Crystal Clear SUD

Approved Equipment List (AEL)

Below is a list of Crystal Clear SUD (CCSUD) approved brands for use in the Distribution and Collection system.

Brands

Air Relief Valves: Empire, Valmatic, Apco, Mueller Company.

Corporation Stops: Ford

Curb Stops: Ford

Fire Hydrants: American, Mueller Company, EJ.

Gate Valves: Mueller Company, American, EJ.

Pipe Type: High Density Polyethylene, C900 Series.

Restraining Joints: EBAA Iron Inc. – Megalug

Saddles: Smith Blair, Ford, Mueller

Tapping Sleeves: Smith Blair, Ford, Mueller, JCM Industries

Tapping Valves: American, Mueller

Meters: Kamstrup

Meter Boxes: DFW Plastics, NDS Meter Boxes.

VFD: Yaskawa

Vertical Turbine Pump: HydroFlo

Motors: TECO or US Motor

Any equipment to be installed in the CCSUD Distribution or Collection systems must come from the list above. Any equipment installed that is not listed above must be approved by the CCSUD inspector or a CCSUD Manager or the installation is subject to a failed inspection until the correct brand can be installed. If you have any questions about these procedures please contact the CCSUD Inspector.

Last Updated: 7/16/2020

SECTION 01000
MOBILIZATION

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall mobilize all materials, labor, equipment, and incidentals in preparation for beginning, with subsequent cleanup, of Work performed under the Contract.

B. Work includes, but is not necessarily limited to: mobilization of personnel, equipment, supplies, and incidentals to the project site; establishment of the Contractor's onsite facilities, safety precautions, scaffolding and/or lifting methods; any other facilities necessary for work on the project; construction submittals; fees for bonds and insurance; obtaining all required permits; coordination with the Owner for the scheduling of all construction activities; disposal and hauling of cleared, grubbed material, debris, surplus excavated material including all existing pipe and appurtenances to be abandoned (where specified in the Drawings), tree protection, coordinating with other utilities for locating buried cables and other utilities during construction, repairing and replacing fences, cleaning and, any other items required for beginning work, but not included explicitly in other bid items.

PART 2 – PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: The lump sum price for Mobilization shall not exceed ten percent (10%) of the subtotal of all other base bid items, excluding this item.

4.2 PAYMENT: Partial payments directed towards the "Lump Sum" bid for Mobilization will be structured as follows:

Payment for this item will be payable will be limited to 75% of the contract lump sum price in the first partial payment; and, the balance payable after cleanup and demobilization.

END OF SECTION

SECTION 01100
SITE PREPARATION

PART 1 - GENERAL

1.1 SCOPE

A. The Work included in this Section shall consist of preparing the designated easements and/or right-of-way as necessary for construction operations.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 CLEARING

A. The surface of the ground, for the area to be cleared and grubbed, shall be completely cleared of all timber, brush, stumps, roots, grass, weeds, rubbish, topsoil and vegetation removal, and all other objectionable obstructions resting on, or protruding through, the surface of the ground.

B. Trees and shrubs designated for preservation shall be carefully trimmed as directed and shall be protected from scarring, barking, or other injuries during construction. Exposed ends of pruned limbs shall be treated with an approved pruning material. Tree protection shall be installed as necessary per the Drawings.

C. Clearing operations shall be conducted so that the Contractor shall not damage the existing structures and installations, or those structures under construction. Clearing shall be conducted in a manner that provides for the safety of employees and others.

D. Clearing away structures shall consist of removing remains of houses or other structures not completely removed previously (by the Contractor or others), foundations, floor slabs, concrete, brick, lumber, plaster, cisterns, septic tanks, basements, abandoned utility pipes or conduits, equipment or other foundations, fences, retaining walls, outhouses, shacks and all other debris, as well as buried concrete slabs, curbs, gutters, driveways and sidewalks.

3.2 GRUBBING

A. Grubbing shall consist of the complete removal of all stumps, roots larger than 1-1/2 inches in diameter, matted roots, brush, timber, logs and any other organic or metallic debris not suitable for foundation purposes, resting on, under or protruding through the surface of the ground to a depth of 18 inches below the subgrade.

B. All depressions excavated below the original ground surface for, or by the removal of, such objects, shall be refilled with suitable materials and compacted to a density conforming to the surrounding ground surface.

PART 4 – JOB CONDITIONS

4.1 STRIPPING

A. In areas so designated, top soil shall be stockpiled. Stockpiled topsoil shall be protected until it is placed as specified.

B. Any topsoil remaining after all Work is in place shall be removed and disposed of by the Contractor in accordance with local, state and federal regulations.

4.2 DISPOSAL OF CLEARED AND GRUBBED MATERIAL

A. Dispose of all material and debris from the clearing and grubbing operation by hauling such material and debris away to an approved facility.

B. Disposal by burning or burial will not be permitted.

C. The cost of disposal (including hauling) of cleared, grubbed material, debris, surplus material shall be considered a subsidiary obligation of the Contractor.

4.3 FENCES

A. Unless shown otherwise in the Contract Documents, all fences along the proposed route and Right-Of-Way which are damaged or removed temporarily by the Contractor shall be replaced by the Contractor to an equal or better condition.

4.4 HOLES

A. Holes remaining after removal of structures, objectionable materials, etc., shall be backfilled and the entire area shall be bladed to prevent ponding of water and to provide adequate drainage of storm water.

4.5 HAZARDOUS MATERIAL

A. If the Contractor encounters hazardous substances, industrial waste, or other environmental pollutants, underground storage tanks, or conditions conductive to environmental damage, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner in writing.

B. The Contractor shall not be responsible for, or be required to conduct, any investigation, site monitoring, containment, cleanup, removal, restoration or other remedial work of any kind or nature under any applicable state or federal law, regulation, ordinance, or any judicial order.

PART 5 – MEASUREMENT AND PAYMENT

No direct measurement or payment will be made for the work to be done or the equipment to be furnished under this item but shall be considered subsidiary to the particular items of work for which unit prices are required in the proposal.

END OF SECTION

SECTION 01140
DEWATERING

PART 1 - GENERAL

1.1 SCOPE

A. The Work included in this Section consists of furnishing all equipment, fuel, materials, and labor necessary for dewatering, along with the necessary control and disposal of groundwater, on a continual basis during construction.

1.2 DESCRIPTION OF REQUIREMENTS

A. Dewatering shall include the lowering of the groundwater table to relieve any hydrostatic head that could cause a decrease in the stability of the excavated subgrade. Remove and dispose of water and provide siltation settling basins for all discharges from dewatering systems.

B. Dewatering also shall include the intercepting of seepage which could otherwise emerge from the slope or sides of excavations which could cause a decrease in the stability of the excavated subgrade or the slopes or sides of the excavations.

C. The Contractor shall assume full responsibility and expense for the adequacy of the dewatering system with no additional contract time or cost allowance for performance.

1.3 REFERENCE STANDARDS

A. The drilling, operation, and abandonment of all dewatering wells used in the dewatering system shall comply with regulations of the Texas Commission on Environmental Quality (TCEQ), and the Texas Water Well Drillers Association.

1.4 SUBMITTALS

A. Submit construction plans of dewatering well point system, settling basins and discharge facilities for review by the Owner/Engineer prior to dewatering system installation.

PART 2 – PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. Selection of equipment and materials is at the option of Contractor as necessary to achieve desired results for dewatering.

B. Eductors, well points, or deep wells, where used, shall be furnished, installed and operated by an experienced Subcontractor who is engaged regularly in ground water control system design, installation and operation.

C. All equipment must be in good repair and operating order.

D. Sufficient standby equipment and materials shall be kept available to ensure continuous operation, where required.

PART 3 - EXECUTION

3.1 DEWATERING

A. The dewatering system shall be capable of providing an excavated subgrade that is relieved of any hydrostatic pressure that could cause a decrease in the stability of the excavated subgrade, and which will provide the necessary groundwater control for the proper performance required to complete the Work described within the Project Specifications.

B. As part of his request for review of a dewatering system, the Contractor shall demonstrate the adequacy of the proposed system and well point filter sand by means of a test installation at the jobsite. Discharge water shall be clear, with no visible soil particles contained within a one-quart sample.

C. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.

D. The Contractor shall provide for the disposal of the water removed from the excavation in such a manner as to not cause injury to the public health, private or public property, or to any portion of the work completed or in progress, to the surface of the streets, or cause any impediment to the reasonable use of the site by other contractors.

E. The dewatering system shall not cause damage to newly constructed or existing buildings, utilities, and other work due to the loss of support from incompletely drained soils or from removal of soil particles resulting from the dewatering system operation.

F. If the dewatering system utilized by the Contractor causes or threatens to cause damage to new or existing facilities, the dewatering system shall be modified to prohibit such damage at no additional cost to the Owner.

G. Dispose of subsurface water collected in the manner which conforms to all applicable local and state ordinances, statutes and laws.

H. Maintain continual and complete effectiveness of the dewatering system operation to provide a firm, stable, and excavated subgrade at all times as required for proper performance of Work.

I. Provide dewatering necessary to maintain the groundwater table below the level of backfill as it is being placed.

J. Provide dewatering necessary to maintain the groundwater table below the level of backfill as requested by the Owner. The Contractor’s proposed method of dewatering shall include a minimum of two operating groundwater

observation wells or piezometers at each proposed structure and one observation well at each manhole to be used to determine the water level during construction of the structures. Locations of the observation wells shall be at structures and along pipelines as approved by the Owner prior to their installation. The observation wells shall be extended to 6 inches above finished grade, topped with screw-on caps, protected by a 4-inch thick, 24-inch x 24-inch square concrete base, and left in place at the completion of the project.

K. The Contractor shall maintain log readings of the dewatering system documented at least daily. The Contractor shall submit these readings to the Inspector for review, if requested.

