWWA C900, Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4" through 12", for Water.

r. AWWA C901, Standard for Polyethylene (PE) Pressure Pipe, Tubing, and Fittings, 2" through 3", for Water.

s. AWWA C905, Standard for Polyvinyl Chloride (PVC) Pressure Pipe 14" through 36".

6. National Fire Protection Association

   a. NFPA No. 194, Standard for Screw Threads and Gasket for Fire Hose Couplings.

7. Louisiana Standard Specification for Roads and Bridges

8. American National Standards/National Sanitation Foundation Standard for Drinking Water System Components (ANSI/NSF 61)

C. GENERAL

Contract Drawings: The contract drawings indicate the general design, arrangement and extent of the piping system. It is desired that the indicated positions be followed as closely as possible. Do not scale drawings for roughing in measurements nor use as shop drawings. Prepare shop drawings per Paragraph 1.04, Submittals, herein. The exact location of the various items is subject to construction, and the actual materials and equipment furnished by the Contractor. The Contractor shall verify the location of all items furnished, installed, or connected to by him. Coordinate work with other specification divisions.

1. Piping systems shall be located from dimensions given on drawings or all implied locations shall be determined after field measurements have been taken.

2. Should interferences or discrepancies prevent the installation of any part of the work, the Engineer shall be notified and he will determine the steps necessary to complete the true development of the intent of the drawings and specifications.

Materials:

1. General

   a. Unless otherwise specified or shown, pipe, fittings, and general purpose valves for each piping system shall be as shown in the drawings.

b. If there are any conflicts in the specifications, use the stronger pipe class. Contractor shall submit calculations with shop drawings where specified.

c. All piping shall have a minimum cover of 36 inches.

D. SUBMITTALS

1. General: Shop drawings and product data shall be submitted in accordance with the General Requirements.

2. Product data shall include all manufacturer's literature, catalog cuts and other descriptive literature to fully substantiate the conformance with specifications of materials and equipment submitted. Mark product-data to indicate exactly those items that are to be provided and cross out unrelated or nonapplicable items.

3. Shop drawings shall include Contractor prepared plans, sections and details fully dimensioned showing all piping systems and appurtenances to be installed and with system designations as indicated herein. Show all equipment connection details.

E. JOB CONDITIONS

Schedule Of Work: Arrange work to comply with schedule of construction. In scheduling, anticipate means of installing equipment through available openings in structure.

Coordination Of Work: The Contractor shall coordinate all trades whose work is adjacent, in order to avoid field interference and delay in execution of the work of all trades. Furnish detailed advance information regarding all requirements related to work by others. Furnish sizes and accurate data and location of any and all foundations, pits, chases, holes through beams, floors, walls, ceilings and roof, and other special openings required for this contract work.

Inserts: Prior to the execution of each step in the general construction work, determine that all chases and holes required for the specified work are properly located and sized and supervise the setting of all sleeves, inserts and other required build-in items. If this preliminary work is not properly performed and should cutting by required to install the specified work, the Contractor shall bear all expense of cutting and restoring the construction to its original condition.

Cutting: The work shall be carefully laid out in advance and any cutting of construction shall be done only with the written permission of the Engineer. Cutting shall be carefully done, and any damage to the building, piping, wiring and equipment as a result of the cutting shall be repaired by persons skilled in the particular trade.

F. MANUFACTURER

Pipe and fittings shall be manufactured by a firm regularly engaged in the successful manufacture of the type of pipe furnished. All water piping specified shall be NSF approved and all piping shall bear the NSF stamp of approval. (ANSI/NSF 61)

G. HANDLING OF PIPE

The pipe shall not be dropped or subjected to any unnecessary jar, impact or other treatment that might damage the pipe. Any unit of pipe that in the opinion of the Engineer is damaged beyond repair by the

Contractor shall be replaced by another unit. Any pipe that is damaged and repairable shall be repaired in the field, or at the direction of the Engineer shall be returned to the manufacturing plant for repair.

PART 2 - PRODUCTS

A. DUCTILE IRON FITTINGS

Manufacture: Ductile Iron pipe shall be manufactured in the U.S.A. in accordance with the latest revision of ANSI/AWWA C151/A21.51. All ductile iron pipe shall be hydrostatic pressure tested at the plant of the manufacturer to 500 psi.

Design: Ductile Iron Pipe shall be designed in accordance with the latest revision of ANSI/AWWA C150/A21.50. The design shall include a minimum working pressure of 150 psi plus a 150 psi surge allowance. A two to one safety factor shall be applied to the sum of the working pressure plus the surge allowance. A two to one safety factor shall also be applied to the bending stress and deflection design for a Type 3 to Type 5 laying condition with the depth of cover as required per the plans.

Unless noted otherwise on the plans, the minimum pressure classes for ductile iron pipe shall be as follows: PC 350 for 8" - 12" pipe, PC 250 for 14" - 20" pipe, PC 200 for 24" pipe and PC 150 for 30" and larger pipe.

Coating and Lining: Pipe shall have a standard asphaltic coating on the exterior. Pipe shall have a cement mortar lining on the interior in accordance with the latest revision of ANSI/AWWA C104/A21.4.

Joints: All ductile iron piping shall be restrained joint and shall be shall per the qualified manufacturer list as approved by the City of Zachary.

Ductile Iron Fittings: Ductile Iron Fittings shall conform to the latest revisions of either ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53. Linings and coatings for fittings shall be the same as specified for ductile iron pipe.

Flanged Pipe: All above ground or exposed pipe shall be ductile iron and shall comply with ANSI/AWWA C115/A21.15. The pipe barrel shall be made in accordance with ANSI/AWWA C151/A21.51, and shall have a thickness of no less than special thickness Class 53. All flanges shall be ductile iron and rated for a working pressure of 250 psi. Flange pipe and fittings shall be cement lined as specified above and shall be shop primed on the outside diameter with primer. Primer manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

Outlets: Welded on outlets may be provided in lieu of trees and crosses. Outlets shall be fabricated from centrifugally cast ductile iron pipe, manufactured and tested in accordance with the latest revision of ANSI/AWWA C151/A21.51, using a high nickel content weld such as NI-Rod #55. Welding shall be performed in the pipe manufacturer's shop only. Outlets shall not be more than 70% of the size of the parent pipe. Minimum walls for the parent and outlet pipes shall be per the qualified manufacturer list as approved by the City of Zachary.

B. POLYVINYL CHLORIDE (PVC) PIPING

All PVC piping shall meet the requirements and conform to one of the paragraphs as designated on the Drawings.

1. AWWA C900, Plastic pipe designated as C900 shall be made of rigid polyvinyl chloride (PVC) compounds conforming to ASTM D1784 for Type 1, Grade 1 (PVC 1120). The pipe shall be

standard sizes 4" through 12" in pressure class 100, 150 and 200 conforming with the outside diameter (OD) of cast-iron (CI) and with the wall thickness of dimension ratio DR series 25, 18 and 14 as indicated on the Drawings. Standard laying lengths shall be twenty feet (20').

2. AWWA C905, plastic pipe designated as C905 shall be made of rigid polyvinyl chloride (PVC) compounds conforming to ASTM D1784 for Type 1, Grade 1 (PVC 1120). The pipe shall be the standard sizes 14" through 36" conforming with the outside diameter (OD) for cast iron (CI) and with the wall thickness of dimension ration DR series 25 and 18 as indicated in the Plans. Standard laying lengths shall be twenty feet (20') laying length. Sizes and pressures are as follows:

Size	DR	Pressure	DR	Pressure
14	25	165	18	237
16	25	165	18	237
18	25	165	18	237
20	25	165	NA	---
24	25	165	NA	---
30	25	165	NA	---
36	25	165	NA	---

3. Joints:

Joints shall be rubber ring and made to manufacturer's specifications. Rubber rings shall be securely locked into the bell.

4. Fittings:

Fittings shall be the same type and grade, pressure rating and manufacturer of the pipe, and conform to the pipe specifications AWWA 900 or AWWA 905; or shall be ductile iron as specified herein under ductile iron pipe, except that fittings shall have all connections of standard AWWA dimensions or dimensions as required or with adapters of the proper class for the size of plastic pipe laid. Fittings 3" and smaller shall be PVC equal. Fittings 4" through 36" shall be ductile iron meeting C-153 specifications of AWWA. Where new water main is being cut into existing water main, only ductile iron fittings, all sizes, will be accepted.

5. Manufacturer's Representative:

The pipe manufacturer must furnish a trained representative for not less than one (1) eight (8) hour day on the job site to instruct and supervise the contractor in the proper method for installation of pipe and pipe fittings.

C. HIGH DENSITY POLYETHYLENE PRESSURE PIPE

High density polyethylene pipe shall be made from polyethylene resin compound that meet the requirements for Type III, Category 5, Class C, Grade P34 as defined in ASTM D1248.

The pipe produced from this resin shall have a classification of 345434C in accordance with ASTM D 3350 and shall have a Plastic Pipe Institute (PPI) rating of PE 3408.

The material shall be of virgin quality and contain a minimum of 2% well dispersed carbon black. The workmanship shall be of the highest level compatible with current commercial practice. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification and from the same raw material supplier. The polyethylene pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions or other injurious defects. It shall be uniform in color, opacity, density and other physical properties.

The pipe shall have a manufacturer's recommended hydrostatic design stress rating of 800 psi based on a material with a 1,600 psi design basis determined in accordance with ASTM D2837. The pipe shall conform to the dimensions, wall thickness, testing, marking and all other provisions of ASTM F 714 for the dimension ratios as shown on the drawings or on the bid form.

Pipe shall be marked at 5-foot intervals with a coded number which identifies the manufacturer, SDR, size, PPI rating, manufacturing standard reference and production code form which date and place of manufacture can be determined.

Flange adaptors shall be manufactured by the same manufacturer as the pipe using the same resin as the pipe. Each flange adaptor shall be furnished with a ductile iron convoluted backup ring drilled to match a standard ANSI bolt pattern for welded steel pipe.

The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions or other injurious defects. It shall be uniform in color, opacity, density and other physical properties.

Butt fusion of the pipe and fittings shall be performed by the thermal butt fusion system. Polyethylene pipe lengths, fittings and flange adaptor connections to be fused shall be of the same type, grade and class of polyethylene compound and supplied by the same raw material supplier.

D. CASTING PIPE

1. Pipe:

Casing pipe shall be steel having a minimum yield strength of 35,000 psi, conforming to A.P.I. Specification 5L. Casings shall have the following minimum wall thicknesses:

Size (Non. Diam., In.)	Thickness (Inches)
Under 12" I.D.	0.250
14 and 16 O.D.	0.281
18 O.D.	0.313
20 O.D.	0.344
24 O.D.	0.375
26 O.D.	0.438
28 and 30 O.D.	0.469
32 O.D.	0.500
34 and 36 O.D.	0.532
38, 40 and 42 O.D.	0.563

Both the interior and exterior of the pipe shall have a bituminous coating.

2. Joints:

Joints shall be butt welded. Coatings shall be continuous at the joints.

3. Carrier Runners:

The carrier pipe shall be supported by utilizing three way to concentric casing cradle. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

4. Casing Seal:

Casing seals, which seals the annulus between the casing and carrier pipe, shall be made of cement grout or bituminous material.

E. RESTRAINED JOINT PVC PRESSURE PIPE

Restrained Joint PVC Pressure Pipe shall be used for all trenchless installations and shall be AWWA C900 DR 18 where the restraint mechanism is lodged in the bell. Pipe Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary and shall be restrained joint C900 with Bulldog restraint system and rieber gasket per ASTM F477 to seal the integral bell socket to the spigot of the next joint (conforming to the requirements of ASTM D3139) or approved equal.

Each piece of pipe shall be factory hydrostatically proof tested to two times its pressure rating. Pipe shall be flattened tested per ASTM D2412, as well as be periodically tested in accordance with ASTM D2152. Pipe dimensions shall be checked in compliance with ASTM D2122.

Joints must meet the requirements of ASTM D3139.

F. PLASTIC SERVICE PIPE

1. Polyethylene Pipe:

Polyethylene service pipe shall conform to AWWA Standard C901 and be approved by the National Sanitation Foundation. The pipe shall have a standard dimension ration (SDR) of 9, and pipe shall conform to PE 3306, Type III, Grade 3, Class C.

2. Service Pipe Connections:

Only compression type couplings with inserts or flared couplings will be acceptable. Hot flared or hose connections are not permitted. The pipe must be continuous from water main to meter.

G. MECHANICAL COUPLINGS

1. Flexible Couplings: Flexible (sleeve) couplings shall be of the full sleeve type, split sleeve type, or flanged adaptor type, as shown on the Drawings, specified herein, or as otherwise permitted by the Engineer. The coupling shall provide the requisite pipe flexibility without jeopardizing pipe joint integrity due to hydraulic thrust, and shall have the same pressure-rating as the pipe. Couplings shall have all metal bearing surfaces and shall be provided with galvanized steel bolts and nuts. Flexible couplings shall be restrained unless the Engineer has given his approval to omit this feature for specific cases.

    a. Full Sleeve Type Couplings shall be properly gasketed and shall be of a diameter to fit the pipe. Each coupling shall consist of a steel middle ring, 2 steel followers, 2 gaskets and the necessary steel bolts and nuts to compress the gaskets. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary. Couplings to be installed underground shall have a hot-dipped galvanized sleeve with corrosion resistant bolts conforming to AWWA C-111 (type 316 stainless steel).

b. Split Sleeve Type Couplings shall consist of one gasket, 2 housing clamps, and 2 bolts and nuts to obtain the flexibility for connecting the piping. Steel shoulders shall be provided and welded to the pipe ends to accommodate the couplings. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

c. Flexible Flanged Coupling Adaptors shall be of the sleeve type, consisting of steel middle ring, steel followers, gaskets, and steel bolts and nuts to compress the gaskets. The couplings shall contain anchor studs of strength adequate to hold the pipe together under a pull equal to the longitudinal strength of the pipe at a tensile stress of 20,000 psi. Couplings to be installed underground shall have a hot-dipped galvanized steel with corrosion resistant bolts conforming to AWWA C-111 (type 316 stainless steel). Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

H. GATE VALVES (4-IN AND LARGER)

1. General Requirements:

   a. Unless otherwise specified below, these requirements shall apply to all gate valves.

   b. Gate valves shall meet the requirements of AWWA C500 and AWWA C509 as applicable to the type of valve specified.

   c. Buried and submerged valves shall be furnished with mechanical joints and stainless steel hardware; non-rising stem design.

   d. Exposed valves shall be furnished with Class 125 flanged ends; provided valves with outside screw and yoke.

   e. All metal valves shall be manufactured of ASTM A126 Cast Iron, Class B, with bronze mounting design.

   f. Rising stem valves shall be sealed with adjustable and replaceable packing; valve design must permit packing replacement under operation system pressures with only moderate leakage.

   g. Non-rising stem valves shall use a double O-ring stem seal, except that packing shall be used where geared operators are required.

   h. Except as otherwise specified, valves shall be rated for the following working water pressures:

Valve Size	Pressure (psig)
2-in to 12-in	200
14-in to 20-in	150
24-in and greater	50

   i. Valve bodies shall be hydrostatically tested to at least twice the rated working water pressure. In addition, valves shall be seat-tested, bi-directional at the rated working pressure, with seat leakage not to exceed one fluid once per inch of valve diameter per hour. Provide certificates of testing.

j. Flanged valves to have face-to-face dimensions per ANSI B16.1 and flanges per ANAI B16.10.

k. Exposed valves 16-in and larger to have valve by-pass.

l. Bonnet and packing gland bolts shall be zinc or cadmium electroplated steel; packing gland bolts shall have nuts.

m. Exposed valves 16-in and greater indicated for horizontal stem installation shall be furnished with rollers, tracks and scrapers and enclosed bevel gear grease case.

n. Provide geared operator and chain wheel, chain and chain guides for valves with handwheel centerline more than 5-ft above operating level.

o. Valves shall be marked per AWWA Standards, including name of manufacturer, valve size and working pressure and year of manufacture.

p. Unless otherwise indicated, valves 12-in and smaller shall be capable of installation in the vertical or horizontal position, sealing in both directions at the rated pressure.

q. Valve operation shall be counterclockwise for potable water. Provide permanent label showing "OPEN" and arrows.

r. Metal-seated valves shall be coated internally and externally with an asphaltic varnish, per AWWA C500. Resilient seated valves shall be coated, interior and exterior, with fusion bonded epoxy per AWWA C550.

2. Valve Applications:

   a. Valves for Potable Water Service shall be double disc or resilient seated design. Manufacturer shall be as approved by the City of Zachary.

3. Valve Requirements:

   a. Double Disc.

      i. Conform to AWWA C500.

      ii. Wedging surfaces shall be bronze, monel or stainless steel.

   b. Resilient Seated.

      i. Conform to AWWA C509. Also UF and FM approved.

      ii. Internal and external epoxy coating of valve body, including bonnet, per AWWA C550.

      iii. Gate shall be encapsulated with synthetic rubber. It shall be bonded and vulcanized in accordance with ASTM B429, Method B.

      iv. No recesses in valve body.

4. Buried Valves:

a. Conform to the requirements above, except restrained mechanical joint bell ends per AWWA C111. Exposed valve hardware (nuts, bolts, washers, etc.) including bonnet, bonnet cover, stuffing box, gear adaptor and joints shall be Type 304 stainless steel.

b. Non-rising stem design, double O-ring seals for non-geared valves and shall incorporate packing for geared valves.

I. VALUE BOXES

Valve boxes shall be provided for all below ground valves. Valve boxes in non-traffic areas shall be of the two-piece sliding or threaded type. For traffic areas, boxes shall be of the three-piece sliding type with the appropriate base. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

J. FIRE HYDRANTS

1. Fire Hydrants:

Fire hydrants shall be cast iron bodies, full bronze mounted, suitable for a working pressure of one hundred fifty pounds (150#) per square inch, and shall meet all requirements of the latest AWWA Standard C-502. Hydrants shall be Factory painted yellow 5 ¼" A425 Mueller Super Centurion "200" with two pumper nozzles. Hydrants shall have double "O-Rings" seals and dry bonnets. Each hydrant shall be given a 300 psi hydrostatic test in the shop. Nozzles shall be bronze.

Pump Nozzle	1-4 ½"
Main Lead Diameter	6"
Min Opening Diameter	5 ¼"
Min. Barrel Diameter	7 ¼"

Unless noted otherwise on the Plans and specified in the special conditions, nozzle thread and operating nuts shall be as follows: Threads for nozzle connections shall conform to NFPA No. 194, and shall be opened by turning in a counter clockwise direction. The operating nut at the top of the hydrant and cap nuts shall be one and one-half inch pentagon nut (measured point to flat) and shall open counter-clockwise. The Contractor shall verify all pertinent hydrant features and dimensions with both the Engineer and the Owner adapt to the Owner's standards shall be made at no additional cost to the Owner.

The hydrant main valve shall be of the compression type closing with pressure. The valve shall be faced with heavy impregnated water-proof balata, or other approved material. Hydrants shall have a safety "Breakable" section located above the ground line. The minimum distance from the ground line to the top of the hydrant lead (cover) and from ground line to bottom of hydrant lead (bury) shall be thirty inch (30") cover. After installation, exposed surfaces of hydrants shall be touched up with one (1) finish coat of yellow enamel (Alkyd paint). The Contractor shall provide the Owner with two (2) cartons of collision breakage repair parts for the hydrants.

2. Wrenches and Keys for Hydrants:

The Owner shall be furnished one (1) key wrench for each ten (10) hydrants, or a minimum of one (1) for ten (10) or less hydrants.

3. Manufacturer:

Provide hydrants by Mueller Centurion.

K. NEW SERVICE ASSEMBLY WITH METER SETTING

New water service assemblies with meter setting where called for on the Plans, shall each include a plastic meter box with reading lid, service tap clamps or fittings, curb stop, corporation stop, and the required connectors and service pipe. All equipment shall be bronze. Water meters shall be furnished by the City of Zachary. All connectors shall comply with A.W.W.A. Standard C800.

1. Service Assembly and Corresponding Service Pipe Size:

SERVICE ASSEMBLY	SERVICE PIPE SIZE
5/8" x 3/4" small res. & comm. (up to 2 baths)	3/4"
5/8" x 3/4" large res. & comm. (more than 2 baths)	1"
3/4" or 2-5/8" x 3/4"	1 1/2"
1" or 2-3/4"	1 1/2"
1 1/4" or 2-3/4"	2"
1 1/2" or 2-1"	2 1/2"
2"	3"
3"	4"

2. Corporation stops shall be of bronze or brass and shall be designed and manufactured in accordance with AWWA C800, except as modified herein.

   Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary. Where corporation stops are used with plastic pipe, a brass companion flange shall be provided on the outlet of each corporation stop.

3. Curb stops shall be similar to corporation stops as manufactured by Crane; Ford; McDonald or equal.

4. All service taps shall be threaded couplings or strap clamps for A.W.W.A threads. Thread couplings for galvanized pipe shall not be permitted.

Maximum Size Threaded Coupling
Permitted in Ductile Iron Pipe

Pipe Size	Tap Size	Pipe Size	Tap Size
2"	1/2"	8"	1 1/4"
3"	1/2"	10"	1 1/2"
4"	3/4"	12"	2"
6"	1"		

Where it is necessary to provide a service larger than the allowable ductile tap size, multiple taps shall be employed by staggering the taps around the pipe and spacing the taps at least twelve (12) inches apart and twelve (12) inches from the end of the pipe length, or service clamps shall be used.

Service strap clamps shall be galvanized malleable or ductile iron or bronze with rubber gasket. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

Maximum Size Service Clamp Permitted

Pipe Size (Inches)	Ductile Iron Size	Plastic and Galvanized Size
2	1"	3/4"
2 1/2	1 1/4"	1"
3	1 1/2"	1 1/2"
4	2"	1 1/2"
6	2"	1 1/2"
8	3"	1 1/2"
10	3"	1 1/2"
12	4"	1 1/2"

L. THRUST BLOCKS AND ANCHORS

1. For all water lines, at 1/8 bends or greater, and at tees, caps, plugs, and other fittings, concrete thrust blocks or anchor rods shall be provided by the Contractor to firmly secure these fittings. Anchor blocks and straps shall be used under valves and hydrants and plastic pipe in accordance with the manufacturer's standards or recommendation. Thrust blocks shall be of such size and dimensions as detailed on the plans. Concrete for thrust blocks shall be not leaner than one (1) cement to two and one-half (2 1/2) sand to five (5) aggregate, and having a compressive strength of not less than 2,000 psi at 28 days. Otherwise, concrete shall be in strict conformance with the applicable section on concrete in these Specifications. Restrainer devices such as Uni-Flange or an approved equal shall be acceptable.

2. Restrained Joints:

    a. Restrained joints may be considered by the Engineer in lieu of thrust blocks if they meet the requirements of the section. Restrained joints shall be constructed using pipe and fittings with restrained "Lock-type" joints. The joints shall be capable of holding against withdrawal and no axial movement for line pressures 50 percent above the normal working pressure but not less than 100 psi. The pipe and fittings shall be as shown for restrained push-on joints or restrained mechanical joints in the Handbook of Cast Iron Pipe, 4th Edition, except that mechanical joint ductile iron pipe retainer glands will not be permitted.

    b. Restrained pipe joints that achieve restrain by incorporating cut out sections in the wall of the pipe shall have a minimum wall thickness at the point of cut out that corresponds with the minimum specified wall thickness for the rest of the pipe.

    c. The minimum number of restrained joints required for resisting forces at fittings and changes in direction of pipe shall be determined from the length of restrained pipe on each side of fittings and changes in direction necessary to develop adequate resisting friction with the soil. The formula and parameters given below shall be used to determine the minimum requirements:

$$L = \frac{1.5PA\,(1-\cos X)}{fw}$$

Where L = length of pipe on each side of fitting or change in direction
P = 50 percent above the normal working pressure
A = cross-sectional area in square inches based on outside diameter (O.D.) of pipe
X = angle of bend or change in direction in degrees
f = coefficient of friction = 0.4 (maximum)
w = earth + pipe + water in pipe

earth = (density of soil*) (depth of cover in feet) (O.D. in feet) (2)

* maximum 120 lbs/ft above maximum water table elevation

and 60 lbs/ft below maximum water table elevation

d. Bolts and nuts for restrained joints shall be corten, low alloy, high strength steel.

e. Restrained joints Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

PART 3 - EXECUTION

A. LAYING WATER PIPE

1. General:

Installation of water pipe shall be in conformance with provisions of A.W.W.A. Standard C605, Installation of PVC pressure pipe for water mains, except in cases of conflict with these Specifications, in which case these Specifications will govern.

Water mains shall have a minimum 6-foot HORIZONTAL separation, measured from edge to edge, from any existing or proposed sewer main. Water mains crossing sewer mains shall be laid to provide a minimum vertical distance of 18" between the outside of the water main and the outside of the sewer main.

When work is suspended either for the night or for any other reason, open ends of the pipe shall be securely capped or plugged to prevent the entrance of mud, water, animals, or any obstruction.

Dead ends of pipe and unused branches of crosses, tees, valves, etc., shall be closed with a plug suitable to the type of pipe used.

Proper and suitable tools and appliances for the safe and convenient handling and laying of pipe shall be used, and care shall be taken to prevent damage to pipe coating. If required by the size pipe being used, mechanical pullers (or spreaders) shall be used in conformance with the pipe manufacturer's instructions.

While pipe laying is in progress, the trench shall be kept free of water.

While suspended in the sling and before lowering in the trench, the pipe shall be swabbed clean and inspected for defects and tapped with a light hammer to detect cracks. Defective, damaged, or unsound pipe shall not be used.

2. Excavation and Bedding:

The width of the trench at the top of the pipe for water pipe installation shall not exceed the external diameter of the barrel of the pipe plus nine inches (9") on each side.

Trenches for water lines shall be of a depth to provide a thirty-six inch (36") minimum cover over the top of the pipe.

Where sanitary sewer, storm sewer, or other subsurface utilities are encountered in trenching for water lines, it will be permitted to lay pipe above the obstruction if a minimum cover of twenty four inches (24") can be obtained while providing a cushion between the bottom of the pipe and the top of the obstruction of at least eighteen inches (18") in thickness. Otherwise, the obstruction will have to be by passed or tunneled under. Approval must be sought by the Department of Health in these situations.

Mechanical excavation shall be stopped so that the pipe may be laid on a firm, undisturbed, continuous native earth bed. Prior to laying the pipe, the trench shall be manually excavated so that it is flat, true to grade, and provides continuous contact with the pipe barrel. Bell holes shall be spaced as required providing two inches (2") minimum between earth and the pipe coupling.

If over digging occurs, the trench bottom must be brought back to grade with compacted select material, and the cost borne by the Contractor.

Where the bottom of the trench is rock, water bearing soil, or unstable material, the Resident Project Representative may direct that the pipe be bedded in granular material, a concrete cradle, or granular material on timber runners, and paid for as separate items. The pipe shall be bedded as provided above, but in no case shall the bedding provide less than eighteen inch (18") cushion below and at the sides of any part of the pipe.

Granular material, where required, shall be sand, crushed stone, or gravel, and shall not exceed 3/4 inch maximum size.

Concrete for pipe foundations, where required, shall be proportioned a required hereinbefore for thrust blocking concrete. Other excavation and trenching requirements as specified hereinbefore (Section 2) shall be complied with.

3. Backfilling:

The initial backfill under the pipe haunches, around the pipe, and over the top of the pipe shall be manually placed in layers, each layer being thoroughly hand tamped. The thickness of each layer, prior to compaction, shall be six inches (6"). Special laying instructions of any pipe manufacturer shall be rigidly followed.

Where the Contractor uses a trenching machine for the excavation, the initial backfill shall be brought to not less than one foot (1') above the top of the pipe, as hereinafter specified. Should the Contractor elect to use a backhoe, dragline clam shell bucket or equipment other than a trenching machine, then the initial backfill shall be brought to not less than two feet (2') above the top of the pipe.

Other backfill requirements as specified hereinbefore in Section 2 of the Specifications shall be complied with.

B. PLACING VALVES AND FITTINGS

Valves and fittings shall be placed in the location indicated on the Plans.

All underground valves shall be set vertically. Boxes shall be set with covers flush with the surface.

Before being placed in the trenches, all valves, meters, fittings, etc., shall be carefully examined to see that they are in good working order and are clean.

C. JACKING AND BORING PIPE

1. General:

Where pipe is to be laid beneath railroads, Federal Highways, State Highways, and concrete pavement, jacking and boring is required. The Contractor will not be permitted to open cut.

The requirements of the approving agency, such as railroad or State Highway Department, shall govern over these Specifications and Plans.

Sub-surface operations resulting in damage to the tracks or pavement, shall be the responsibility of the Contractor and shall be repaired at no cost to the OWNER.

2. Jacking and Boring Casing Pipe:

Installing of steel casing pipe shall conform to the A.R.E.A. Manual for Railway Engineering and Louisiana Standard Specifications for Roads and Bridges, Sections 7 and 8, latest edition.

Where the ends of pipe used as casing for other pipe are below ground, the ends shall be sealed.

The barrel of the carrier pipe shall be supported within the casing. Supports or carrier runners shall be spaced as recommended by the manufacturer.

D. INSTALLING FIRE HYDRANTS

Hydrant nozzles shall face the street.

Each hydrant shall be placed vertically on a concrete base, and shall be secured against dislocation as shown on the Plans. Hydrants shall be placed as shown on the Plans and as follows:

Fire hydrants placed behind curbs shall be set so that no portion of the hydrant or nozzle caps shall be less than eighteen (18) inches from the vertical face of the curb. Hydrants shall not be placed within twenty (20) feet of the intersection of curb lines at street corners.

Vertical off-sets or hydrant extensions shall be used as required in the hydrant lead so that the bury line of the hydrant will be flush with the natural ground and the specified cover will be maintained on the main and the hydrant lead.

Hydrants shall be secured in place by hydrant valve anchoring tee with hydrant anchoring connection pieces, concrete thrust blocks, or socket clamps and tie rods. Tie rods shall extend from hydrant to tee fitting in main. Clamps shall be of either wrought iron or steel, and not less than two (2) inches wide and three-eight (3/8) inches thick. Bolts used shall be not less than three-quarter (3/4) inches in diameter. Material shall be wrought iron steel. Wrought iron and steel shall be protected against corrosion by painting with tar, asphaltic, or other suitable and approved material.

E. TESTING WATER PIPING

No pressure tests shall be made until all concrete thrust blocks are at least forty-eight (48) hours old.

Installed pipe shall be pressure and hydrostatically tested in accordance with the latest appropriate AWWA standards. Post-installation water line testing shall include a hydrostatic pressure test of 1.5 times the operating pressure for a period not less than two hours and a 24-hour leakage test.

F. STERILIZATION

Following the pressure and leakage tests, all lines shall be disinfected in accordance with LAC Title 51, Public Health Sanitary Code, Part XII, Water Supplies as follows:

Pumps, pipes, wells, tanks and other parts of new systems shall be thoroughly disinfected by the use of chlorine or chlorine compounds before being placed in use. The rate of application of chlorine shall be in such proportion to the rate of water entering the pipe or other appurtenances that the chlorine dose applied to the water shall be at least 50 mg/l. Chlorinated water shall be retained long enough to destroy non-spore-forming bacteria. The period shall be at least three hours and preferably longer, as may be directed. After the chlorine treated water has been retained for the required time, the chlorine residual at pipe extremities and at other representative points shall be at least 5 mg/l. If the residual is less than 5 mg/l, the disinfection procedure shall be repeated until a 5 mg/l residual is obtained, as required above.

All new potable water lines, including pipe, valves, etc. shall be sterilized prior to being placed in use with a solution or an approved disinfectant containing no less than fifty (50) parts per million of available chlorine. Products used must be in conformance to NSF 60.

For this work, the Contractor shall furnish suitable plugs or caps for the pipe, injection pumps, pipe connections, flush points and other equipment together with all labor required.

While the disinfectant is being applied to any section of the system, the water shall be allowed to escape at all extremities of this section until an orthotolidine test shows a deep orange color. The disinfectant shall be allowed to remain in the pipe for twenty-four (24) hours, after which the lines shall be thoroughly flushed by flush valves and/or fire hydrants. Each section of the system shall be sterilized and re-sterilized until bacteriological approval has been obtained from the appropriate health agency.

G. TRACERS FOR NON-METALLIC PIPE

A plastic bonded 10 gauge copper wire shall be laid one foot (1') above the top of the pipe. The wire shall be continuous along the entire length of the pipe and grounded to gate valves, fire hydrants, flush valves, and water meters. A warning/cautionary tape strip (2" width) shall be placed over the pipe approximately 12 inches below finished grade.

H. HIGH DENSITY POLYETHYLENE (HDPE) PIPE INSTALLATION

Polyethylene pipe shall be joined by the method of thermal butt-fusion as outlined in ASTM D 2657 "Heat Joining Polyolefin Pipe and Fittings." All butt-fusion joining of pipe and fittings shall be performed in accordance with proven procedures and techniques recommended by manufacturer. Thermal butt-fusion of the pipe shall be performed by an experienced technician, certified in the jointing of high-density polyethylene pipe in accordance with Title 49 CFR 192.285. Written certification of the individual welders as per Attachments found at the end of this section shall be submitted to the Engineer prior to the performance of any welding.