PART 4 – JOB CONDITONS

4.1 EROSION CONTROL

A. Provide adequate protection from erosion that may be caused by any of the dewatering operations utilized during the course of the construction. Any damage, disruption or interference to newly constructed work or existing properties, buildings, structures, utilities and/or other work resulting directly or indirectly from dewatering operations conducted under this Contract shall be remedied by the Contractor, at no additional cost to the Owner.

4.2 TREATMENT OF DEWATERING OPERATIONS DISCHARGES

A. Provide such additional treatment devices as may be required to meet the provisions of the Contract. This may include the construction of sumps and/or settling basins, stone rip-rap, silt fences or other requirements. The treatment devices shall be removed afterwards and/or filled in with acceptable backfill material and restored to original conditions once they are no longer needed, at no additional cost to the Owner.

4.3 NOISE CONTROL

A. When dewatering operations continue between the hours of 6 PM and 8 AM, the Contractor shall control the noise to meet local standards.

PART 5 – MEASUREMENT AND PAYMENT

5.1 MEASUREMENT: Dewatering operations are considered to be subsidiary to Section 01230 – Excavation and Backfill, and no separate measurement will be made by the Contractor for this Work.

5.2 PAYMENT: Dewatering operations are considered to be subsidiary to Section 01230- Excavation and Backfill, and no separate payment will be made to the Contractor for this Work.

END OF SECTION

SECTION 01220
EXPLORATORY EXCAVATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This section covers exploratory excavation, backfilling exploratory excavation, and restoration of the ground surface as necessary to locate existing underground structures. This includes excavation within the limits of construction or as required.

1.2 DESCRIPTION

A. Exploratory excavation shall be performed for the purpose of determining the location of underground structures and utilities using tight control machinery supplemented by hand labor.

B. Damage to existing structures and utilities shall be avoided during exploratory excavation. Any such structures or utility damaged by the CONTRACTOR shall be replaced or repaired at no cost to the Owner.

1.3 CONTROL OF WORK

A. The locations at which exploratory excavations are to be made shall be determined by the CONTRACTOR for facilitating safe and thorough execution of the work. In addition, exploratory excavations may be indicated in the Contract Documents or designated by the Owner.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 SCHEDULING

A. Consult with the Owner as to location of the exploratory excavations so that this work may be scheduled sufficiently in advance of installation of other items of the Work.

B. Obtain all available information on the location of existing underground structures and utilities prior to starting this type of excavation.

C. Notify the Utility Owner of the structures and/or utilities to be affected, in sufficient time to allow their Representatives to observe the exploratory excavations.

3.2 EXCAVATION

A. Conduct all excavations with extreme care so as not to damage any existing structure or utility. If damage occurs notify the Owner and the respective Utility Owner immediately. Make repairs promptly if authorized by the Utility Owner or coordinate with the Utility Owner to facilitate prompt repair and compensation for damages.

B. When the location of underground structures or utilities has been determined, notify the Owner.

3.3 BACKFILL AND RESTORATION

A. Exploratory excavations shall be backfilled and the surface restored according to the applicable Section of the Contract Documents unless otherwise directed by the Owner.

4.0 MEASUREMENT AND PAYMENT

A. MEASUREMENT: Exploratory excavation operations are considered to be subsidiary to 01230 – Excavation and Backfill, and no separate measurement will be made by the Contractor for this Wwork.

B. PAYMENT: Exploratory excavation operations are considered to be subsidiary to Section 01230 – Excavation and Backfill, and no separate payment will be made to the Contractor for this Work.

END OF SECTION

SECTION 01230
EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.1 SCOPE

A. The Work included in this Section shall consist of furnishing all labor, materials, equipment, and incidentals necessary to perform all excavation (unclassified), backfill, fill, grading and slope protection required for completing the structural and/or utility piping work and/or other work shown within the Drawings and specified herein.

B. The item shall include, but not necessarily be limited to: manholes, vaults, duct conduit, pipe, and roadways and paving; all backfilling, fill and required borrow; grading; dewatering, sheeting, shoring, bracing, water handling, and all other work incidental and specified herein.

C. Trench Excavation shall be in accordance with the Typical Trench Backfill standard details included within the Construction Drawings.

D. Where references are made to other standards and codes, unless specific date references are indicated, the latest edition of said standard or code shall govern.

1.2 QUALITY ASSURANCE

A. Required Tests:

1. The Owner will engage the services of a qualified testing laboratory to make tests and determine acceptability of the fill or materials as listed below.

2. Required tests:

a. Select Fill Samples: Gradation, ASTM D422.

b. Compacted Select Fill: Compaction, ASTM D1556, ASTM D1557, and ASTM D2922.

B. Permits and Regulations:

1. Obtain all necessary permits for work in roads, rights-of-ways, railroads, etc.

2. Obtain permits as required by local, state and federal agencies for discharging water from excavations.

3. Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

1.3 RELATED SECTIONS

A. Section 01140, Dewatering.
B. Section 02650, PVC Pipe
C. Section 02660, Ductile Iron Pipe
D. Section 02680, Ductile Iron Fittings

1.4 REFERENCE STANDARDS

A. Comply with the applicable provisions and recommendations of the following except as otherwise shown or specified; latest revision thereof shall apply.

1. ASTM A36 - Specification for Structural Steel.

2. ASTM A328 - Specification for Steel Sheet Piling.

3. ASTM D422 - Method for Particle-Size Analysis of Soils.

4. ASTM D1556 - Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

5. ASTM D1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft 16/cu ft) (2,700 KN-m/cu m).

6. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

7. AISC Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings.

8. Occupational Safety and Health Administration (OSHA) Standards, Title 29, Code of Federal Regulations, Part 1926, Section .650 (Subpart P-Excavations).

1.5 SUBMITTALS

A. Drawings shall be prepared by a licensed Texas Professional Engineer recognized as an expert in the specialty excavation and backfill activities involved. Drawings shall be submitted to the Engineer for review and record purposes only. Calculations shall not be submitted for review, unless requested by the Engineer. Drawing submittals will not be checked and will not imply approval by Engineer of the work involved. The Contractor shall be solely responsible for designing, installing, operating and maintaining whatever system is necessary to satisfactorily accomplish all necessary sheeting, shoring, bracing, protection, cofferdams, underpinning and dewatering.

B. Test Reports - Borrow, Backfill, and Grading:

1. Owner's testing laboratory will submit copies of the following reports directly to Engineer, with a copy to the Contractor:

a. Tests on borrow material.

b. Tests on footing subgrade.

c. Field density tests.

d. Optimum moisture - maximum density curve for each soil type used for backfill.

e. Tests of actual unconfined compressive strength or bearing tests of each strata.

C. The Contractor shall submit samples of all select fill, gravel and base materials as required.

1. Deliver samples to Owner.

D. Compaction equipment and proposed methods.

E. Erosion and sedimentation control plan.

1.6 TRENCH EXCAVATION SAFETY

A. Trench Excavation Safety shall conform to requirements contained within Section 01240 of these Project Specifications.

1.7 SITE PREPARATION

A. Site preparation shall be completed in accordance with Section 01100 of these Project Specifications.

1.8 DEWATERING

A. Dewatering shall be conducted in accordance with Section 01140 of these Project Specifications.

1.9 JOB CONDITIONS AND SAFETY

A. The Contractor shall examine the site and review the available test borings or undertake his own soil borings prior to submitting his bid, taking into consideration all conditions that may affect the work.

B. The Owner will not assume responsibility for variations of sub-soil quality or

conditions at locations other than places shown at the time the subsurface investigation was made. Boring log data and soil samples may be available for examination by the Contractor upon request.

C. Existing Structures: The Drawings may show certain surface and underground structures adjacent to the Work. This information has been obtained from existing records. It is not guaranteed to be correct or complete and is shown for the convenience of the Contractor. Contractor shall explore ahead of the required excavation to determine the exact location of all structures. They shall be supported and protected from damage by Contractor. If they are broken or damaged during construction, they shall be restored immediately by Contractor at the Contractor's expense.

D. Existing Utilities: Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the Owner of such piping or utility immediately for directions on how to proceed with construction activities.

2. Cooperate with the Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of the Owner.

3. Demolish and completely remove from site all existing underground utilities indicated within the Contract Documents to be removed.

E. Protection of Persons and Property: Barricade open excavations occurring as part of this Work and post with warning lights. Operate warning lights as recommended by authorities having jurisdiction.

1. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

F. Use of Explosives:

1. The use of explosives at the job site will not be permitted.

G. Dust Control:

1. Conduct all operations and maintain areas of activity, including sweeping and sprinkling of roadways adjacent to the work area, to minimize creation and dispersion of dust. Calcium chloride may be used to control serious or prolonged dust problems, subject to approval of Engineer.

1.10 CODES, ORDINANCES, AND STATUTES

A. The Contractor shall be familiarized and comply with all applicable codes, ordinances, statutes, and bear sole responsibility for any penalties imposed for noncompliance.

1.11 SHORING, SHEETING, BRACING, AND SLOPING

A. The Contractor shall provide shoring, sheeting, bracing, or sloping as required to protect excavations. All shoring, sheeting, bracing, and sloping will be installed and maintained in accordance with OSHA standards and other applicable laws.

B. For trench sheeting for pipes, no sheeting is to be withdrawn if driven below mid-diameter of any pipe, and no wood sheeting shall be cut off at a level lower than one (1) foot above the top of any pipe unless otherwise instructed by the Owner. If during the progress of the Work the Owner decides that additional wood sheeting should be left in place, he may instruct the Contractor in writing. If steel sheeting is used for trench sheeting, removal shall be as specified above, unless written approval is given for an alternate method of removal.