A minimum of two test joints shall be fused and cut from each pipe size and each SDR prior to beginning joining the pipe system. The test joints shall be visually examined in accordance with Title 49 CFT 192.285. The Engineer reserves the right to request that no more than 10 additional samples be cut from the pipe during the jointing process at no additional cost to the Owner, to document the integrity of the fusion process.

All finished butt-fusion welds shall be ground out to the inside of joined pipe sections such that the maximum finished bead protrudes no more than 1/8-inch from the inside of the pipe wall at any given point.

Where shown on the plans, the HDPE pipe shall be adapted to fittings and valves by means of an assembly consisting of polyethylene stub-ed, butt-fused to the pipe, a back-up flange of ductile iron, made to Class 140, ANSI B16.5 dimensional standard with exceptions, bolts of compatible material and a viton gasket to fill the joints. Bolts shall be drawn up evenly and in line.

I. CLEANUP AND REPAIR OF EXISTING CITY STREETS

General: The Contractor shall maintain his operations in a neat and orderly manner causing as little inconvenience as possible. Within 10 working days from the time a trench is opened all roadside ditches, culverts, etc., shall be repaired and surfaces thoroughly cleaned. All excess excavation shall be removed from the trench side and disposed of at the Contractor expense. The work area shall be then thoroughly cleaned.

Clean-up and repair shall as approved by the City of Zachary.

J. ACCEPTANCE

Final acceptance of the project will not be made until the CONTRACTOR has completed the total project and all tests, restoration, and clean-up have been performed to the satisfaction of the City of Zachary. All installed valves shall be located using a GPS coordinate system and data shall be turned over to the City of Zachary prior to final acceptance.

END OF SECTION

PART III

GAS SYSTEM

SECTION 301
NATURAL GAS SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section of the specifications details requirements for work and materials to be used in connection with installing, constructing, laying, placing, etc., gas lines, gas valves, valve boxes and other gas system appurtenances detailed on the plans and in the other sections of these specifications. The CONTRACTOR'S attention is directed to the Specifications and Plans to determine which type of material is to be used on this particular project. The CONTRACTOR shall provide all labor, materials, tools and equipment necessary to install all gas lines, valve boxes and appurtenances as shown on the Plans. The Work shall include excavation, sheeting and bracing, bedding, backfill, etc.

B. All work performed under this Contract shall comply to the requirements of the United States Department of Transportation, Office of Pipeline Safety, Part 192 of Title 49, Code of Federal Regulations "Transportation of Natural and Other Gas by Pipeline, Minimum Safety Standards."

C. Any part, portion, or section of this Specification found to be in conflict with any part, portion, or section of Part 192, shall be considered null and void and the applicable part, portion or section of Part 192 shall be substituted therefor.

D. Contractor shall furnish Owner with copies of the welder certifications and PE Fusion Certification for their records prior to any work being done. Contractor shall be certified in accordance with the City of Zachary's Certification Requirement and for working on their system.

PART 2 - PRODUCTS

2.01 HIGH DENSITY POLYETHYLENE GAS MAIN (HDPE) – TO BE USED ONLY WHERE WHEN CROSSING STATE HIGHWAYS OR WHERE REQUIRED BY THE CITY OF ZACHARY

A. Gas lines, including pipe and fittings shall be made of polyethylene compound to ASTM D-1248 for Type III, Grade P34, Category 5 (ASTM Material Designation PE 3408). Pipe and fittings shall be rated for a minimum working pressure of 100 psi at 73.4 degrees Fahrenheit and shall conform to ASTM D-2513-85a "Standard Specifications for Thermoplastic Gas Pressure Piping", ASTM D-3261-85 "Standard Specifications for Butt Heat Fusion Polyethylene Plastic Pipe and Tubing" and corresponding standards for electrofused pipe.

B. Pipe and fittings shall be installed in accordance with manufacturer's recommendations. All connections shall be visually inspected by the CITY OF ZACHARY prior to the CONTRACTOR performing any backfilling.

C. All polyethylene pipe shall be visually inspected by the CITY OF ZACHARY prior to the CONTRACTOR performing any backfilling.

D. All polyethylene pipe at the construction site shall be marked with Manufacturer's Batch Number. Markings shall consist of at least the following: manufacturer, product name or trade name, nominal diameter, material type, SDR value, applicable standards, class rating.

E. Gas main shall have a SDR rating of 11.

F. Pipe manufacturer shall be approved by the City of Zachary.

2.02 MEDIUM DENSITY POLYETHYLENE GAS PIPE (MDPE)

A. Gas lines, including pipe and fittings shall be made of polyethylene compound to ASTM D-1248 (ASTM Material Designation PE 2406). Pipe and fittings shall be rated for a minimum working pressure of 100 psi at 73.4 degrees Fahrenheit and shall conform to ASTM D-2513-85a "Standard Specifications for Thermoplastic Gas Pressure Piping", ASTM D-3261-85 "Standard Specifications for Butt Heat Fusion Polyethylene Plastic Fittings for Polyethylene Plastic Pipe and Tubing" and ASTM D-2683-85 "Standard Specifications for Socket-Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing."

B. Pipe and fittings shall be installed in accordance with manufacturer's recommendations. All connections shall be visually inspected by the CITY OF ZACHARY prior to the CONTRACTOR performing any backfilling.

C. All polyethylene pipe shall be visually inspected by the CITY OF ZACHARY prior to the CONTRACTOR performing any backfilling.

D. All polyethylene pipe at the construction site shall be marked with Manufacturer's Batch Number. Markings shall consist of at least the following: manufacturer, product name or trade name, nominal diameter, material type, SDR value, applicable standards, class rating.

E. Gas main shall have a SDR rating of 11.

F. Pipe manufacturer shall be approved by the City of Zachary.

2.03 POLYETHYLENE GAS VALVES

A. Gas valves shall be polyethylene valves for gas distribution pipelines (ASTM Material designation PE 3408). Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary. Plug Valves, or approval equal and shall conform to ASTM D-3261-85 "Standard Specifications for Butt Head Fusion Polyethylene Plastic Fittings for Polyethylene Plastic Pipe and Tubing and ASTM D2683-85 "Standard Specifications for Socket-Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing

2.04 VALVE LUBRICATION

A. All valves shall be provided with a combination button head fitting and lubricant screw.

B. The Contractor shall provide four (4) sticks of the proper size lubricant specified for each valve, three of which shall be used to lubricate each valve prior to installation in the system.

C. Lubricant sticks shall be of the grade recommended for natural gas service by the manufacturer of the valve.

D. All service cocks shall be fully lubricated at the time of installation. Lubricant Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary. In addition, the Contractor shall provide the Owner with one-pound lubricant, in unopened containers, for each one hundred (100) service cocks provided.

2.05 VALVE BOXES

A. Valve boxes on 4" and smaller valves shall be two sections sliding type adjustable valve boxes. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

B. Valve boxes on 6" and larger valves shall be three section adjustable valve boxes. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

C. In event the valve must be installed at a below normal depth, a suitable valve box extension shall be provided to adjust the top of the box to the roadway or ground level. Cost of furnishing and installing valve box extensions shall be included in other items; no additional compensation will be allowed.

D. All valve boxes shall be provided with cast iron covers on which the word "GAS" is printed in raised letters.

E. All valve boxes shall have a 6" by 1'-0" concrete ring around the top of the box as detailed on the Plans. The cost of this concrete ring shall be included in the unit price bid for the valve. No additional compensation shall be allowed.

F. To eliminate any possible transfer of loads from the valve box to the valve, the Contractor shall furnish and install masonry or other approved supports beneath all valve boxes as detailed on the Plans.

2.06 CASING PIPE

A. All mains and laterals crossing state highways and railroads shall be encased in a steel pipe of larger diameter. This casing pipe shall have a minimum wall thickness of 0.250 inches and shall extend through the roadway at least from ditch to ditch line and across the roadway right-of-way a distance designated on the Plans.

B. All casing shall be installed with an even bearing throughout its length and with a slope to one end. Due care shall be taken to prevent a waterway from forming adjacent to the casing.

C. The vents shall be fabricated from 2" or larger pipe and installed as indicated on the standard detail sheet of the Plans.

D. The Contractor shall also install the insulator spacers and end seals. The cost of these and all other work incidental to the installing of the casing shall be included in the unit price bid.

E. Typical examples of casing installation are shown in the detail section of the Plans.

F. Casing pipe shall be steel having a minimum yield strength of 35,000 psi, conforming to A.P.I. Specification 5L. Casings shall have the following minimum wall thicknesses:

Size (Non. Diam., In.)	Thickness (Inches)
Under 12" I.D.	0.250
14 and 16 O.D.	0.281
18 O.D.	0.313
20 O.D.	0.344
24 O.D.	0.375
26 O.D.	0.438

28 and 30 O.D.	0.469
32 O.D.	0.500
34 and 36 O.D.	0.532
38, 40, and 42 O.D.	0.563

G. Both the interior and exterior of the pipe shall have a bituminous coating.

H. Upon written permission of the approving agency (Railroad Company or Highway Department) and the Engineer, the Contractor may be permitted to substitute reinforced concrete culvert pipe or bituminous coated corrugated metal pipe for steel casing pipe specified above, provided that the substituted pipe conforms to the approving agency's specifications.

I. Joints shall be butt welded. Coatings shall be continuous at the joints.

J. The carrier pipe shall be supported by utilizing threeway to concentric casing cradle. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

K. Casing seals, which seals the annulus between the casing and carrier pipe, shall be made of cement grout or bituminous material.

PART 3 - EXECUTION

3.01 LAYING POLYETHYLENE GAS PIPE

A. General

Gas Piping shall be installed in accordance with ASTM D2774-72 "Standard Recommended Protective for Underground Installation of Thermoplastic Pressure Piping." Proper implements, tools and facilities satisfactory to the ENGINEER shall be utilized by the CONTRACTOR for the safe and efficient execution of the Work. All pipe, fittings, valves and accessories shall be carefully lowered into the trench using suitable equipment in such manner as to prevent damage to pipe fittings. Under no circumstances shall the pipe or accessories be dropped or dumped into the trench. A minimum cover of 60" shall be maintained between the top of the trench and top of the pipe.

B. Inspection Of Pipe And Accessories

The pipe and accessories shall be inspected for defects prior to lowering into trench. Any defective, damaged or unsound material shall be repaired or replaced as directed by the ENGINEER.

C. Pipe Kept Clean

All foreign matter or dirt shall be removed from the interior of the pipe before lowering into position in the trench. Pipe shall be kept clean by means approved by the ENGINEER during and after laying. All openings to the pipe shall be closed by suitable means at all times except as the actual progress of the Work may require. Stub ends and fittings installed for further connection shall be closed with plugs or caps normally used for that purpose.

D. Joints

All joints shall be made in accordance with manufacturer's recommendations. A "Bull-Horn"

type connection where a heat fuse connection is required will not be accepted. The CONTRACTOR will be required to cut out the "Bull-Horn" section and make a new acceptable splice at no additional cost or contract adjustment.

E. Tracers For Non-Metallic Pipe

Tracer wire for non-metallic pipe shall be provided in accordance with 49CFR, Part 192.321. Plastic pipe that is not encased must have an electrically conducting wire (plastic bonded 10 gauge copper wire) as a means of locating the pipe underground. Tracer wire may not be wrapped around the pipe and contact with the pipe must be minimized but is not prohibited. Tracer wire installed for pipe locating purposes must be resistant to corrosion damage. If buried splices are specifically approved by the City of Zachary, then all splices in the tracer wire must be connected using a direct burial connection to prevent corrosion or deterioration of the connection so as to not loose connectivity over time. Such connection may be made by using the appropriate size direct burial kit. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

Tracer wire shall be installed 6-8 inches above the top of the pipe after partial backfill. Tracer wire must be protected at all time to prevent damage. The use of splices shall be kept to a minimum. A continuity/ connectivity test shall be conducted and witnessed by the Engineer prior to acceptance.

A "Warning/Cautionary Tape" shall be placed over the pipe approximately 12" below the natural ground level. The "Warning/Cautionary Tape" shall be 2" wide, orange in color, and shall be marked "WARNING/CAUTION BURIED GAS LINE BELOW", and shall be of non-corrosive manufacture.

Service pipe shall have the same wire laid six inches (6") above the top of the service pipe and project one (1) foot into or alongside each meter.

3.02 PLACING VALVES AND FITTINGS AND TEST STATIONS

A. Valves fittings and test stations shall be placed in the location indicated on the Plans and as directed by the ENGINEER.

B. All underground valves shall be set vertically. Boxes shall be set with covers flush with the surface of the adjacent ground, street, etc.

C. Before being placed in the trenches, all valves, meters, fittings, etc., shall be carefully examined by the Contractor are in good working order and are clean.

3.03 JACKING AND BORING PIPE

A. General

Where pipe is to be laid beneath railroads, Federal Highways, State Highways, and concrete pavement, jacking and boring will be required. The Contractor will not be permitted to open cut.

The requirements of the approving agency, such as railroad or State Highway Department, shall govern over these Specifications and Plans.

Sub-surface operations resulting in damage to the tracks or pavement, shall be the responsibility of the Contractor and shall be repaired at no cost to the OWNER.

B. Jacking and Boring Casing Pipe:

Installing of steel casing pipe shall conform to the A.R.E.A. Manual for Railway Engineering and Louisiana Standard Specifications for Roads and Bridges, Sections 7 and 8, latest edition.

Where the ends of pipe used as casing for other pipe are below ground, the ends shall be sealed.

The barrel of the carrier pipe shall be supported within the casing. Supports or carrier runners shall be spaced as recommended by the manufacturer, or as directed by the ENGINEER.

3.04 SERVICE ASSEMBLIES TO BE PROVIDED BY BUILDING CONTRACTOR (BUILDING CONTRACTOR SHALL COORDINATE METER INSTALLATION WITH THE CITY OF ZACHARY)

A. Contractor shall furnish all service regulators, fittings, bushings, meter loops, insulating pipe unions, safety relief valves, and dust trap required and shall install the assemblies as specified herein.

1. Dust Traps

Dust traps for 3/4" and one inch services shall be straight through type. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

2. Safety Relief Valves

For service assemblies using a regulator without internal relief valve (usually Nos. 6 and 7), the Contractor shall furnish and install a safety relief valve. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

For service assembly No. 1 high pressure the safety relief shall be a 3/4" Fisher Series 1805 or equal set to relieve at pressure designated by the Engineers.

3. Insulated Unions

The Contractor shall provide insulating unions where noted on the Plans. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

4. Meter Loops

Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

3.05 TESTING GAS PIPING

A. All tests shall be conducted in the presence of the City of Zachary.

B. For these tests, the Contractor shall furnish suitable testing plugs or caps for the pipe, all necessary compressors, pipe connections, recording gauges and other equipment, together with all labor required.

C. All breaks, leaks, or defects in the pipe, valves and fittings shall be repaired and made good by the Contractor at this own expense, following which the lines shall be retested until the test requirements have been fulfilled.

D. The distribution system shall be pressure tested and leak tested by the Contractor with compressed air. The City of Zachary shall be notified a minimum of 72 hours in advance of the pressure testing.

E. A minimum of 100 psi shall be applied by suitable means and shall be maintained for a period of twenty-four (24) hours without pressure drop. A recording gauge shall be used to measure the pressure. The system shall be divided for testing into convenient sections. The total length of pipe in each section shall not exceed 6,000 feet.

F. The original charts made by the recording gauge during the test shall be of such condition and appearance that they can be reproduced and they shall be provided to the City of Zachary.

G. Services shall be tested separately from the gas mains. Service lines shall be individually tested to the same pressure as the main after the main has been installed. This 100 psi pressure shall be maintained without pressure drop for at least twenty-four (24) hours.

3.06 PIPE FUSING

A. All polyethylene pipe shall be fused and installed by a certified technician with certification and credentials filed with the City of Zachary before work begins.

3.07 TRENCHING

A. Trenching for installation of the supply (transmission) mains shall be such that the pipe will have a minimum cover of fifty (50") inches below grade.

B. The maximum permissible width of cut shall be as follows: for pipe less than six (6") inches in diameter, twelve (12") inch trench; for pipe six (6") inches in diameter and greater, the trench width shall not exceed twice the diameter of the pipe.

C. Where subsurface obstructions are encountered in the above trenching, the Contractor will be permitted to lay pipe above the obstruction if the minimum cover require can be obtained while providing a cushion between the bottom of the pipe and the top of the obstruction at least twelve (12") inches for transmission lines and six (6") inches for distribution mains.

D. Where this minimum cover cannot be obtained, the Contractor will be required to lay pipe under the obstruction and he will receive no additional compensation for constructing the line in this manner.

E. All shade trees, telephone poles, power poles, etc., along the line of work shall be protected, and sufficient barricades, lanterns, etc., shall be provided for the protection of the public.

The Engineers reserve the right to control the length of trench opened in advance of pipe installation if, in their opinion, the laying of pipe is not proceeding fast enough to complete the installation and backfilling within a reasonable length of time.

3.10 MAINS AND LATERALS UNDER PAVED STREETS OR ROADWAYS

A. Where mains and laterals are to be held beneath roadway paving on roadways, they shall be installed by means of a boring machine, auger or by means satisfactory to the Engineers. In the event subsurface operations result 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 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. In cases where no other practical method for installation is available, the Contractor, with the permission of the Engineers, may be permitted to cut the pavement if the area is not within a state roadway. He shall in no case make any continuous open cut more than twenty-five (25') feet in length through any concrete or concrete base roadway pavement except with specific consent of the Engineers, a brace or undisturbed pavement no less than two (2') feet in width shall be left across the trench at such intervals as the Engineer may direct. These braces shall remain undisturbed until the Contractor is ready to repave the cut.

C. All mains and laterals crossing paved state highways shall be encased in a pipe of larger diameter where indicated. This casing shall extend through the highways at least from ditch line to ditch line. Casing for the pipelines shall be vented in an approved manner.

3.11 MAINS AND LATERALS UNDER DRIVEWAYS AND SIDEWALKS

A. Where mains and laterals are to cross under concrete or brick driveways/sidewalks, the Contractor will be required to install them by means of a boring machine, auger or by other means satisfactory to the Engineers. Where it become necessary to cut and replace the driveway/sidewalk, it shall be cut by use of a concrete saw and replaced as soon as practicable after the trench has been backfilled and tamped.

3.12 SURFACE OBSTRUCTION

A. All buildings, walls, fences, poles, bridges, railroads, trees, and other property or improvements encountered shall be carefully protected from all injury, and in the event that any of the foregoing are damaged or removed during the progress of the work they shall be repaired or replaced in a satisfactory manner within a reasonable time. Special care must be exercised in trenching under or near railroads in order to avoid or minimize delays or injuries resulting therefrom.

3.13 SUBSURFACE OBSTRUCTIONS

A. In excavating, backfilling, and laying pipe, care must be taken not to remove, disturb, or injury other pipes, conduits, or structures, without the approval of the Engineers. If necessary, the Contractor, at his own expense, shall sling, shore up, and maintain such structure in operation and within a reasonable time shall repair any damage done thereto. Repairs to these facilities shall be made to the satisfaction of the OWNER of the damaged facility.

B. The Contractor shall give sufficient notice to the interested utility of his intention to remove or disturb any other pipe, conduit, etc., and shall abide by their regulations governing such work.

C. In the event that subsurface structures are broken or damaged in the prosecution of the work, the Contractor shall immediately notify the proper authorities, and at the option of said

authority, either repair the damage at once at his own expense, or pay the utility the proper charges for repairing said damage. The Contractor shall be responsible for any damage to persons or property caused by such breaks or due to his own neglect in reporting and/or repairing such damage.

D. Delays, such as would result in buildings being without service overnight or for needlessly long periods during the day, will not be tolerated, and the Owner reserves the right to make repairs at the Contractor's expense without prior notification. Should it become necessary to move the position of a pipe, conduit or structure, it shall be done by the Contractor in strict accordance with instructions given by the Engineers or the utility involved.

E. The Owner or Engineers will not be liable for any claim made by the Contractor based on underground obstructions being different than that indicated in the Contract Documents. Where ordered by the Engineers, the Contractor shall uncover subsurface obstructions in advance of construction so that the method of avoiding same may be determined before pipe laying reaches the obstruction.

F. The Contractor shall be governed by instructions of the Engineers regarding the laying of pipe along State Highways and the latter will determine whether the pipe shall be laid over, under, or along the end of the various drainage structures encountered.

3.14 BACKFILLING

A. Backfilling shall begin as soon as possible after installation of the pipe. A maximum of one day's trenching may remain open overnight.

B. In backfilling all trenches, the excavated material shall be thoroughly compacted around and to a depth of six (6") inches above the pipe for the entire length or the trench. The remaining portion of the trench shall be backfilled and thoroughly compacted for the entire length of the trench and left in a lightly overfilled and crowned condition. The method of compacting trenches shall be approved by the Engineers.

C. Backfilling of all trenches crossings, or in all sidewalks and surfaced areas and shoulders of improved streets shall be filled and power tamped in six (6") inch layers.

A. All excavated material shall be cleared from adjacent street surfaces, gutters, sidewalks, parkways, railroads, grass plots, etc., and the whole shall be left in a tidy and acceptable condition. All surplus material shall be removed by the Contractor.

3.15 CLEAN-UP AND REPAIR OF EXISTING CITY STREETS

A. General: The Contractor shall maintain his operations in a neat and orderly manner causing as little inconvenience as possible. Within 10 working days from the time a trench is opened all roadside ditches, culverts, etc., shall be repaired and surfaces thoroughly cleaned. All excess excavation shall be removed from the trench side and disposed of at the Contractor expense. The work area shall be then thoroughly cleaned.

B. Clean-up and repair shall as approved by the City of Zachary.

3.16 ACCEPTANCE

A. Final acceptance of the project will not be made until the CONTRACTOR has completed the total project and all tests, restoration, and clean-up have been performed to the satisfaction of the CITY OF ZACHARY. All installed (as-built) valves shall be located using GPS coordinate system and data shall be turned over to the City of Zachary prior to final acceptance.

END OF SECTION

PART IV

PAVING

SECTION 401
PAVING AND SURFACING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

This Section of the Specifications details requirements of work and materials to be used in connection with all hauling, rolling, compacting, and other operations pertaining thereto for the construction of various roadways, driveways, sidewalks, curbs, and gutters all in accordance with the items of work shown on the Plans and contained in the Proposal Form.

1.02 REFERENCED STANDARDS

All work in this Section shall be in accordance with "Louisiana Standard Specifications for Roads and Bridges", 2016 edition with revisions. This standard specification will hereinafter be referred to as "LA DOTD Standards". When the term department is used in this specification, it shall mean Engineer.

PART 2 - PRODUCTS

2.01 ASPHALTIC CONCRETE

Asphaltic concrete pavement materials shall conform to the following Subsections of LA DOTD Standards:

Asphalt Materials	1002.01
Asphalt Material Additives	1002.02
Aggregates - General	1003.01
Aggregates for Asphalt Mixtures	1003.06

2.02 PORTLAND CEMENT CONCRETE PAVEMENT

Portland cement concrete and associated paving materials shall conform to the following Subsections of LA DOTD Standards:

Portland Cement Concrete	901
Aggregates for Portland Cement Concrete & Mortar	1003.08
Joint Materials for Pavement and Structures	1005
Reinforcing Steel, Strand and Wire Rope	1009
Concrete Curing Materials, Admixtures & Special Finishes	1011

All Portland cement concrete used for pavement in this Contract shall be pavement type "B" or "D" as defined by Section 901 of LA DOTD Standards.

2.03 PORTLAND CEMENT CONCRETE, CURBS, AND GUTTERS

Portland cement concrete and associated materials for Section 707 - Curbs and Gutters shall conform to the following Subsections of LA DOTD Standards:

Portland Cement Concrete (Class A1, B,D)	901
Aggregates for Portland Cement Concrete & Mortar	1003.08
Joint Materials for Pavement and Structures	1005

Reinforcing Steel, Strand and Wire Rope	1009
Concrete Curing Materials, Admixtures & Special Finishes	1011

2.04 PORTLAND CEMENT CONCRETE, CONCRETE WALKS, DRIVES, AND INCIDENTAL PAVING

Portland cement concrete and associated materials for Section 706 - Concrete Walks, Drives, and Incidental Paving shall conform to the following Subsections:

Portland Cement Concrete (Class M)	901
Aggregates for Portland Cement Concrete & Mortar	1003.08
Concrete Joint Materials	1005
Reinforcing Steel, Strand and Wire Rope	1009
Curing Materials, Admixtures & Special Finishes	1011

2.05 BASE COURSE AGGREGATES

Material for the various types of base courses shall conform to the following Subsections:

Portland Cement and Cementitious Materials	1001
Asphalt Cement, Emulsions and Additives	1002
Stone	1003.05.2
Recycled Portland Cement Concrete	1003.03.2
Sand-Clay- Gravel	1003.05.2
Water	1018.01

2.06 AGGREGATE FOR SURFACE COURSE

Material for the various types of aggregate surface courses shall conform to the following Subsections:

Stone/Recycled Portland Cement Concrete	1003.05.1
Sand-Clay-Gravel	1003.05.2
Reclaimed Asphalt Pavement (RAP)	1003.05.3

Unless otherwise approved in writing, the same type of material shall be used throughout the project.

2.07 LIME TREATMENT

Materials for lime treatment subbase or base shall conform to the following Subsections:

Emulsified Asphalt	1002.02
Water	1018.01
Lime	1018.02

2.08 IN-PLACE CEMENT STABILIZED AND TREATED BASE COURSE

Materials for in-place cement stabilized and treated base course subbase or base shall conform to the following Subsections:

Portland Cement	1001.01
Blended Hydraulic Cement	1001.02
Ground Granulated Blast Furnace Slag Cement	1001.05
Emulsified Asphalt	1002
Water	1018.01
Lime	1018.02

2.09 SIGNS AND PAVEMENT MARKERS

Materials for raised pavement markers (reflectorized) shall conform to LA DOTD Standards Section 1015.09.2. Materials for Thermoplastic Pavement Markings shall conform to LA DOTD Standards Section 1015.10.

2.10 TRAFFIC PAINT

Materials for traffic paint shall conform to LA DOTD Standards Section 1015.12.

PART 3 – EXECUTION

3.01 BASE COURSES

This work consists of furnishing and placing a base course or courses on a prepared surface in accordance with these Specifications, in conformity with the lines, grades, thicknesses and typical cross sections shown on the Plans or established by the Engineer. Unless approved in writing, the same base course material shall be used throughout the project.

Base and subbase courses shall conform to the following Sections of LA DOTD Standards:

Class I Base Course	301
Class II Base Course	302
In-Place Cement Stabilized and Treated Base Course	303
Lime Treatment	304
Subgrade Layer	305

All grade courses (roadbeds), base courses, and subbase covers requiring lime stabilization shall be in accordance with "Type C" treatment as specified in Section 304. The Owner has obtained the services of a qualified soils laboratory to recommend the percentage of lime and cement to be incorporated in each type of course to be furnished by the Contractor.

3.02 ASPHALT PAVEMENTS

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

This work consists of furnishing and constructing one or more courses of asphaltic concrete mixture applied hot to the prepared and approved foundation in conformance with lines, grades, thicknesses, and typical cross sections shown on the Plans or established by the Engineer within tolerances specified. The mixture shall consist of aggregates and asphalt with additives, combined in such proportions to meet the requirements as specified in the Sections below.

Asphaltic concrete wearing, binder, and base course mixtures shall conform to the following Sections of LA DOTD Standards:

Thin Asphalt Concrete Applications	501
Asphalt Concrete Mixtures	502
Asphalt Concrete Equipment and Processes	503
Asphalt Tack Coat	504
Asphalt Prime Coat	505
Asphalt Curing Membrane	506
Asphalt Surface Treatment	507
Milling Asphalt Pavement	509
Asphalt Concrete Pavement Patching, Widening and Joint Repair	510

3.03 PORTLAND CEMENT CONCRETE PAVEMENT

This work consists of constructing portland cement concrete pavement, with or without reinforcement as specified, on a prepared subgrade or base course in accordance with these Specifications in conformity with the lines, grades, thicknesses and typical cross sections shown on the Plans or established by the Engineer.

Portland cement concrete pavement shall conform to Section 901 of LA DOTD Standards.

3.04 PORTLAND CEMENT CONCRETE PAVEMENT REHABILITATION

This work consists of repairing and rehabilitating existing and aged portland cement concrete pavements. This work includes full depth pavement patching, cleaning and resealing or filling of longitudinal and transverse joints, cleaning and resealing cracks and undersealing shown on the Plans, Specifications or as directed by the Engineer.

Portland cement concrete pavement rehabilitation shall conform to Section 602 of LA DOTD Standards.

3.05 AGGREGATE SURFACE COURSES

This work consists of furnishing and constructing aggregate surface courses for roadways, shoulders, drives or other facilities in accordance with these Specifications, and in conformity with the lines, grades, thicknesses and typical Sections shown on the Plans or established by the Engineer.

Aggregate surface courses shall conform to Section 401 of LA DOTD Standards.

3.06 CURBS AND GUTTERS

This work consists of furnishing and constructing curbs and gutters in accordance with these Specifications and in conformity with lines, grades, dimensions and typical sections shown on the Plans and established by the Engineer.

Curbs and gutters shall conform to Section 707 of LA DOTD Standards.

3.07 CONCRETE WALKS, DIRVES AND INCIDENTAL PAVING

This work consists of furnishing and constructing portland cement concrete walks, drives, and incidental paving slabs in accordance with these Specifications and in conformity with lines and grades shown on the Plans or established by the Engineer.

Concrete walks, drives, and incidental paving shall conform to Section 706 of LA DOTD Standards.

3.08 ASPHALT CONCRETE PAVEMENT PATCHING, WIDENING, AND JOINT REPAIR

This work consists of patching, widening, and joint repair of existing pavements in accordance with these Specifications and in conformity with the lines, grades, and typical cross sections shown on the Plans or as established by the Engineer.

Pavement patching, widening, and joint repair shall conform to Section 510 of LA DOTD Standards.

3.09 RAISED PAVEMENT MARKERS (REFLECTORIZED)

This work consists of placing raised pavement markers (reflectorized) to add or replace those covered or removed during the overlaying or construction process.

Raised pavement markers (reflectorized) shall be in accordance with Section 731 of the LA DOTD Standards.

3.10 PLASTIC PAVEMENT MARKINGS

This work consists of placing plastic pavement markings to add or replace those covered or removed during the overlaying or construction process.

Plastic pavement markings shall be in accordance with Section 732 of the LA DOTD Standards.

3.11 TRAFFIC PAINT

This work shall consist of striping areas as indicated on the plans or as directed by the project engineer.

Traffic paint striping shall be in accordance with Section 737 of the LA DOTD Standards.

3.12 SAWING AND SEALING JOINTS

This work consist of locating, marking, sawing and sealing an asphalt joint over an existing concrete joint. Joints are longitudinal and transverse.

This work shall be in accordance with Section 502, 901 and 1005 of the LA DOTD Standards.

END OF SECTION

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SECTION 402
PAVING REPAIR AND RESTORATION

PART 1 - PRODUCTS

1.01 MATERIALS

A. All materials utilized in pavement and base course shall be as specified in the Louisiana Standard Specifications for Road and Bridge Construction, latest edition, except as modified below.

B. Asphaltic Concrete Pavement for Town Streets and Driveways:

Asphaltic concrete used for repair, replacement, and repaving the streets and driveways shall be Type 3 w/AC 30 Asphaltic Concrete as specified by LDOTD.

C. Material used for temporary granular surfaces shall be the same as the base course material specified above with the exception of sand-clay-gravel. Sand-clay-gravel shall not be used as a temporary granular surface.

PART 2 - EXECUTION

2.01 CUTTING PAVEMENT

A. The Contractor shall cut and remove pavement as necessary for installing the new pipelines and appurtenances and for making connections to existing pipelines.

B. Before removing pavement, the pavement shall be marked for cuts nearly paralleling pipe lines and existing street lines. Asphalt pavement, including soil-cement or Portland cement concrete base course, and where allowed on concrete driveways and sidewalks shall be cut along the markings with a rotary saw. Concrete street and roadway pavement shall be removed and replaced from joint to joint.

C. No pavement or base course shall be machine pulled until completely broken and separated along the marked cuts.

D. The pavement adjacent to pipe line trenches shall neither be disturbed nor damaged. If the adjacent pavement is disturbed or damaged, irrespective of cause, the Contractor shall remove the damaged pavement. The damaged area shall be replaced concurrently with the trench paving and the extra pavement replacement shall not be measured for payment.

2.02 TEMPORARY GRANULAR SURFACE

A. To provide for the comfort and safety of the traveling public, it is the Contractor's responsibility to provide and maintain temporary granular surface material, or as specified in the plans, up to the top of the adjacent pavement and maintain it at the elevation until the roadway is closed to traffic during the street restoration work. Minimum allowable thickness of the temporary granular surface material shall be the thickness of the adjacent existing pavement. Maintenance shall consist of regrading the temporary granular surface material and of restoring said surface to proper grade and cross section daily or more frequent as directed by the Engineer together with wetting as required for dust abatement.

2.03 GENERAL RESTORATION

A. The restoration of street paving and extra pavement replacement shall use the same type of construction as existed prior to the beginning of the Work, unless otherwise allowed in writing by the Engineer and approved by the Owner's, Department of Public Works. The Contractor shall be responsible for restoring all such work, including subgrade and base courses where present. The Contractor shall obtain and pay for at his own expense

such local or other governmental permits as may be necessary for the opening of streets and shall satisfy himself as to any requirements other than those herein set forth which may affect the type, quality and manner of carrying on the restoration of surfaces by reason of jurisdiction of such governmental bodies.

B. The Contractor will be required to maintain without additional compensation all permanent replacement of street paving performed by him under this Contract, until accepted by the Owner, including the removal and replacement of such work wherever surface depressions or underlying cavities result from settlement of trench backfill.

C. The Contractor shall perform all final resurfacing and repaving of streets or roads over the excavations required as a part of the work. He shall be responsible for relaying paving surfaces of roadway that have failed or been damaged at any time prior to acceptance by the Owner and within the required one (1) year warranty period on account of the work. He shall resurface or repave over any tunnel, jacking, or boring excavation that shall settle, crack or break the roadway surface to the satisfaction of the Owner. Backfilling of trenches and the preparation of subgrades shall conform to the requirements of the City of Zachary standards.

2.04 TESTING

A. All field testing shall be performed by an independent laboratory employed by the Owner. All materials shall be tested and certified by the producer. Tests repeated because subgrade or base does not meet specified compaction shall be borne by the Contractor and at no additional cost to the Owner. Testing frequency shall be as specified for the material being placed in accordance with the applicable requirements of LADOTD and these specifications.

2.05 ADJUSTING EXISTING STRUCTURES

A. Existing manholes, inlets, valve boxes, etc., within the limits of the proposed work, which do not conform to the finished grade of the proposed pavement or the finished grade designated on the Drawings for such structure shall be cut down or extended and made to conform to the new grade. The materials and construction methods for this work shall be approved by the Engineer.

2.06 MISCELLANEOUS RESTORATION

A. Sidewalks cut or damaged by construction shall be restored in full sections or blocks to a minimum thickness of four inches. Concrete curb and gutter shall be restored to the existing height and cross section in full sections or lengths between joints. Concrete driveways shall be restored to a minimum thickness of six inches. Grassed yards, shoulders and parkways shall be restored to match the existing sections with grass seed or sod of a type matching the existing grass as required in the City of Zachary standards.

2.07 CLEANUP

A. After all repair and restoration or paving has been completed, all excess asphalt, dirt, and other debris shall be removed from the roadways. All existing storm sewers and inlets shall be checked and cleaned of any construction debris.

END OF SECTION

PART V

DRAINAGE SYSTEM

SECTION 501
DRAINAGE CONSTRUCTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section of the specifications details requirements of work and materials to be used in connection with furnishing and installing pipe culverts and cross drains; pipe arch culverts; reinforced concrete "cast-in-place" or "precast" concrete catch basins; and miscellaneous accessories to complete the drainage system in accordance with these Specifications and in conformity with lines and grades shown on the Plans or established by the Engineer; all in accordance with the items of work shown on the Plans and contained in the Proposal Form

1.02 REFERENCED STANDARDS

A. All work in this section shall be in accordance with "Louisiana Standard Specifications for Roads and Bridges", Latest Edition as revised or amended by supplementation. This standard specification will hereinafter be referred to as "LA DOTD Standards". When the term department is used in this specification, it shall mean Engineer.

PART 2 - PRODUCTS

2.01 GENERAL

Excavation shall extend 18" from outside of structure on all sides. Structures shall be set on a 6" compacted thickness of bedding material if foundation soil is stable; if foundation soil is unstable, unstable soil shall be removed as directed and replaced with bedding material, and payment therefor will be made as extra work. Bedding material shall be compacted. At time structure is placed, excavation shall be dry.

Pipes shall be flush with inside walls of structure. Completed new or adjusted structures shall be cleaned of dirt and debris.

2.02 MATERIALS

A. Pipe Conduit

Materials for the various types of pipe conduit shall conform to the following Sections and Subsections of LA DOTD Standards:

Concrete Pipe	1016
Thermoplastic Pipe	1006
Metal Pipe	1007
Rip Rap	711
Geotextile Fabric	1019

B. Concrete

Portland cement concrete for bridges, box culverts, catch basins, headwalls and other drainage related structures shall conform to Section 901 of LA DOTD Standards.

C. Granular Bedding

Granular bedding material shall conform to Subsection 1003.10 of LA DOTD Standards.

2.03 BRICK STRUCTURES

Concrete foundations for brick structures shall be constructed in accordance with Section 601 and shall be placed 24 hours before brickwork is begun. Brick shall be clean, wetted immediately before laying, and laid on a full mortar bed. Joints between courses of bricks shall be a uniform thickness of 3/8". If new work is to be joined to existing or unfinished work, contact surfaces shall be cleaned and moistened.

No water shall be permitted to stand or run on brickwork until mortar has set. Inside and outside surfaces of structure shall be plastered with ½" thick mortar. No brick structures will be placed in roadways.

2.04 PIPE CONNECTIONS

At pipe connections with structure, a ½" diameter bead of hydrophilic elastic sealant shall be placed around pipe at center of structure wall and also along center of wall opening. Space between pipe and wall shall then be grouted up from both sides of wall.

2.05 ADJUSTING STRUCTURES

If grade adjustment of existing structures is required, frames, covers and gratings shall be removed and structure walls reconstructed as specified for new work. Frames, covers and grates shall be cleaned and placed in good repair (or replaced, if specified).

Structures may also be adjusted with metal adjusting rings connected to existing ring by either welding at least 30% of circumference or by using an epoxy system design for metal-to-metal adhesion.

2.06 FRAMES, COVERS AND GRATES

Frames shall be set in a full mortar bed. Non-galvanized parts shall be coated with metalwork paint.

PART 3 - EXECUTION

3.01 GENERAL

All work necessary to furnish, deliver, install, remove, and reinstall, etc., the pipes and structures called for in the Specifications and/or as shown on the Plans shall conform with the applicable Sections and Subsections of LA DOTD Standards including but not necessarily limited to the following:

Culverts and Storm Drains	701
Manholes, Junction Boxes, Catch Basins and End Treatments	702
Removing, Relocating and Demolishing Structures	710
Riprap	711
General Requirements for Structures	801
Structural Excavation, Backfill and Earth Retaining Systems	802
Structural Concrete	805
Deformed Reinforcing Steel	806

3.02 TEMPORARY EROSION CONTROL

This work consists of providing temporary erosion control measures on the project and in areas outside the right-of-way where work is accomplished in conjunction with the project, to prevent pollution of water, detrimental effects to property adjacent to the right-of-way and damage to work on the project. These measures shall consist of construction and

maintenance of temporary erosion control features shown on the Plans or as established by the Engineer.

Installation of temporary erosions control features shall be coordinated with construction of permanent erosion control features to the extent necessary to assure economical, effective and continuous control of erosion and water pollution throughout the life of the contract.

Temporary erosion control shall conform to Section 204 of LA DOTD Standards.

END OF SECTION

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SECTION 502
DRAIN MANHOLES, INLETS AND JUNCTION BOXES

PART 1 - GENERAL

1.01 DESCRIPTION

This work consists of constructing and adjusting storm drain manholes, inlets and junction boxes.

PART 2 - PRODUCTS

2.01 MATERIALS

All work in this Section shall be in accordance with "Louisiana Standard Specifications for Roads and Bridges", latest edition with revisions. This standard specification will hereinafter be referred to as "LA DOTD Standards". When the term department is used in this specification, it shall mean Engineer

PART 3 - CONSTRUCTION

3.01 GENERAL

Excavation shall extend 18" from outside of structure on all sides. Structures shall be set on a 6" compacted thickness of bedding material if foundation soil is stable; if foundation soil is unstable, unstable soil shall be removed as directed and replaced with bedding material, and payment therefor will be made as extra work. Bedding material shall be compacted. At time structure is placed, excavation shall be dry.

Pipes shall be flush with inside walls of structure. Completed new or adjusted structures shall be cleaned of dirt and debris.

3.02 CONCRETE STRUCTURES

Cast-in-place concrete structures shall be constructed in accordance with the City of Zachary Standards.

Joints between precast concrete units shall be sealed with flexible plastic gasket material.

Prior to installing gasket materials, the gasket seat shall be cleaned of dirt and other foreign matter and shall be dry. At temperatures below 60°F, gasket material shall be heated before installation.

3.03 PIPE CONNECTIONS

At pipe connections with structure, a ½" diameter bead of hydrophilic elastic sealant shall be placed around pipe at center of structure wall and also along center of wall opening. Space between pipe and wall shall then be grouted up from both sides of wall.

3.04 ADJUSTING STRUCTURES

If grade adjustment of existing structures is required, frames, covers and gratings shall be removed and structure walls reconstructed as specified for new work. Frames, covers and grates shall be cleaned and placed in good repair (or replaced, if specified).

Structures may also be adjusted with metal adjusting rings connected to existing ring by either welding at least 30% of circumference or by using an epoxy system design for metal-to-metal adhesion.

3.05 FRAMES, COVERS AND GRATES

Frames shall be set in a full mortar bed. Non-galvanized parts shall be coated with metalwork paint.

3.06 BACKFILL

Backfill shall be select excavated material or borrow material; sand will not be permitted. Backfill shall be placed in lifts not more than 12" thick (loose).

1. Paved Areas: Backfill shall be compacted to at least 95% of maximum density determined by AASHTO T 99.

2. Non Paved Areas: Backfill shall be compacted to at least the density of undisturbed surrounding ground.

END OF SECTION

SECTION 503
MANHOLES, CATCH BASINS AND VALVE VAULTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Manholes

B. Catch Basins

C. Valve and Meter Vaults

1.02 REFERENCES

A. ASTM A48 - Gray Iron Castings

B. ASTM C 478 - Precast Reinforced Concrete Manhole Sections.

C. ASTM C 858 - Underground Precast Concrete Utility Structures.

1.03 SUBMITTALS

A. Submit design calculations by a registered professional engineer in the State of Louisiana for each manhole and vault installed showing concrete thickness and reinforcement requirements for the depths each structure is to be constructed.

PART 2 - PRODUCTS

2.01 USABLE SOILS

A. Use select fill meeting AASHTO A-4 specifications for backfilling of manholes, catch basins and valve vaults.

2.02 CATCH BASIN AND MANHOLE MATERIALS

A. Cast-In-Place Concrete: 4000 psi minimum compressive strength @ 28 days (minimum).

B. Reinforcement: Provide to meet the City of Zachary Standards.

C. Precast Manholes: ASTM C76, Wall C.

D. Precast Valve and Meter Vaults: ASTM C858 - Precast Concrete Utility Structures.

E. Frames, Grates and Covers: ASTM A48.

F. Joints: Flexible plastic gaskets; Ram-Nek, Kent-Seal, or equal.

2.03 FABRICATION

A. Cast into precast manholes, catch basins and vault structures, the number and size of pipe openings as indicated for incorporation of the unit into the drainage system.

PART 3 - EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Protect above and below grade utilities which are to remain.

3.02 EXCAVATION

A. Perform excavation operations in accordance with Section 02200.

B. Excavate subsoil to the depths indicated on the Drawings and to a width sufficient for proper joining of pipe sections and thorough compaction of backfill material under and around pipe. Undercut, as directed, soft areas of subgrade not capable of insitu compaction or not capable of properly supporting the pipe.

C. Excavate subsoil as required to properly construct manholes and catch basins.

D. Dispose of material not satisfactory for backfill.

3.03 INSTALLATION – MANHOLES, CATCH BASINS AND VALVE VAULTS

A. When precast manholes, catch basins and vaults are selected, provide a minimum of six inches of bedding material beneath manhole and catch basin foundation slabs; bedding material to be approved by the Engineer; level and compact to proper grade.

B. When selected, construct cast-in-place concrete manholes, catch basins and vaults in accordance with the provisions of Section 03300 for form work and the placing, furnishing and curing of cast-in-place concrete.

C. Erect manholes, catch basins and vaults to the proper alignment and elevation.

D. Set metal frames in full mortar bed.

E. Cut pipe flush to inside face of structure.

3.04 BACKFILLING MANHOLES, CATCH BASINS AND VAULTS

A. Verify that structures have cured sufficiently.

B. Backfill with usable soil.

C. Place backfill at or near optimum moisture content in layers not exceeding six inches compacted thickness.

D. Compact each layer by approved mechanical compaction equipment, to at least 95 percent of maximum density prior to placing a subsequent layer.

E. Maximum density will be determined in accordance with ASTM D-1557 (modified proctor) maximum density at or above optimum moisture content.

3.05 CLEANUP

A. Clean structures of silt and debris.

B. Coat metal parts not galvanized with asphaltic varnish.

3.06 FIELD QUALITY CONTROL

A. Where compaction tests indicate work does not meet specified requirements, remove work and replace.

END OF SECTION

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PART VI

DRAINAGE IMPACT ANALYSIS

SECTION 601
DRAINAGE DESIGN CRITERIA AND STORMWATER MANAGEMENT

PART 1 - GENERAL

1.01 REQUIREMENTS

A. The design of storm water drainage systems shall insure adequate control of storm water runoff through the use of properly sized and positioned drainage structures including, but not limited to, curb and gutter, curb and grate inlets, raised grates, storm sewer pipe, box culverts, cross drains, open ditches, detention and retention areas and bridges. The design of storm drainage systems shall be in accordance with this section.

B. The design of any storm water drainage system shall be compatible with overall drainage plans developed for and approved by the City of Zachary, where applicable. Unless the proposed development is in an area where the receiving drainage system was designed to accommodate the stormwater from the proposed development (burden of proof on the developer or his representative), the post-development discharge rates shall not exceed the pre-development discharge rates from the site. Drainage facilities shall be designed to prevent excessive runoff onto adjacent properties. Excessive runoff includes quantity (cfs) and quality (erosion, siltation contaminants).

C. For all development and redevelopment activities, including single-family residential, the following minimum requirements shall apply:

1. Lots and buildings shall be developed in a manner to ensure that stormwater exiting individual parcels or lots under post-developed conditions approximates the same discharge points as the pre-developed condition, does not adversely impact the adjacent parcels or lots as a result of concentrated flows, flooding, erosion, or deposits of silt or sediment (due to construction);

2. The stormwater discharge from a roof drain, or any water collection device shall be located a distance of no less than ten feet from common property line and oriented, so the direction of concentrated flow shall not be toward the adjacent property line;

3. For properties located within areas having set back limits less than ten feet or zero lot lines, the direction of concentrated flow is not toward the adjacent property,

4. No person shall erect, construct, or otherwise permit any obstruction that prevents the natural or contained flow of water to any component of a stormwater system unless such obstruction is allowed as part of a permit approved under this section.

D. *Low impact design required*. All projects shall minimize impervious surface and alteration of natural vegetation and topography and shall meet the following requirements:

1. Clearing and re-grading on a development site shall be minimized.

2. Clearing shall be done in phases to minimize the amount of bare ground at any one time.

E. All developments must have applicable DEQ or U. S. Army Corps of Engineers (COE) permits prior to construction plan approval.

F. Pipe and culvert sizes shall be selected by use of computed hydrological and hydraulic data. Design flows shall be based on climatic factors such as rainfall intensity, duration, frequency and distribution and physiographic factors such as size, shape, and slope of drainage area, anticipated land use or cover, surface infiltration condition, soil type and topographical condition. Pipe selection shall be based on its hydraulic capacity considering size, slope, and roughness characteristics as well as its tendency to become choked and the ability to clean and remove obstructions from the pipe.

G. The design of storm water drainage systems shall insure adequate control of storm water runoff through the use of properly sized and positioned drainage components including but not limited to curb and gutter, curb and grate inlets, raised grates, storm water sewer pipe, box culverts, open ditches, and ponds for detention/retention.

H. Drainage facilities and systems shall be designed to meet all City requirements and prevent excessive runoff onto adjacent properties.

I. The minimum storm drainage pipe size shall be 15 inches.

J. Internal street drainage systems shall not be surcharged (because of being tied below the static water surface of a detention pond or receiving stream) or hold water except during rainfall events.

K. Internal street drainage design shall have the 25-year Hydraulic Grade Line (HGL) one (1) foot below the proposed gutter line, and the HGL shall be included in the Plan-Profile sheets of the Construction Plans.

L. Internal storm drainage flow velocities shall be greater than two (2) feet per second (FPS) and shall not exceed ten (10) fps. Stamped and sealed drainage calculations for the internal drainage system proposed shall be provided with the Construction Plan submittal. Hydraulic losses at bends and junctions must comport with industry standard and be shown in the calculations.

M. Cross drains shall be provided to accommodate all-incoming flow and shall be of sufficient length to permit construction of a full width roadway section including side slopes. Headwalls or flared end sections, aprons, channel bottom and slope protection shall be provided at the upstream and discharge end of the cross drain.

N. No individual, partnership or corporation shall deepen, widen, fill, reroute or change the location of any existing ditch, stream, or drainage canal without first submitting plans and obtaining written permission from the City of Zachary.

1.02 Streets, Curb and Gutter, and Inlets

A. Street grades shall be coordinated with lot drainage as proposed in the development grading plan, and shall be no lower than 18-inches below the 100-year base flood elevation or 1.0 feet above the 50-year flood elevations, whichever is greater. Projects in the floodplain are to be analyzed for potential adverse upstream impacts when the proposed project will result in roadway elevation that is higher than existing ground elevation.

B. A stamped and sealed Gutter Analysis determining inlet spacing shall be provided with Construction Plan submittal. Each street inlet shall be designed to have a goal of an 80% capture efficiency at the "inlet design storm" – twenty-five (25) year return period for a 15-minute duration

(*approximately 1.75-inches*). The hydraulic capacity of the curb and gutter shall be determined by generally accepted engineering principles taking into consideration roughness, street cross-slope, and street gradient. Inlet spacing shall be a maximum of 300'.

C. Drainage areas contributing to each inlet shall be delineated in the Construction Plans and reflected in the drainage system calculations.

D. The hydraulic capacity of curb inlets shall be determined by generally accepted engineering procedure taking into consideration inlet geometry and characteristics of the gutter flow. Curb inlets shall be spaced so as to limit the spread of water to not more than one quarter of the lane width during the inlet design storm. Inlets shall also be placed at all low points in the gutter grade, at intersections outside the radius where necessary to prevent gutter flow from crossing traffic lanes of an intersecting street, or at points of special concern as designated by the City. Inlets shall be provided so that surface water shall not be carried across or around any intersection nor for more than 300 feet in the gutter. When calculations indicate that curb capacities are exceeded at a point, no further allowances shall be made for flow beyond that point, and basins shall be used to intercept flow at that point. Surface water drainage patterns shall be shown for each lot and block.

E. Multiple inlets shall be provided at low points (sags) in the streets. The number of multiple inlets shall be a byproduct of the design engineer's analysis to comply with the criteria in this section.

F. For proposed developments, runoff from proposed developments and over the curb drainage areas shall be limited to approximately 100 feet behind the curb and have a maximum contributing area of 1/3-acre. Proposed site grading plans shall reflect this unless all internal site drainage is captured onsite.

1.03 Bridges and Box Culverts

A. The structural design of all box culverts or bridges shall conform to the standard plans of the Louisiana Department of Transportation and Development (LADOTD).

B. Bridges, where required, shall be constructed of reinforced concrete and in accordance with LADOTD criteria.

C. All bridges shall be provided with sidewalks on both sides.

1.04 Design Criteria for Hydrology and Discharge Analysis

A. General

1. For City of Zachary the LADOTD 2011 Hydraulics Manual (or latest edition) will be used for:

   i. NRCS (SCS) Rainfall Depth,
   ii. NRCS (SCS) Hydraulic Classification of Soils,
   iii. Runoff Curve Number (CN),
   iv. Rational Method Runoff Coefficients.
   v. Design Rainfall Events for specific return periods.

2. Peak flow calculations for the City of Zachary shall follow:

   i. Drainage Areas 1-acre or less shall use a peak flow of 3.0 cfs per acre.

ii. Areas from 1 to 200 acres, the Rational Method as defined in the LADOTD 2011.

a. Times of Concentration
1. Minimum Times of Concentration for Unimproved, Rural, and Low-Density Residential areas shall be 30 minutes,
2. Minimum Times of Concentration for Business/Commercial areas shall be 20-minutes,

iii. Areas greater than 300 acres but less than 2,000 acres, use the NRCS (SCS) method,
a. Use the TR55 method to calculate the time of concentration (overland flow, shallow flow, and channel or pipe flow).

iv. Areas greater than 2,000 acres, use HEC-HMS or USGS procedures.

1.05 Detention/Retention Pond Design

A. Design Water Surface shall be for the 100-year rainfall event.

B. If an external pond is proposed, emergency outfall spillway shall be required to accommodate events more than the 100-year rainfall event.

C. If internal ponds (surrounded by residential lots or commercial development on all sides) are proposed, there shall be a designated overflow area, 25-feet in width, to accommodate the emergency outfall spillway in the event the primary outfall is blocked or inundated.

D. Ponds shall not utilize internal street drainage systems to convey flow unless the primary outfall is inundated and/or blocked.

E. Tailwater consideration in pond outfall design (if a pipe system) shall be justified if utilized, not just assigned

F. In no case shall shoreline, pond/lake bank, side slopes be steeper than 3:1 unless adequate slope protection is provided and approved.

G. Detention basin bottoms shall have a minimum width of two feet per one foot of depth.

H. Dry detention basins shall have a minimum slope of one percent to the outlet structure.

I. Maximum depth of stormwater stored shall not exceed eight (8) feet. A minimum of one foot of freeboard shall be provided, measured from the top of the peak water surface elevation for the 100-year event to the lowest point on the top of the pond bank (or levee), excluding the emergency spillway invert.

All dams and/or levees shall be designed and constructed according to accepted engineering standards and have applicable approvals from the USACE, if required.

1.06 Drainage Impact Analysis

Adequate provisions shall be made for the management of stormwater resulting from developments.

A. The developer shall prepare and submit to the City a Drainage Impact Analysis (DIA) that recommends specific on-site drainage improvements to provide adequate capacity for a 100-year storm (a storm with a one (1%) percent chance of occurring in any given year) event. Construction plans for any proposed development shall be consistent with the recommendations presented in the DIA. All drainage improvements shall be planned in accordance with the criteria for drainage as specified by the City of Zachary. DIA shall be submitted and reviewed prior to submittal of any Construction Plans for review.

B. Exemptions

The following development activities shall be exempted from the requirements of preparing a DIA:

i. Proposed development on an undeveloped site (having been subdivided prior to the date of this section's adoption) or parcel in which the aggregate area of impervious surface does not exceed 20 percent of the site area. The total impervious area shall include all proposed buildings, driveways, sidewalks, streets, parking areas, lakes, ponds, and similar facilities that are considered "impervious".

ii. Additions or modifications to existing developments which result in no more than a ten percent increase in existing impervious area and which have existing engineered, or subsurface (not natural) public storm drainage facilities designed to accommodate runoff from the existing site.

C. Development Location and Description:

The DIA shall comply with the following minimum requirements:

i. Location:
Describe the location of the subject property Township and Range, identifying adjacent developments, major drainage outfalls, streets, highways, lot and block page number, and provide a vicinity map.

ii. Description
Describe the predominant existing land use and future land use in the project watershed (Comprehensive Land Use Data, aerial photos, etc.). Describe the proposed development, soil types, vegetative cover, and watershed slopes. Provide an estimate of percent of impervious area for pre- and post-development conditions. Provide photos of existing channels, ditches, natural drains, and drainage structures.

D. Watershed Map
Delineate drainage boundaries, indicate the acreage, and show the slope of basins, and the peak 100-year runoff rates at entry and exit points of the development. The watershed map should indicate the location of existing channels, ditches, natural drains, proposed major drainage structures, channel realignments, and cross section location.

E. Hydrologic Design

i. The DIA shall indicate existing conditions for peak 100-year flow rates at the development entry and exit points.

ii. The DIA shall indicate future conditions for peak 100-year flow rates at the development entry and exit points.

iii. If ponds or sub-surface detention systems are used in design for routing of flows, the peak 100-year storm event shall be used in design for the capacity and site runoff.

iv. Developments shall not create a new point-source discharge or a new non-point source discharge onto adjacent properties of lower ground elevations without appropriate drainage servitudes and hydraulic energy dissipation measures. Unless otherwise approved by the City of Zachary, storm-water overflow from detention ponds shall maintain a sheet flow condition to the receiving stream or outfall.

F. Hydraulic Capacities

i. On-site capacity

a. Indicate the capacity of any existing drainage outfall facility (ditch, canal, culvert, bridge, or similar) within the proposed development site and the required type, size, and capacity of any proposed outfall facilities.

ii. Off-site capacity

a. Determine the capacity of existing downstream outfall facilities (ditches, canals, culverts, bridges, or similar) that will be utilized to convey flow from the downstream limits of the proposed development to the first public outfall as identified. An inventory of downstream structures including the size, type, invert elevation, and cover topping elevation should be made. Channel cross sections at the upstream and downstream limits of the proposed development at structure locations and at intermediate canal locations shall be required to adequately define existing channel capacities.

b. Adjacent areas (dominant estate) that drain through the proposed site (servient estate) must be accounted for in its developed condition. Servitudes through the proposed site may be required to account for the adjacent properties in a reasonably developed condition if they are contributing as an undeveloped drainage area.

G. Special Site Conditions

3. Special conditions that may exist at the proposed development site should be clearly identified including but not limited to such items as:

- Special Flood Hazard Areas (Firm Zones A and AE)
- Regulatory Floodways
- Fill placement locations and mitigation requirements
- Potential wetland sites
- Landfills and hazardous waste sites
- Parks

H. Conclusions and Recommendations

4. The DIA should clearly identify the results and conclusions of the study and provide recommendations of any required action(s) so that surrounding properties experience no adverse impact.

1.07 Floodplain Management Observance

A. In effort to promote the public health, safety, and general welfare and to minimize public and private losses to flood conditions, all proposed development shall comply with Chapter 46 (FLOOD DAMAGE PREVENTION) of the City of Zachary Code of Ordinances, https://library.municode.com/la/zachary/codes/code_of_ordinances?nodeId=PTIICOOR_CH46FLDAPR . All proposed developments shall be reviewed by the City of Zachary to reasonably assure that:

   i. All such proposals are consistent with the need to minimize flood damage;

   ii. All public utilities and facilities such as sewer, gas, electrical, and water systems are located, elevated, and constructed to minimize or eliminate flood damage,

   iii. Adequate drainage is provided to reduce exposure to flood hazards; and,

   iv. All necessary permits required by federal, or State laws have been obtained, including those required by Section 404 of the Federal Water Pollution Control Act (33 USC 1334).

B. Fill Within the Floodplain

   i. If development, including any intended modification of the natural topography of a site, proposes to place fill within a floodplain associated with an indexed stream of East Baton Rouge Parish (or a stream recognized by the FEMA Flood Maps), a study shall be performed utilizing HEC-RAS (or an industry accepted hydraulic modeling equivalent) to show no adverse impact shall occur upstream. "Adverse Impact" is defined as a modification to the existing hydraulic section of the stream resulting in an increase in the hydraulic grade line upstream of the site.

C. Maintenance Covenants

   i. A legally binding Maintenance Agreement specifying the parties' responsible Enforceable operations and maintenance agreements included as part of the covenant are required to ensure the system will function as designed during and after construction. The Maintenance Agreement will include any and all maintenance easements required to access and inspect the stormwater systems, and to perform routine maintenance as necessary to ensure proper functioning of the stormwater treatment practices. The parties responsible for the documented SWPPP BMPs shall make records of the installation, maintenance and repairs of the facility and shall retain these records for at least 5 years. These records shall be made available to the City of Zachary during inspection of the facility and at other reasonable times upon request.

END OF SECTION

PART VII

RESERVED

PART VIII

SANITARY SEWER WORK

SECTION 801
SEWER MANHOLES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all materials, labor, and equipment and construct manholes consisting of precast sections.

B. The manholes shall have an invert channel shaped to correspond with the lower half of the pipe. The top of the shelf created by the invert channel grouting shall be sloped to drain toward the channel. Every effort shall be made by the Contractor to construct watertight structures.

C. Openings for gravity sewer and force main penetrations of the manhole walls shall be fitted with preformed elastomeric gaskets or boot type seals to provide for flexible, watertight pipe to manhole connections.

D. The forms, dimensions, concrete, and construction methods shall be approved by the Engineer in advance of construction.

E. Precast concrete manholes shall be used for all manhole structures. No substitution of either brick and mortar or other manhole materials will be allowed.

1.02 REFERENCE STANDARDS

A. ASTM A48 – Gray Iron Castings

B. ASTM C478 – Precast Reinforced Concrete Manhole Section

C. ASTM C443

D. ASTM C150 Type II

E. ASTM C858 – Underground Precast Concrete Utility Structures

F. Federal Specification SS-S-210-A

1.03 QUALITY ASSURANCE

A. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the City of Zachary. Such inspection may be made at the place of manufacture, or at the site after delivery, or at both places, and the sections shall be subject to rejection at any time on account of failure to meet any of the Specification requirements; even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. All sections which have been damaged after delivery will be rejected, and if already installed, shall be acceptably repaired, if permitted, or removed and replaced, entirely at the cost of the developer.

B. The sections shall comply with the ASTM designation specified below and these Specifications, and with the approved manufacturer's drawings. All sections shall be acceptable in general appearance, dimension, "scratch-strength," blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.

C. All manholes rejected by the City of Zachary shall be removed and replaced at the cost of the developer.

PART 2 - PRODUCTS

2.01 PRECAST CONCRETE SECTIONS

Precast concrete manhole base, riser, and eccentric and flat slab top sections shall conform to the Specifications for Precast Reinforced Concrete Manhole Sections, ASTM Designation C478, except as otherwise specified below. The method of construction shall conform to the Drawings and the following additional requirements.

A. The minimum wall thickness for the various manhole sections shall be as listed below.

Inside Diameter of Barrel	Minimum Wall Thickness
48-in.	5-in.
60-in.	5-in.
72-in.	6-in.
96-in.	8-in.
120-in.	10-in.

B. Manhole sections shall have tongue and groove joints. Joints shall have round rubber gaskets set in specially provided indentations. The round rubber "O"-ring gasket shall conform to ASTM C443 standard Specifications.

C. The manhole manufacturer's standard mortar joint may be used in lieu of the "O"-ring gasketed joint, provided a butyl rubber sealant meeting the performance requirements of Federal Specifications SS-S-210-A is installed to seal the joint. The joint area shall be primed with an adhesive primer formulated for use with the butyl rubber base sealant. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

D. ASTM C150 Type II cement shall be used except as otherwise approved.

E. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section.

F. Sections shall be cured by an approved method and shall not be shipped until at least five (5) days after having been fabricated.

G. Top sections shall be eccentric cone sections except that flat slab tops shall be used where cover over the top of the pipe is less than four feet (4').

H. Precast flat slab top sections, shall be capable of supporting the overburden plus a live load equivalent to AASHTO H-20 loading.

I. The tops of bases shall be suitably shaped to mate with the precast riser section.

J. Openings through the manhole wall shall be either precast, cored, or drilled. Gravity sewer and force main connections to the manhole shall be sealed with either elastomeric cast-in-place gaskets or elastomeric manhole boots. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary. Where metallic bands are required for sealing, elastomeric boots to the pipe, the entire band assembly shall be fabricated of stainless steel.

2.02 MANHOLE RING AND COVER CASTINGS

A. All castings shall be cast with the manufacturers name and part number. As part of the shop drawing submittal the manufacturer shall furnish load rating certificates for all castings to be installed in areas subject to heavy traffic.

B. Cast iron material shall conform to ASTM A48-83 Class 30 or Class 35 as required. The foundry will furnish a certified tensile test report for castings produced. The tensile test certificate shall confirm a minimum of 30,000 or 35,000 PSI tensile strength, and lists the quantities and part numbers certified by that test. All castings certified under the test shall be identified by the corresponding date or heat number cast on the product.

Ductile iron material shall conform to ASTM A536-80 grade 65-45-12. A certified chemical analysis, by an independent testing laboratory, shall be furnished upon request.

C. All castings shall be furnished free from blowholes, shrinkages, or other surface imperfections.

D. All castings shall be manufactured true to manufacturer's submittal drawing. All round manhole rings and covers or grates shall be furnished with machined horizontal bearing surfaces unless otherwise stated. All other castings will be furnished with ground seating surfaces. Prior to shipping, manufacturer will fit all components and guarantee that all castings furnished are of proper fit, and all castings have machined bearing surfaces are free from rattle.

E. Actual dimensions of all castings shall have a tolerance of ± 1/16 inch, and an additional tolerance of ± 1/16 inch per foot of dimension. All frames, covers, and grates of the same part number shall be interchangeable.

F. Casting weights are approximate and shall be within ± 5% of catalog weight. Manufacturer shall furnish a minimum weight certificate of compliance as required by local standards.

G. Covers shall have letters "sewer" embossed on top.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Manholes and other precast structures shall be constructed to the dimensions as shown on the plans.

B. Precast concrete structure sections shall be set so as to be vertical and with sections in true alignment with a 1/4-inch maximum tolerance to be allowed. The outside and inside joint shall be filled with a comparatively dry mortar (one part cement to two parts sand) and finished flush with the adjoining surfaces. Backfilling shall be done in a careful manner, bringing the fill up evenly on all sides. If leaks appear in the structures, the inside joints shall be caulked with lead wool to the satisfaction of the City of Zachary. The Contractor shall install the precast section in a manner that will result in a watertight joint.