C. All sheeting and bracing not left in place shall be carefully removed in such a manner as not to endanger the construction or other structures, utilities, existing piping, or property. Unless otherwise approved or indicated in the Drawings, all sheeting and bracing shall be removed after completion of the substructure, care being taken not to disturb or otherwise injure the finished masonry. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, by watering or otherwise as may be required.

D. Owner has the right to instruct the Contractor with regard to sheeting and bracing to be left in place shall not be construed as creating any obligation on his part to issue such instructions, and his failure to exercise his 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 otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

E. The Contractor shall construct cofferdams and sheeting outside the neat lines of the foundation unless indicated otherwise to the extent he deems it desirable for his method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting, bracing, and cofferdams shall be adequate to withstand all pressures to which the structure will be subjected. Pumping, bracing, and other work within the cofferdam shall be done in a manner to avoid disturbing any construction of the masonry enclosed. Any movement or bulging which may occur shall be corrected by the Contractor at his own expense so as to provide the necessary clearances and dimensions.

1.12 EROSION AND POLLUTION CONTROLS

A. The Contractor shall provide silt barriers, hay bales or other approved devices to prevent erosion or siltation of waterways and drainage courses, in accordance with the Drawing details.

PART 2 – PRODUCTS

2.1 SOIL MATERIALS

A. General:

1. Materials for use as base, fill and backfill shall be as described below.

a. Satisfactory soil materials are defined as those complying with American Association of State Highway and Transportation Officials (AASHTO) M-145, soil classification Groups A-1, A-2-4, A-2-5 and A-3.

b. Unsatisfactory soil materials are those defined in AASHTO M-145 soil classification Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 along with peat and other highly organic soils.

B. Structural Fill:

1. Structural fill material shall be well graded soil material consisting of coarse aggregate to medium to fine grain sized sand, free of organic, deleterious and/or compressible material. Rock in excess of 3-1/2 inches in diameter shall not be used in the fill material. Structural fill shall not contain hardpan, stones, rocks, cobbles or other similar materials.

C. Select Common Fill:

1. Select common fill material shall be satisfactory soil material containing no more than 15 percent by weight finer than No. 200 mesh sieve. It shall be free from organic matter, muck, marl, and rock exceeding 3-1/2 inches in diameter. Select common fill shall not contain broken concrete, masonry, rubble or other similar materials.

2. Material falling within the above referenced specification, encountered during the excavation, may be stored in segregated stockpiles for reuse. All material which, in the opinion of the Owner, is not suitable for reuse shall be spoiled as specified herein for disposal of unsuitable materials.

D. Bedding Rock:

1. The bedding and initial backfill materials for ductile iron pipe (DI), Polyvinyl Chloride Pipe (PVC), HDPE Pipe, and Wrapped Steel Pipe in all nominal diameters shall be composed of well graded crushed stone or gravel conforming to the following measurements:

Sieve Size	Avg. Retained (%)	Tolerance (%)
1/2"	0	0
3/8"	0	0-5
#4	30	20-45
#8	90	90-100
#16	95	95-100
#30	98	98-100

E. Secondary and General Backfill:

1. Provide approved soil materials for backfill and fill, free of clay, rock, or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetable and other organic matter and other deleterious materials. Previously excavated materials meeting these requirements may be used for backfill.

F. Topsoil

1. Topsoil shall be reasonably free from subsoil, stumps, roots, brush, stones (2 inches or more in diameter), clay lumps, or similar objects.

2. The topsoil and or soil mixture, unless otherwise specified or approved, shall have a PH range of approximately 5.5 to 8.0.

3. The organic compound of topsoil shall be not less than 1%.

2.2 WATER

A. Water used in compaction shall be clean and free from oil and grease. It shall not contain any organic matter or any other deleterious substances.

2.3 COMPACTION EQUIPMENT

A. Compaction equipment shall be of suitable type and adequate to obtain the densities specified, and shall provide satisfactory breakdown of materials to form a dense fill. Compaction equipment shall be operated in accordance with the Manufacturer's instructions and recommendations.

B. Equipment shall be maintained in such condition that it will deliver the manufacturer's rated compaction effort. If inadequate densities are obtained, larger and/or different types of additional equipment shall be provided by the Contractor. Hand-operated equipment shall be capable of achieving the specified densities.

2.4 MOISTURE CONTROL EQUIPMENT

A. Equipment for applying water shall be of a type and quality adequate for the work, shall not leak, and shall be equipped with a distributor bar or other approved device to assure uniform application. Equipment for mixing and drying out material shall consist of blades, discs, or other approved equipment.

PART 3 – EXECUTION

3.1 GENERAL

A. Material shall be furnished, as required, from off site sources and hauled to the site.

B. The Contractor shall take all the necessary precautions to maintain the work area in a safe and workable condition.

C. The Contractor shall protect his work at all times by flagging, marking, lighting and barricading. It shall also be the Contractor’s responsibility to preserve and protect all above and underground structures, pipe lines, conduits, cables, drains or utilities which are existing at the time he encounters them. Failure of the Contract Documents to show the existence of these obstructions shall not relieve the Contractor from this responsibility. The cost of repair of any damage which occurs to these obstructions during or as a result of construction shall be borne by the Contractor without additional cost to the Owner.

3.2 INSPECTION

A. Provide the Resident Inspector with sufficient notice and with the means to examine the areas and conditions under which excavating, filling, and grading are to be performed. The Resident Inspector will notify the Owner and the Engineer if conditions are found that may be detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in an acceptable manner.

3.3 EXCAVATION

A. Excavation of all trenches required for the installation of pipes and electrical ducts shall be made to the depths indicated in the Contract Documents. Excavate in such manner and to such widths as will give suitable room for laying the pipe or installing the ducts within the trenches, for bracing and supporting, and for pumping and drainage facilities. The trench width at the top of the pipe shall not exceed the allowable value as determined by the depth of cut and indicated in the Contract Documents.

B. Rock shall be removed to a minimum 4-6 inches clearance around the bottom and sides of all the pipe or ducts being laid as shown in the Contract Documents.

C. The bottom of the excavations shall be firm, dry and acceptable to the Owner. Excavate unsatisfactory soil material from the bottom of the trench to a depth determined by the Owner/Engineer and replace with rock or shell bedding.

D. Where pipe or ducts are to be laid in bedding or encased in concrete, the trench may be excavated by machinery to, or just below, the designated subgrade provided that the material remaining in the bottom of the trench is no more than slightly disturbed.

E. Where the pipes or ducts are to be laid directly on the trench bottom, the lower part of the trenches shall not be excavated to the trench bottom by machinery. The last of the material being excavated shall be done manually in such a manner that will give a flat bottom true to grade so that pipe or duct can be evenly and uniformly supported along its entire length on un- disturbed material or bedding rock. Bell holes shall be made as required manually so that there is no bearing surface on the bells and pipes are supported along the barrel only.

F. The Contractor shall abide by the following schedule of criteria concerning interferences with other utilities. In no case shall there be less than 0.33 feet (4 inches) between any two pipe lines or between pipe lines and structures.

G. Concrete encasement shall be provided in accordance with the Concrete Encasement standard detail drawing shown within the Construction Drawings.

3.4 BACKFILLING

A. Backfilling over pipes shall begin as soon as practicable after the pipe has been laid, jointed, and inspected and the trench filled with suitable bedding material.

B. Backfilling over ducts shall begin not less than three days after placing concrete encasement.

C. All backfilling shall be prosecuted expeditiously and as detailed in the Contract Documents.

D. Select granular bedding material shall meet the required measurements.

E. The remainder of the trench shall be filled with compacted backfill, free from stones having a diameter greater than 2 inches and thoroughly compacted with a tamper as fast as placed.

F. The filling shall be carried up evenly on both sides with at least one person tamping for each person shoveling material into the trench.

G. The remainder of the trench above the compacted backfill, as just described above, shall be filled and thoroughly compacted with topsoil with mechanical equipment. The topsoil shall be mound over the original ground surface to permit

passage of vehicles to allow for future settling. There shall be 4 inches of topsoil on the trench supplied from the stockpiled topsoil.

H. In locations where pipes pass through building walls, the Contractor shall take the following precautions to consolidate the refill up to an elevation of at least 1 foot above the bottom of the pipes:

1. Place structural fill in such areas for a distance of not less than 3 feet either side of the center line of the pipe in level layers not exceeding 6 inches in depth.

2. Wet each layer to the extent requested and thoroughly compact each layer with a power tamper.

3.5 GRADING

A. Grading shall be performed at such places as are indicated in the Contract Documents, to the lines, grades, and elevations shown or as approved by the Owner/Engineer and shall be made in such a manner that the requirements for formation of embankments can be followed. All unacceptable material encountered, of whatever nature within the limits indicated, shall be removed and disposed of as requested. During the process of excavation, the grade shall be maintained in such condition that it will be well drained at all times. Temporary drains and drainage ditches shall be installed to intercept or divert surface water which may affect the prosecution or condition of the work.

B. If at the time of excavation, it is not possible to place any material in its proper section of the permanent structure, it shall be stockpiled in approved areas for later use. No extra payments will be considered for the stockpiling or double handling of excavated material.

C. The right is reserved by the Owner to make minute adjustments or revisions in lines or grades if found necessary as the work progresses, due to discrepancies in the Contract Documents or in order to obtain a satisfactory construction outcome.

D. Stones or rock fragments larger than 1-1/2 inches in their greatest dimensions will not be permitted within the top 12 inches of the subgrade line of all dikes, fills or embankments.

E. All fill slopes shall be uniformly dressed to the grade, cross-section and alignment shown in the Contract Documents, or as approved in writing by the Owner.

F. In cuts, all loose or protruding rocks on the back slopes shall be jarred loose or otherwise removed to line or finished grade of slope. All cut and fill slopes shall be uniformly dressed to the grade, cross-section and alignment shown in the Contract Documents or as approved in writing by the Owner.