C. The Contractor shall take care during handling and setting operations so that the precast sections are not damaged. If manhole boots which extend beyond the outer face of the precast sections are used, the boot shall be inverted back into the precast section until just prior to inserting the pipe through the boot to help protect the boot from damage.

D. The pipe shall be installed through the elastomeric gaskets or boots and sealed in accordance with the gasket/boot manufacturer's directions.

E. Holes precast in the manhole sections required for handling or other purposes shall be plugged with a

non-shrinking grout or by grout in combination with concrete plugs.

F. More holes must be cut in the precast sections to accommodate pipes, cutting shall be done by drilling or coring prior to setting them in place to prevent any subsequent jarring which may loosen the mortar joints.

END OF SECTION

SECTION 802
SANITARY SEWERAGE SYSTEMS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The work shall consist of furnishing all labor, materials, equipment, and incidentals required to install new gravity sanitary sewer lines and fittings and remove and dispose of existing gravity sewer pipe if required, perform point repairs, remove and replace repairs.

B. Contractor shall provide sewer pipes with the inside diameter shown on the plans. Diameters shown on the plans represent the required inside diameters, regardless of pipe material.

1.02 INSPECTION AND TESTS

A. All pipe and accessories to be installed under this Contract shall be inspected and tested at the place of manufacture by the manufacturer as required by the Standard Specifications to which the material is manufactured.

B. Each length of pipe shall be subject to inspection and approval at the factory, point of delivery, and site of work. Sample of pipe to be tested shall be selected at random by the Engineer or the testing laboratory and shall be delivered by the Contractor to the testing laboratory approved by the Engineer.

C. When the specimens tested conform to applicable standards, all pipe represented by such specimens shall be considered acceptable based on the test parameters measured. Copies of test reports shall be submitted to the Engineer before the pipe is installed in the project. Acceptable pipe will be stamped with an appropriate monogram under the supervision of the testing laboratory.

D. In the event that any of the test specimens fail to meet the applicable standards, all pipe represented by such tests shall be subject to rejection. The Contractor may furnish two additional test specimens from the same shipment or delivery for each specimen that failed and the pipe will be considered acceptable if all of these additional specimens meet the requirements of the applicable standards.

E. Pipe which has been rejected by the City of Zachary shall be removed from the site of the work by the Contractor and replaced with pipe which meets these specifications.

PART 2 - MATERIALS

2.01 GENERAL

A. Each length of pipe shall bear the name or trademark of the manufacturer, the location of the manufacturing plant, and the class or strength classification of the pipe. The markings shall be plainly visible on the pipe barrel.

B. Polyvinyl chlorinate pipe for sewer systems shall be green in color.

2.02 POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE

A. Smooth wall pipe and fittings in sizes 4" through 15" shall be manufactured in accordance with the requirements of ASTM D3034 SDR 35 and 18" and larger shall be manufactured in accordance

with ASTM F679, T-l wall Type 1, SDR 35. P.V.C. pipe shall be manufactured from PVC compound having a minimum cell classification of 12454C as described in ASTM D1784. The pipe shall be joined with an integral bell, bell and spigot, type rubber gasket joint. Each integral bell joint shall be of the push-on type meeting the requirements of ASTM D3212 and shall consist of a formed bell complete with a single rubber gasket. The rubber gasket shall conform to the requirements of ASTM F477 and shall be held in place in the bell by mechanical means.

2.03 PVC PIPE JOINTS

A. The P.V.C. joints shall be of the push-on type so that the pipe and fittings may be connected on the job without the use of solvent cement or any special equipment. The joint seal shall be effected by a single rubber joint gasket designed to be assembled by the positioning of the continuous, molded rubber ring gasket in an annular recess and the forcing of the spigot end of the joining pipe into the socket, shall compress the gasket radially. The gasket and annular recess shall be designed and shaped so that the gasket is locked in place against displacement by mechanical means. Systems in which the gasket is held in place only by means of an adhesive agent shall not be considered equal to the mechanical anchorage and shall not be allowed. The rubber ring joint shall be designed for thermal expansion or contraction with a total temperature change of at least 75^{o} F and shall meet the requirements of ASTM D3212. Lubricant furnished for lubricating joints shall be nontoxic, shall not support the growth of bacteria, and shall have no deteriorating effects on the gasket or pipe material.

B. The jointing of the pipes shall be done in strict accordance with the manufacturer's instructions and shall be done entirely in the trench.

C. Expend extreme care to keep the bells of the pipe free from dirt and rocks so joints may be properly assembled without overstressing the bells.

D. Provide lubricant, place and drive home newly laid sections. Use of backhoes or similar powered equipment will not be allowed unless protective measures are provided.

E. Install pipe to "full insertion mark" where provided.

2.04 PIPE BEDDING AND PIPE COVER MATERIALS

A. Pipe bedding material and trench backfill material shall be as specified in Section 901 and City of Zachary standard detail sheet 5.

PART 3 - EXECUTION

3.01 PIPE PREPARATION AND HANDLING

A. Inspect all pipe and fittings prior to lowering into trench to insure no cracked, broken, or otherwise defective materials are being used. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.

B. Use proper implements, tools, and facilities for the safe and proper protection of the work. Lower pipe into the trench in such a manner as to avoid any physical damage to the pipe. Remove all damaged pipe from the jobsite. Do not drop or dump pipe into trenches under any circumstances.

3.02 LINE AND GRADE

A. Do not deviate from line and grade, as shown on the plans and as laid out by a licensed professional land surveyor.

B. The Contractor may use the laser beam method of maintaining line and grade. The Contractor shall have documentation showing that a qualified operator will handle the equipment during the course of construction. A "Caution-Laser Light" placard shall be mounted in a conspicuous place. When "in the pipe" method is used, grade boards will be required to install the first 50 feet of pipe, and the Contractor shall check the line and grade at any additional points at which offset stakes have been placed. If bending of the beam due to air temperature variations becomes apparent with "in the pipe" units, a fan shall be provided to circulate the air. However, air velocity shall not be so excessive as to cause pulsating or vibrating of the beam. If the beam cannot be accurately controlled, this method of setting line and grade shall be discontinued. When the above ground method is used, the set-up shall be checked with three grade boards including one set at the upstream manhole. If the laser has a gradient indicator, two boards may be used to check the set-up. The grade board at the upstream manhole shall be retained to be used as a check as pipe laying progresses.

3.03 PREPARATION OF TRENCH

A. Provide pipe bedding in accordance with Section 901 and City of Zachary standard detail sheet 5.

B. Excavate bell holes at each joint to permit proper assembly and inspection of the entire joint.

3.04 DEWATERING

A. Prevent water from entering the trench during excavation and pipe laying operations to the extent required to properly grade the bottom of the trench and allow for proper compaction of the backfill. Pipe shall be laid in the dry.

3.05 LAYING AND JOINTING CONCRETE PIPE AND FITTINGS

A. Pipe laying shall proceed upgrade with spigot ends pointing in direction of flow. After a section of pipe has been lowered into the prepared trench, clean the end of the pipe to be joined, the inside of the joint, and, if applicable, the rubber ring immediately before joining the pipe. Make assembly of the joint in accordance with the recommendations of the manufacturer of the type of joint used. Provide all special tools and appliances required for the joint assembly.

B. All pipe shall be laid uniformly to line and grade so that the finished sewer will present a uniform bore. Variations from line and grade in excess of the tolerances specified under the City of Zachary standard detail sheet 5 will be considered sufficient cause for rejection of the work and shall be removed and relaid at the Developer’s expense for the duration of the warranty period.

C. Check pipe for alignment and grade after the joint has been made. The pipe bedding shall form a continuous and uniform bearing and support for the pipe barrel between joints. Apply sufficient pressure in making the joint to assure that the joint is “home” as defined in the standard installation instructions provided by the pipe manufacturer. Place sufficient pipe cover material to secure the pipe from movement before the next joint is installed to assure proper pipe alignment and joint makeup.

D. Pipe 21-inches and smaller intended to be in straight alignment shall be laid so the inside joint space does not exceed 3/8 inch in width. If interior joints on 24 inch and larger pipe laid either in straight alignment or on a curve are greater than 3/8 inch, thoroughly clean the joint surfaces, and fill and seal the entire joint with premixed mortar conforming to ASTM C-387 only after the trench has been backfilled, unless otherwise approved by the Engineer. Trowel smooth on the inside surface. Water shall not be allowed to rise in or around, or pass over any joint before it has substantially set.

E. When pipe is laid within a movable trench box, take all necessary precautions to prevent pipe joints from pulling apart when moving the box ahead.

F. Prevent excavated or other foreign material from getting into the pipe during the laying operation. Close and block the open end of the last laid section of pipe to prevent entry of foreign material or creep of the gasketed joints when laying operations are not in progress, at the close of the day's work, or whenever the workers are absent from the job.

G. Plug or close off pipes which are stubbed off for manhole construction or for connection by others with temporary plugs.

H. Take all necessary precautions to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation.

I. When field cutting and/or machining the pipe is necessary, use only tools and methods recommended by the pipe manufacturer.

J. New pipe-existing pipe connections: Connections between existing and new pipe shall be jointed with non-shear repair couplings conforming to ASTM C425 and ASTM C1173. The stainless steel shear rings and clamping bands used in conjunction with the molded rubber sleeve shall conform to ASTM A 240 Series. When using the non-shear repair coupling, the gap between the two pipes shall be no more than ¼".

K. Pipe-Manhole Connections: All sewer pipe shall be connected to new manholes with either flexible rubber boot connectors or integrally cast flexible connectors installed in accordance with the manufacturer's instructions. Then the opening on the inside and outside of the manhole shall be grouted (no-shrink) if necessary, to achieve a watertight seal. For existing manhole connections, pipe shall be connected with a hydraulic cement material having a set time of no more than two (2) minutes; compressive strength of 600 psi at one (1) hour, 1,000 psi at twenty-four (24) hours; bond of 40 psi at one (1) hour, 80 psi at twenty-four (24) hours. These requirements apply whether it is a connection to an existing sanitary sewer manhole or connections through a storm water conflict manhole, junction box, or inlet.

3.06 LAYING PLASTIC PIPE

A. Plastic (PVC) piping shall be installed in accordance with the details shown on the Drawings and applicable requirements of ASTM D-2321, "Standard Practice for Underground Installation of Flexible Thermoplastic Pipe" and the manufacturer's recommendations. Pipe Bedding as specified in Section 901 and the City of Zachary standard detail sheet 5.

B. The Contractor shall use care in handling, storage, and installation of pipe. Storage of pipe on the job site shall be done in accordance with the pipe manufacturer's recommendation. Under no circumstances shall pipe be dropped into the trench.

3.07 TESTS FOR GRAVITY SEWERS - GENERAL

A. Gravity sewers shall be required to pass a leakage test and meet the requirements of Section 802A "New Sewer Pipe CCTV Inspection" before acceptance by the City of Zachary. All manholes shall also be individually tested as described herein. Leakage tests may be by the infiltration test or exfiltration test, depending on the level of the groundwater table or by the low-pressure air test all as described below. All testing shall be conducted in the presence of the Engineer or his designated representative.

B. Water infiltration or exfiltration or air loss rates will be measured with equipment supplied by the

Contractor and shall be observed by the City. The tests shall be performed by the Contractor under the observation of the City.

C. The groundwater height for all test methods above the installed pipe shall be determined by attaching a transparent plastic tube to a pipe nipple in the manhole and using the plastic tube as a manometer.

D. The ends of branches, laterals, tees, wyes, and stubs to be included in a test section shall be plugged to prevent water or air leakage. All plugs shall be secured to prevent blowout due to internal pressure. A test section is defined as the length of sewer between manholes.

E. The Contractor shall repair all visible leaks in manholes and pipe, even though the leakage test and CCTV Inspection requirements are met.

3.08 LEAKAGE TEST – INFILTRATION METHOD

A. The water infiltration test shall not be considered a valid leakage test unless the top surface of the groundwater level is at least seven feet (7') above the pipe crown during the test measurement. The rate of infiltration of water into the sewers, including manholes and appurtenances, shall not exceed 125 gallons per day per inch diameter per mile of sewer. In the event groundwater does not submerge the pipe as specified, the Contractor shall conduct an exfiltration test described hereinafter.

B. A visual inspection and an infiltration test will be conducted on all completed sewers 30 inches in diameter or larger when they are submerged by groundwater as specified above. The Contractor shall provide facilities to stop inflow from adjacent sections of sewer and to provide pondage to permit measurement of infiltration. Visible leaks, defective joints, and defective pipe shall be satisfactorily repaired or replaced.

3.09 LEAKAGE TEST – EXFILTRATION METHOD

A. Sewers not submerged by groundwater shall be tested for exfiltration or, if approved, by low-pressure air method. The Engineer reserves the right to waive the exfiltration test on any section of sewer based on his evaluation of the results of previous tests.

B. The hydrostatic head for test purposes shall be seven feet (7') above the sewer crown at the upstream end. The water level in the sewer shall be adjusted so that the hydrostatic head is seven feet minimum above the ground water level when the ground water level is higher than the pipe crown. Any arrangement of testing equipment which will provide observable and accurate measurement of water leakage under the specified conditions will be permitted. The rate of exfiltration of water out of the sewers, including manholes and appurtenances, shall not exceed 125 gallons per day per inch diameter per mile of sewer. Visible leaks, defective joints, and defective pipe shall be satisfactorily repaired or replaced.

C. The sewer test section may be filled 24 hours prior to time of exfiltration testing, if desired, to permit normal absorption into the sewer pipe walls to take place.

3.10 LEAKAGE TEST – LOW-PRESSURE AIR METHOD

A. Test Procedure. The following test procedures shall be used in making each test:

1. The section of sewer line to be tested shall be flushed and cleaned prior to conducting the low-pressure air test to clean out any debris, wet the pipe, and produce more consistent results.

2. Isolate the section of sewer line to be tested by means of inflatable stoppers or other

suitable test plugs. Each plug shall have an inlet/outlet tap, or other provision for connecting a hose to a portable air source at one plug and bleeding the air pressure off at the other plug.

3. If the test section is below the groundwater level, determine the height of the groundwater above the springline of the pipe at each end of the test section and compute the average. For every foot of groundwater above the pipe springline, increase the gauge test pressure by 0.43 pounds per square inch.

4. Connect the air hose to the inlet tap and a portable air source. The air equipment shall consist of necessary valves and pressure gauges to control the rate at which air flows into the test section and to enable monitoring of the air pressure within the test section. The testing apparatus shall be equipped with a pressure relief device to prevent the possibility of loading the test section with the full capacity of the compressor.

5. Add air slowly to the test section until the pressure inside the pipe is raised to 4.0 psig greater than the average back pressure of any groundwater that may be over the pipe.

6. After a pressure of 4.0 psig above the groundwater back-pressure is obtained, regulate the air supply so that the pressure is maintained between 3.5 and 4.0 psig (above the average groundwater Sack pressure) for a period of two minutes to allow the air temperature to stabilize in equilibrium with the temperature of the pipe walls.

7. Determine the rate of air loss by the time pressure-drop method. After the two-minute air stabilization period, disconnect the air supply and adjust the pressure to 3.5 psig above the average groundwater back pressure. The time required for the test pressure to drop from 3.5 psig to 2.5 psig shall be determined by means of a stopwatch and this time interval will be compared to the required time in the table below to determine if the rate of air loss is within the allowable time limit. If the time is equal to or greater than the times indicated in the table, the pipeline shall be deemed acceptable.

8. The pressure shall be monitored by a recording type pressure gauge and a copy of the strip chart shall be given to the Engineer upon completion of the test. The chart shall show the initial pressurization of the sewer, the two minute stabilization time, the test period, and the bleed-off of the pressure at the completion of the test.

9. Upon completion of the test, the air pressure in the sewer shall be bled off slowly and from the end of the test section opposite to the location of the test pressure gauge. The reduction in air pressure shall be shown on the recording of the pressure test as described above.

B. For sewer diameter between 4 inches and 24 inches inclusive, the Pipe shall be tested between adjacent manholes. The test time for the air pressure to drop the specified one pound shall be as required by the following table.

1.0 PSIG AIR TEST PRESSURE DROP

Pipe Diameter	Minimum Time Lapse (min:sec)							
Inch	*100 ft*	*150 ft*	*200 ft*	*250 ft*	*300 ft*	*350 ft*	*400 ft*	*450 ft*
4	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38

15	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33

3.11 MANHOLE AND VACUUM TEST

A. All manholes installed in gravity flow sanitary sewerage systems shall be tested using an inflatable compression band, vacuum pump and appurtenances specifically designed for vacuum testing manholes. Test procedures shall be in accordance with the test equipment manufacturer's recommendations. Test equipment Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

B. Manholes may be tested by vacuum test immediately after assembly of the manhole and connecting pipes and before any backfill is placed around the manholes. However, the final test and acceptance shall be based only upon a test after the manhole is backfilled and the cover frame castings are grouted in place.

C. All pipes entering the manhole shall be plugged, taking care to securely brace the plugs and pipe.

D. After the testing equipment is in place, a vacuum of ten inches (10") of Hg shall be drawn on the manhole. The manhole will be considered to have passed the test if the vacuum does not drop more than one inch (1") of Hg in one minute.

E. If the manhole fails the initial test, the Contractor shall locate the point(s) of leakage and make proper repairs, and retest until a satisfactory test result is obtained.

F. After the manholes have been backfilled, the cover frame casting sealed in place, vacuum tested, and prior to final acceptance of the project, any signs of leaks or weeping visible from the inside of the manhole shall be repaired and the manhole made watertight and retested in accordance with this specification.

G. The vacuum test shall be monitored by a recording type pressure/vacuum gauge and a copy of the strip chart shall be given to the Engineer upon completion of the test. The chart shall show the initial vacuum draw down, the test period, and a slow, controlled release of the vacuum.

3.12 SMOKE TEST

1. Smoke Testing as required by the City of Zachary at any time during the subdivision construction and during the warranty period shall be performed at the Developer’s expense.

2. All new sewer lines including service laterals shall be smoke tested prior to backfilling in the presence of a City of Zachary representative.

3. Leaks detected during smoke testing must be repaired.

3.13 FINAL ACCEPTANCE

A. Prior to final acceptance and final manhole-to-manhole inspection of the sewer system by the Owner, flush and clean all parts of the system. Remove all accumulated construction debris, rocks, gravel, sand, silt, and other foreign material from the sewer system at or near the closest downstream manhole. If necessary, use mechanical rodding or bucketing equipment.

B. Upon the Engineer's final manhole-to-manhole inspection of the sewer system, if any foreign matter is still present in the system, reflush and clean the section and portions of the lines as required.

END OF SECTION

SECTION 802A
NEW SEWER PIPE ACCEPTANCE INSPECTION

PART 1 - GENERAL

1.01 PROCESS

A. Upon installation of new sanitary sewer pipe, CONTRACTOR must wait a minimum of 30 days before beginning new pipe acceptance inspections to allow for the settling of the new pipe(s). New pipe acceptance inspection shall be performed by a Third Party CCTV Inspection Consultant, hereinafter referred to as "CONSULTANT"

B. After the 30-day wait period, CONSULTANT must clean all sanitary sewer mains and sewer laterals, as defined in the specifications below.

C. After cleaning a pipe, CONSULTANT will flood the pipe segment with potable fire hydrant water for a minimum of 30 minutes and allow the water to settle out.

D. Once a pipe is flooded and water has settled out, CONSULTANT will attach a new pipe acceptance device to its cleaning nozzle and pull the device through the sewer main in front of the CCTV inspection camera.

   a. The new pipe acceptance device must contain the appropriate-sized stainless steel ball bearings (minimum of 5 ball bearing) evenly spaced and attached to a cable.

   b. Because there is a tolerance on newly laid sewer main pipe of ±10% of the design slope, CONSULTANT must use 0.8" ball bearings in an 8" pipe, 1" ball bearings in a 10" pipe, 1.2" ball bearings in a 12" pipe, etc.

   c. If a ball bearing is documented dipping completely under the water line in the newly laid sewer main pipe via CCTV inspection, CONSULTANT will be required to perform an accurate measuring probe (AMP) assessment of the pipe(s) in question.

   d. If after the AMP assessment the pipe is further determined to be out of tolerance, CONTRACTOR must repair the pipe to an acceptable slope prior to City acceptance. CONSULTANT must follow the new pipe acceptance process on the repaired pipe after the required 30-day wait period.

E. CONSULTANT will not be required to use new pipe acceptance ball bearing device or AMP on sewer laterals, but CONSULTANT will be required to flood all sewer laterals and CCTV inspect all sewer laterals as detailed in the specifications below.

PART 2 – MATERIALS

Not Used

PART 3 – EXECUTION

3.01 SANITARY SEWER LINE CLEANING

A. Sewer line cleaning shall be performed to remove foreign material and restore sewer mainline and sewer lateral pipe capacity to 95%.

B. Conditions such as broken pipe may prevent cleaning from being accomplished, especially where additional damage would result if cleaning were attempted or continued. Should such conditions be encountered, the CONTRACTOR shall repair the damaged pipe prior to proceeding with the inspection.

C. During sewer cleaning operations, satisfactory precautions shall be taken by the CONSULTANT in the use of cleaning equipment. Precautions shall be taken to ensure that damage to or flooding of public or private property does not occur during the cleaning procedure.

D. Selection of the equipment shall be the sole discretion of the CONSULTANT and based on the conditions of lines at the time the work commences. The equipment shall be capable of removing dirt, grease, rocks, sand, and other materials and obstructions from the sewer lines and manholes.

E. All sludge, dirt, sand, rocks, grease, and other solid or semi-solid materials resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. Passing materials from pipe segment to pipe segment, which could cause line stoppages, accumulations of debris in wet wells, interference with in-line long term flow monitoring equipment or damage to pumping equipment will not be permitted. Under no circumstances shall sewage or solids removed during the cleaning operation be dumped onto the streets or in ditches, catch basins or storm drains.

F. If the CCTV inspection shows the cleaning to be unsatisfactory, the CONSULTANT shall re-clean and re-inspect the sewer line at his sole expense until the cleaning is shown to be satisfactory.

G. All sludge, dirt, sand, rocks, grease, and other solid or semisolid materials removed from the sewers and manholes during the cleaning operation shall be drained of water and transported to a licensed offsite disposal location.

H. The CONTRACTOR will provide water for cleaning operations. Fire hydrants shall not be used unless expressly approved by the City of Zachary.

3.02 CCTV INSPECTION

A. The CONSULTANT shall furnish all labor, equipment, supplies, and supervision and shall perform all work required in accordance with these specifications. CCTV inspection shall be performed in all sewer lines to be considered for acceptance by the City of Zachary.

B. It shall be the responsibility of the CONSULTANT to schedule and perform investigations to prevent system overflows. If flows are such that they interfere with the CONSULTANT's ability to collect accurate data, then the CONSULTANT shall be responsible to schedule his work during low flow periods or to request written permission to perform by-pass pumping around the site. By-pass pumping shall be used when required.

C. Inspection of sewer infrastructure by means of CCTV equipment shall be performed to determine the location and extent of any obstructions and defects such as sags, offset joints, protruding tees, broken pipe, and other pipe defects that may permit groundwater infiltration. Logs shall note the existence of any significant defects. Cleaning by the CONSULTANT shall be performed prior to each CCTV inspection on each pipeline to be inspected.

D. CCTV inspections shall be performed on one manhole-to-manhole pipe segment at a time. The inspection shall be performed by moving the CCTV camera through the line along the axis of the pipe at a rate not to exceed 30 feet per minute. Any means of propelling the camera through the sewer that would exceed this rate of speed or produce non-uniform or jerky movements shall not be acceptable. The camera shall be stopped for a minimum of 5 seconds at each identifiable defect to ensure proper documentation of the lines condition. In addition, the camera shall be stopped at each service connection, and the camera shall pan the service connection to video inside the service line. CCTV inspection is performed from the upstream manhole to the downstream manhole when the conditions allow. If conditions do not allow an upstream to downstream inspection, the inspection will be performed in reverse (from the downstream to the upstream manhole).

E. A log shall be made by the CONSULTANT when each manhole-to-manhole pipe segment is televised. The log shall include at a minimum:

a. Location of each defect
b. Location of each service connection or other pipe entering the televised line
c. Location and degree of offsets
d. Location of any damaged sections, and nature of damage
e. Location of buried structures or blind junctions
f. Location and amount of any deflection in alignment or grade of pipe; also the total length of pipe sag
g. Pipe materials, diameter, and distance between pipe joints
h. Date, city, manhole-to-manhole segment, reference manhole number, name of operator, and inspector
i. Video Filename

F. The pipe segment length, with respect to the referenced manhole, shall be determined with a meter device, accurate to within ±2%. Markings on the cable, instruments requiring observation inside a manhole, or correction of each reading for the depth of the reference manhole shall not be allowed. Accuracy of the measurement meters shall be checked daily by use of a walking meter, roll-a-tape, or other suitable device.

G. A header screen showing tape number, segment number, and manhole number shall be taped for 10 seconds at the beginning of each televised line segment. All header information shall be recorded on the log forms.

H. At the CONSULTANT's discretion the camera shall be stopped or backed up to view and analyze conditions that appear to be unusual or uncommon for a sound sewer line. At all times, the operating technician shall be able to move the camera through the line in either direction without loss of quality in the video presentation on the monitor. The picture shall be free of electrical interference and provide a clear, stable image of the specified resolutions at all times. The camera lens shall be cleaned, as required, to provide a clear image within the sewer lines.

I. In the event that equipment becomes lodged in the sewer line, line shall be excavated to remove lodged equipment, the pipe shall be repaired and re-inspected.

3.03 CCTV INSPECTION OF SERVICE LATERALS

A. Television inspection of sewer laterals will be attempted from inside the mainline sewer up into the lateral OR attempted from the cleanout towards the sewer main. Lateral sewers inspected from the cleanout towards the mainline will be attempted by using a mini push camera if necessary.

B. When inspected from the main up into the lateral, CONSULTANT will use a lateral launch inspection system consisting of a robotic tractor and a lateral launch CCTV camera, to remotely deploy a pan & rotate camera into lateral pipes connected to a mainline sewer pipe. Should CONSULTANT encounter multiple laterals converging in a single tap, CONSULTANT shall utilize a steerable lateral camera with guide pin to inspect the adjoining laterals separately. Each pipe shall be identified as an independent inspection.

C. A main sewer television camera is used to position the lateral camera launcher. The lateral sewer camera is used to inspect each lateral from the mainline towards the cleanout.

D. In the event a lateral pipe segment cannot be fully inspected after reasonable attempts, lateral shall be excavated and visually inspected to remove the blockage.

3.04 Data Submittals

A. All data collected shall be provided to the City of Zachary.

B. All videos will be digital .mp4 files, clear, legible and free of "snow" or haze.

C. Electronic copies (data files) shall be submitted in a PACP Exchange Database.

D. The CONSULTANT shall prepare and submit a list of defects, which appear to require immediate corrective action, based on their size and/or type, on a daily and weekly basis. This submittal is not a final deliverable.

E. To establish the working criteria for video picture quality which must be maintained throughout the project, the CONSULTANT shall furnish a USB drive with .mp4 video footage of an actual sewer line inspection that is satisfactory to the City of Zachary, and meets the specifications for CCTV inspection. The USB drive and shall be used throughout the project as a standard that the CONSULTANT's video picture quality must meet.

F. The CONSULTANT shall furnish the City of Zachary a USB drive that contains both data files and video files. The data files shall be able to upload into a PACP Exchange Database.

G. All inspections shall be made by PACP and LACP certified operators and data shall be documented using NASSCO's Pipeline Assessment Certification Program and Lateral Assessment Certification Program.

3.05 ACCURATE MEASURING PROBE (AMP) PIPE ASSESSMENT

A. The as-builts location of the pipe shall be determined by use of the AMP that measures up to 100 angular and linear velocity changes, in multiple gyroscopic orientation measurement units per second as the AMP moves through the pipeline structure. The changes shall be stored within the AMP and be able to be downloaded to plot the pipeline location in both a plan (X, Y) and profile (X, Z) view. Additionally, the location of the pipeline in both the plan and profile dimensions will be tied to an approved and reproducible coordinate system accepted within the state that the project is being performed.

B. Application of the AMP within a pipeline/conduit structure will be performed under the following procedures:

a. Surveyed coordinates and elevations from both access points of the pipeline/conduit collected from the top, center, or invert portion of the pipeline material will be included.

b. Inside and outside diameters will be recorded and input into the software under the appropriate fields.

c. The appropriate wheel sets will be affixed to the AMP body via threaded ends.

d. The AMP along with the wheels sets will be sized accordingly to the inside diameter of the pipeline/conduit.

e. The AMP will then be attached to the tag line that has been previously installed.

f. The AMP will be turned on and placed within the pipeline/conduit for a period of 1-minute to allow for the AMP sensors to calibrate.

g. The AMP will then be advanced within the pipeline/conduit via the aid of mechanical or manual reels/winches and will be collecting 3D positional measurements.

h. Once the AMP has arrived at the other end of the pipeline/conduit it will again rest within the pipeline for a period of 1-minute for calibration purposes, and then it will be advanced back to its original starting position.

i. The AMP will calibrate for a final time and then be removed from the pipeline/conduit and the unit will be turned off.

j. Once the AMP is connected to the field laptop then the 3D positional measurement data will be uploaded to the computer.

k. The software on the computer provides the analyst diagnostic analysis via reviewing information on the AMP's linear measurements, velocity, roll, pitch, and heading.

l. The CONSULTANT will then review all positional measurements in determining that the positional measurements are within the tolerance specification for the AMP. Note: additional positional measurement runs maybe required based on this review.

C. Upon collection of the 3D positional measurements with the AMP and processing of the positional measurement data, the resulting positional data will be provided in the form of as-built file(s) to the City of Zachary.

D. Deliverables

a. As-built map (plan and profile view) in .PDF format of pipe segment

b. Horizontal (x,y) and vertical (z) coordinates of the as-built in .CSV format

c. Bending radius analysis and inclination report of the as-built in .XLS format

d. ESRI shape file and Google Earth in .KML format of the pipe segment

END OF SECTION

SECTION 803
POLYVINYL CHLORIDE (PVC) FORCE MAIN PIPE

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. All labor, materials, equipment and incidentals required shall be provided to install polyvinyl chloride (PVC) force main pipe, fittings, and appurtenances in accordance with the City of Zachary Standards.

1.02 SUBMITTALS TO BE PROVIDED

A. A list of materials to be furnished, the names of the suppliers and the date of delivery of materials to the site.

B. Detailed shop drawings of all PVC pipe and fittings.

C. Certification of compliance with the pipe manufacturer's recommendations for handling, storing, and installing pipe and fittings.

D. Pipe manufacturer's certification of compliance with these Standards.

PART 2 - PRODUCTS

2.01 FORCE MAIN MATERIALS

A. Pipe

1. Polyvinyl chloride (PVC) force main pipe smaller than four inches (4") in diameter shall conform to ASTM D-2241, "Standard Specifications for Polyvinyl Chloride (PVC) Pressure-Rated Pipe (SDR) Series." The pipe shall be limited to only that pipe produced from PVC compound having a cell classification of 12454-A or B and having a hydrostatic design basis of 4000 psi, as listed by the Plastics Pipe Institute. Pipe supplied under this specification shall have a standard dimension ratio (SDR) of 21 or as indicated on the drawings.

2. Polyvinyl Chloride (PVC) force Main Pipe in sizes 4-inch through 12-inch diameters (inclusive) shall conform to AWWA C-900, "Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch, for water." Pipe supplied under this specification shall have a minimum pressure class (PC) of 150 and a maximum dimension ratio (DR) of 18 unless otherwise indicated on the Drawings.

3. Polyvinyl Chloride (PVC) force main pipe 14-inches in diameter and larger shall conform to AWWA C905, "Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 through 36 Inch." Pipe supplied under this specification shall have a minimum pressure rating (PR) of 235 and a maximum dimension ratio (DR) of 18 for pipes 14-inches through 18-inches in diameter (inclusive), a minimum pressure rating (PR) of 165 and a maximum dimension ratio (DR) of 25 for pipes larger than 18 inches in diameter, and cast iron outside diameters unless otherwise indicated on the Drawings.

B. Joints

B. Joints

The pipe shall be joined with gasketed, integral bell and spigot or double bell coupling with plain end spigot type joints except for restrained joint PVC pipe less than 4 inches in diameter which shall be solvent cemented joints. Gasketed joints shall conform to ASTM D3139. Gaskets shall conform to ASTM F477. Solvent cement shall conform to ASTM D2564 and primer shall conform to ASTM F656.

C. Length

Pipe shall be furnished in standard laying lengths not exceeding 20 feet.

D. Joint Restraint

1. Restrained joints shall be provided at all force main adjustments, approaches to canal crossings, horizontal bends, and locations shown on the Drawings.

2. Restrained joints for pipe less than 4 inches in diameter shall have bell ends for joints of solvent cemented type in accordance with ASTM D2672.

3. Restrained joints for pipe sizes 4 inches through 12 inches in diameter (inclusive) shall be either ductile iron or mechanical joint ductile iron fittings with PVC joint restraint devices such as series 2000 PV with 8 mil polyethylene wrap, as specified for ductile iron pipe, taped to the pipe. Manufacturer shall be as approved by the City of Zachary.