G. No grading is to be done in areas where there are existing pipe lines that may be uncovered or damaged until such lines which must be maintained are relocated, or where lines are to be abandoned, all required valves are closed and drains

plugged at manholes.

H. The Contractor shall replace all pavement that is cut or otherwise damaged during the progress of the work as specified elsewhere herein.

3.6 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Owner's testing service may inspect and approve subgrades and fill layers before construction work is performed thereon. Tests of subgrades and fill layers may be taken as follows:

1. Footing Subgrade: For each strata of soil on which footings will be placed, at least one test will be made to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to Engineer.

2. Tank and Building Slab Subgrade: At least one field density test of subgrade will be made for every 2,000 square feet of tank subgrade or building slab, but in no case less than 3 tests will be made per tank or building structure. In each compacted fill layer, one field density test will be made for every 2,000 square feet of overlaying building slab or tank subgrade, but in no case less than 3 tests will be made.

B. If testing service reports or field inspections show subgrade or fills are below specified density, the Contractor shall provide additional compaction at no additional expense to the Owner.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: Unless shown on the construction plans or called out within the technical specifications as a pay item, the structural and/or utility excavation and backfill quantities shown or described are for informational purposes only. No separate measurement of excavation and backfill quantities will be made by the Contractor for this Work.

4.2 PAYMENT: Unless specified as a pay item, structural and/or utility excavation and backfill performed and materials furnished in accordance with this Specification Section will not be paid for directly, but is considered to be subsidiary to the pertinent items associated with construction activities. No separate payment will be made to the Contractor for this Work.

END OF SECTION

SECTION 01240
TRENCH EXCAVATION SAFETY

PART 1 - GENERAL

1.1 SCOPE

A. The Work included in this Section consists of furnishing all materials, equipment, and labor necessary to perform construction of all trench excavation protection systems to be utilized within the project as shown in the Drawings and specified within.

1.2 RELATED SECTIONS

A. Section 02650, PVC Pipe
B. Section 02660, Ductile Iron Pipe
C. Section 02665, HDPE Pipe
D. Section 02675, Pipe Encasement
E. Section 02680, Ductile Iron Fittings
F. Section 02690, Tapping Sleeves and Valves

1.3 REFERENCE STANDARDS

A. Latest provision of Part 1926, Subpart P- Excavations, Trenching, and Shoring of the Occupational Safety and Health Administration (OSHA) Standards and Interpretations, or the most applicable approved equal provision.

1.4 SUBMITTALS

A. Excavation Plan: Prior to start of excavation operations, submit a written plan to Engineer for review to demonstrate Contractor's compliance with OSHA Standard 29 CFR Part 1926.650 and Section 01240 of these Project Specifications. At a minimum, excavation plan shall include:

1. Name of competent person to be placed in charge of excavation and trenching operations.

2. Excavation method(s) or trench protective system(s) to be used.

3. Copies of "manufacturer's data" or other tabulated data if protective systems(s) are designed on the basis of such data.

PART 2 - PRODUCTS

Not Used.

PART 3 – EXECUTION

3.1 Trench excavation safety protection shall be accomplished as required by the latest

provision of OSHA Standards, or the most applicable approved equal provision.

3.2 SHORING, SHEETING, BRACING, AND SLOPING

A. The Contractor shall provide shoring, sheeting, bracing, or sloping as required to protect excavations. All shoring, sheeting, bracing, and sloping will be installed and maintained in accordance with OSHA standards and other applicable laws.

B. For trench sheeting for pipes, no sheeting is to be withdrawn if driven below mid-diameter of any pipe, and no wood sheeting shall be cut off at a level lower than one (1) foot above the top of any pipe unless otherwise instructed by the Owner. If during the progress of the Work the Owner decides that additional wood sheeting should be left in place, he may instruct the Contractor in writing. If steel sheeting is used for trench sheeting, removal shall be as specified above, unless written approval is given for an alternate method of removal.

C. All sheeting and bracing not left in place shall be carefully removed in such a manner as not to endanger the construction or other structures, utilities, existing piping, or property. Unless otherwise approved or indicated in the Drawings, all sheeting and bracing shall be removed after completion of the substructure, care being taken not to disturb or otherwise injure the finished masonry. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, by watering or otherwise as may be required.

D. Owner has the right to instruct the Contractor with regard to sheeting and bracing to be left in place shall not be construed as creating any obligation on his part to issue such instructions, and his failure to exercise his 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 otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

E. The Contractor shall construct cofferdams and sheeting outside the neat lines of the foundation unless indicated otherwise to the extent he deems it desirable for his method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting, bracing, and cofferdams shall be adequate to withstand all pressures to which the structure will be subjected. Pumping, bracing, and other work within the cofferdam shall be done in a manner to avoid disturbing any construction of the masonry enclosed. Any movement or bulging which may occur shall be corrected by the Contractor at his own expense so as to provide the necessary clearances and dimensions.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: Trench Excavation Safety labor and materials are considered to be subsidiary to other pay items. No separate payment will be made to the Contractor for this Work.

4.2 PAYMENT: Trench Excavation Safety labor and materials are considered to be subsidiary to other pay items. No separate payment will be made to the Contractor for this Work.

END OF SECTION

SECTION 01350

HYDROTESTING AND DISINFECTION

PART 1 – GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, materials, equipment, appurtenances, and services required to clean, flush, disinfect, and hydrostatically test all interior surfaces of water main pipelines in accordance with these Project Specifications.

B. All structures containing water, including treatment units not subject to disinfection, shall be cleaned in accordance with Paragraph 3.3 of this Specification Section.

C. Water for initial hydrostatic testing and disinfecting will be furnished by the Owner.

D. Contractor shall provide all temporary piping, hoses, valves, appurtenances, pumps, and services as required.

E. Where references are made to other standards or codes, unless specific date references are indicated, the latest edition of said standard or code shall govern.

1.2 REFERENCE STANDARDS

A. Comply with the following applicable provisions and recommendations; the revision in effect at time of the bid opening shall apply.

1. AWWA C600 - Installation of Ductile Iron Mains and Their Appurtenances

2. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings

3. AWWA C604 - Installation of Buried Steel Water Pipe- 4 In. and Larger

4. AWWA C651 - Disinfecting Water Mains

5. AWWA C652 - Disinfection of Water Storage Facilities

6. AWWA C653 - Disinfection of Water Treatment Plants

1.3 SUBMITTALS

A. Submit for approval the following:

1. Hydrostatic testing and disinfection procedures, methods, coordination, and schedules.

2. Related impacts on coordination with Owner's operations and Work Sequence.

1.4 RELATED SECTIONS

A. Section 02400, Valves and Appurtenances
B. Section 02440, Combination Air Valve
C. Section 02640, Fire Hydrant Assembly
D. Section 02650, PVC Pipe
E. Section 02660, Ductile Iron Pipe
F. Section 02665, HDPE Pipe
G. Section 02670, Ductile Iron Fittings
H. Section 02690, Tapping Sleeves and Valves
I. Section 02700, Water Main Tie-Ins

PART 2 – PRODUCTS

2.1 DISINFECTANT

A. Before disinfection for use with potable water, the water main pipeline shall be filled to eliminate air pockets and flushed to remove particulates. The flushing velocity in the main shall not be less than 2.50 feet/second unless the Owner determines that conditions do not permit the required flow rate.

B. The Contractor shall disinfect all installed water mains in accordance with the requirements of AWWA C651.

C. Liquid chlorine, sodium hypochlorite or calcium hypochlorite shall be used in accordance with AWWA C652 and AWWA C653.

D. Liquid chlorine shall be used only where gas-flow chlorinators and injectors are installed for treatment applications. Portable or makeshift gas chlorination equipment is not acceptable.

E. Disinfectant chemicals and materials shall be furnished by the Contractor.

F. All disinfection of water mains and piping shall be done under general supervision of the Inspector.

PART 3 - EXECUTION

3.1 FLUSHING

A. Immediately upon completion of water main installation or repair Work, the Contractor shall flush all mains affected by the scope of the Work.

B. This flushing shall consist of completely filling sections of main between valves and then displacing such initial volumes of water by introducing clear water from existing facilities into and through the main to the point of discharge from the main being flushed.

C. The flow-through shall continue until it is determined all dust, debris, or foreign matter that may have entered during pipe laying operations has been flushed out.

D. All new water mains shall then be left under system pressure for testing.

E. To avoid damage to pavement and inconvenience to the public, fire hoses shall be used to direct flushing water from the main into suitable drainage channels or sewers.

F. The Contractor shall coordinate with the Inspector prior to beginning flushing activities.

3.2 CLEANING

A. All scaffolding, planks, tools, rags, dirt, debris, and any other material not part of the structural or operating facilities shall be removed prior to chlorination.

B. The surfaces of the walls, floors, and operating facilities shall then be thoroughly cleaned by sweeping, a high pressure water hose, scrubbing, or another equally effective method.

C. All water, dirt, or foreign material accumulated in this operation shall be removed from the water storage facility.

3.3 CHLORINATION PROCEDURE

A. Facilities requiring disinfection shall be chlorinated by one of the following methods described in AWWA C652:

1. Method 1: Chlorination of treatment facilities such that at the end of the appropriate retention period the water will have a free chlorine residual of not less than 10 mg/l.

2. Method 2: Applying a solution of 200 mg/l available chlorine to the surfaces of all treatment facilities that will come in contact with water.

3. Method 3: Chlorination of treatment facilities with water having a free chlorine residual of 2 mg/l after 24 hours.

B. Contractor shall:

1. Provide all temporary taps, plugs, valves (including any necessary temporary valves to isolate new piping or structures from existing system), drains, pumps, piping, and connections required to clean, flush, disinfect, and remove the disinfectant.