4. Restrained joint pipe for pipe sizes larger than 12 inches shall be ductile iron pipe or prestressed concrete cylinder pipe. Suitable PVC/ductile iron or prestressed concrete cylinder pipe adapters shall be provided as required.

5. Bolts and nuts for PVC joint restraint devices shall be teflon-coated ductile iron with a cathodic protection anode cap on each bolt.

E. Fittings

1. Fittings for Polyvinyl Chloride (PVC) Force Mains less than 4 inches in diameter shall be Schedule 80 solvent cement type in accordance with ASTM D2466. Fittings shall be limited to only those fittings which are produced from PVC resin having a cell classification of 12454-B.

2. Fittings for Polyvinyl Chloride (PVC) Force Mains from 4 inches to 12 inches in diameter (inclusive) shall be Mechanical Joint Ductile Iron when PVC joint restraint devices are used or restrained joint ductile iron when restrained joint ductile iron pipe is used.

3. Fittings for Polyvinyl Chloride (PVC) Force Mains larger than 12 inches in diameter shall be restrained joint ductile iron when restrained joint ductile iron pipe is used or restrained joint prestressed concrete cylinder pipe fittings when restrained joint prestressed concrete cylinder pipe is used.

4. Tees which are used solely for installation of air release valves shall not be restrained joint unless the tee falls within an area of restrained joint pipe required to control thrust of other fittings.

2.02 CERTIFICATION

A. The PVC pipe manufacturer shall provide a certified copy of the stress regression test that has been performed on the specific PVC compounding being utilized in the manufacture of his product. This stress regression testing shall have been done in accordance with ASTM D1598 and the manufacturer shall provide a product supplying a minimum Hydrostatic Design Basis (HDB) of 4,000 psi as determined in accordance with ASTM D 2837.

2.03 IDENTIFICATION

A. Pipe shall bear identification markings that will remain legible after normal handling, storage, and installation. Markings shall be applied in a manner that will not weaken or damage the pipe. Marking shall be applied at intervals of not more than 5 feet on the pipe. Marking on the pipe shall include the following:

B. Nominal size and OD base, material, SDR, pressure rating, AWWA designation, manufactures names, "sewer" and production codes.

C. PVC.

D. Dimension ratio.

E. AWWA pressure rating.

F. AWWA designation.

G. Manufacturer's name or trademark.

H. Manufacturer's production code, including day, month, year, shift, plant, and extruder of manufacture.

I. All PVC sewage force main pipe shall be color coded green.

2.04 MANHOLE CONNECTIONS

A. Pipe stubs for all manhole connections shall not exceed 2 feet in length. Caps shall be furnished where required.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Polyvinyl Chloride (PVC) force main pipe shall be installed in conformance with the published instructions of the manufacturer, as shown on the Drawings, and as specified herein.

B. The Contractor shall use care in handling, storing, and installing the pipe and fittings. Storage of pipe and joining components on the job site shall conform with the pipe manufacturer's published recommendation. Under no circumstances shall pipe or fittings be dropped into the trench.

C. Pipe shall be laid to lines and grade shown on the Drawings with bedding and backfill as shown on the Drawings and as specified in Section 02200. Blocking under the pipe is prohibited.

D. Solvent cemented joints shall be made in strict accordance with ASTM D2855, including the Appendix.

E. When laying is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plugs or by other approved means.

F. In all cases where this type of pipe is installed, a metallic tape shall be buried directly over the centerline of the pipe and shall be one to two feet above the top of the pipe.

3.02 TESTING

A. All force mains shall be field tested. The Contractor shall supply all labor, equipment, material, gages, pumps, meters, and incidentals required for testing. The Contractor shall pressure test each force main upon completion of the pipe laying and backfilling operations, including placement of any required temporary roadway surfacing.

B. All force mains shall be tested at 125 psi for SDR 21 and DR 18 pipe and 100 psi for DR 25 pipe unless otherwise approved by the Engineer. The test pressure shall be measured at the highest point along the test section by a recording type pressure gauge and a copy of the readout shall be submitted to the Engineer upon completion of the test. Fill testing shall be conducted in the presence of the Engineer or his designated representative.

C. Testing shall be conducted after backfilling has been completed and before placement of permanent surface.

D. Testing procedure shall be as follows:

1. Fill line slowly with water. Maintain flow velocity less than two (2) feet per second.

2. Expel air completely from the line during filling and again before applying test pressure. Air shall be expelled by means of taps at points of highest elevation.

3. Apply test pressure. Measure the quantity of water that must be pumped into the line to maintain pressure within 5 psi of the test pressure for a period of 2 hours. This quantity is defined as leakage.

4. Carefully examine all exposed, pipe, fittings, and joints during the test.

5. Upon completion of the test, the pressure shall be bled off from a location other than the point where the pressure is monitored. The pressure drop shall be witnessed by the resident project representative at the point where the pressure is being monitored and shall show on the recorded pressure read-out submitted to the Engineer.

E. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD\,(P)^{1/2}}{133{,}200}$$

In which L is the allowable leakage in gallons per hour; S is the length of the pipe tested in feet; D is the nominal diameter in inches; and P is the average test pressure, in psig.

F. If any test of Pipe laid discloses leakage greater than that allowed, the Contractor shall, at his own expense, locate and repair the cause of leakage and retest the line.

G. All visible leaks are to be repaired regardless of the amount of leakage.

3.03 CLEANING

A. At the conclusion of the work, the Contractor shall thoroughly clean all of the new pipe lines by flushing with water or other means to remove all dirt, stones, Pieces of wood or other material which may have entered during the construction period. Debris cleaned from the lines shall be removed from the job site. If, after this cleaning, any obstructions remain, they shall be removed.

SECTION 804
POLYETHYLENE SANITARY FORCE MAIN PIPING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work covered by this section consists of all labor, materials, equipment, and incidentals necessary to completely furnish, install, test, and clean all polyethylene sewer force main piping, and accessories indicated on the drawings and/or specified herein including all appurtenances necessary to make the force main system complete and fully operational.

1.02 GENERAL

A. Contract Drawings: The contract drawings indicate the general design, arrangement and extent of the piping system. It is desired that the indicated positions be followed as closely as possible. Do not scale drawings for roughing in measurements nor use as shop drawings. Prepare shop drawings per Paragraph 1.03, Submittals, herein. The exact location of the various items is subject to building construction, and the actual materials and equipment furnished by the Contractor. The Contractor shall verify the location of all items furnished, installed, or connected to by him. Coordinate work with other specification divisions.

1. Piping systems shall be located from dimensions given on drawings or all implied locations shall be determined after field measurements have been taken.

2. Should interferences or discrepancies prevent the installation of any part of the work, the Engineer shall be notified.

B. Materials

1. General

a. Unless otherwise specified or shown, pipe, fittings, and general purpose valves for each piping system shall be as shown in the drawings.

b. If there are any conflicts in the specifications, use the stronger pipe class. Contractor shall submit calculations with shop drawings where specified.

c. All piping shall have a minimum cover of 30 inches unless otherwise shown on the drawings.

1.03 SUBMITTALS

A. General: Shop drawings and product data shall be submitted in accordance with the General Requirements.

B. Product data shall include all manufacturer's literature, catalog cuts and other descriptive literature to fully substantiate the conformance with specifications of materials and equipment submitted. Mark product-data to indicate exactly those items that are to be provided and cross out unrelated or non-applicable items.

C. Shop drawings shall include Contractor prepared plans, sections and details fully dimensioned showing all piping systems and appurtenances to be installed and with system designations as indicated herein. Show all equipment connection details.

1.04 JOB CONDITIONS

A. Schedule Of Work: Arrange work to comply with schedule of construction. In scheduling, anticipate means of installing equipment through available openings in structure.

B. Coordination Of Work: The Contractor shall coordinate all trades whose work is adjacent, in order to avoid field interference and delay in execution of the work of all trades. Furnish detailed advance information regarding all requirements related to work by others. Furnish sizes and accurate data and location of any and all foundations, pits, chases, holes through beams, floors, walls, ceilings and roof, and other special openings required for this contract work.

C. Inserts: Prior to the execution of each step in the general construction work, determine that all chases and holes required for the specified work are properly located and sized and supervise the setting of all sleeves, inserts and other required build-in items. If this preliminary work is not properly performed and should cutting be required to install the specified work, the Contractor shall bear all expense of cutting and restoring the construction to its original condition.

D. Cutting: The work shall be carefully laid out in advance and any cutting of construction shall be done only with the written permission of the Engineer. Cutting shall be carefully done, and any damage to the building, piping, wiring and equipment as a result of the cutting shall be repaired by persons skilled in the particular trade.

1.05 MANUFACTURER

A. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

1.06 HANDLING OF PIPE

A. The pipe shall not be dropped or subjected to any unnecessary jar, impact or other treatment that might damage the pipe. Any unit of pipe that in the opinion of the City of Zachary is damaged beyond repair by the Contractor shall be replaced by another unit. Any pipe that is damaged shall be returned to the manufacturer.

PART 2 - PRODUCTS

2.01 HIGH DENSITY POLYETHYLENE PRESSURE PIPE

A. High density polyethylene pipe shall be made from polyethylene resin compound that meet the requirements for Type III, Category 5, Class C, Grade P34 as defined in ASTM D1248.

B. The pipe produced from this resin shall have a classification of 345434C in accordance with ASTM D 3350 and shall have a Plastic Pipe Institute (PPI) rating of PE 3408.

C. The material shall be of virgin quality and contain a minimum of 2% well dispersed carbon black. The workmanship shall be of the highest level compatible with current commercial practice. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin

of the same specification and from the same raw material supplier. The polyethylene pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions or other injurious defects. It shall be uniform in color, opacity, density and other physical properties.

D. The pipe shall have a manufacturer's recommended hydrostatic design stress rating of 800 psi based on a material with a 1,600 psi design basis determined in accordance with ASTM D2837. The pipe shall conform to the dimensions, wall thickness, testing, marking and all other provisions of ASTM F 714 for the dimension ratios as shown on the drawings or on the bid form.

E. Pipe shall be marked at 5-foot intervals with a coded number which identifies the manufacturer, SDR, size, PPI rating, manufacturing standard reference and production code form which date and place of manufacture can be determined, and shall have a green stripe or similar marking to indicate sanitary sewer.

F. Flange adaptors shall be manufactured by the same manufacturer as the pipe using the same resin as the pipe. Each flange adaptor shall be furnished with a ductile iron convoluted backup ring drilled to match a standard ANSI bolt pattern for welded steel pipe.

G. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions or other injurious defects. It shall be uniform in color, opacity, density and other physical properties.

H. Butt fusion of the pipe and fittings shall be performed by the thermal butt fusion system. Polyethylene pipe lengths, fittings and flange adaptor connections to be fused shall be of the same type, grade and class of polyethylene compound and supplied by the same raw material supplier.

2.02 THRUST BLOCKS AND ANCHORS

A. For all lines, at 1/8 bends or greater, and at tees, caps, plugs, and other fittings, concrete thrust blocks or anchor rods shall be provided by the Contractor to firmly secure these fittings. Anchor blocks and straps shall be used with plastic pipe in accordance with the manufacturer's standards or recommendation. Thrust blocks shall be of such size and dimensions as detailed on the plans. Concrete for thrust blocks shall be not leaner than one (1) cement to two and one-half (2 1/2) sand to five (5) aggregate, and having a compressive strength of not less than 2,000 psi at 28 days. Otherwise, concrete shall be in strict conformance with the applicable section on concrete in these Specifications. Restrainer devices manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

B. Restrained Joints:

1. All pressure piping shall have (thrust-blocks or) restrained joints as needed and shall be constructed using pipe and fittings with restrained joints. Restrained Joint Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary. The joints shall be capable of holding against withdrawal and no axial movement for line pressures 50 percent above the normal working pressure but not less than 100 psi. The pipe and fittings shall be as shown for restrained push-on joints or restrained mechanical joints on Page 416 in Section VI, in the Handbook of Cast Iron Pipe, 4th Edition, except that mechanical joint ductile iron pipe retainer glands will not be permitted.

2. Restrained pipe joints that achieve restrain by incorporating cut out sections in the wall of the pipe shall have a minimum wall thickness at the point of cut out that corresponds with the minimum specified wall thickness for the rest of the pipe.

3. The minimum number of restrained joints required for resisting forces at fittings and changes in direction of pipe shall be determined from the length of restrained pipe on each side of fittings and changes in direction necessary to develop adequate resisting friction with the soil. The formula and parameters given below shall be used to determine the minimum requirements:

$$L = \frac{1.5A\,(1-\cos X)}{fw}$$

Where

L = length of pipe on each side of fitting or change in direction
P = 50 percent above the normal working pressure
A = cross-sectional area in square inches based on outside diameter (O.D.) of pipe
X = angle of bend or change in direction in degrees
f = coefficient of friction = 0.4 (maximum)
w = earth + pipe + water in pipe

earth = (density of soil*) (depth of cover in feet) (O.D. in feet) (2)

* maximum 120 lbs/ft above maximum water table elevation

and 60 lbs/ft below maximum water table elevation

4. Bolts and nuts for restrained joints shall be corten, low alloy, high strength steel.

5. Restrained joint devices manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

PART 3 - EXECUTION

3.01 LAYING SEWER FORCE MAIN

A. General:

Grading, excavation, and earthwork required in laying sewer force main shall conform to the City of Zachary Standards.

When work is suspended either for the night or for any other reason, open ends of the pipe shall be securely plugged to prevent the entrance of mud, water, or any obstruction.

Dead ends of pipe and unused branches of crosses, tees, valves, etc., shall be closed with a plug suitable to the type of pipe used.

Proper and suitable tools and appliances for the safe and convenient handling and laying of pipe shall be used, and care shall be taken to prevent damage to pipe coating. If required by the size pipe being used, mechanical pullers (or spreaders) shall be used in conformance with the pipe manufacturer' instructions.

While pipe laying is in progress, the trench shall be kept free of water.

While suspended in the sling and before lowering in the trench, the pipe shall be swabbed clean and inspected for defects and tapped with a light hammer to detect cracks. Defective, damaged, or

unsound pipe shall not be used.

3.02 TESTING PIPING

A. No pressure tests shall be made until all concrete thrust blocks are at least forty-eight (48) hours old.

B. Before any lines will be accepted by the Engineer, all lines shall be subjected to a hydrostatic pressure of 150 pounds per square inch, unless required otherwise by the Special Conditions, for a period of not less than one (1) hour, and any defective work revealed by the test shall be repaired or replaced by the Contractor and the system re-tested.

C. After the pressure test, a separate leakage test shall be conducted. Leakage shall not exceed 10 gallons per inch of pipe diameter per mile of pipe per 24 hours when tested at 2 times the working pressure or the rated pressure of the pipe, whichever is greater. All visible leaks shall be stopped, defects connected, and pipe shall be re-tested. The Contractor shall submit to the Engineer test results in a neat, tabular form.

D. The Contractor shall furnish all taps, pumps, piping, gauges, and measuring devices for performing all pressure and leakage tests.

3.03 TRACERS FOR NON-METALLIC PIPE

A. A plastic bonded 12-gauge copper wire shall be laid one foot (1') above the top of the pipe. The wire shall be continuous along the entire length of the pipe and grounded to gate vales, fire hydrants, flush valves, and water meters. See City of Zachary Standard Details for additional information.

3.04 HIGH DENSITY POLYETHYLENE (HDPE) PIPE INSTALLATION

A. Polyethylene pipe shall be joined by the method of thermal butt-fusion as outlined in ASTM D 2657 "Heat Joining Polyethylene Pipe and Fittings." All butt-fusion joining of pipe and fittings shall be performed in accordance with proven procedures and techniques recommended by manufacturer. Thermal butt-fusion of the pipe shall be performed by an experienced technician, certified in the jointing of high-density polyethylene pipe in accordance with Title 49 CFR 192.285. Written certification of the individual welders shall be submitted to the Engineer prior to the performance of any welding.

B. A minimum of two test joints shall be fused and cut from each pipe size and each SDR prior to beginning joining the pipe system. The test joints shall be visually examined in accordance with Title 49 CFT 192.285. The Engineer reserves the right to request that no more than 10 additional samples be cut from the pipe during the jointing process at no additional cost to the Owner, to document the integrity of the fusion process.

C. All finished butt-fusion welds shall be ground out to the inside of joined pipe sections such that the maximum finished bead protrudes no more than 1/8-inch from the inside of the pipe wall at any given point.

D. Where shown on the plans, the HDPE pipe shall be adapted to fittings and valves by means of an assembly consisting of polyethylene stub-ed, butt-fused to the pipe, a back-up flange of ductile iron, made to Class 140, ANSI B16.5 dimensional standard with exceptions, bolts of compatible material and a viton gasket to fill the joints. Bolts shall be drawn up evenly and in line.

E. Where called for on the drawings the pipe installation shall be by the Horizontal Directional Drilling

(HDD) procedure. A plastic bonded 10 gauge copper wire shall be attached to the pipe at three (3) foot intervals.

3.05 CLEAN UP AND REPAIR

A. General: The Contractor shall maintain his operations in a neat and orderly manner causing as little inconvenience as possible. Within 10 working days from the time a trench is opened all roadside ditches, culverts, etc, shall be repaired and surfaces thoroughly cleaned. All excess excavation shall be removed from the trench side and disposed of at the Contractor expense. The work area shall be then thoroughly cleaned.

B. Clean-up and repair shall conform to the City of Zachary Standards.

3.06 ACCEPTANCE

A. Final acceptance of the project shall not be made until the CONTRACTOR has completed the total project and all tests, restoration, and clean-up have been performed to the satisfaction of the Engineer.

END OF SECTION

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SECTION 805
STRUCTURAL PRECAST CONCRETE WETWELL

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all materials, labor, and equipment and construct wet wells, valve pits, and accessory items, consisting of precast sections as shown on the Drawings and as specified herein.

B. The forms, dimensions, concrete, and construction methods shall be approved by the Engineer in advance of construction.

C. These specifications are intended to give a general description of what is required, but do not purport to cover all of the structural design details which will vary in accordance with the requirements of the equipment as offered. It is, however, intended to cover the furnishing, shop testing, delivery, and complete installation of all precast structures whether specifically mentioned in these specifications or not.

D. The supplier of the precast wet wells, valve pits, and accessory items shall coordinate his work with that of the Contractor to the end that the unit will be delivered and installed in the excavation provided by the Contractor, in accordance with the Contractor's construction schedule.

E. The precast manufacturer will be responsible for the certification of design and construction of all precast concrete sections by a registered professional structural engineer. This certification will accompany all shop drawings submittal s for review by the Engineer.

F. The Contractor will ensure coordination of the precast structures fabrication with the equipment supplied to achieve the proper structural top slab openings, spacings, and related dimensions for the selected equipment frames and covers. The top slabs and subsurface structures shall be capable of supporting the overburden plus live load equivalent to AASHTO H-20 loading.

1.02 REFERENCE STANDARDS

A. ASTM A48 – Gray Iron Castings

B. ASTM C478 – Precast Reinforced Concrete Manhole Section

C. ASTM C858 – Underground Precast Concrete Utility Structures

D. American Concrete Institute 318 Building Code Requirements for Reinforced Concrete

E. ASTM C-76 Prestressed Concrete Cylinder Pipe

1.03 SUBMITTALS

A. Submit Shop Drawings showing details of construction, reinforcing and joints.

B. Shop Drawings

1. Content

a. Dimensions and finishes

b. Estimated camber

c. Reinforcing and connection details

d. Anchors

e. Lifting and erection inserts

f. Other items cast into members

2. Show location of unit by same identification mark placed on member.

3. Include design calculations as well as a certification of professional engineer, registered in the State of Louisiana, showing concrete thickness and reinforcement requirements.

C. Manufacturer's Literature: Manufacturer's recommended installation instructions.

D. Manufacturer's certificates of material conformance with specifications.

E. Test Reports: Reports of tests on concrete.

1.04 QUALITY ASSURANCE

A. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and acceptance by the City of Zachary. Such inspection may be made at the place of manufacture, or at the site after delivery, or at both places, and the sections shall be subject to rejection at any time on account of failure to meet any of the Specification requirements; even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. All sections which have been damaged after delivery will be rejected, and if already installed, shall be acceptably repaired, if permitted, or removed and replaced, entirely, to the acceptance of the City of Zachary.

B. At the time of inspection, the sections will be carefully examined for compliance with the ASTM designation specified below and these Specifications, and with the approved manufacturer's drawings. All sections shall be inspected for general appearance, dimension, "scratch-strength" blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.

C. Imperfections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi at the end of seven (7) days and 5,000 psi at the end of twenty-eight (28) days, when tested in 3-inch by 6-inch cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs subject to the approval of the Engineer.

PART 2 - PRODUCTS

2.01 PRECAST CONCRET SECTIONS

A. Precast concrete structures for submersible pump stations shall consist of either a precast or cast-in-place base slab, precast wet well sections, top cover slab, precast valve pit and valve pit cover slabs. All concrete and reinforcing steel shall comply with the City of Zachary Standards; however, the air-entrapment requirements shall not apply to the precast elements. Concrete shall have a minimum compressive strength of 5,000 psi at the end of twenty-eight (28) days.

B. The cylindrical wet well structures may be manufactured as one complete precast section as shown on the Drawings or may be separated into more easily handled sections; however, no section shall be less than four (4) feet in length.

C. Joints between precast concrete sections shall be set by plastic shims and fitted with non-metallic non-shrink grout or double application of a performed mastic sealant material meeting Federal Specification SS-S-210 as approved by the Engineer. If the mastic sealant is used, the concrete surfaces of the joint shall be primed in accordance with the recommendation of the mastic material manufacturers.

D. The top slab shall be fitted with water tight hatches. The size of the frames and covers shown on the Drawings is for informational and bidding purposes and the size shall be adjusted as required by the pump manufacturer for clearance of his equipment. Additional costs incurred to provide and install the required size hatches shall be borne by the pump manufacturer and the Contractor and will not be considered for payment as extra work.

E. The various precast sections should have the inside dimensions and minimum thickness of concrete as indicated on the Drawings. Fill precast and cast-in-place concrete members shall conform to the Building Code Requirements for Reinforced Concrete ACI 318.

F. A vent pipe shall be furnished and installed. It shall be a 4-inch ductile iron pipe (minimum). The vent pipe shall be installed as shown on the Drawings. The vent pipe shall be fitted with an insect screen and installed as shown on the Drawings.

G. Fillets shall be provided and installed in the wet wells as shown on the Drawings. They shall be constructed using concrete fill. Fillets shall be constructed to ensure a structural bond between wet well walls and floors and shall be indicated on shop drawings submittals to the Engineer.

H. Precast structures shall be constructed to the dimensions as shown on the Drawings and as specified in these Specifications.

I. Type II cement shall be used except as otherwise approved.

J. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on each precast section.

K. Sections shall be cured by an approved method and shall not be shipped until at least seven (7) days after having been fabricated and in no case prior to the concrete attaining a minimum strength of 4000 psi.

L. Each precast section manufactured in accordance with the drawings shall be clearly marked to indicate the intended pump station installation location. The Contractor shall be responsible for the installation of the correct precast sections in their designated pump station locations.

M. Precast concrete cylinders shall be designed and manufactured in accordance with the provisions of ASTM C-478 as modified herein.

N. Concrete pipe manufactured under ASTM Designation C-76 or Prestressed Concrete Cylinder Pipe manufactured under AWWA Designation C-301 may be used in lieu of the ASTM C-478 sections specified above.

O. Wet well, valve pit elements and grout for joints shall include antimicrobial and crystalline admixture or equal at a rate of 1% by weight of total cementitious materials and in accordance with manufacturer's instructions. Product shall include field detention colorant, antimicrobial additive and crystalline chemical all in one package. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Earth excavation and backfill are to be done as part of the work under this Section, including any necessary sheeting and bracing. The Contractor shall be responsible for handling ground water to provide firm, dry subgrade for the structure and shall prevent water rising on newly poured in place concrete or grouted joint sections within 24 hours after placing, and shall guard against flotation or other damage resulting from ground water or flooding.

B. A minimum of a 12-inch layer of thoroughly compacted stabilization material shall be placed as a base for the wet well and valve pit foundation slabs.

C. Backfill material around the wet well except for the bedding of pipes serving the pump station shall be structural fill.

D. Precast foundation slabs conforming to all requirements of ASTM C478 and the above listed requirements for precast sections, may be used. The slab shall be set in place on the specified aggregate base and adjusted in grade for the correct structure elevation.

E. The station shall not be set into the excavation until the installation procedure and excavation have been approved by the Engineer.

F. The foundation slabs may be cast-in-place concrete, placed on the specific aggregate base. The tops of the cast-in-place slabs shall be shaped to mate with the precast barrel section.

G. Precast concrete structure sections shall be set so as to be vertical and with sections in true alignment with a 1/4-inch maximum tolerance to be allowed. The outside and inside joint shall be sealed with materials as specified in Article 2.01.C of this Specification. Backfilling shall be done in a careful manner, bringing the fill up evenly on all sides. If leaks appear in the structures, the inside joints shall be caulked with butyl mastic joint sealant to the acceptance of the City of Zachary. Joint Sealer Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary. The Contractor shall install the precast sections in a manner that will result in a watertight joint.

H. Holes in the concrete sections required for handling or other purposes shall be plugged with a non-metallic, non-shrinking grout or by grout in combination with concrete plugs.

I. Where holes must be cut in the precast sections to accommodate pipes, cutting shall be done prior to setting them in place to prevent any subsequent jarring which may loosen the mortar joints. Cutting shall be performed in such a manner so as to damage the remaining concrete as little as possible and in no case will the breaking of holes by jack hammering or impacting the structure with a sledge hammer be allowed.

J. Frames and hatches shall be cast into the top slab.

END OF SECTION

SECTION 806
WASTEWATER PUMPING EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required and install, place in operation, and field test new submersible pumps and appurtenances complete and in place, including but not limited to heavy duty wastewater pumps, controls, motors, hatch covers, base elbows, guide rails, and other auxiliary equipment and materials as specified herein and as required.

B. For all units, there shall be furnished and installed all necessary appurtenant equipment as required for a complete and operable installation.

C. Controls for this system are specified herein, and shall be provided under this Section.

1.02 DESCRIPTION OF SYSTEMS

A. Each station shall be complete and shall include each: no less than two explosion proof submersible pump units, motors, pump lifting assemblies, and other equipment as specified herein and shown on the Drawings. The pump systems shall also include a central control panel and all other electrical work with all accessories for complete installation.

B. In order to assure electrical and control system responsibility, the pump control panels shall be furnished by the pump supplier and shall be completely wired, including all interlocking between motor control, accessory devices, and level sensor systems. The panel manufacturer/assembler shall provide U.L. inspection of the service entrance and control panels and each panel shall have a U.L. label meeting U.L. 508 and UL698A for Industrial Control Panel standards. Individual parts listing will not be accepted. Each panel shall have a registered U.L. label attached.

C. All the equipment specified herein is intended to be standard equipment for pumping all material in normal domestic wastewater.

1.03 QUALIFICATIONS

A. The CONTRACTOR and manufacturers shall assume responsibility for the satisfactory installation and operation of the entire pumping system including pumps, motors, pump controllers, and other auxiliary equipment and materials as specified.

B. The pumps covered by these Specifications are intended to be standard pumping equipment of proven ability as manufactured by a manufacturer having a minimum of five (5) years experience in the production of such pumps. The pumps furnished shall be designed, constructed and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed. Pumps shall be tested in accordance with the Hydraulic Institute Standards.

C. All equipment furnished under this Specification shall be new and unused, shall be the standard product of manufacturers having a successful record of manufacturing and servicing the equipment and systems specified herein for a minimum of five (5) years.

D. The submersible pumps Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary

1.04 SUBMITTALS

A. Submittals shall include the following at a minimum:

1. Complete system layout and erection drawings showing all details of construction, including dimensions and anchor bolt locations.

2. Materials of construction list for all system components.

3. Descriptive literature, bulletins, and/or catalogs of the equipment.

4. Data on the characteristics and performance of each size pump. Data shall include guaranteed performance curves, based on actual shop tests of duplicate units, which show that they meet the specified requirements for head, capacity, efficiency, and horsepower. Factory certified curves shall be submitted on 8 1/2-inch by 11 -inch sheets. Curves shall be plotted from zero flow at shut off head to pump capacity at minimum specified total dynamic head. Professional Engineer of Record's Calculated System Curve shall be plotted against Pump Curve.

5. The total weight of the equipment including the weight of the single largest item.

6. A complete total bill of materials for all equipment.

7. A list of the manufacturer's recommended spare parts. Include gaskets, packing, etc. on the list. List bearings by the bearing manufacturer's numbers.

8. Complete mechanical and electrical data on the motor.

9. Shop and erection drawings for the controls shall be submitted showing all details of construction, dimensions, anchor bolt locations, dead front panel layouts, sub-dead front panel layouts, etc. The submittal shall also include a layout of panel penetrations for connections of the required conduits. The Drawings shall be certified by the panel supplier.

10. Wiring diagrams and ladder diagrams shall be submitted and certified by panel supplier.

1.05 OPERATING INSTRUCTIONS

A. Copies of an operating and maintenance manual for the pumps, motors, and controls shall be furnished to the ENGINEER. The manuals shall be prepared specifically for this installation and shall include all required catalog cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operating and maintenance personnel unfamiliar with such equipment.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All parts shall be so designed and proportioned as to have adequate strength, and stiffness and to be especially adapted for the work to be done.

B. Stainless steel nameplates giving the name of the manufacturer, the rated capacity, head, speed, serial number, model number, horsepower, voltage, amperes and all other pertinent data shall be attached to each pump.

C. The nameplate ratings for the motors shall not be exceeded, nor shall the design service factor be reduced when its pump is operating at any point on its characteristic curve at maximum speed.

2.02 SUBMERSIBLE PUMPS – GENERAL

A. At each station, the CONTRACTOR shall furnish and install two submersible non-clog wastewater pumps with a submersible electric motor connected for operation on the phase and voltage as shown on the drawings, 60 hertz, with sufficient length of submersible cable to reach the junction box and suitable for submersible pump applications for the flow and total dynamic head conditions described in the plans. Pumps shall be 3-phase, 60 Hertz, 230/460 Volt (3/60/230) connected for 230 volt operation. The power cable shall be sized according to NEC and ICEA standards. Each pump shall be supplied with a mating cast iron discharge connection.

B. Pumps shall be capable of handling raw, unscreened sewage. The design shall be such that pumping units will be automatically connected to the discharge piping when lowered into place on the discharge connection. The pumps shall be easily removable for inspection or service, requiring no bolts, nuts or other fastenings to be removed for this purpose, and no need for personnel to enter pump well.

C. A sliding guide bracket consisting of two 304 stainless steel rails shall be an integral part of the pumping unit and the pump casing shall have a machined connecting flange to connect with the cast iron discharge connection, which shall be bolted to the floor of the sump and so designed as to receive the pump connecting flange without the need of any bolts or nuts.

D. Sealing of the pumping unit to the discharge connection shall be accomplished by a simple linear downward motion of the pump with the entire weight of the pumping unit guided to and pressing tightly against the discharge connection; no portion of the pump shall bear directly on the floor of the sump and no rotary motion of the pump shall be required for sealing.

E. Each pump shall be automatically and firmly connected to the discharge connection, guided by no less than two 304 stainless steel guide bars extending from the top of the station to the discharge connection. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal-to-metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable.

2.03 PUMP CONSTRUCTION

A. Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer and a polyester resin paint finish on the exterior of the pump.

B. Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

C. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

2.04 COOLING SYSTEM

A. Motors shall be designed such that they are sufficiently cooled by the surrounding environment or pumped media.

2.05 CABLE ENTRY SEAL

A. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

2.06 MOTOR

A. The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The motor shall be designed for NEC Class I Div I, Groups C&D. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31.The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The motor shall be capable of withstanding at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.

B. The junction chamber containing the terminal board or wire connectors, shall be hermetically sealed from the motor by an elastomer compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts or wire nuts. The motor and pump shall be designed and assembled by the same manufacturer.

C. The motor service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 104°F (40°C) ambient and shall have a NEMA Class B maximum operating rise of 176°F (80°C). A motor performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

D. The pump and motor shaft shall be the same unit. The pump shaft shall be an extension of the motor shaft. Couplings shall not be accessible. The shaft shall be AISI Type 420 stainless steel and shall be completely isolated from the pumped liquid.

E. The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out. Required motor horsepower shall not exceed the horsepower as shown on the drawings. The pump head curve shall slope in one direction (always negative slope) with no points of inflection capable of causing hunting at the pump operation speed.

2.07 BEARINGS

A. The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease or oil lubricated. The calculated L10 bearing life rating shall be 50,000 hours minimum. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. Single row lower bearings are not acceptable.

2.08 MECHANICAL SEAL

A. Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide seal ring. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.

B. Each pump shall be provided with an oil chamber for the shaft sealing system. The oil chamber shall be designed to prevent overfilling and to provide oil expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load.

2.09 IMPELLER

A. The impeller shall be of gray cast iron, ASTM A-48 Class 35B, dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The screw-shaped leading edges of the impeller shall be hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The Impeller shall be locked to the shaft, held by an impeller bolt and treated with a corrosion inhibitor.

2.10 VOLUTE

A. The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have integral spiral-

shaped, sharp-edged groove(s) that is cast into the suction cover. The spiral groove(s) shall provide the sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The internal volute bottom shall provide effective sealing between the multi-vane semi-open impeller and the volute.

2.11 PROTECTION

A. All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 125°C (260°F) the thermal switches shall open, stop the motor and activate an alarm.

B. A leakage sensor shall be provided to detect water in the stator chamber. The Float Leakage Sensor (FLS) will be connected to a control unit providing a contact to stop the motor and send an alarm. (USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 125°C (260°F) SHALL NOT BE ALLOWED)

C. Monitoring unit for the above sensors shall be supplied by the pump manufacturer. The monitoring unit shall be designed to mount flush in the control panel below and shall be equipped with separate lights to indicate each alarm condition. Power shall be 120 VAC, 60 Hz.

D. The pump system including the pump, motor and power cables, and float cable assembly shall be explosion proof, and shall be approved for use in areas classified as hazardous locations in accordance with the NEC Class 1, Div. 1, Group C and D service as determined and approved by a U.S. nationally recognized testing laboratory (U.L., FM, CSA) at the time of the bidding of the project. As required by Factory Mutual (FM) the motor shall be capable of operating in pumped media up to 104°F. Motor thermal switches shall monitor and protect the motor from excessive temperature. An internal Float Switch or seal probe shall be provided in the motor chamber. Service of explosion-proof submersible units shall be performed by qualified Factory Mutual experienced personnel. The pump manufacturer must provide training schools to qualify personnel in the proper service and repair of explosion-proof pumps.

2.12 ACCESS FRAMES AND CABLE HOLDERS

A. The pump station wet well access cover shall be Heavy Duty construction – 300 PSF load rating in accordance with O.S.H.A standard 1910.23 and a confined space entry safety device shall be in accordance with O.S.H.A standard 1910.146. The covers shall be sized as required for the removal of the pumps using the stainless steel guide rails in a continuous and effortless motion. The access cover with confined space entry safety device shall allow visual inspections, limited maintenance and level system adjustment while safety grate is left in place. The confined space entry safety device shall be orange in color to promote a visual awareness of the hazard. The material of the access cover bars, angles, and extrusions shall be 6061-T6. The diamond deck plate shall be constructed of 5086 aluminum. The access frame and bearing plate shall be cast into the concrete. Each access cover with safety device shall be supplied with a heavy duty, stainless steel, pneu-spring for ease of operation when opening. The grate shall be counter-balanced for ease of opening. Each unit shall be equipped with a 316 stainless steel hold open arm and shall lock in the 90 degree position. The aluminum lift handle shall be recessed and the slam-lock assembly will be fitted to the deck plate. A special key for the slam lock will be provided.

B. The pump station valve pit access cover shall be Heavy Duty construction – 300 PSF load rating in accordance with O.S.H.A standard 1910.23. The covers shall be sized as shown on the plans. The material of the access cover bars, angles, and extrusions shall be 6061-T6. The diamond

deck plate shall be constructed of 5086 aluminum. The access frame and bearing plate shall be cast into the concrete.

Each unit shall be equipped with a 316 stainless steel hold open arm and shall lock in the 90 degree position. The aluminum lift handle shall be recessed and the slam-lock assembly will be fitted to the deck plate. A special key for the slam lock will be provided.

C. Stainless steel cable holders including the cable hooks shall be fabricated from type 316 stainless steel plate. Sharp corners and edges shall be ground smooth to prevent abrasion and cutting of electrical cable insulation. The cable holder shall be of sufficient length and strength to provide support for each separate cable, except that the pump power and lift cables may use the same hook position, provided the cables do not foul one another and the lift cable is easily accessed from the hatch opening.

2.13 CONTROL EQUIPMENT – GENERAL

A. The contractor shall furnish and install a Solid State Pump Control System designed to operate sewage pumps in a sewage lift station as described herein. The utility power supply at the pump station shall be for the voltage and phase as shown on the plans. The duplex submersible pump motors shall be rated at the horsepower as shown on the plans, 8.2 FLA's each and shall be equipped with high temperature sensors and internal probes to detect the presence of moisture inside the motor housing.

B. The Solid State Control System shall be designed to operate two submersible pumps based on level in the wet well. Float level sensors shall be used to monitor the level in the wet well. Four normally open float level sensors shall be required for automatic operation of the duplex pump station. The control panel shall be designed for the float level sensor system to operate on 120 VAC, to provide the following functions; stop pumps, start lead pump, start lag pump, and high level alarm. The panel shall require intrinsically safe components for interface with wet well level sensors, built-in pump motor temperature and seal sensors, and to meet control requirements.

C. The Solid State Control system shall be a logic control unit with a multi-line alphanumeric display with 18 front panel input keys provided for operator interface with the CPU. The Solid State Control System shall be pre-programmed to operate 2 pumps in a duplex float panel configuration. The Solid State Control System shall be a standard product of the manufacture and shall not require any in field programming changes to be made.

D. The operator shall be able to view all system status and alarms on the Solid State Control System display and shall be able to input his operational choices via the systems function keys. Eight (8), user friendly, display screens shall be available to the operator to allow him to be aware of and monitor the control systems current operational status.

E. Pump Control System as manufactured Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

F. Electrical equipment, materials and workmanship shall comply with all applicable codes, safety and fire law regulations at the location of the work and shall conform to applicable codes and standards of the organizations listed below.

1. Institute of Electrical and Electronic Engineers (IEEE)
2. National Electric Code (NEC)
3. International Electrotechnical Commission (IEC)
4. American National Standards Institute (ANSI)

5. Underwriters Laboratories (UL-08A)

G. All equipment and materials shall be new and shall bear the manufacturers name and trade name. In cases where the standard has been established for the particular material, the material shall be so labeled. The equipment to be furnished shall essentially be the standard product of a manufacturer regularly engaged in the production of the required type of equipment for this type of work and shall be the manufacturers latest approved design. Equipment and material shall be suitably delivered and stored and shall be readily accessible for inspection. All items subject to moisture damage shall be stored in dry spaces. All material and equipment shall be protected against dirt, dust, water and chemical or mechanical injury, vandalism and theft.

H. The Duplex Pump Controller shall be capable of operating at the horsepower as shown on the plans, 8.2 FLA pumps in a constant speed mode in order to convey sewage to the next Pump Station without causing a sewage over-flow, regardless of system demands.

I. The available input power shall be for the amperage, voltage and phase as shown on the plans 4 wire, 60 HZ and is supplied from a 30 KVA, 2% impedance 2 transformer bank with grounded open Delta secondary winding configuration.

2.14 PUMP CONTROLLER

2.14-1 GENERAL

A. The system controller shall supervise all sequencing, pump combinations, non-critical annunciation, system testing, system monitoring and back-up systems, and overall system status and control for the station wetwell and sumps.

B. The pump controller system shall be a complete system. The Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary

C. At low wet well levels, the lead pump shall operate alone and maintain adequate control of the wet well. If the wet well level continues to rise and reaches the lag pump start level the lag pump will start and work with the lead pump in gaining control of the wet well. If the wet well continues to rise further a high level alarm will be activated.

D. On decreasing wet well level, the pump sequence will reverse and the pumps will shut off in reverse starting order. As the wet well level decreases and the stop lag pump level is reached the lag pump will be stopped. The lead, will continue to run until the level decreases sufficiently to reach the stop lead pump level. Once the lead stop pump level has been reached the lead pump will be stopped.

2.14-2 EQUIPMENT DESCRIPTION

A. Circuit Breakers

1. Circuit breakers shall have a quick make and break operator mechanism. The handle position shall indicate on, off, or tripped.

2. Pump motor breakers shall be sized per NEC.

3. A padlock provisions shall be provided to lock the circuit breaker in the Off position.

4. Provide 3-20 amp, 1 pole breakers for 120 volt service to lights, receptacle, and spare.

5. Provide 1-15 amp, 1 pole breaker for 120 volt control power.

B. Motor Control (Starters, Contactors)

1. All contactors shall be NEMA size 1 minimum; HP rated, and bear a U.L. listed label.

2. Minimum short circuit current withstand shall be (10,000 interrupting amps @ 480V or 22,000 interrupting amps @ 240 V) symmetrical amps or as indicated on drawings.

3. Mechanical and electrical interlocks will be provided whenever two contactors are connected to any electrical component or motor and the possibility exists for equipment damage or personnel injury.

4. A minimum of 2 (1 N.O.-1 N.C.) auxiliary contacts shall be provided for each starter or contactor.

5. Overload heaters must be of the bimetallic type and shall be ambient compensated.

6. Unit Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

C. Relays

1. Relays shall be of the plug-in design and have a transparent, polycarbonate dust cover to protect the contact surfaces from airborn dust and other contaminants. All relays shall have 4PDT or DPDT contacts and a molded nylon coil rated for continuous duty operation on 24 and 120 VAC. Relay contacts shall be rated for 10A at 300VAC with .187 quick connect terminals.

2. Time-delay relays shall be of the plug-in design and have a dust cover to protect the contact surfaces from airborne dust and other contaminants. Time-delay relays shall operate on 24 or 120VAC and shall have DPDT contacts rated at 10A. The timing function shall incorporate CMOS technology with two selectable timing ranges. The timing ranges shall be (0.06-160 seconds) and (15 seconds-640 minutes). The time-delay relay shall be provided with a red LED for output contact status. Time-delay relay sockets shall be of the octal design and have screw terminals with self-lifting clamps. Terminal identification numbers shall be provided in the sockets.

D. Control Circuit Transformer

1. Nominal control voltage not to exceed 120V.
2. Control power transformers (CPT) shall be mounted inside the enclosure.

3. Overcurrent protection shall be supplied on both the line and load sides. Line protection for all step-down transformers shall be provided.

4. Provide CPT for electric services other than 120/240 volt 1 phase, 3 wire; 120/240 volt 3 phase, 4 wire or 120/208 volt 3 phase, 4 wire.

5. Transformers to be sized for a minimum of 25% extra capacity under full load conditions. Minimum size shall be 2 KVA.

6. One secondary line shall be grounded for operator safety.

7. Transformers Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

E. Surge Protection

1. Line-to-line and line-to-ground protection shall be provided. This protection shall exceed the requirements of ANSI/IEEE standard C62.1-1984 section 8.6.1 and 8.7.3 by a factor of at least 300%.

2. Voltage clamping time shall be less than 5 nanoseconds with a maximum surge current of 30,000A RMS at a clamping voltage 552VAC.
3. Clamping voltage levels shall be specifically sized for the applied system voltage as well as the winding and grounding configuration of the supply transformer. These voltage levels will be chosen to assure minimizing system voltage excursion.

4. One surge arrestor shall be supplied at the incoming service to the control panel.

F. Lighting Arrestor

1. Line-to-line and line-to-ground protection Intermatic AG-6503 shall be provided. This protection shall exceed the requirements of ANSI/IEEE standard C62.1-1984 section 8.6.1 and 8.7.3 by a factor of at least 300%.

2. Voltage clamping time shall be less than 5 nanoseconds with a maximum surge current of 30,000A RMS at a clamping voltage 552VAC.

3. Clamping voltage levels shall be specifically sized for the applied system voltage as well as the winding and grounding configuration of the supply transformer. These voltage levels will be chosen to assure minimizing system voltage excursion.

4. One lighting arrestor shall be supplied on each line of the incoming service to the control panel.

G. Phase Monitor Relay

1. The three phase monitor relay shall be connected to the power input terminals. The unit shall have a LED indicator which shall illuminate when the power conditions are normal.
2. During periods of phase imbalance, loss of phase, or low voltage the phase monitor shall deactivate and shut down the pump motors. The phase monitor shall automatically reset upon restoration of normal power conditions.

H. Seal Failure Relays

1. The pump manufacturer shall supply relays to sense seal failure in the pumps as noted above. The controls manufacturer shall install, wire and test the system.

2. Upon activation, the seal failure relay shall not shut down the pump but shall illuminate a red pilot light located on the inner door that shall correspond to the appropriate pump.

3. The moisture sensing probes shall be supplied and installed in the pumps by the pump manufacturer.

I. Over Temperature Sensing Relays

1. Pump over temperature sensors located in the pump motor shall be supplied for each pump.

2. A red pilot light and reset push button for each pump motor shall be supplied and located on the inner door.

3. When activated, the appropriate pilot light shall illuminate and the associated pump shall not be allowed to run.

J. Radio System - Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary

1. The Radio shall have point to multipoint 2 way communications capability. The radio shall have high receive sensitivity for noisy environments and long distances and must be compatible with multiple industry protocols including Modbus and DNP3.

2. The yagi antenna shall be suitable for operation in the 890-960 MHz band. The internal balun, coax feed and connector shall be sealed in a foam potting system to prevent moisture penetration and assure long service life in a severe environmental environment.

3. A coaxial cable (length required with connectors) for the Yagi Antenna, manufactured with corrugated ½ inch copper and insulated with low density foam shall be supplied with the antenna.

K. Industrial Uninterruptible Power Supply (UPS) - Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary

1. The UPS shall have networking capabilities that allow the end user to remotely monitor the status of the individual UPS device.

L. Slim-View Solid State Control System - Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary

1. The Slim-View Solid State Control System shall provide the automatic control as well as the alternation of the pump station pumps in order to maintain pump down control of the wet-well. The float control system shall sense the wet-well level through remote, level sensing float switches. Floats shall be mounted in the wet-well in a manner that precludes anything from obstructing the full travel of the float, including but not limited to the other floats.

2. Four float switches shall be provided for pumps off level, lead pump on level, lag pump on level and high level alarm level.

3. Terminal blocks shall be provided for each separate float switch connection and other remote devices if applicable.

4. The main screen shall display the overall pump status of the control system.

5. The screen shall display the call to run condition of each pump by indicating yes or no next to the pumps position and the pump run condition of each pump by indicating yes or no next to each pump number.

6. The Main Screen shall display an Allow Pumping condition.

8. The Allow Pumping condition shall be determined, by the wet well level, in relationship to the stop float level. The display shall display a yes or no next to the Allow Pumping condition based on the level being above or below the stop pump float level.

9. The Analog-Display Screen shall display the value of any single analog input wired to the Slim-View, Control System.

10. The Pump #1 Status Screen shall indicate if Pump #1 has been designated the lead or lag pump. The screen shall indicate the run condition of the pump by indicating if the pump is running or stopped.

11. The Pump #2 Status Screen shall indicate if Pump #2 has been designated the lead or lag pump. The screen shall indicate the run condition of the pump by indicating if the pump is running or stopped.

12. The Pump #1 Alarm Screen shall display detailed alarm text for Pump #1.

13. The Pump #2 Alarm Screen shall display detailed alarm text for Pump #2.

14. The Float Alarm Screen shall display alarm text for a float alarm. The screen shall direct the operator to manually reset the alarm by pressing the alarm reset button on the screen. The Float out of sequence alarm shall not be re-settable until all floats are deactivated and hanging free.

15. The Alternation Set-Up Screen shall display the options of either Automatic or Manual alternation. The operator shall be able to select the type of preferred alternation by selecting yes or no next to alternation. The type of selected alternation shall be displayed on the screen.

M. Float Switches

1. Float Switches shall manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary. The switch contact shall not be affected by rotation of float about its longitudinal axis and shall be specifically designed for operation with the intrinsically safe relays.

2. The float switch shall be supplied with neoprene jacketed control cable of sufficient length to reach the Control Panel without splicing. Verify locations of the Control Panel and wet well depth for exact lengths of cable and operation.

3. Installation of the float system shall be as noted on the Drawings and/or as directed herein.

4. Float switches shall be protected by intrinsically safe relays with lighted indicators and test pushbuttons mounted in the control panel. The system shall auto reset after power outages and/or spurious signals. This system shall be suitable for operation in wet wells with the control panel remotely located as shown on the drawings. An input suppression network shall be provided as required for proper operation.

5. Intrinsically safe relays shall be provided for each float switch used in the control scheme.

N. Elapsed Time Meter

1. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

2. The hour meter shall be sealed against the environment to provide years of service.

O. Alarm Horn

1. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

2. Horn shall be suitable for NEMA 4X installations.

P. Alarm Beacon

1. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary and shall be suitable for 120-volt operation and rated for NEMA 4X installation.

2. The alarm beacon is to be mounted on top of the Control Panel when visible from the street. Mount on NEMA 4X outlet with ¾" RGS conduit extension where required to be visible from the street.

Q. Power Supply

1. The power supply shall be rated for 120 volt input, 30-watt, 24 VAC, 1.3-amp output.
2. The power supply shall be IDEC PS5R-C24.

R. Thermostat

1. The Control Panel space heater thermostat Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary and shall be set at 40 degrees F.

2. Provide two (2) 35-watt space heaters suitable for 120-volt operation.

S. UPS Power Supply

1. The UPS power supply Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

2. The power supply shall be rated 500 Volt Amperes, 325 watts, 120-volt.

T. Interface Signal Converter

1. The interface signal converter Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.
2. The converter shall be rated 24VOC, 85 mA.

U. Mini-Cas Unit

1. The Mini-Cas unit Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

2. The unit shall be rated for 24 VAC/120VAC

V. Recircuit Thermal Circuit Breaker

1. The recircuit breakers Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

2. Recircuit ratings shall be 24VAC, 3 Amps.

W. Overload Heater Pack

1. The overloads Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

2. Rating shall match motor full load amp ratings.

X. Low Voltage Control Transformer

1. Transformers Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

2. Transformers shall be rated 120/24 VAC, 50 VA or as required.

Y. Fuses

1. Fuses Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

2. Phase Monitor Fuses – ATQR 1/8

3. Slimview Fuses – TRM 1/2

2.15 INDICATION & ANNUNCIATION

A. The Control Panel shall house pump no. 1 and no. 2 elapsed time meters, red over temperature pilot lights, amber seal failure pilot lights, reset push switches, red overload pilot lights, green run lights, and hand/off/auto switches.

B. The duplex pump control and annunciator panel shall be mounted on the inner door of the enclosure.

2.16 ENCLOSURES

A. The maximum size of the control panel enclosure shall be (48"Hx36"Wx12"D). The enclosure shall be modified NEMA type 4X which is designed to house electrical and electronic equipment. The enclosure shall be of the type for use outdoors to provide a degree of protection against falling rain and sleet and shall remain undamaged by the formation of ice on the enclosure. Delete screw clips that secure the outer door and provide door holder.

B. The material used for construction shall be type 304 stainless steel, with a minimum thickness of 14 gage for the control panel. All seams shall be continuously welded and the welds will be ground to present an attractive appearance. Body stiffeners shall be welded into the enclosure to further insure a rigid construction. The integrity of the door seal shall be assured by using an oil-resistant gasket, bonded to the inside of the doors with an oil-resistant adhesive, and held in place by steel retaining strips. The door seal shall be made complete by using a three point latching mechanism, operated by an oil-tight, key-locking handle.

C. The 3-20/1 and 1-15/1 circuit breakers, 2 motor circuit breakers, slim view controller and instructions, duplex pump control and annunciator panel and pump overload reset shall be mounted on the inner door.

D. The maximum size of the terminal junction box (TJB) shall be 24" x 24" x 10". The enclosure shall be NEMA type 4X with power and control terminal blocks to terminate the pump power cables, pump control cables, and float control cables.

E. The TJB shall be constructed of Type 304 stainless steel with a minimum thickness of 14 gauge and constructed same as the control panel.

F. Enclosures Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

2.17 MANUFACTURER'S EXPERIENCE

A. The manufacturer of the control system shall be certified by Underwriters Laboratories (UL) as being a UL 508 and 698A listed systems panel manufacture certified to install a serialized label for quality control and insurance liability considerations.

B. The manufacturer of the control system must submit documentation verifying at least 10 years of experience in manufacturing constant speed control systems of a similar size and scope.

C. The manufacturer of the control system must submit to the Consulting Engineer documentation proving experience in successfully designing and manufacturing at least 10 similar systems of a similar scope.

2.18 MANUFACTURER'S QUALITY CONTROL

A. The complete control system, shall be functionally tested at the manufacturer's facility and certified as a complete system to assure proper operation per specification in order to minimize costly field changes.

B. All components must be mounted with stainless steel hardware.

C. Manufacturers listed in this specification do not constitute approval. All controls must have the capabilities and functions as outlined in the following paragraphs.

D. All components that make up the system shall meet UL (Underwriters Labatories) standards and bear a UL label. The system enclosure shall also bear the UL label certifying that the system meets all UL requirements.

2.19 SUBSTITUTIONS

A. The Engineer will consider proposals for substitution of materials, equipment, methods, and services only when such proposals are accompanied by full and complete technical data and all other information required by the Engineer for the proposed substitution.

B. Substitution of materials, equipment, methods, and/or services is not allowed unless such substitution has been specifically approved by the Engineer.

C. Do not assume that any materials, equipment, methods, or services will be approved as equal unless the item has been specifically pre-approved by the Engineer.

2.20 SHOP DRAWINGS

A. All drawings are to be of "computer generated" class, 8.5" x 11" in size, and bound.

B. All equipment and materials shall be new and shall be specifically designed for the function herein.

C. Approval for fabrication and installation will be made only after submittal and review of all shop Contract Documents. The minimum information required for approval shall include four (4) sets of the following.

1. Computer generated, 3-line electrical diagram of the power and control system.

2. Complete electrical schematics detailing every wire and connection within the system as well as all field connections.

3. Bill of material and product data sheets on all components.

4. Detailed drawings of the enclosure (size, construction, entry/exit, and mounting).

5. Exploded detail of every face plate, light, switch or arrestor mounted on the exterior of the enclosure.

2.21 RECORD DOCUMENTS

A. Four (4) sets of "Shop Drawings" shall be supplied and marked in colored ink as depicting "As-built" conditions. These are to include any field modifications made by the authorized start-up personnel during installation, start-up, or testing.

B. Original copy of the final Q.C. report.

C. Operation and Maintenance Manuals: the control system manufacturer shall supply 4 sets of complete and detailed operation and maintenance manuals prepared for this system.

2.22 WARRANTIES

A. All guarantees implied or stated by the control system manufacturer shall be passed in full force to the Owner. The manufacturer of the control system shall warrant all components in the system for unit responsibility purposes.

B. As a minimum, all components in the specified control system shall carry a comprehensive, thirty-six (36) month guarantee against defects in workmanship and material from the date of final inspection and acceptance by the Owner.

2.23 EQUIPMENT IDENTIFICATION

A. All electrical equipment shall be identified in accordance with these specifications.

B. All identification labels, both within the enclosure and external, shall be laser-screened laminated mylar.

C. All control wiring shall be numbered on each termination.

D. Screw-in type, engraved nameplates or laser-screened laminated mylar shall be provided to identify all individually mounted push buttons, rocker switches, lights, meters, disconnect switches, circuit breakers, motor starters, transformers, relays, fuses, phase monitors, surge arrestors, and any other equipment for which identification is required for eventual service or replacement. This includes the appropriate equipment within the cabinet. Embossed tape is not acceptable.

2.24 TOOLS AND SPARE PARTS

A. One set of all special tools required for normal operation and maintenance shall be provided. All such tools shall be furnished in a suitable steel tool chest complete with lock and duplicate keys.

B. A complete set of manufacturer's recommended spare parts shall be provided with each pump. Spare parts shall include at least one set of mechanical seals, one set of 0-rings, and one set of bearings for each pump supplied under this Specification.

C. All spare parts shall be properly protected for long periods of storage and packed in containers which are clearly identified with indelible markings as to the contents.

2.25 PRODUCT HANDLING

A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation.

B. All equipment and parts must be properly protected against any damage during a prolonged storage period at the site.

C. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the ENGINEER.

D. Finished surfaces of all exposed pump openings shall be protected by wooden blanks, strongly built and securely bolted thereto.

E. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

F. After hydrostatic or other tests have been completed, all entrapped water shall be drained prior to shipment and proper care shall be taken to protect parts from the entrance of water during shipment, storage, and handling.

G. Each box or package shall be properly marked to show its net weight in addition to its contents.

2.26 SCADA SYSTEM

Station shall be equipped with SCADA System. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall be in strict accordance with the manufacturer's instructions and recommendations. Installation shall include furnishing the required oil and grease for initial operation. The grades of oil and grease shall be in accordance with the manufacturer's recommendations. Anchor bolts shall be set by the CONTRACTOR in accordance with the manufacturer's recommendations.

B. The CONTACTOR shall supply all anchor bolts, temporary life equipment, power, water, labor, and all other incidentals required for the proper installation of the pumps.

3.02 SURFACE PREPARATION AND SHOP PAINTING

A. Before exposure to weather and prior to shop painting, all surfaces shall be thoroughly cleaned, dried, and free from all mill-scale, rust, grease, dirt, and other foreign matter.

B. All pumps and motors shall be shop coated.

C. All nameplates shall be properly protected during painting.

D. Gears, bearing surfaces, and other similar surfaces obviously not to be painted shall be given a heavy shop coat of grease or other suitable rust-resistant coating. This coating shall be maintained as necessary to prevent corrosion during periods of storage and erection and shall be satisfactory to the ENGINEER up to the time of the final acceptance test.

3.03 INSPECTION AND TESTING

A. Furnish the services of factory representative of the pump manufacturer for a

minimum of two 8-hour days who has complete knowledge of proper operation and maintenance to inspect the final installation and supervise a test run of the equipment. Furnish the services of a factory representative of the control system manufacturer for the same period of time to inspect and test his controls.

B. After all pumps have been completely installed and working, under the direction of the manufacturer, conduct in the presence of the ENGINEER, such tests as are necessary to indicate that pump discharge conforms to the Specifications. Field tests shall include all pumps supplied under this Section. Supply all electric power, water or wastewater, labor, equipment, and incidentals required to complete the field test.
The Final Acceptance Test shall demonstrate that all items of these Specifications have been met by the equipment as installed and shall include, but not be limited to, the following tests:

1. The quick release lift out feature functions properly and allows the pump to be raised and lowered without draining the pit.
2. That all units have been properly installed and are in correct alignment.
3. That the units operate without overheating or overloading any parts and without objectionable vibrations.
4. That there are no mechanical defects in any of the parts.
5. That the pumps can deliver the specified pressure and quantity.
6. That the pumps shall be capable of pumping raw, unscreened sewage.
7. That the pump sensors and controls perform satisfactorily as to the sequence control, correct start and stop elevations, and proper high level alarm functions.

C. If the pump performance does not meet the Specifications, corrective measures shall be taken by the CONTRACTOR, or pumps shall be removed and replaced with pumps which satisfy the conditions specified. A 24-hour operating period of the pumps will be required before acceptance. During this 24-hour operating period, the CONTRACTOR shall supply all power, water, labor, equipment, and incidentals necessary.

D. Furnish the services of a factory representative for a minimum of one 8-hour day for operator training.

E. CONTROL SYSTEM TESTING

At least two weeks prior to substantial completion the panel manufacture and the contractor shall submit a proposed test procedure to the ENGINEER for approval. The proposal shall be designed to completely check out all components and control sequences point by point during a formal test. Each part of the test shall be completely documented and each part shall be signed off in the presence of the ENGINEER. CONTRACTOR shall supply all equipment and labor necessary to complete all testing and correct all defects to the satisfaction of the ENGINEER.

END OF SECTION

PART IX

MISCELLANEOUS CONSTRUCTION

SECTION 901
EXCAVATION, BACKFILLING, AND COMPACTION
FOR SANITARY SEWERS, RELATED STRUCTURES AND AREAS THAT WILL BE TURNED OVER FOR PUBLIC MAINTENANCE

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Work shall include, but not necessarily be limited to, excavation and trenching operations to install pipe, manholes, pump stations, and other structures and all related work such as shoring, bracing, water handling, and miscellaneous clearing and grubbing; filling and grading under and around sanitary sewer structures; and all backfilling, compaction, grading, import of backfill material, disposal of surplus and unsuitable materials.

B. All work shall be performed in compliance with L.R.S. 40:1749.11-22, "Louisiana Underground Utilities and Facilities Damage Prevention Law", OSHA regulations and applicable codes, ordinances, and standards of governing authorities having jurisdiction.

C. Open excavations, including incomplete manholes and pump stations, shall be barricaded and posted with operating warning lights in accordance with Federal, State and local requirements.

D. Public and private structures, utilities, driveways, sidewalks, pavements, and other facilities shall be protected from damage caused by settlement, lateral movement, undermining washout, construction activities, and other hazards created by these operations. All settlement or other damage caused by the Contractor's operations shall be repaired within 7 days, or the facilities shall be replaced, at the Contractor's sole expense and at the discretion and direction of the Engineer. This includes the warranty period as well.

PART 2 - PRODUCTS

2.01 MATERIALS

A. **General:** At the request of the City of Zachary, the Contractor shall give notice of the source of each material. At the request of the City of Zachary, the Contractor shall test a representative sample of each material weighing approximately fifty (50) pounds, at least ten (10) calendar days prior to the date of anticipated use of such material. Materials shall be furnished as required from approved off-site sources and hauled to the site.

B. **Sand-Clay-Gravel Materials:** Material shall be a sand-aggregate mixture. The aggregate shall be free of angular stones that could score, crack, or puncture the pipe. The sand-aggregate mixture shall meet the following gradation:

Sieve Size	Percent Passing
1-1/2 inch	95-100
No. 4	30-50
No. 10	20-45
No. 200	0-10

C. **Usable Excavated Soils:** Usable excavated soils shall have a maximum PI of 25 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 will not be allowed. Soil shall be tested at Owner's option by the Owner's testing lab. 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 or adjoining property owners.

D. **#610 Stone Backfill:** The 610 Stone shall be one hundred percent quarried material. The stone shall pass the ASTM soundness test and abrasion test. Soundness loss shall not exceed fifteen percent when subjected to five cycles of
the magnesium sulfate soundness test in accordance with AASHTO 104. The stone shall show an abrasion loss of not more than forty percent when tested in accordance with AASHTO 96. The 610 Stone backfill shall meet the following gradation:

Sieve Size	Percent Passing
1-1/2 inch	100
1 inch	90-100
3/4 inch	70-100
No. 4	35-65
No. 40	12-32
No. 200	5-12

E. **#57 Stone Backfill:** The stone shall be one hundred percent quarried material. The stone shall pass the ASTM soundness test and abrasion test. Soundness loss shall not exceed fifteen percent when subjected to five cycles of the magnesium sulfate soundness test in accordance with AASHTO 104. The stone shall show an abrasion loss of not more than forty percent when tested in accordance with AASHTO 96. The 57 Stone backfill shall meet the following gradation:

Sieve Size	Percent Passing
1-1/2 inch	100
1 inch	90-100
1/2 inch	25-60
No. 4	0-10
No. 8	0-5
No. 200	0-1

F. **Other Approved Granular Material:** Granular material shall be non-plastic and siliceous material, and shall comply with the following gradation:

Sieve Size	Percent Passing
1/2 inch	100
No. 10	75-100
No. 200	0-10

G. **Imported Clay Fill:** Where shown on the Drawings or as directed by the Engineer, clay shall be imported from a borrow site approved by the Engineer. Soils meeting the Unified Soil Classification CL and free of organic material are acceptable clay fill. The clay material shall have the following properties:

i. Maximum Liquid Limit of 50
ii. Maximum Plasticity Index of 30
iii. Organic content less than 5%.

H. **Geotextile Fabric:** The geotextile fabric shall consist of a nonwoven geotextile fabric Class B, C, or D. In trenches requiring the use of aggregate material, this material shall be encapsulated in geotextile fabric. Geotextile fabric shall be class B, C, or D.

I. **Controlled Low-Strength Material (CLSM):** CLSM shall consist of Type I Portland Cement, Class C or F Fly Ash, sand, and water in the following proportion per cubic yard. CLSM shall be used to backfill trenches where the Geotechnical Engineer of Record has determined it is required.

i. Portland Cement	50 pounds
ii. Fly Ash – Class C or F	125 pounds
iii. Sand	2900 pounds
iv. Water	50 to 65 gallons

Mixing and hauling equipment shall conform to Certified Testing Lab Requirements.

J. **Select Imported Material:** Selected soils are 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 will not be allowed. Any select material used to supplement or replace unusable excavated soil shall meet these requirements and must be approved by the Engineer.

K. **Structural Fill:** Structural fill shall be used below spread footing foundations, slab-ongrade floors, and other portions of structures. Acceptable structural fill materials are non-expansive clay with a Plasticity Index between 10 and 25, a maximum Liquid Limit of 45, less than 5% organics, and free of degradable material or debris or as otherwise determined by the Geotechnical Engineer of Record. Well-graded crushed stone aggregate such as an ASTM D1241 gradation C stone may also be acceptable.

L. **Manhole and Pump Station Bedding and Backfill:** Bedding material used below base foundations of manhole and pump station structures shall be #57 stone material, encapsulated in geotextile fabric. The material shall be placed in maximum 12 inch lifts with each lift rodded and vibrated to orient the stone and eliminate voids to create uniform bedding support for the pipe. The manhole and pump station structures shall be backfilled with granular material. In the case of manholes within existing or planned roadways alignments, the granular material shall be placed and compacted to within 2 feet of the surrounding grade, and #610 stone shall be placed and compacted for the remainder of the backfill to surrounding or specified grade. In the case of manholes located in unimproved surface areas, the granular material shall be placed and compacted to within 2 feet of the surrounding grade, and useable excavated soil shall be placed and compacted for the remainder of the backfill to surrounding or specified grade.