2. Provide all temporary pumps, piping, and facilities, as required, to drain all flushing water to the work area runoff control area in accordance with the Contractor's Storm Water Pollution Prevention Plan (SWPPP).

3. Perform disinfection of each facility immediately before the facility is placed in operation and ensure that the facility is not contaminated after being acceptably disinfected.

3.4 BACTERIOLOGICAL SAMPLING AND TESTING

A. After the chlorination procedure is completed and before each facility is placed in service, water from the completed facility shall be sampled and tested by Owner for coliform organisms and odor.

B. Samples for bacteriological tests will be taken by the Owner. These samples shall indicate microbiologically-satisfactory water before the facilities will be accepted.

C. If initial test results indicate contamination is present, the Contractor shall repeat the cleaning and disinfection procedure until the test results indicate microbiologically-satisfactory water.

D. The initial cleaning and disinfection procedures shall be performed at the Contractor's expense. The initial sampling and testing shall be at the Owner's expense. However, all expenses associated with subsequent cleaning, disinfection, sampling, and testing required due to positive bacteriological tests resulting from the Contractor's error or negligence shall be paid for by the Contractor. No extra payment or extension of Contract Times will be given to the Contractor for the time elapsed to achieve acceptable disinfection of the pipe.

E. Bacteriological tests will be completed in accordance with AWWA C652.

1. If a test is negative (satisfactory bacteriological sample), the facility may be placed in service.

2. If a test is positive, Owner will perform an additional set of tests to confirm the results of the initial tests.

3. If a repeat test for coliform organisms indicate positive results, the Contractor shall repeat the cleaning and disinfection procedure for the facility until satisfactory results are obtained.

3.5 HYDROSTATIC TESTING FOR PIPES

A. After the water pipeline has been laid and after inspection by the Owner, all newly laid main shall be subjected to a hydrostatic pressure test in accordance with AWWA C600/C605. The Contractor shall perform a hydrostatic pre-test to provide reasonable assurance of acceptance prior to performance of the witnessed test. Upon accomplishing a successful pre-test, the Contractor shall contact the Owner/ Engineer at least 48 hours prior to the test. The Owner or the Inspector shall be present during all hydrostatic pipeline tests.

B. Testing shall not be performed before three (3) days after all portions of water mains installation work has been completed.

C. Proper measures shall be taken to ensure that no cross connections are made during testing activities.

D. Test Pressure: The hydrostatic test pressure shall be 1.5 times the anticipated maximum sustained working pressure of the line or 150 psi, whichever is higher. However, in no case shall the test pressure exceed the rated working pressure for any joint, thrust restraint, valve, fitting, or other connected appurtenance of the test section.

E. Slowly fill the pipe with water and allow it to stand for 24 hours. Expel all air from the main. Apply and maintain the specified test pressure by continuous pumping if necessary, for the entire test period. The test pressure shall be calculated for the point of lowest elevation, or as specified by the Owner. The pump suction shall be in a barrel or similar device or metered so that the amount of water required to maintain the test pressure may be measured accurately.

F. Each pressure test duration shall be a minimum of two (2) hours, and allowable leakage shall be determined according to the following formula, unless otherwise directed by the Owner:

1. Leakage shall be defined as the quantity of makeup water required to hold the specified test pressure for the duration of the test period. No pipe installation will be accepted if the leakage is greater than the number of gallons per hour as determined by the following formula:

$$L = \frac{SD\sqrt{P}}{148{,}000}$$

L = quantity of makeup water, in gallons per hour. S = length of pipe section being tested, in feet. D = nominal pipe diameter, in inches. P = average hydrostatic test pressure, in psi (gauge).

G. Test service connection pipe by either testing in conjunction with the main at the test pressure required for the main, or by testing at the normal hydrostatic main pressure after the main has been completely installed and tested. Inspect visually for leaks and repair any leaks before backfilling. Duration of the test shall be at 15 minutes.

H. Upon completion and disinfection, the water mains shall be tested to determine water tightness according to AWWA C605 or most recent revision.

I. The hydrostatic pressure test must be successful. If the test is unsuccessful the contractor, at his expense, must rectify any problems and repeat the testing protocol.

3.6 HYDROSTATIC TESTING FOR TAPPING SLEEVES

A. Tapping tees shall be tested per manufacturer's recommendation. Inspect sleeve for leaks, and remedy leaks prior to tapping operation. The test pressure shall be maintained for a minimum of 10 minutes without any perceivable decline in pressure.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: Unless shown on the construction plans or called out within the technical specifications as a pay item, the hydrostatic testing and disinfection quantities shown or described are for informational purposes only. No separate measurement of hydrostatic testing and disinfection quantities will be made by the Contractor for this Work.

4.2 PAYMENT: Unless specified as a pay item, hydrostatic testing and disinfection performed and materials furnished in accordance with this Specification Section will not be paid for directly but will be subsidiary to the pertinent items associated with construction activities. No separate payment will be made to the Contractor for this Work.

END OF SECTION

SECTION 01410

TESTING LABORATORY SERVICES

PART 1 – GENERAL

1.1 SCOPE

A. The Work included in this Section consists of furnishing all labor, materials, equipment and incidentals required for testing laboratory services as specified herein.

1.2 DESCRIPTION OF REQUIREMENTS

A. The Owner will employ and pay for the services of an Independent Testing Laboratory to perform specified services and testing.

B. Employment of the laboratory shall in no way relieve the Contractor's obligations to perform the Work of the Contract.

1.3 QUALIFICATION OF LABORATORY

A. Authorized to operate in the State of Texas.

1.4 RELATED SECTIONS

A. Section 01230 – Excavation and Backfill.
B. Section 03600 – Grout.
C. Section 06001 – Flexible Base.
D. Section 09900 – Painting.

1.5 REFERANCE STANDARDS

A. Laboratory of National Institute of Standards and Technology (NIST).

1.6 SUBMITTALS

A. Submit a copy of report of inspection of facilities made by Materials Reference Laboratory of National Institute of Standards and Technology (NIST) during the most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.

PART 2 – TESTING EQUIPMENT

2.1 GENERAL

A. Calibrated at reasonable intervals by devices of accuracy traceable to either:

1. NIST

2. Accepted values of natural physical constants.

PART 3 - EXECUTION

3.1 LABORATORY DUTIES

A. Cooperate with Engineer and Contractor to provide qualified personnel after due notice.

B. Perform specified inspections, sampling and testing of materials and methods of construction.

C. Comply with specified standards.

D. Promptly notify Engineer/Owner and Contractor of observed irregularities or deficiencies of work products.

E. Promptly submit written report of each test and inspection; one copy each to Engineer, Owner and Contractor. Each report shall include:

1. Date issued.

2. Project title and number.

3. Testing laboratory name, address and telephone number.

4. Name and signature of laboratory inspector.

5. Date and time of sampling or inspection.

6. Record of temperature and weather conditions.

7. Date of test.

8. Identification of product and specification section.

9. Location of sample or test in the Project.

10. Type of inspection or test.

11. Results of tests and compliance with Contract Documents.

12. Interpretation of test results, when requested by Engineer.

13. Employment of personnel making test samples.

14. Perform additional tests as required by Engineer or the Owner.

3.2 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

A. Laboratory is not authorized to:

1. Release, revoke, alter or expand requirements of the Contract Documents.

2. Approve or accept any portion of the Work.

3. Perform any duties of the Contractor.

3.3 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel, provide access to Work, and to Manufacturer's operations.

B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.

C. Furnish copies of Products test reports as required.

D. Furnish incidental labor and facilities.

E. Provide access to Work to be tested.

F. Obtain and handle samples at the Project site or at the source of the product to be tested.

G. Facilitate inspections and tests.

H. Provide a suitable storage box at the site for storage and curing of test samples.

I. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

J. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.

K. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience, including concrete design mixes.

L. Pay for the services of the Independent Testing Laboratory to perform additional inspections, sampling, and testing required when initial tests indicate that work does not comply with the Contract Documents.

PART 4 – MEASUREMENT AND PAYMENT

4.1 Measurement and payment shall be the sole responsibility of the Owner. No separate measurement shall be done by, or payment made to, the Contractor for this Work.

END OF SECTION

SECTION 01500
REINFORCED CONCRETE

PART 1 - GENERAL

1.1 SCOPE

A. This item shall govern the storage, handling and usage of materials; and the proportioning, mixing and transportation of concrete for all concrete construction.

B. This item shall provide for the furnishing and placing of bar reinforcing steel for use in structures and other concrete items that require reinforcing steel as shown in the contract documents

C. This item shall govern the construction of foundations, cast in place valve vaults, retaining walls, drainage structures, concrete pavement, and other designated structures. All concrete structures shall be constructed in accordance with the specifications herein outlined and in conformity with the required lines, grades, sections and details shown in the contract documents or as directed by the Engineer.

1.2 RELATED SECTIONS

A. Section 01410, Testing Laboratory Services

1.3 REFERENCE STANDARDS

Reference standards cited in this Specification Item No. 01500 refer to the current reference standard published at the time of the latest revision date logged at the end of this Specification Item No. 01500, unless a date is specifically cited.

A. Texas Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition.

B. American Concrete Institute standards, latest edition.

C. American Society for Testing and Materials (ASTM) International

D. American Society of Mechanical Engineers

1.4 SUBMITTALS

A. Concrete – Contractor shall submit manufacturer’s product data, instructions, recommendations, shop drawings, and certifications. All submittals shall be in accordance with Engineer’s requirements and submittals shall be approved prior to delivery.

1. Submit proposed mix design and test data for each type and strength of concrete in work.

2. Submit laboratory reports prepared by independent testing laboratory stating that materials used comply with requirements of this Sections.

3. Submit manufacturer's mill certificates for reinforcing steel. Provide specimens for testing when required by Engineer.

4. Submit certification from concrete supplier that materials and equipment used to produce and deliver concrete comply with this Specification.