2.02 PLACEMENT OF FILL

A. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills.

B. Material placed in fill areas shall be deposited within the lines and to the grades shown on the Plans, making due allowance for settlement/shrinkage of the material. Fill shall be placed only on properly prepared surfaces. If sufficient fill material is not available from excavation on site, the Contractor shall provide select material as may be required.

C. Fill shall be brought up in substantially level loose lifts of maximum of eight (8) inches in depth and compacted throughout the site, starting in the deepest portion of the fill. During the process of dumping and spreading, all roots, debris, and other objectionable material shall be removed from the fill areas. The entire surface of the Work shall be maintained free from ruts and in such condition that construction equipment can readily travel over any section. All fill materials shall be placed and compacted "in-the-dry."

D. Where trench backfill and compaction work is following pipe laying or where the entire area of the backfilling cannot be completed with full area lifts, the trench backfill will be benched.

1. Benches shall be a maximum of three lifts tall.
2. Benches shall be separated by a minimum 8 foot horizontal distance.

E. If the compacted surface of any layer of material is determined to be too smooth to bond properly with the succeeding layer, it shall be loosened by harrowing or by another approved method before the succeeding layer is placed.

F. Fill shall not be placed against concrete structures until they have been in place a minimum of fourteen (14) days or have been shown to reach a minimum of 75% of their design compressive strength.

PART 3 - EXECUTION

3.01 EXCAVATIONS

Consists of removal and handling of material encountered when establishing required grade elevations in accordance with the Contract Documents.

A. **Trench Excavation:** Excavation of trenches required for the installation of pipes and ducts shall be made to the depths required to accommodate placement of bedding material.

B. **Additional Excavation:** When excavation has reached required subgrade elevations, notify the Engineer of Record and the City of Zachary who will make an inspection of conditions. If unsuitable, unsatisfactory bearing materials are encountered at the required subgrade elevation, carry excavation deeper and replace the additional excavated material with #57 Stone wrapped in geotextile fabric or CLSM as directed by the Engineer. Sandaggregate bedding shall then be placed and compacted over the #57 Stone separated by the geotextile fabric or placed and compacted over the CLSM.

C. **Excavation for Pipelines, Manholes, Pump Stations and Structures:** Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 feet, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection, or as shown on the Contract Documents. Care shall be taken not to disturb the bottom of excavation. Trim bottoms to required lines and grades to leave solid base to receive required bedding material. The pipe or duct shall be evenly supported on the bedding material. Bell holes shall be made as required. The bottom of the excavations shall be firm and dry. Sides of excavations are to be maintained in a safe condition until the completion of backfilling.

3.02 SHORING AND BRACING IN EXCAVATIONS

A. The Contractor shall be fully responsible for designing, constructing, and maintaining cofferdams consisting of shoring and bracing, as required, to support the sides of excavations to prevent any movement which could in any way reduce the width of the excavation below that necessary for proper construction, and to protect adjacent structures, existing utilities, and/or foundation material from disturbance, undermining, or other damage. Care shall be taken to prevent voids outside of the shoring, but if voids are formed they shall be immediately filled with suitable material (either useable excavated soils or selected imported material if approved), compacted by hand or mechanical means to condition judged visually comparable to condition of adjoining native soil.

B. All steel trench shoring and bracing not left in place shall be carefully removed in such a manner as not to endanger the construction or other structures, existing utilities, existing piping, or personnel and property. Care shall be taken not to disturb or otherwise injure any finished facility. All voids left or caused by withdrawal of shoring shall be immediately refilled with the corresponding bedding/backfill material as defined herein and rammed/compacted with tools especially adapted for that purpose, by hydraulic compaction, or as otherwise directed.

C. The right of the City of Zachary to order shoring and bracing left in place shall not be construed as creating any obligation on the City of Zachary's part to issue such orders. In addition, the City of Zachary's failure to exercise this right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or on the Work occasioned by negligence or other cause, growing out of a failure on the part of the Contractor to leave in place sufficient shoring and bracing to prevent any caving or moving of the ground.

D. The Contractor may construct the cofferdams and shoring outside the neat lines of the foundation for pipes and manholes, unless indicated otherwise, to the extent deemed desirable for the planned method of operation so long as it does not encroach on areas outside the limits of the Work. Shoring shall be plumb and securely braced and tied in position. Shoring, bracing, and cofferdams shall be adequate to withstand all pressures to which the existing or new structure or excavation will be subjected. Pumping, bracing, and other work within the cofferdam shall be done in a safe manner and shall avoid disturbing any completed construction. The Contractor shall provide the necessary clearances and dimensions to correct any movement or bulging that may occur.

E. The Contractor shall maintain shoring and bracing in excavations regardless of time period excavations will be open, and shall carry down shoring and bracing as excavation progresses.

F. As an alternate to shoring, the Contractor may elect to utilize an OSHA approved mechanical trench box or slide-rail system, the size and construction of which shall be designed for the intended depth/loads. Documentation of the trench box or slide-rail system shall be prepared by the Contractor.

3.03 DEWATERING, DRAINAGE AND FLOTATION

A. The Contractor shall furnish all materials and equipment and perform all work required to install and maintain the drainage systems necessary for handling groundwater and surface water encountered during construction of structures, pipelines, and compacted fills. The Contractor is responsible for providing temporary power for any pumping operation that may be required.

B. The Contractor is responsible for complying with the requirements and obtaining necessary permits of all agencies having jurisdiction and control over use of groundwater and matters affecting well installation, water discharge, and use of existing storm drains and natural water sources. Because

the review and permitting process may be lengthy, the Contractor is required to take early action to pursue and submit for the required approvals so that construction is not delayed.

C. It shall be the Contractor's responsibility to prepare detailed drawings and design calculations descriptive of the proposed means and method of dewatering and maintaining dry conditions. This submittal shall be prepared and sealed by a professional engineer licensed in the State of LA. The Contractor shall be responsible for the satisfactory performance of the system and for correcting any disturbance of natural bearing of soils or damage to structures caused by the dewatering system or by interruption of the continuous operation of the system as specified.

D. The Contractor shall construct and place all pipelines, concrete work, structural fill, bedding, and base course in-the-dry (no standing water in the trench). In addition, the Contractor shall make the final twenty-four (24) inches of excavation for this work inthe-dry, and not until the groundwater level is a minimum of twelve (12) inches below proposed bottom of excavation. The Contractor shall provide means and methods to control the potential for excavation base instability from either excess hydrostatic water pressures or basal heave in the design of their shoring system.

E. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to promptly remove and dispose of all water entering excavations and shall keep such excavations dry to obtain a satisfactory undisturbed subgrade foundation condition. Dewatering shall be required until the fill, structure, or pipes to be built have been completed to the extent that they will not be floated or otherwise damaged by allowing water levels to rise or return to natural elevations.

F. Wellpoints or larger wells may be required for predrainage of the soils prior to final excavation for deeper below-ground structures or piping, and for maintaining the lowered groundwater level. If so, this system shall be designed by a professional engineer licensed in the State of LA. A copy of the subsurface characterization, calculations, layout, and narrative descriptive of operation through removal and/or abandonment shall be prepared. Wellpointing and larger wells shall be maintained until construction has been completed to such an extent that the structure, pipeline, or fill will not be floated or otherwise damaged. Wellpoints or larger wells shall be surrounded by suitable filter sand and no fines shall be removed by pumping. The Contractor may be required to demonstrate the adequacy of the proposed system and filter sand by means of a test installation. Discharge water shall be clear, with no visible soil particles in a one-quart sample.

G. If requested by the City of Zachary, the Contractor's proposed method of dewatering shall include a minimum of two (2) each 2-inch diameter, Schedule 40 PVC operating groundwater observation wells, with factory slotted screen and appropriate sand pack. The observation wells shall be screened within each stratum to be dewatered at each structure. A bentonite seal and grout shall be provided above the screened depth to the surface. Observation wells are to be used to determine/monitor the water level during construction of the structure. Locations of the observation wells shall be at structures and along pipelines. During backfilling and construction, water levels shall be measured in observation wells at frequencies. Contractor shall be responsible for maintaining and repairing/replacing damaged observation wells during the project.

H. While dewatering for new construction in the vicinity of existing structures, depletion of the groundwater level underneath these existing structures may cause settlement of within the site footprint and at some distance beyond the footprint. To avoid this settlement, the groundwater level under these structures shall be maintained by appropriate methods. In conditions where dewatering in excess of 20 gpm for over 24 hours is anticipated, a professional engineer specializing in geotechnical engineering shall evaluate the potential for settlements created by dewatering that may be detrimental to existing structures. This evaluation shall include an investigation of the

specific soil and groundwater conditions to a depth of at least 2 times the depth of the excavation including the permeability and compressibility of the various soil strata (either by direct measurement or by empirical methods), an interpretation of the water table drawdown at the location of any potentially affected structure(s), the duration of the dewatering program, and the resulting amount of settlement that will be created at the structure(s).

3.04 BACKFILLING AROUND STRUCTURES, MANHOLES, PUMP STATIONS AND AREAS THAT WILL BE TURNED OVER FOR PUBLIC MAINTENANCE

A. All backfill shall be placed in layers having a maximum thickness of eight (8) inches in loose state and shall be compacted.

B. Backfilling shall be carried up evenly on all walls of an individual structure simultaneously. No backfill shall be allowed against walls until the walls and their supporting slabs, if applicable, have attained sufficient strength as described previously.

C. Backfilling shall be carried up evenly on both sides of the pipeline. Contractor shall take special care to ensure proper support, compaction and elimination of voids under the haunches of the pipe.

D. In the case of trenches across or along roadways with open ditch drainage. When any portion of a sewer (sanitary or storm) excavation trench limit falls within 1 foot inside or 5 feet outside the pavement edge the Contractor shall place and compact Imported Clay Fill for the length of the trench excavation as shown on the Roadside Ditch Slope Stability Treatment Detail included at the end of this Section.

   After placement and compaction of the clay material, a layer of topsoil shall be placed on the slope. The topsoil shall be seeded and fertilized. Once the topsoil has been seeded and fertilized the Contractor shall overlay the topsoil with an Erosion Control Mat. The Contractor shall maintain existing roadside slopes, ditch side slopes and ditch flow lines by undercutting existing grades for placement of the clay fill and topsoil.

   Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

E. In locations where pipes pass through structure walls, the Contractor shall take the following precautions to consolidate the backfilling up to an elevation of at least one (1) foot above the bottom of the pipes:

   1. Place sand-aggregate bedding and initial backfill in such areas for a distance of not less than three (3) feet either side of the centerline of the pipe in level loose layers not exceeding eight (8) inches in thickness. Compact each layer.

   2. Place and thoroughly compact adjacent layers simultaneously.

F. The final finished surface of filled areas shall be graded to smooth, true lines, strictly conforming to grades indicated on the grading plan, and no soft spots or uncompacted areas will be allowed in the Work.

G. Temporary bracing shall be provided as required during construction of all structures to protect partially completed structures against all construction loads, hydraulic pressure, and earth pressure. The bracing shall be capable of resisting all loads applied to the walls as a result of backfilling.

Contractor shall take precautions as to not disturb the compaction of the backfill when removing the bracing.

H. Controlled Low Strength Material placement will cause hydrostatic uplift pressure on the pipe in cases where bedding and initial backfill material may not be used. Therefore, the Contractor shall anchor the pipe to remain on its intended alignment and grade. Contractor shall have an Engineered pipe anchorage plan for the use of CLSM backfill. The plan shall include at a minimum:

1. Anchor/ballast material,

2. Size and weight of each,

3. Required spacing

4. Dams to confine the CLSM

I. At a minimum the anchorage shall be located at the pipe joints and midpoints. The anchoring/ballasting system shall be designed and stamped by a Professional Engineer licensed in the State of Louisiana. In addition to the anchorage system the CLSM shall be placed in incremental lifts around the pipe. Each lift shall be allowed to attain partial set before placing the next lift. The recommended incremental lifts are as follows:

1. First lift = 1/4 pipe outer diameter (OD)

2. Second lift = 1/3 OD

3. Third lift placed to the pipe crown

4. Remainder of backfill may be placed in one lift

PART 4 - COMPACTION

4.01 GENERAL

A. Contractor shall control soil compaction during construction and obtain the minimum required percentage of the maximum dry densities determined by a Certified Testing Lab. Soil compaction with a backhoe bucket or any other heavy apparatus not designed specifically for soil compaction is not allowed. The Developer shall maintain the backfill for a period of three years 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. It shall be the Developer's responsibility to notify the City of Zachary of the proposed course of action.

B. The frequency for density tests will be a minimum of one test per lift per 100 linear feet of trench excavation and one randomly selected test per 2,500 square feet of excavation for open areas. If the density tests indicate that the Work does not meet specified density requirements, the City of Zachary may require additional density tests to determine the extent of the deficient Work at the Developer's expense. The Developer shall be required to remove, replace and compact deficient Work at no additional cost to the City of Zachary.

C. It is the Developer's responsibility to provide equipment and labor as needed to achieve the required compaction as specified herein. Should the rates of compaction fall below the values

specified herein; the City of Zachary has the right to require the Contractor to alter his work and/or to provide different equipment to assure that the required backfill quality is consistently achieved. Any decision by the City of Zachary to forgo such instructions shall in no way relieve the Developer of his responsibility to provide backfill of the specified quality.

4.02 PERCENTAGE OF MAXIMUM DENSITY REQUIREMENTS

Compact subgrade, and fill materials to not less than the following percentages of maximum dry density as determined in accordance with ASTM 698, the Standard Proctor Test.

A. **Structural Fill below Spread Footing Foundations, Slabs-on-Grade, and other Portions of Structures**: Structural fill shall be place in horizontal lifts not exceeding eight-inch (8") loose thickness, or less if necessary to obtain proper compaction. Moisture content shall be within 3% of optimum as determined in accordance with ASTM D698, with stability present. Clay structural fill shall be compacted full depth to a minimum of 95 percent of the maximum dry density. Granular structural fill, with less than 5% passing the No. 200 Sieve shall be compacted full depth to at least 75% of the relative density as determined by ASTM D4253 and D4254.

B. **Manholes, Pump Stations, Structures, and Buildings:** Areas adjacent to structures shall be compacted with vibratory mechanical compaction equipment. Compact eight-inch (8") loose lifts to a minimum of 95 percent of the maximum dry density as determined by ASTM D698. Moisture content of backfill material shall be within 3% of optimum as determined in accordance with ASTM D698. Granular backfill, with less than 5% passing the No. 200 Sieve, shall be compacted to at least 75% of the relative density as determined by ASTM D4253 and D4254. The bedding shall be placed in maximum 12" loose lifts, rodded and vibrated to orient the stone and eliminate voids to create uniform bedding support for the pipe, with the material compacted to 100% of the materials maximum dry rodded weight in accordance with ASTM C29.

C. **Compaction of Bedding, Initial & Intermediate Backfill Material:** Material shall be compacted. Compact eight-inch (8") loose lifts to a minimum of 95 percent of the maximum dry density as determined by ASTM D698. Bedding material will be rodded and vibrated to orient the stone and eliminate voids to create uniform bedding support for the pipe. Bedding material will not be compacted until rodding is complete. Moisture content of bedding and initial backfill material shall be within 3% of optimum as determined in accordance with ASTM 698.

D. **Compaction of Backfill Directly Under Pavements:** Backfill directly under pavements (roadways and parking lots) shall be #610 Stone material and placed in loose layers of eight (8) inches and compacted. Backfill shall be compacted with vibratory compaction equipment to not less than 95 percent of the maximum dry density as determined by ASTM D698. Moisture content of backfill material shall be within 3% of optimum as determined in accordance with ASTM 698.

E. **Compaction of Backfill Near Existing Structures and Pavements or Directly Under Future Pavements:** Secondary backfill within 10 feet of an existing structure foundation, the edge of an existing road/shoulder/back of curb, and/or directly under the limits of a future asphaltic or PCC roadway/parking lot to be constructed subsequent to sanitary sewer installation shall be bedding and initial backfill (sand-aggregate) material. In this situation the sand aggregate material shall be placed and compacted to within 3.5 feet of the surrounding grade, and usable excavated soils or select imported fill for the remainder of the backfill to surrounding or specified grade. Both materials shall be placed in loose layers of eight (8) inches and compacted. All backfill shall be compacted with vibratory compaction equipment to not less than

95 percent of the maximum dry density as determined by ASTM D698. Moisture content of backfill material shall be within 3% of optimum as determined in accordance with ASTM 698.

F. **Unsuitable Subgrades or Wet Trench Bottoms:** If trench bottoms contain unsuitable subgrades, muck bottoms, or wet bottoms that cannot be pumped dry, #57 Stone encapsulated in geotextile fabric, shall be used in accordance with the Standard Detail 801-01. #57 Stone shall be placed and compacted in lifts suitable to provide a suitable, non-yielding working surface for the required construction operations.

G. **Compaction of All Other Backfill:** Where a trench is in open ground and the backfill is not influenced by loading conditions, secondary backfill shall be as shown on the Contract Documents and compacted in loose layers of eight (8) inches and compacted to a minimum 90 percent of the maximum dry density. If the Contractor is unable to dry the excavated soil to an appropriate moisture content in order to achieve the required rate of compaction, he shall deem the excavated soil as unusable and replace with imported select material for backfill. The final surface shall be left in a condition equal to that originally found at the start of the Work. The backfill shall be finished over the trench flush with the ground surface. The Contractor will add backfill material monthly during the duration of construction and during the warranty period to compensate for settlement and erosion.

H. **Moisture Control:** Contractor shall condition subgrade or fill material to moisture content sufficiently near optimum to accommodate compaction meeting the required percent compaction. When the material is too dry to be compacted efficiently, the Contractor shall uniformly apply water to soil material and thoroughly mix the soil to achieve moisture content near the optimum level to facilitate compaction. Contractor shall remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

I. Incidental compaction due to traffic by construction equipment will not be credited toward the required minimum compaction as required for any material.

4.03 GRADING

A. **General:** Uniformly grade areas within limits of grading under this Section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades as are required.

B. **Grading Outside Building Lines:** Grade areas adjacent to building lines, as shown on the Drawings, to drain away from structures and to prevent ponding. Finish surface free from irregular surface changes and to within not more than 0.10 feet above or below the required elevation.

C. **Grading Surface of Fill under Building Slabs:** Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of one-half inch when tested with a ten (10) foot straightedge.

D. During the process of excavation, the grade shall be maintained in such condition that it will be well drained at all times. When directed by the Engineer, temporary drains and drainage ditches shall be installed to intercept or divert surface water that may affect the prosecution or condition of the Work.

4.04 MAINTENANCE

A. **Protection of Graded Areas:** Protect newly graded areas from traffic and erosion. Keep areas free of trash and debris and repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. **Protection of Sloped Areas:** If a fill section or backfilled trench zone falls within a sloped area then Contractor shall place an erosion control blanket over the slope. Areas requiring an erosion control blanket shall be approved prior to placement. After materials are placed and spread, lumps, stones, roots and other foreign matter shall be removed from the area. Erosion control blanket shall be placed in a timely manner to prevent erosion.

C. **Protection of Roadside Ditch Sloped Areas:** In the case of roadways with open ditch drainage - when any portion of a sewer (sanitary or storm) excavation trench limit falls within 1 foot inside or 5 feet outside the pavement edge the Contractor shall place and compact Imported Clay Fill for the length of the trench excavation. After placement and compaction of the clay material, a layer of topsoil shall be placed on the slope. The topsoil shall be seeded and fertilized. Once the topsoil has been seeded and fertilized the Contractor shall overlay the topsoil with an Erosion Control Mat. The Contractor shall maintain existing roadside slopes, ditch side slopes and ditch flow lines by undercutting existing grades for placement of the clay fill and topsoil.

D. **Reconditioning Compacted Areas:** Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

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SECTION 902
EROSION CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

A. This work consists of providing all; administrative, labor, materials, equipment, and accessories required to permit, install, monitor, maintain, and remove where required, temporary and permanent sedimentation and erosion control measures.

PART 2 - PRODUCTS

2.01 CONSTRUCTION:

A. Installation of temporary erosion control features shall be coordinated with construction of permanent erosion control features to ensure effective erosion control at all times. The contractor shall install or construct temporary erosion control features prior to initiation of land disturbance activities.

B. **Temporary Erosion Control and Storm Water Pollution Prevention Plan:** The contractor will abide by the terms and conditions of the appropriate LPDES General Permit. The Contractor shall prevent to the maximum extent practicable the transmission of soil particles into streams, canals, lakes, reservoirs or other waterways. Except as necessary for construction, excavated material shall not be deposited in streams or impoundments, or in a position close enough to be washed into waterways by high water or runoff. Lands or waters outside construction limits shall not be disturbed, except as authorized. The contractor shall not unnecessarily strip vegetation near stream banks.

1. The Contractor shall limit exposure of unprotected earth and may direct the contractor to provide immediate permanent or temporary erosion or pollution control measures to prevent contamination of streams, lakes, reservoirs, canals or other impoundments or prevent detrimental effects on property outside the right-of-way.

2. For projects with a total cumulative disturbed area greater than 1 acre including but not limited to: project construction limits, staging and disposal areas, temporary access roads, detours, and borrow areas, the contractor shall be required to develop a SWPPP (Storm Water Pollution Prevention Plan) by completing the current EPA SWPPP template. The contractor shall contact LADEQ for the latest specific requirements regarding the appropriate LADEQ Storm Water General Permit, Notice of Intent, and Notice of Termination forms.

3. As required by the contract documents and as detailed in the contractors SWPPP, the contractor shall place, monitor, and maintain; temporary seed, fertilizer, mulch, sandbags, hay bales, silt fences, slope drains, sediment check dams, sediment basins, and other best management practices/stormwater containment measures. Earth berms shall be constructed as needed to direct water away from slopes.

4. The use of erosion control features or methods other than those in the contract shall be as contained in the Contractors SWPPP and shall be considered included in the lump sum cost for the development and maintenance of the SWPPP.

    i. **Temporary Seeding, Fertilizing and Mulching:** Seeding, fertilizing and mulching shall be performed as follows: grass seed shall be a fast-growing species suitable to the area; application rates of seed, fertilizer and mulch shall be used to prevent erosion.

ii. **Sandbags and Hay Bales:** Sandbags shall be 1 cubic foot burlap bags, filled at least 3/4 full with sand. Hay bales shall be standard size bales and shall be secured by stakes.

iii. **Slope Drains:** Slope drains shall be constructed of pipe, riprap or other suitable material, with riprap protection at the discharge end.

iv. **Sediment Basins:** Sediment basins shall be excavated to collect silt, and shall be cleaned out as necessary to maintain their effectiveness. Basin outfall shall be riprap protected.

v. **Sediment Check Dams:** Check dams shall be constructed in ditches, and shall consist of logs and brush or fencing.

vi. **Silt Fencing:** Silt fencing shall be geotextile fabric, either wire-supported or selfsupported, attached to posts. Silt fencing shall be trenched in to ensure effectiveness.

vii. **Curb Inlet Protection**: Temporary sediment control device or measure to prevent silt, sediment and debris from entering storm drain curb inlets. Inlet protection is to be implemented at existing curb inlets prior to construction. The device shall be centered against the curb inlet with a minimum of 12 inches of the device overhanging on each side of the inlet opening. No part of the device, or ponding created by the device, shall interfere with the flow of traffic, create a safety hazard, or cause property damage. Effective curb inlet protection must be provided throughout the project until all sources with potential for discharging into inlets have been paved or stabilized. Contractor shall remove curb inlet protection once surface restoration in the contributing drainage area is complete. Due care shall be taken to ensure sediment does not fall into the inlet and impede the intended function of the device. Any material falling into the inlet shall be removed. Contractor shall maintain devices and remove all accumulated sediment and debris from surface and vicinity of unit after each rain event or as directed by Engineer in order to provide adequate sediment holding capacity and performance of device.

viii. **Maintenance of Erosion Control Features:** Temporary erosion control features shall be inspected at least once every 14 calendar days by the Contractor, in advance of any anticipated rain events, and within 24 hours after a rainfall event of 0.5 inches or greater. The features are to be maintained as described below or replaced as directed at no direct pay.

- **Temporary Seeding:** The seeded areas showing erosion after inspection shall be reseeded if necessary.
- **Mulches:** Mulched areas showing erosion shall be repaired and the mulch reapplied if necessary.
- **Straw or Hay Bale Barriers:** The bale barriers shall be inspected after each rainfall and time frame as defined above and at least daily during prolonged rainfall. Close attention shall be paid to the repair of damaged bales, "end runs" and undercutting beneath bales.
- **Slope Drains:** Slope drains shall be inspected weekly and after each rainfall as defined above, and repairs made if necessary. The contractor shall avoid the placement of any material on and prevent construction traffic across the slope drain.
- **Sediment Check Dams:** Sediment deposits shall be removed when the deposits reach one-half the height of the check dam. Inspections shall be made to insure that the center of the dam is lower than the edges. Erosion around the edges shall be corrected immediately.

- **Silt Fencing:** Sediment deposits shall be removed when the deposits reach one-half the height of the fence. If the fabric on the silt fence decomposes or becomes ineffective, the fabric shall be replaced promptly.

- **Temporary Stone Construction Entrance and/or Wash Racks:** The construction entrance shall be maintained to allow for removal of mud from the tires. The sediment from the wash rack runoff shall be removed once the wash rack is no longer performing as intended.

ix. **Removal of Temporary Erosion Control Features:** Temporary erosion control features existing at the time of construction of permanent erosion control features shall be removed or incorporated into the soil in such manner that no detrimental effect will result. The engineer may direct that temporary features be left in place.

2.02 Permanent Erosion Control:

A. **Seeding and Fertilizing:** Seed beds shall be disked and pulverized at least 3" deep; then leveled and lightly rolled prior to seeding. Seed shall be applied by one of the following methods:

B. **Broadcast:** Seed and fertilizer shall be uniformly spread by hand or mechanical methods. If hand spreading is used, seed and fertilizer shall be sown in 2 directions at right angles to each other.

1. Fertilizer: Fertilizer shall be applied at the following rate:

Type	Pounds Per Acre
8-8-8	1,000
12-12-12	667
13-13-13	615
16-16-16	500

2. Seed: Seed shall be sown at the following rate:

	Seed Mixture and Rate/1000 SF
March-September	1 Lb Hulled Bermuda
October-February	1 Lb Unhulled Bermuda and 2 Lb Winter Rye

C. **Hydroseeding:** Seed, fertilizer, mulch and tackifier shall be placed in a single mechanical operation at the following rates:

	Planting Mixture and Rate (Lb/1000 SF)					
	Hulled Bermuda Seed	Unhulled Bermuda Seed	Winter Rye Seed	Water Soluble Fertilizer	Fiber Mulch	Soil Tackifier
March-September	1	-	-	30	35	1.5
October-February	-	1	2	30	35	1.5

D. **Watering:** Seeded and sodded areas shall be watered at a rate of 5 gal/sy immediately after seed is broadcast or sod is placed. When necessary, additional water shall be applied to seeded or sodded areas to supplement natural rainfall until the Owner accepts the work. Water shall be applied with approved sprinkling equipment what will spread the water evenly and in a manner that will not cause erosion of the soil surface.

E. **Mulching:**

F. **Straw Mulch:** Straw mulch shall be spread on seeded areas at rate of 2 ton/acre.

G. **Fiber Mulch:** Fiber mulch shall be spread on seeded areas at rate of 1-1½ tons/acre.

H. **Erosion Blanket:** Erosion control blankets shall be straw or excelsior mats and shall be placed on seeded areas.

1. On slopes, blanket strips shall be placed either transverse or parallel to slope. Blanket shall be turned down into 6" anchor slots at top and bottom of slope. Mats shall be stapled to ground at maximum 6-foot intervals staggered on adjacent rows. Straw mats shall be overlapped 6" on ends and sides; excelsior blanket strips shall be tightly butted with adjacent strips at ends and sides.

2. In ditches, blanket strips shall be placed parallel to ditch, beginning at downstream end. Sides and ends of excelsior strips shall be tightly butted with adjacent strips; sides and ends of straw mats shall be turned down into 6" deep anchor slots at ends and sides. Mats shall be stapled to ground at maximum 4-foot intervals, staggered on adjacent rows.

I. **Slab Sod:** When the trench backfill has stabilized sufficiently and for a period of time not to exceed fourteen (14) days from the completion of the repair, the Contractor shall commence work on lawns and grassed areas. Prior to slab sodding, topsoil shall be uniformly spread over areas and lightly compacted. Areas to be sodded shall be finish graded, tilled, raked and debris removed. The Engineer shall approve the finish grade of all areas prior to application of sod. The Contractor shall furnish sod equal to and similar in type as the surrounding area.

1. Approximately 90% of the required fertilizer shall be placed on the area prior to placing sod, and the remainder of the fertilizer shall be broadcast after the sod is placed. Sod shall be rolled or tamped after placement.

2. Upon completion of sodding operations, all excess soil, stones, and debris remaining shall be removed from the construction area. Sodded areas shall be protected against traffic or other use by placing warning signs or erecting barricades as necessary. The Contractor, at no additional cost, shall repair any areas damaged prior to actual acceptance by the Owner.

3. The sodded area will not be accepted until a satisfactory stand of grass has been established. A satisfactory stand of grass is defined as a full lawn cover of the predominant vegetative species existing prior to the beginning of the Work over the disturbed areas, with grass free of weeds, alive and growing, leaving no bare spots larger than ¾ square yard within a radius of ten (10) feet. If a satisfactory stand of grass has not been obtained within a reasonable period of time, the Engineer shall instruct the Contractor in writing that the vegetative cover is not adequate and that additional measures shall be undertaken by the Contractor to establish the required satisfactory stand of grass.

SECTION 903
VALVES AND GATES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The Contractor shall furnish all labor, material and equipment required to provide and install all valves and gates as shown on the Drawings and as specified herein.

1.02 SUBMITTALS

A. Product Data: Complete literature of the manufacturer describing in full the characteristics of each item and shall include calculations as required. Include requirements for storage, handling and installation instructions.

B. Shop Drawings: Submit drawings showing complete dimensions, weights, and materials of construction. Special mounting requirements shall be identified.

1.03 MANUFACTURERS

A. Manufacturers shall be of established good reputation, regularly engaged in the fabrication of such equipment. Unless otherwise noted, any equipment offered shall be current modifications which have been in successful regular operation under comparable conditions.

PART 2 - PRODUCTS

2.01 GENERAL

A. All valves shall be manufacturer's standard design unless otherwise specified and shall be furnished with operating wheel, wrench nut or lever. Unless otherwise indicated, the direction of rotation of the wheel, wrench nut or lever to open the valve shall be to the left (counter-clockwise). Each valve body or operator shall have cast thereon the word OPEN and an arrow indicated the direction to open. A union flanged, grooved or shouldered type connection shall be provided within 2 feet of each threaded end valve.

B. All valves of the same type shall be from a single manufacturer.

C. Cast-iron valve boxes extending to the finished or established ground or paved surfaces shall be provided for all buried valves. They shall have suitable base castings to fit properly over the bonnets of their respective valves and heavy top sections with stay-put covers. Boxes shall be of the screw or sliding type having 5 1/4 inch shaft diameter or greater. All parts of the valve boxes, bases and covers shall be coated by dipping in hot bituminous varnish, except that part set in concrete shall be galvanized. Covers for all boxes shall have cast thereon an appropriate name designating the service for which the valve is used. All valve boxes in unpaved areas shall be set in 18 inch by 18 inch by 4 inch thick concrete pad at ground.

D. All buried valves shall have position indicators in the valve box and wrench nut operator complying with AWWA C500. Extend shaft to within 8 inches from grade, and support every 5 feet minimum.

2.02 CHECK VALVES

A. Swing check valve shall be rubber flapper style with cast iron long body and cover with 125 pound ANSI flanges. Rubber flapper shall be with and "O" ring seating edge and internal steel reinforcement.

Flapper shall be easily removed without need to remove valve from line. Valve shall have full pipe size flow area. Seating surface shall be on 45 degree angle such that the flapper travels only 35 degrees from full closed to full open position. Flapper shall have an elastic spring to assist flapper closing against slight head to prevent slamming. Manufacturer shall be as approved by the City of Zachary.

B. Silent check valves shall have stainless steel wafer style body for installation between 125/150 pound ANSI flanges. Valve trim and spring shall be stainless steel with Buna-N resilient seating. The valve plug shall be center guided at both ends with a through integral shaft and spring loaded for guaranteed silent shut-off operation. Mounting flanges shall be flat face with full face rubber gasket. Manufacturer shall be as approved by the City of Zachary.

2.03 GATE VALVES (2-IN AND LARGER)

A. General Requirements:

1. Gate valves shall meet the requirements of AWWA C500 and AWWA C509 as applicable to the type of valve specified.

2. Buried and submerged valves shall be furnished with mechanical joints and stainless steel hardware; non-rising stem design.

3. Exposed valves shall be furnished with Class 125 flanged ends; provided valves with outside screw and yoke.

4. All metal valves shall be manufactured of ASTM A126 Cast Iron, Class B, with bronze mounting design.

5. Rising stem valves shall be sealed with adjustable and replaceable packing; valve design must permit packing replacement under operation system pressures with only moderate leakage.

6. Non-rising stem valves shall use a double O-ring stem seal, except that packing shall be used where geared operators are required.