5. When required on Drawing, submit shop drawings showing reinforcement type, quantity, size, length, location, spacing, bending, splicing, support, fabrication details, and other pertinent information.

6. For waterstops, submit product information sufficient to indicate compliance with this Section, including manufacturer's descriptive literature and specifications.

B. Reinforced Steel – Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications. All submittals shall be in accordance with Engineer's requirements and submittals shall be approved prior to delivery.

C. Concrete Structures – Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and submittals shall be approved prior to delivery.

1. Submit proposed design mix and test data for each type and strength of concrete.

2. Submit manufacturer's data and details of following items for approval:

    a. Frames, gates, rings, and covers.

    b. Materials to be used in fabricating drop connections.

    c. Materials to be used for pipe connections at structure walls.

    d. Materials to be used for stubs and stub plugs.

    e. Installation instructions for forms.

    f. Shop drawings of hatches.

3. Summary of criteria used in structure design including, as minimum, material properties, loadings, load combinations, and dimensions assumed. Include certification that structure design is in full accordance with ASTM C890 and design criteria.

4. Materials and procedures for corrosion-resistant liner and coatings or concrete additive, if required.

PART 2 - PRODUCTS

2.1 CONCRETE

A. The concrete shall be composed of Portland Cement, mineral filler, if necessary, natural aggregates (fine and coarse), and water, proportioned and mixed as hereinafter provided in these specifications. Concrete shall meet all the requirements as set forth in the latest provision of ASTM C94 or the most applicable approved equal provision.

B. The minimum cement content, maximum allowable water content, and maximum slump of the various classes of concrete shall conform to Table 8 from TxDOT specification 421 Hydraulic Cement Concrete.

C. Concrete Classes

Class of Concrete	Design Strength, Min f'_c (psi)	Max w/cm Ratio	Coarse Aggregate Grades	Cement Types	Mix Design Options	Exceptions to Mix Design Options	General Usage
A	3,000	0.60	1–4, 8	I, II, I/II, IL, IP, IS, IT, V	1-2	When the cementitious material content does not exceed 520 lb./cu. yd., Class C fly ash may be used instead of Class F fly ash.	Curb, gutter, curb & gutter, conc. retards, sidewalks, driveways,
B	2,000	0.60	2–7				Riprap, traffic signal controller foundations, small roadside signs, and anchors
C[6]	3,600	0.45	1–6	I, II, I/II, IP, IS, IT,[7] V	1–2		Foundations, retaining walls, valve vaults
P	3,200	0.50	2–3	I, II, I/II, IL, IP, IS, IT, V	1–2	When the cementitious material content does not exceed 520 lb./cu. yd., Class C fly ash may be used instead of Class F fly ash.	Concrete pavement

Option 1. Replace 20% to 35% of the cement with Class F fly ash.

Option 2. Replace 35% to 50% of the cement with slag cement or MFFA.

2.2 REINFORCED STEEL

A. Reinforcing steel shall be grade 60 and all bar reinforcement shall be deformed, conforming to the latest provision of Item No. 440, "Reinforcing Steel" of the TX-DOT Standard Specifications or most applicable approved equal provision. Reinforcing steel bars produced outside of the United States

are acceptable, if such bar reinforcement conforms to the requirements of the latest provision of the ASTM Specifications for the various designations of bars.

B. Bending, tolerances and storage of reinforcing steel shall conform to the latest provision of Article 440.3.A-C, in Item No. 440, "Reinforcing Steel" of the TX-DOT Standard Specifications or most applicable approved equal provision.

2.3 CONCRETE STRUCTURES

A. Concrete: All concrete shall conform to this specification, "Concrete (Class C)" or the most applicable approved equal provision, or the concrete shall be of a class as noted in the contract documents.

B. Reinforcing Steel: All reinforcing steel shall conform to the provisions of this specification.

C. Membrane Curing Compound: Provide membrane curing compounds that conform to the latest provision of TX-DOT's DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants" or most applicable approved equal provision.

D. Expansion Joint Materials: Provide materials that conform to the latest provision of TxDOT's DMS-6310, "Joint Sealants and Fillers" or most applicable approved equal provision.

E. Metal for Structures: Metal for structures shall conform to the latest provision of TxDOT Standard Specifications for Construction Item 442, "Metal for Structures", or most applicable approved equal provision.

PART 3 - EXECUTION

3.1 REINFORCING STEEL

A. Splices: No splicing of bars, except when provided in the contract documents, will be permitted without written approval of the Engineer.

B. Placing Reinforcement: All steel reinforcing shall be accurately placed in the position shown in the contract documents and firmly held during the placement and setting of concrete. All reinforcement shall be free from dust, rust, mill scale, paint, oil, mortar or foreign material. Bars shall be tied at all intersections. Where spacing of bars in each direction is less than 12 inches, only alternate intersections need be tied. Distances from forms shall be maintained by means of stays, precast blocks, ties, hangers, metal chairs or other approved supports. Blocks for holding reinforcing bars from contact with the forms shall be precast concrete blocks of approved shape and dimensions or other equally suitable devices. The use of pebbles, pieces of broken stones or brick, metal pipe and wooden blocks shall not be permitted. Reinforcement in any sections shall be placed and then inspected and approved by the Inspector before the placing of concrete begins.

TABLE 2			
Bar size, number	**Nominal diameter, inches**	**Nominal Area, square inches**	**Weight, pound per linear foot**
2	0.250	0.05	0.167
3	0.375	0.11	0.376
4	0.500	0.20	0.668
5	0.625	0.31	1.043
6	0.750	0.44	1.502
7	0.875	0.60	2.044
8	1.000	0.79	2.670
9	1.128	1.00	3.400
10	1.270	1.27	4.303
11	1.410	1.56	5.313
14	1.693	2.25	7.65
18	2.257	4.00	13.60

3.2 CONCRETE STRUCTURES

A. Forms: Forms shall be of wood, metal or other approved materials and shall conform to the following requirements:

1. Wood Forms:

a. Unexposed concrete surfaces, No. 2 common or better lumber.

b. Exposed concrete surfaces, dressed and matched boards of uniform thickness and width.

2. Plywood: Commercial Standard Douglas Fir, moisture resistant, concrete form plywood, not less than 5 ply and at least 9/16th of an inch in thickness. The face of the plywood shall be free from knot holes and other blemishes.

3. Metal Forms: Metal forms of an approved type that will produce surfaces equal to or better than those specified for wood forms.

Forms may be constructed of any of the above substances or of other material if suited to the intended purpose and when approved by the Inspector. Forms shall be built mortar tight and of sufficient strength to prevent bulging between supports and shall be set and maintained to the line and grade designated until the concrete is sufficiently hardened to permit removal. All details of form construction shall be subject to the approval of the Inspector and, in special cases, the approval of the Engineer may be required. Permission to place concrete will not be given by the Inspector until all form work has been placed in accordance with the above requirements. If at any stage of the work, the forms show signs of bulging, sagging or moving, that portion of the concrete causing such conditions shall be immediately removed, if required by the

Inspector, and the forms reset and securely braced against further movement.

All corners and edges, which will be exposed after construction, shall be chamfered with triangular chamfer strips ¾ inch measured on the sides.

B. Placing Reinforcement: All steel reinforcement shall be placed in accordance with this specification.

C. Placing Concrete: The base slabs of concrete structures shall be placed and allowed to set before the remainder of the structure is constructed. Suitable provisions shall be made for bonding the sidewalls to the base slab by means of longitudinal keys so constructed as to prevent the percolation of water through the construction joints. Before concrete is placed in the walls, the keyed-edge joints shall be thoroughly cleaned of all shavings, sticks, trash or other extraneous materials. The top slabs of valve vaults and like structures may be poured monolithic with the walls, provided the walls are poured and allowed to set a minimum of 1 hour. No more than 2 hours shall elapse between the placing of the concrete in the wall and that in the top slab; such interval is to allow for shrinkage of the concrete in the wall. Under adverse weather conditions, the minimum time may be increased by the Engineer.

All concrete shall be placed with the aid of mechanical vibrating equipment supplemented inside the forms. Vibrating equipment shall be of the internal type and shall maintain a speed of 6,000 impulses per minute, when submerged in concrete. Vibrators shall be adequate in number of units to properly consolidate all concrete. Form or surface vibrators shall not be used. The duration of vibration shall be limited to properly consolidate the concrete without causing objectionable segregation of aggregates. Insertion of vibrators into lower courses that have commenced initial set, or the disturbance or reinforcement in concrete beginning to set, shall be avoided.

Concrete shall not be allowed to drop freely more than 5 feet in unexposed work, nor more than 3 feet in exposed work; where greater drops are required, a tremie or other approved means shall be employed. Concrete shall not be placed when the ambient temperature is below 40degrees F, nor where the concrete is likely to be subject to freezing before final set has occurred. When the air temperature is expected to drop below 40degrees F during the first 72 hours of the curing period, polyethylene sheeting or burlap-polyethylene blankets shall be placed in direct contact with the top surface of the concrete. Concrete may be poured in temperatures below 40□ F, when poured in protected areas, or where adequate protection can be provided against freezing, if approved by the Engineer. When concrete is poured in air temperatures above 85□ F, an approved retarding agent, meeting the latest provision of ASTM C494, Type B or most applicable approved equal provision, will be required in all concrete used in superstructures and top slabs of culverts unless directed otherwise by the Engineer.

D. Form Removal: Forms shall be removed only with the approval of the Inspector and in a manner to ensure complete safety of the structure when the structure as a whole is supported on shoring. Form removal from structures shall not begin until the concrete has attained the following compressive strengths:

1. Vertical forms shall not be removed until the concrete has set a minimum of 24 hours, or the concrete has attained a minimum compressive strength of 500 psi.

2. When wall and top slabs are poured monolithically, wall forms shall not be removed until the concrete has attained a minimum compressive strength of 2,000 psi.

E. Finish: Honeycomb and other minor defects shall be patched with one part of cement to 2 parts fine aggregate. All exposed surfaces shall be given one of the following finishes:

1. Rough Finish: Concrete for which no other finish is indicated or specified shall have fins and rough edges removed.
2. Smooth Finish: Smooth finish shall be given to the interior of inlets, junction boxes, culverts and other structures. Joint marks, fins and rough edges shall be smoothed off and blemishes removed, leaving finished surfaces smooth and unmarred, subject to approval by the Inspector.

3. Floor Finish: Floor finish shall be given to the floors of all inlets, culverts and other structures, and shall be struck off true to the required grade as shown in the contract documents and floated to a smooth, even finish by manual or mechanical methods. No coarse aggregate shall be visible after finishing.

4. Foundations top surface shall be Floor Finish unless noted on plans.

5. Rubbed Finish: Rubbed Finish: All exposed surfaces of concrete structures, after patching and painting has been completed and the surface has been wetted, shall be given a first rubbing with a No. 16 Carborundum Stone. After the first rubbing is completed and the ground material has been evenly spread, the material shall be allowed to take a reset. After sufficient aging, the surface shall be wetted and given a finish rubbing with a No. 30 Carborundum Stone, after which the surface shall be neatly striped with a brush and allowed to take a reset. On the inside surfaces of all culvert walls an area from the top slab, on a line 30 degrees from the vertical, to the bottom slab shall be rubbed as specified above.

   The entire structure shall be left with a clear, neat, uniform finish, free from form markings and shall be uniform in color.

5. Sidewalk surfaces shall be given a wood float finish, a light broom finish, or may be stripped with a brush as directed by the Inspector or specified in the contract documents.

6. Concrete pavement shall be given a broom finish after completion of the floating or straight-edging operation, but before the disappearance of the moisture sheen. The grooves of the finish shall be parallel to the centerline of the roadway. The average texture depth of the grooves shall be a minimum of 0.035 inches.

F. Curing: Immediately after placing or finishing, concrete surfaces not covered by forms shall be protected from loss of surface moisture for not less than 4 curing days. When forms are left in place, they shall be kept sufficiently wet to reduce cracks in the forms and prevent the form joints from opening. If forms are removed before 4 curing days have transpired, the formed surface shall be protected for the remainder of the 4 day curing period. Protection and curing shall be accomplished by one of the following

methods and shall be subject to the approval of the Inspector during the entire curing process:

1. Water Curing: Water curing shall be effected by covering exposed surfaces with cotton or burlap mats, previously wetted before applying, and kept thoroughly wet during the entire curing period. The application of the mats shall not mar or disturb surfaces which will be exposed on completion.

2. Membrane compound curing: Provide membrane curing compounds that conform to the latest provision of TxDOT's DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants" or the most applicable approved equal provision.

G. Fine Grading: All fine grading of structure foundations shall provide for seating on firm, clean, natural earth foundation except as otherwise provided. Any under-cut foundations, except where authorized, shall be corrected to the satisfaction of the Inspector, at the sole expense of the Contractor.

H. Excavation and Backfilling shall conform to the latest provision of the TxDOT Standard Specifications for Construction Item 400, "Excavation and Backfill for Structures" or the most applicable approved equal provision.

PART 4 – MEASUREMENT AND PAYMENT

A. Concrete

1. MEASUREMENT: The quantities of concrete, of the various classifications which constitute the completed and accepted structure, will be measured by the cubic yard in place. Only accepted work will be included, and the dimensions used will be those shown in the contract documents or ordered in writing by the Engineer. No deductions in measurement will be made for paneling less than 3 inches in width, and by 1 inch in depth. For chambers less than 2 inches, for embedded reinforcing steel, or for embedded portions of structural steel members no deductions in measurement will be made as well.

2. Foundations may be measured by the Each and includes the concrete as described below and appurtenances such as electrical racks and canopies, curbs, reinforcing steel, housekeeping pads, steps or any other item designated in the Each measurement.

3. PAYMENT: The concrete quantities, measured as provided above, will be paid for at the contract unit prices bid per cubic yard for the various classifications of concrete shown, which prices shall be full compensation for furnishing, hauling and mixing all concrete materials; placing, curing, and finishing all concrete; all grouting and pointing; furnishing and placing all drains and expansion joints, except as hereinafter provided; furnishing and placing metal flashing strips; and for all forms and false work, labor, tools, equipment, and incidentals necessary to complete the work.

   The above provisions for payment shall not be interpreted to provide payment for

concrete in piping, concrete culvert pipe, precast prestressed concrete units, or other concrete items for which provision is otherwise made in the contract.

B. REINFORCING STEEL

1. MEASUREMENT: The measurement of quantities of bar reinforcing furnished and placed will be based on the calculated weight of the steel actually placed in accordance with the contract documents with no allowance made for added bar lengths or splices, nor for extra steel used when bars larger than those specified are substituted with the permission of the Engineer. Tie wires and supporting devices will not be included in the calculated weights. The calculated weight of bar reinforcement will be determined using the theoretical bar weight set forth in Table No. 2, with no allowance for overrun or under runs:

2. PAYMENT: Reinforcing Steel measured, as provided above, will be paid for at the contract unit price bid per pound of "Reinforcing Steel," which price shall be full compensation for furnishing, bending, fabricating, welding and placing reinforcement; for all clips, blocks, metal spacers, ties, wire or other materials used for fastening reinforcement in place, and for all tools, labor, equipment and incidentals necessary to complete the work.

   Payment for reinforcing an item which specifically includes the cost of reinforcement shall be paid for as provided in the specifications for those items.

C. CONCRETE STRUCTURES

1. MEASUREMENT AND PAYMENT: No direct measurement or payment will be made for the work to be done or the equipment to be furnished under this item but shall be considered subsidiary to the particular items of work for which unit prices are required in the proposal.

END OF SECTION

SECTION 01700

SITE RESTORATION

PART 1 – GENERAL

SCOPE

A. The Work included in this Section consists of furnishing all labor, materials, and equipment for preparing and spreading topsoil, fertilizer, seeding, and mulch as shown in the Drawings and specified herein.

B. The Work included in this Section shall also include site restoration of soils to original grade along pipeline installations.

C. Where references are made to other standards or codes, unless specified date references are indicated, the latest edition of said standard or code shall govern.

1.1 RELATED SECTIONS

A. Section 01100, Site Preparation.

1.2 REFERENCE STANDARDS

A. Comply with the applicable provisions and recommendations, except where otherwise shown or specified.

1. Association of Official Analytical Chemists, Official Methods of Analysis.

2. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

3. FSO-F-241D, Fertilizer, Mixed, Commercial.

1.3 SUBMITTALS

A. The Contractor shall submit certification from supplier that each type of seed conforms to this Section's requirements and the requirements of the Texas Seed Law.

B. The Contractor shall submit certification stating that the fertilizer complies with this Section's requirements and the requirements of the Texas Fertilizer Law.

1.4 PRODUCT DELIVERY STORAGE, AND HANDLING

A. Materials shall be delivered in proper containers and protect materials from deterioration during delivery.

B. Store and cover material to prevent deterioration. Remove packaged materials which have become damaged or show deterioration from the site.

PART 2 – MATERIALS

2.1 TOPSOIL

A. Topsoil shall be reasonably free from subsoil, stumps, roots, brush, stones (2 inches or more in diameter), clay lumps or similar objects.

B. The topsoil and or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 to 8.0.

C. The organic content of topsoil shall be not less than 1%.

2.2 GRASS SEED

A. Grass seed shall conform to the U.S. Department of Agriculture rules and regulations of the Federal Seed Act and the Texas Seed Law.

B. Seed shall be certified 90 percent pure and furnish 80 percent germination and meet the following requirements:

1. Rye: Fresh, clean, Italian rye grass seed (lollium multi-florum), mixed in labeled proportions. As tested, minimum percentages of impurities and germination must be labeled. Deliver in original unopened containers.

2. Bermuda: Extra-fancy, treated, lawn type common Bermuda (Cynodon dactylon). Deliver in original, unopened container showing weight, analysis, name of vendor, and germination test results.

3. Wet, moldy, or otherwise damaged seed will not be accepted.

4. Seed requirements, application rates and planting dates are:

Type	Application Rate (pounds/acre)	Planting Date
Hulled Common Bermuda Grass 98/88 Unhulled Common Bermuda Grass 98/88	40/40	Jan 1 to Mar 31
Hulled Common Bermuda Grass 98/88	40	Apr 1 to Sep 30
Hulled Common Bermuda 98/88 Unhulled Common Bermuda Grass 98/88 Annual Rye Grass (Gulf)	40/40/30	Oct 1 to Dec 31

2.4 FERTILIZER

A. Fertilizer shall be dry and free flowing, inorganic, water soluble commercial fertilizer, which is uniform is composition. Caked, damaged, or otherwise unsuitable fertilizer will not be accepted.

B. Fertilizer shall be standard commercial fertilizers containing 12%, nitrogen, 8% phosphoric acid, and 8% potassium.

C. The fertilizers shall meet the specified requirements of the applicable State and Federal laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon.

2.5 MULCH

A. Mulch shall be virgin wood cellulose fibers from whole wood chips having a minimum of 20 percent fibers 0.42 inches (10.7mm) in length and 0.01 inches (0.27 mm) in diameter.

B. Mulch shall be dyed green for coverage verification purposes. Straw mulch or hydromulch may be used in lieu of wood mulch if accepted by the Engineer.