7. Except as otherwise specified, valves shall be rated for the following minimum working pressures:

Valve Size	Pressure (psig)
2-in to 12-in	200
14-in to 20-in	150
24-in and greater	50

8. Valve bodies shall be hydrostatically tested to at least twice the rated working water pressure. In addition, valves shall be seat-tested, bi-directional at the rated working pressure, with seat leakage not to exceed one fluid once per inch of valve diameter per hour. Provide certificates of testing.

9. Flanged valves to have face-to-face dimensions per ANSI B16.1 and flanges per ANAI B16.10.

10. Exposed valves 16-in and larger to have valve by-pass.

11. Bonnet and packing gland bolts shall be zinc or cadmium electroplated steel; packing gland bolts shall have nuts.

12. Exposed valves 16-in and greater indicated for horizontal stem installation shall be furnished with rollers, tracks and scrapers and enclosed bevel gear grease case.

13. Provide geared operator and chain wheel, chain and chain guides for valves with handwheel centerline more than 5-ft above operating level.

14. Valves shall be marked per AWWA Standards, including name of manufacturer, valve size and working pressure and year of manufacture.

15. Unless otherwise indicated, valves 12-in and smaller shall be capable of installation in the vertical or horizontal position, sealing in both directions at the rated pressure.

16. Valve operation shall be counterclockwise for potable water. Provide permanent label showing "OPEN" and arrows.

17. Metal-seated valves shall be coated internally and externally with an asphaltic varnish, per AWWA C500. Resilient seated valves shall be coated, interior and exterior, with fusion bonded epoxy per AWWA C550.

B. Valve Requirements:

1. Double Disc.

a. Conform to AWWA C500.

b. Wedging surfaces shall be bronze, monel or stainless steel.

2. Resilient Seated.

a. Conform to AWWA C509. Also UF and FM approved.

b. Internal and external epoxy coating of valve body, including bonnet, per AWWA C550.

c. Gate shall be encapsulated with synthetic rubber. It shall be bonded and vulcanized in accordance with ASTM B429, Method B.

d. No recesses in valve body.

C. Buried Valves:

1. Conform to the requirements above, except restrained mechanical joint bell ends per AWWA C111. Exposed valve hardware (nuts, bolts, washers, etc.) including bonnet, bonnet cover, stuffing box, gear adaptor and joints shall be Type 304 stainless steel.

2. Non-rising stem design, double O-ring seals for non-geared valves and shall incorporate packing for geared valves.

2.04 BALL VALVES

A. Ball valves shall have PVC body and ball, one-piece construction, teflon seats with EPDM cushion, socket ends.

B. Ball valves Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

2.05 AIR VALVES

A. Air valves shall be a combination air-inlet and air-release type actuated by a float, shall remain open for filling the line until the water has displaced all air at the point of attachment of the valve assembly after which it shall close, shall open whenever the pressure in the pipeline drop sufficiently to create a vacuum, and shall permit the release of trapped air directed downward. Two petcocks shall be furnished for each valve, one at the top to permit checking the effectiveness of each air valve and one at the bottom to allow the valve to be drained. Internal parts, such as guides, bushings, and screws shall be stainless steel. Air valves shall have a cold-water pressure rating for all parts of 150 pounds per square inch. Valves Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

2.06 REDUCED PRESSURE BACKFLOW PREVENTERS

A. A backflow preventer that operates on the reduce inlet pressure principle shall be provided and installed on the potable water service supply. The backflow preventer device shall be located downstream of the service metering point and upstream of any point of use. The backflow preventer shall be supplied with an inlet strainer and ball type isolation valve. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

2.07 DIAPHRAGM AND FLAP CHECK VALVES

A. Diaphragm check valves Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary. Compression bands for attaching the valves shall be stainless steel.

B. Flap valves Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All valves and gates shall be installed in accordance with AWWA Standards or in accordance with the manufacturer's recommendations. Alignment and adjustments shall be verified after installation. Tee wrenches and operators shall perform freely, without binding or other interferences.

1. Valves shall be cleaned and Contractor shall touch up all previously primed surfaces to repair damages. Contractor shall make visual check of operating parts for proper and satisfactory operation.

2. Buried valve operators shall be installed in a vertical position and be provided with a two-piece cast-iron valve box. The valve boxes shall be set to position during backfilling operation so they will be in a vertical alignment to the valve operating gear shift. The lower casting of the unit shall be installed first in such a manner as to be cushioned and to not bear directly upon the body of the valve or upon the pipe. The upper casting of the unit

shall then be paced in proper alignment at such an elevation that its top will be at final grade. Valve boxes in unpaved areas shall be protected in concrete pad in accordance to Paragraph 2.01C.

3. Buried valves shall be bedded and backfilled according to the requirements of the pipe to which they are connected.

4. It is recommended that the slide/weir gates be installed after the concrete has been poured. Where the gates are to be embedded in concrete, a box-out should be provided so that the gates can be properly located, braced and grouted in place. Where the gates is to mount on the face of the concrete, anchor bolts would be set in the concrete for mounting the gate. One inch of grout should be placed between the gate frame and the concrete. It is important that the gate frame not be distorted during installation, and by installing the gates in box-outs in the concrete or with 1" of grout between the frame and the concrete wall, there is much less chance that the frame will be distorted.

3.02 TESTING

A. The Contractor shall furnish all equipment, material and labor to perform the required tests. Any defects which become evident during the tests shall be corrected by the Contractor at his own expense. The Contractor shall notify the Engineer prior to performing any tests.

1. Valves shall be tested and proven satisfactory with the pipeline they are attached to and at the pipeline pressure specified in the respective pipe sections herein. In addition to the pressure test, all valves shall be given an operational test by completely opening and closing the valve satisfactorily a minimum of 4 cycles against the maximum differential of pipeline test pressure required on one side and 0 pressure on the other side of the valve.

2. Records shall be maintained by the Contractor of all tests indicating date of test, item tested, test pressure passed, and inspector's name. Test reports shall be promptly submitted to the Engineer.

3.03 PAINTING

A. All exposed ferrous surfaces shall be shop primed and finish painted in accordance with City of Zachary Standard Detail Sheet 6.

END OF SECTION

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SECTION 904
JACKING AND BORING

PART 1- GENERAL

1.01 SCOPE OF WORK

A. Boring and jacking shall consist of the furnishing and installation of pipe or casing by boring with special equipment and jacking the pipe or casing into place.

B. These items include furnishing and transporting material, excavation, installation, bracing, dewatering, sealing or grouting, backfill and surface cleanup. Also included is the construction of pits, paving the invert as required, and the installation of conductor pipe inside the casing, all in accordance with the specifications or Special Provisions and in conformity with the line and grade shown on the plans or established by the Engineer.

1.02 PERMIT REQUIREMENTS

A. Installation of pipe casings or sleeves by jacking shall conform to the area "Specifications for Jacking Culvert Pipe Through Fills" and all casing or sleeve pipe installations shall conform to the standards of the Louisiana Department of Transportation and Development. The Contractor shall comply with all requirements of applicable permits.

PART 2- PRODUCTS

2.01 MATERIALS

A. The size and wall thickness of the pipe shall be as shown on the drawings.

PART 3 - EXECUTION

3.01 JACKING PIPE

A. Except as otherwise specified, the methods and equipment used in jacking conduit shall be optional with the Contractor, provided that the proposed method is first approved by the Engineer. Such approval, however, shall in no way relieve the Contractor of the responsibility for making a satisfactory installation meeting the criteria set forth herein.

B. The Contractor shall be fully responsible for the strength of the conduit.

C. The leading section of conduit shall be equipped with a jacking head securely anchored thereto to prevent any wobble or alignment variation during the jacking operation. Excavation shall be carried out entirely within the jacking head and no excavation in advance thereof shall be permitted. Every effort shall be made to avoid any loss of earth outside the jacking head. Excavated material shall be removed from the conduit as excavation progresses, and no accumulation of such material within the conduit will be permitted.

D. Upon completion of the jacking operations, all voids around the outside face of the conduit shall be filled by grouting. Grouting equipment and material shall be on the job site before jacking operations are started in order that grouting around the jacked conduit may be started immediately after the jacking operations have finished.

E. Should appreciable loss of ground occur during the jacking operation, the voids shall be backpacked promptly to the extent practicable with soil cement consisting of a slightly moistened mixture of one part cement to five parts granular material. When material selected from the soil is not suitable for this purpose, the Contractor shall import suitable material at his expense. The soil cement shall be thoroughly mixed and rammed into place as soon after the loss of ground as possible.

F. The Contractor shall submit details of the following to the Engineer:

1. Jacking pit bracing
2. Casing or conduit and jacking head.

G. Only workmen experienced in the jacking of conduit shall be used in performing the work.

H. The casing or sleeve pipe shall be tightly jointed to prevent leakage and, on completion, the ends shall be packed to prevent entrance of earth and excessive flow of ground water but to allow some drainage. Cold mix bituminous material may be used for this packing.

3.02 BORING

A. Where sewers are permitted to be jacked under roadways without a sleeve pipe the sewer pipe shall be installed by means of a boring machine or auger and hydraulic jacks, or by other means satisfactory to the Engineer. In the event subsurface operations result in injury or damage to the pavement, or the surface 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. The diameter of the bored hole shall not be greater than 2" more than the overall diameter of the bell or flange of the conductor pipe.

3.03 GROUTING AND SEALING

A. Voids between the tunnel lining and the surrounding earth shall be filled by grouting. Grouting shall be subject to the direction of the Engineer and shall follow immediately after the completion of excavation and lining operations, as soon as practicable, in order to fill the voids outside of the lining before after-settlement may begin, and to stop the entrance of water into a tunnel through the lining at any point. Grouting shall be done by a suitable machine capable of forcing grout into all the voids which may have been left behind the tunnel lining or in the adjacent earth which may have been disturbed by tunnel operations. A maximum pressure of 50 psi at the grouting nipple may be required. Large void spaced outside the liner plates may be filled by dry packing with selected pea gravel injected by air.

B. The space between precast sewer pipe and inside surface of tunnel shall be filled with dry packing, pea gravel and/or grout by approved means acceptable to the Engineer.

END OF SECTION

SECTION 905
INSTALLATION OF CARRIER PIPE BY DIRECT BORE TECHNIQUE (HDPE PIPE)

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, equipment and incidentals required to install carrier pipe under streets by the technique of inserting the pipe directly into a bored opening, at the locations shown on the Drawings and as specified herein.

B. This procedure shall be allowed only where the carrier pipe can be installed so that no pipe joint is within the bored area. In no case shall this procedure be allowed where installation of the carrier pipe requires the pushing of one piece of pipe with another piece of pipe.

1.02 GENERAL REQUIREMENTS

A. Prior to the start of work, a detailed plan of boring and receiving pits, including excavation, together with an outline of the methods to be used and a time schedule for boring operations shall be submitted to the Engineer for review, and no work shall be done until Engineer's review is completed and written approval has been granted. The Contractor shall also submit the name of the boring subcontractor for approval when applicable.

B. Three days written notice prior to start of the actual work shall be given to the Engineer.

C. The Contractor shall install, maintain, and leave in place any sheeting, underpinning, cribbing, and other related items (other than that required for the boring and receiving pits) to support any structure or facility affected by the boring operations. The Engineer, depending upon existing conditions, may require that additional sheeting for the excavation be left in place. If such a requirement is made, the sheeting left in place shall be paid for at the unit price bid in the Schedule of Prices, unless the extra sheeting is required because of the Contractor's failure to properly protect the Work.

D. All work under this specification affecting the Louisiana Department of Transportation and Development (LADOTD) property, right-of-way, or facilities shall be carried out to the full satisfaction of the LADOTD authorized representative. The Contractor shall fully inform himself of all requirements of the LADOTD as pertains to the specific project and shall conduct all his work accordingly.

E. All equipment used by the Contractor on State property maybe inspected by the State and shall not be used if considered unsatisfactory by State representatives. The State highways shall be kept free of obstructions at all times.

F. The Contractor shall be fully responsible for all damages arising from his failure to comply with the regulations and the requirements of these Specifications.

1.03 SHOP DRAWINGS

A. The Contractor shall furnish shop drawings showing all fabrication and construction details for the bored crossings.

PART 2 – PRODUCTS

2.01 MATERIALS

A. The carrier pipe shall conform to the requirements of the City of Zachary Standards.

B. Grout to be used to fill the annular space between the pipe and the bore wall shall be portland cement, sand and water in proportions that result in a mixture that is pumpable and will flow evenly around the carrier pipe, yet retain enough plastic properties so that it will not tend to drain out of the bore hole and away from the pipe. Grout mixtures shall not contain more than two parts sand to one part portland cement.

PART 3 – EXECUTION

3.01 BORING OPERATION

A. The Contractor shall provide all material, equipment, and facilities required for boring the opening beneath the street or driveway. Proper alignment and elevation of the opening shall be consistently maintained throughout the boring operation. The method used to make the bore shall conform to the requirements of the LADOTD Project Permit, when applicable, which may be inspected at the office of the Engineer.

B. Boring pits shall be shored with sheeting or such other materials as required. Sheeting shall be driven to a sufficient depth below the invert of the carrier pipe to resist any pressure developed by the soil outside the boring pit. Sheeting when used shall terminate not less than 3-feet 6-inches above existing grade.

C. At the completion of the boring operations, the Contractor will be required to leave all wooden sheeting in place. If steel sheeting is used, it may be removed after installation of the carrier pipe in the bore hole but prior to installation of the joining carrier pipe, however, should damage to the roadway, pipeline or any other adjacent structure occur, the Contractor shall leave all remaining sheeting in place and redrive and leave in place any sheeting which is required to stabilize the site and prevent additional damage from occurring. The top of all sheeting left in place shall be cut off 36-inches below finished grade.

D. The Contractor shall be fully responsible for furnishing and installing and later removing to the extent required, a thrust block or other provisions required for backing up jacks which may be employed in installing the carrier pipe. No payment for installation and removal of such backup blocks will be made other than the lump sum prices provided for in the Schedule of Prices. The entire construction of same shall be discussed with the Engineer in advance and shall be fully satisfactory to him before being built. After completion of the boring operation, the backup structures shall be removed sufficiently to permit construction of the pipeline.

E. Where wet type boring techniques are allowed, bentonite or other stabilizing gels shall be used to prevent caving of the unsupported bore hole.

3.02 INSTALLING PIPE

A. The pipe installed within the boring shall be in full conformity with these Specifications and as shown on the Drawings. The pipe shall be installed to the exact lines and grades required and after having been satisfactorily placed and approved by the Engineer, the space between the outside of the pipe and the bore hole shall be completely filled with grout in one continuous

uninterrupted operation in a manner to prevent occurrence of any voids between the pipe and the bore face.

B. An earth bulkhead of sufficient width to retain the grout shall be placed at the lower end of the bore. The bulkhead shall extend up to only 75 percent of the pipe outside diameter to allow an observation port for use during the grouting operation.

C. Grout shall be pumped into the annular space between the bore face and the pipe by means of a manifold system of nozzles that simultaneously deposits grout on both sides of the carrier pipe to provide balanced grout forces. The grouting shall be begun at the lower end of the bore, adjacent to the earth bulkhead. Grout shall be pumped against the bulkhead until the grout fills the annular cavity and is pushed out of the observation port at the top of the bulkhead. The nozzles which deposit the grout shall be withdrawn from the bore hole at a slow rate to assure that the grout is discharged into the grout mass and not into the unfilled void area. This procedure is required to prevent voids from being formed as the grout nozzles are withdrawn.

D. Grouting shall be performed prior to connecting the carrier pipe on highest end of the bored installation. During the grouting process, evidence of excessive grout pressures shall be monitored by observing the inside of the carrier pipe to detect abnormal ovalization or deflection in the pipe wall. For purposes of this observation the inside of the carrier pipe shall be illuminated with a light inserted into the carrier pipe beyond the point where the grouting begins. Grout pressures shall be controlled by monitoring the quantity of grout injected into the annular cavity to determine the rate at which the discharge nozzles are to be withdrawn.

E. At the completion of the grouting operation, the carrier pipe shall be checked for excessive deflection by pulling a go-no go mandrel through the direct bored installation. The mandrel shall be sized through the direct bored installation. The mandrel shall be sized for a maximum of 7.5 percent deflection.

F. Grouting of the annular space will not be required if the diameter of the bore hole does not exceed the outside diameter of the pipe by more than one-half inch.

3.03 TESTING

A. The pipe shall be tested per the City of Zachary Standards.

END OF SECTION

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SECTION 906
PREFABRICATED STEEL LINER

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, equipment and incidentals required to jack pipe sleeves under State highways and to install pipelines therein, at the locations shown on the Drawings and as specified herein.

1.02 OPERATIONS ON STATE PROPERTY

A. All work on this project affecting the Louisiana Department of Transportation and Development (LADOTD) property, right-of-way, or facilities shall be carried out to the full satisfaction of the LADOTD authorized representative. The Contractor shall fully inform himself of all requirements of the LADOTD as pertains to the specific project and shall conduct all his work accordingly.

B. Prior to the start of work, a detailed plan of jacking pits and excavation together with an outline of the methods to be used and a time schedule for jacking operations shall be submitted to the Engineer for review, and no work shall be done until Engineer's review is completed. The Contractor shall also submit the name of the jacking subcontractor for approval.

C. Three (3) days written notice prior to start of the actual work shall be given to the Engineer and the Louisiana Department of Transportation and Development.

D. The Contractor shall install, maintain, and leave in place any sheeting, underpinning, cribbing, and other related items (other than that required for the jacking pits) to support any structure or facility on the right-of-way owned by LADOTD. The LADOTD or the Engineer, depending upon existing conditions, may require that additional sheeting for the trench be left in place. If such a requirement is made, the sheeting left in place shall be paid for at the unit price bid in the Schedule of Values.

E. In no instance shall any wires, equipment, or other appurtenances be placed across or pass across State property without the express written permission of LADOTD's authorized representative.

F. All equipment used by the Contractor on State property may be inspected by the State and shall not be used if considered unsatisfactory by State representatives. The State highways shall be kept free of obstructions at all times.

G. No blasting will be permitted under or adjacent to State highways.

H. The Contractor shall be fully responsible for all damages arising from his failure to comply with the regulations and the requirements of these Specifications.

I. All work at State highway crossings shall be performed and completed in a manner fully satisfactory to LADOTD.

1.03 SHOP DRAWINGS

A. The Contractor shall furnish shop drawings showing all fabrication and construction details for the jacked crossings.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Steel sleeve shall be welded steel pipe, new and unused material conforming to ASTM A139, Grade B, sized as shown on the Drawings. Minimum thickness of the steel sleeve shall be 0.500 inch unless a greater thickness is shown on the Drawings. The steel sleeve shall be painted inside and outside with two coats of bitumastic paint prior to delivery to the job.

B. Class V concrete pipe in accordance with ASTM C-76 and specially designed for stresses encountered in installation by jacking the pipe in place may be used for the casing sleeve in lieu of the steel sleeve specified above.

C. The carrier pipe within the sleeve shall have all joints restrained and shall conform to the requirements of these Specifications. The sleeve has been sized for installation of mechanical joint ductile iron carrier pipe and, if other type pipe materials are used which require a larger sleeve, the larger sleeve shall be provided and installed at no additional cost to the Owner.

D. Insulating spacers shall be painted galvanized steel with skids. Raised mortar collars on prestressed concrete cylinder pipe shall be equal to insulating spacers. Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

E. Brick for bulkheads shall be sound uniformly burned and shall comply with ASTM C 32, Grade SS. Mechanical seals may be used in lieu of the brick bulkheads.

F. Mortar for brickwork shall consist of one-part cement, 1/4 part lime, and 2 parts sand. Sand shall comply with ASTM C-144; lime shall comply with ASTM C 207 Type S; cement shall comply with ASTM C 150, Type II.

PART 3 - EXECUTION

3.01 JACKING SLEEVE

A. The Contractor shall provide all material, equipment, and facilities required for jacking the sleeves beneath the highway. The sleeves shall be jacked in one continuous operation at the locations shown on the Drawings. In no event shall jacking be discontinued for sufficient period to cause the partially jacked sleeve to "freeze" in place. Proper alignment and elevation of the sleeves shall be consistently maintained throughout the jacking operation. The method used to install the sleeve shall conform to the requirements of the LADOTD Project Permit which may be inspected at the office of the Engineer.

B. Jacking pits shall be shored with sheeting or such other materials as required. Sheeting shall be driven to a sufficient depth below the invert of the steel sleeve to resist any pressure developed by the soil outside the jacking pit. Sheeting shall terminate not less than 3-feet 6-inches above existing grade.

C. When steel sleeves are used, the sections shall be field welded in accordance with the applicable portions of AWWA C 206 and AWS D7.0 for field welded water pipe joints. Wire brush and paint the welded joints. Primer Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

D. At the completion of the jacking operations, the Contractor will be required to leave all wooden sheeting in place. If steel sheeting is used, it may be removed, however, should damage to the roadway, pipeline or any other adjacent structure occur, the Contractor shall leave all remaining sheeting in place and redrive and leave in place any sheeting which is required to stabilize the site

and prevent additional damage from occurring. The top of all sheeting left in place shall be cut off 36-inches below finished grade.

E. The Contractor shall be responsible for preventing the occurrence of voids outside the sleeves and if they do occur, he may be directed to fill them with grout in a method approved by the Engineer. The Contractor shall constantly exercise care in the removal of the earth from within the sleeve sufficiently close the forward end to prevent voids.

F. The Contractor shall be fully responsible for furnishing and installing and later removing to the extent required, a thrust block or other provisions required for backing up the jacks employed in driving the sleeve forward. After completion of the jacking operation, the backup structures shall be removed sufficiently to permit construction of the pipeline in the sleeve.

3.02 INSTALLING PIPE IN SLEEVE

A. The pipe installed within the sleeve shall be in full conformity with these Specifications and as shown on the Drawings. The pipe shall be installed to the exact lines and grades required within the sleeve and after having been satisfactorily placed and approved by the Engineer, the space between the outside of the pipe and the sleeve shall be completely filled with sand pumped in one continuous uninterrupted operation in a manner to prevent occurrence of any voids between the pipe and the sleeve. The pipe must be braced to the side and top of the sleeve to prevent flotation or motion during the placing of sand.

B. A masonry bulkhead 8-inches wide shall be placed at the ends of the sleeve. As an alternate, a continuous sleeve type rubber seal of one hundred percent (100%) neoprene with stainless steel straps and clamps, mechanical seals, or approved equal may be installed. Straps, clamps and mechanical seal Manufacturer shall be per the qualified manufacturer list as approved by the City of Zachary.

3.03 TESTING

A. The pipe shall be tested as specified per the City of Zachary Standards.

END OF SECTION

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SECTION 907
PAVEMENT MARKINGS

PART 1 - GENERAL

1.01 LAYOUT:

Pavement Markings (lines, legends, and symbols) shall have the following MUTCD dimensions and patterns, unless specified differently in these specifications or as documented and justified in the Traffic Impact Study.

1. All solid and skip-lane lines shall be four (4) inches wide. A skip-line shall consist of ten (10) foot line segments and thirty (30) foot gap segments. A dotted line shall consist of two (2) foot line segments and four (4) foot gap segments.

2. Double yellow lines shall have a spacing of four (4) to fourteen (14) inches between the lines.

3. Diagonal lines shall be twelve (12) inches or twenty-four (24) lines wide. Spacing between diagonal lines(measured perpendicular to diagonal lines) shall be as follows:

    i. Ten (10) feet when the posted speed limit is forty (40) miles per hour (mph) or less.

    ii. Twenty (20) feet when the posted speed limit is above forty (40) miles per hour (mph).

1.02 THERMOPLASTIC MARKING

A. Preparation of paint: Immediately before application, paints shall be agitated and mixed thoroughly to a uniform consistency, free from lumps or agglomerates. Paints shall be kept covered to retain volatiles. Paint shall not be thinned unless approval is given to correct consistency.

B. Rate of application: This rate of application shall apply to all paints, with proper adjustments for broken line stripe or for other widths, and the rate shall not vary from this amount more than five percent (5%) in any mile. At any point where a check indicates a variation in excess of 5%, the work shall be stopped and the equipment properly adjusted or replaced. The minimum wet thickness of paint shall be 15 mils.

C. For rapid setting pigmented binder, the glass spheres shall be applied at the same time, but in a separate operation, at the rate of six (6) pounds (plus or minus 0.5 pound) of spheres per gallon of binder. Glass spheres shall be applied to the binder before final set has occurred and accomplished in such manner as to provide uniform coverage for the full width of the stripe. The glass spheres shall be applied to the paint stripe while it is still wet throughout, no dry surface film, immediately after it has been applied to the pavement. The glass spheres shall be applied by compressed air of sufficient pressure to cause embedment of the spheres throughout the entire thickness of the paint film. The guns used for glass sphere application shall be of a type approved for embedment.

D. The paint may be heated in heat exchangers in order to accelerate drying. Under no circumstances is the paint to be heated to a temperature exceeding 180 ·F (82 ·C).

E. The paint machine shall be so designed that its operation will be at a uniform speed on a grade as well as level ground. The operating speed of the equipment shall be approved by the Engineer consistent with the characteristics of the equipment's capabilities to produce an acceptable stripe within the required tolerances at the specified rate.

1.03 REMOVAL OF EXISTING PERMANENT PAVEMENT MARKINGS (WHERE REQUIRED):

A. The contractor will be required to remove any permanent pavement markings (painted, thermoplastic or semi-permanent tape) when directed to do so by the City of Zachary.

B. City of Zachary representative will make the final determination on removal of existing pavement marking based on field observations and a field test performed by the Contractors as follows:

1. On a typical ten foot (10') long segment of existing pavement marking stripe or a typical legend or symbol, a steel wire brush will be vigorously applied across the existing pavement marking material.

   i. If the existing pavement marking material remains firmly adhered to the pavement surface and does not powder or crack or flake, then removal is not required. A simple cleaning with a power brush or compressed air to remove surface dirt and debris will still be required at no additional cost.

   ii. If the existing pavement marking material shows loss of adhesion or significant powdering, cracking, or flaking, it shall be removed by approved methods which do not significantly damage the pavement surface to the extent that at least seventy-five percent (75%) of the pavement surface is exposed.

2. When any existing pavement markings are not completely recovered the application of new pavement markings, it shall be removed by approved methods so that at least seventy five percent (75%) of the pavement surface is exposed. Compensation will be at unit cost bid for such removal.

APPENDIX

CITY OF ZACHARY
PARISH OF EAST BATON ROUGE
STATE OF LOUISIANA

ORDINANCE PERTAINING TO THE DECLARATION OF INTENT BY THE CITY OF ZACHARY TO AMEND ITS UNIFIED DEVELOPMENT CODE - ARTICLE 4 STORMWATER MANAGEMENT AND OPEN SPACES TO INCLUDE POLICY CHANGES AND PRACTICES PERTAINING TO CONSTRUCTION BEST MANAGEMENT PRACTICES ENFORCEMENT TO BE ADDED AS §4.301(C) AND TO CREATE DIVISION 4.500 TO BE ENTITLED ILLICIT DISCHARGE ENFORCEMENT PROCEDURES AND FOR ACTIONS IN FURTHERANCE OF THE SAME AND IN ACCORDANCE THEREWITH

WHEREAS, the City of Zachary (the "City") has desires to be compliant with all regulations designed to reduce storm water pollution and to institute best management practices, policies and procedures to accomplish same, and

WHEREAS, the City desires to establish enforcement measures pertaining to illicit discharges for the policing and pressure of compliance of the same.

BE IT ORDAINED, by the City Council for the City of Zachary it that does now amend its Unified Development Code ("UDC") - Article 4 entitled Stormwater Management And Open Spaces to include policy changes and construction best management practices enforcement by adding §4.301 (C) to read as follows:

*C). **Construction Best Management Practices Enforcement Procedures.** The selection of the enforcement measures for identified non-compliance with storm water pollution prevention best management practices is dependent upon the severity of the violation and site-specific details such as proximity to receiving water, watershed sensitivity, past environmental compliance, or noncompliance of the contractor(s) on site, and potential to cause environmental harm because of the non-compliance. The Department of Public Works enforcement procedure for non-compliance with storm water pollution prevention best management practices is provided below:*

1. *Upon discovery of the non-compliance by any City representative, communication between that representative and the Department of Public Works will be made to properly document and record the non-compliance.*

2. *The Department of Public Works will initiate contact with the contractor and/or developer, either in person, via email, and or via telephone within five business days to document the area of concern with the discharger. A specified time frame to remediate the non-compliance or begin corrective action is established and the escalated enforcement process including the potential for stop-work directive is communicated to the contractor and/or developer.*

    a) *If the violation is corrected in the specified time, no further action required.*

b) *If the violation is not remedied timely, enforcement escalation proceeds as described below.*

3. *A meeting between the contractor and/or developer and the Department of Public Works is held to communicate expectations and the enforcement process. The contractor is given an opportunity to explain the site-specific issues and is given a specified timeframe to remediate the non-compliance or begin correction.*

    a) *If the violation is corrected in the specified time, no further action is required.*
    b) *If the violation is not remedied timely, enforcement escalation proceeds as described below.*

4. *A formal Letter of Notice of Violation of the non-compliance is provided to the operator, as well as the City Attorney's Office and LDEQ. The letter provides a specific timeframe to achieve or begin corrective action measures and provides the contractor with notice of actions that will be taken, including stop-work directive, if compliance is not timely achieved.*

    a) *If the violation is correct in the specified time, no further action is required.*
    b) *If the violation is not remedied timely, enforcement escalation proceeds as described below.*

5. *Steps to issue a stop-work directive and/or assessment of fines will be initiated.*

BE IT FURTHER ORDAINED, by the City Council for the City of Zachary that it does also now amend UDC - Article 4 entitled Stormwater Management And Open Spaces to create Division 4.500 To Be Entitled Illicit Discharge Enforcement Procedures by adding 4.500 Illicit Discharge Enforcement Procedures which shall read as follows:

4.500 - ILLICIT DISCHARGE ENFORCEMENT PROCEDURES

Sec. 4.501 Enforcement Procedures

The selection of the enforcement measures for identified illicit discharges is dependent upon the severity of the violation and site-specific details such as rate of discharge, type of business facility, evidence of contamination, proximity to receiving water, watershed sensitivity, past environmental compliance or noncompliance of the operator(s) at site, and potential to cause environmental harm as a result of the illicit discharge. The Department of Public Works enforcement procedure for illicit discharges is provided below:

1. *Upon discovery of the illicit discharge by any City representative, communication between that representative and the Department of Public Works will be made to properly document and record the illicit discharge.*

2. *The Department of Public Works will initiate contact with the illicit discharger, either in person, via email, and or via telephone within five business days to document the area of concern with the discharger. A specified time frame to remediate the illicit discharge or begin corrective action is established and the*

escalated enforcement process including the potential for termination of water service is communicated to the discharger.

c) If the violation is corrected in the specified time, no further action required.
d) If the violation is not remedied timely, enforcement escalation proceeds as described below.

3. *A meeting between the discharger and the Department of Public Works is held to communicate expectations and the enforcement process. The operator is given an opportunity to explain the site-specific issues and is given a specified timeframe to remediate the illicit discharge or begin correction.*

c) If the violation is corrected in the specified time, no further action is required.
d) If the violation is not remedied timely, enforcement escalation proceeds as described below.

4. *A formal Letter of Notice of Violation of the illicit discharge is provided to the operator, as well as the City Attorney's Office and LDEQ. The letter provides a specific timeframe to achieve or begin corrective action measures and provides the operator with notice of actions that will be taken, including termination of water service, if compliance is not timely achieved.*

c) If the violation is correct in the specified time, no further action is required.
d) If the violation is not remedied timely, enforcement escalation proceeds as described below.

5. *Steps to order termination of water service will be initiated.*

This Ordinance shall become effective at the expiration of ten (10) calendar days after publication by the City Council for the City of Zachary unless the referenced ordinance shall specify another effective date, all pursuant to § 2-10 (C) of the Home Rule Charter adopted by the electors for the City of Zachary.

INTRODUCED FOR ADOPTION by the City Council of the City of Zachary as a regular meeting of the said Council held on the 12th day of December, 2023.

David McDavid, Mayor

ATTEST:

Dana LeJeune - Clerk of the City Council

Ambre DeVirgilio - Mayor Pro Tempore

SUBMITTED FOR FINAL APPROVAL AND ADOPTED by the City Council of the City of Zachary as a regular meeting of the said Council after being duly noticed and publicized public hearing held on the 9th day of January, 2024 and upon which the foregoing ordinance was read in full, the roll was called on the adoption thereof, and the Ordinance was adopted.

David McDavid, Mayor

ATTEST:

Dana LeJeune - Clerk of the City Council

Ambre DeVirgilio - Mayor Pro Tempore

Ordinance 2023-20 PRESENTED TO THE MAYOR PURSUANT TO HRC § 2-11(A), this ___ day of January, 2024 at ___:___, ___ M.

Dana LeJeune, Clerk of the City Council

I DO HEREBY ACT TO ___ ADOPT / ___VETO THIS ORDINANCE, this ___ day of January, 2024 at ___:___, ___ M, by my signature below.

David McDavid, Mayor

Dana LeJeune, Clerk of the City Council

I DO HEREBY ACT TO ___ ADOPT / ___VETO THIS ORDINANCE, this ___ day of December, 2023 at ___:___, ___ M, by my signature below.

David McDavid, Mayor