C. The Contractor shall demonstrate comparable performance of straw mulch or hydromulch to wood mulch for acceptance.

PART 3 - EXECUTION

3.1 PREPARATION OF AREA

A. Before applying fertilizer, areas to be seeded shall be rolled or otherwise cleared of stones larger than 2 inches in any diameter, sticks and other debris which might interfere with sowing of seed, growth of grass or subsequent maintenance of grass covered areas.

3.2 PLACING TOPSOIL

A. Topsoil shall be spread evenly on the prepared area to a uniform depth of 4-inches, after compaction.

B. Spreading shall not be done when the ground or topsoil is excessively wet or otherwise in a condition detrimental to the Work.

C. Spreading shall be carried on so that sodding operations can proceed with a minimum of soil preparation or tilling. After spreading, any large stiff clods and hard lumps shall be broken with a pulverizer or by other effective means and all stones or rocks (2-inches or more in diameter), roots litter, or any foreign material shall be raked up and disposed of by the Contractor.

D. The topsoil surface shall conform to the required lines, grades and cross sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

3.3 DISPOSAL OF WASTE MATERIALS

A. The Contractor shall legally dispose of all waste materials, (i.e. roots, stumps, brush, stones, clay lumps, etc.) generated during the processing of the on-site topsoil.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: The quantity measured for payment shall be per square yard of topsoil at 4-inch minimum depth completed with seed, fertilizer, mulch, and watering as agreed upon by the Owner and the Contractor.

4.2 PAYMENT: Payment shall be made for all labor, materials, and equipment necessary for preparing and spreading topsoil, fertilizer, seeding, and mulch in square yard at 4-inch minimum depth as specified in the Drawings and specified herein. This shall include, but not necessarily be limited to: spreading topsoil, seeding, mulching, fertilizing, watering, and any other work incidental and included within this Section.

END OF SECTION

SECTION 02300
DIRECTIONAL DRILLING

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. This item shall govern the furnishing and installation of product piping (and casing where applicable) by the method of directional boring, sometimes referred to as horizontal directional drilling (HDD).

B. The CONTRACTOR shall provide all necessary tools, materials and equipment to successfully complete the installation of directionally drilled piping as specified herein and shown on the drawings. The CONTRACTOR shall be responsible for the final constructed product and for furnishing the qualified labor and supervision necessary for this method of construction.

C. The CONTRACTOR shall furnish all items necessary to perform the horizontal directional drilling operation and construct the pipe to the lines and grade shown on the drawings.

1.1 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO).

B. Occupational Safety and Health Administration (OSHA).

1.2 DEFINITIONS

CONTRACTOR's Construction Drawings shall be defined as drawings by which the CONTRACTOR proposes to construct, operate, build, etc., the referenced item. The submission of these drawings shall be required for the sole purpose of providing the sufficient details to verify that the CONTRACTOR's work in progress is in accordance with the intent of the design.

1.3 SUBMITTALS

A. The ENGINEER and OWNER will base the review of submitted details and data on the requirements of the completed work, safety of the work in regards to the public, potential for damage to public or private utilities and other existing structures and facilities, and the potential for unnecessary delay in the execution of the work. Such review shall not be construed to relieve the CONTRACTOR in any way of his responsibilities under the contract. CONTRACTOR shall not commence work on any items requiring CONTRACTOR's construction drawings or other submittals until the drawings and submittals are reviewed and accepted by the ENGINEER and OWNER.

1. The Contractor shall submit for review complete construction drawings and/or complete written description identifying details of the proposed method of construction, a drill plan, and the sequence of operations to be

performed during construction as required by the method of HDD excavation approved. The drawings and descriptions shall be sufficiently detailed to demonstrate to the OWNER and ENGINEER whether the proposed materials and procedures will meet the requirements of this specification. CONTRACTOR shall submit arrangement drawings and technical specifications of the machine and trailing equipment (including any modifications), three-year experience record with this type of machine, and a copy of the manufacturer's operations manual for the machine.

2. Contractor's construction drawings shall be submitted on the following items.

   a. Complete details of the equipment to be utilized as well as the methods and procedures to be used, including but not limited to primary lining installation, timing of installation in relation to the excavation plan and sequence, bulkheads, etc.

   b. Fluid pumping techniques including equipment, pumping procedures, pressure grout types, mixtures, and plug systems.

   c. Method of controlling line and grade of excavation.

   d. Details of cuttings & drilling fluid removal including equipment type, number, and disposal location. The composition of all drilling fluids proposed shall be submitted for approval. No fluid will be approved or utilized that does not comply with permit requirements and all applicable national, state, and local environmental regulations.

   e. Proposed contingency plans for critical phases and areas of directional drilling.

B. Quality Control Methods. At least two (2) weeks prior to the start of directional drilling, CONTRACTOR shall submit a description of his quality control methods he proposes to use in his operations to the ENGINEER and OWNER for review and approval. The submittal shall describe:

   1. Procedures for controlling and checking line and grade.

   2. Field forms for establishing and checking line and grade.

C. Safety. Procedures including, but not limited to, monitoring for gases encountered shall be submitted.

D. Hazardous chemical list as well as all MSDS and technical data sheets.

1.4 DESIGN CRITERIA

A. Compatibility of Methods.

   1. The methods of excavation, lining, and groundwater control shall be compatible.

1.5 JOB CONDITIONS

A. Environmental Protection

Take all necessary measures to eliminate the discharge of water, drilling mud, and cuttings to nearby waterways during the HDD work. If applicable, provide equipment and procedures to maximize the recirculation or reuse of drilling mud to minimize waste.

B. Safety Requirements

1. Perform work in a manner to maximize safety and reduce exposure of personnel and equipment to hazardous and potentially hazardous conditions, in accordance with applicable safety standards.

2. Whenever there is an emergency or stoppage of work which is likely to endanger the excavation or adjacent structures, operate a full work force for 24 hours a day, including weekends and holidays, without intermission until the emergency or hazardous conditions no longer jeopardize the stability and safety of the work.

C. Air Quality

Conduct directional drilling operations by methods and with equipment which will positively control dust, fumes, vapors, gases, or other atmospheric impurities in accordance with applicable safety requirements.

1.6 PERMITS

Obtain any and all other permits required for prosecution of the work.

PART 2 – PRODUCTS

2.1 GENERAL

A. The product pipe must comply with all applicable ASTM standards depending on the purpose and material of the product pipe. Join the pipe sections so that the joining pipe sections are installable using HDD. Ensure that the joined product pipes have adequate strength and flexibility to withstand the installation stresses, overburden pressures, and operating pressures without compromising the structural stability of the pipe wall. Ensure that the product pipe meets the bend radius required for the proposed installation.

B. The following material standards are the minimum in place standards for the product pipe:

Material Standards for HDD Installation		
Material Type	Non-Pressure	Pressure
Polyethylene (PE)	ASTM D 2447	ASTM 2513 ASTM D 2447
High Density Polyethylene (HDPE)	ASTM D 2447 ASTM D 3350 ASTM F 714	ASTM D 2447 ASTM D 3350 ASTM F 714 ASTM 2513
Polyvinyl-Chloride (PVC)	ASTM F 789	ASTM D1785 ASTM D2241
Steel	ASTM A129 Grade B	AWWA C200 API 2B

C. Detection Wire: Electronic detection material for non-conductive piping products. Select tracer wire design for HDD to conductively locate underground utility lines according to ASTM D-1248. Use either a continuous green sheathed solid conductor copper wire line (minimum #12 AWG for external placement) or a coated conductive tape. Select a minimum 12-gauge copper clad steel wire that is able to withstand the installation tension along the entire length of the line.

PART 3 - EXECUTION

3.1 GENERAL

A. The CONTRACTOR shall be responsible for his means and methods of directional drilling construction and shall ensure the safety of the work, the CONTRACTOR's employees, the public, and the adjacent property, whether public or private.

B. CONTRACTOR should anticipate that portions of the drilled excavation could be below the groundwater table and/or under waterways.

C. Comply with all local, state, and federal laws as well as rules and regulations at all times to prevent pollution of the air, ground, and water.

3.2 EQUIPMENT

A. The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback of the pipe, a drilling fluid mixing and delivery system of sufficient capacity to successfully complete the installation, a guidance system to accurately guide boring operations, and trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials, and spare parts on hand to maintain the system in good working order for the duration of this project.

B. Diesel, electrical, or air-powered equipment will be acceptable and is subject to applicable federal and state regulations.

C. Any method or equipment that the CONTRACTOR can demonstrate will produce the specified results will be considered.

D. CONTRACTOR shall employ equipment that will be capable of handling the various anticipated ground conditions. In addition, the equipment shall:

1. Be capable of minimizing loss of ground ahead of and around the machine

and providing satisfactory support of the excavated face at all times.

2. Provide a system to indicate whether the amount of earth material removed is equivalent to that displaced by the advance of the machine such that the advance rate may be controlled accordingly.

E. Provide adequate secondary containment for any and all portable storage tanks.

D. Drilling must be accomplished with fluid-assisted mechanical cutting. Design/select drilling fluid to: transport the spoils, maintain temperature of bits and transmitter, clean cutting from drill bit, reduce friction and pullback on drill rod and product pipe, stabilize the borehole, and reduce migration of drilling fluids in soil. Drilling fluids shall be a mixture of potable water and bentonite (or other stabilizing agent polymers and additives). It is mandatory that minimum pressures and flow rates be used during drilling operation as to avoid fracturing the sub-grade material around and above the bore.

E. The mobile drilling system must be capable of being launched from the surface at an inclined angle and drilling a sufficient diameter pilot hole. The pilot hole will then be enlarged with reamers as required to achieve the completed directional drill bore hole diameter.

3.3 DIRECTIONAL DRILLING DATA

A. Daily logs of construction events and observations shall be submitted on at least the following:

1. Location and elevation of significant soil strata boundaries and brief soil descriptions.

2. Jacking pressures and torsional forces, if applicable.

B. The path of the pilot hole shall be monitored during drilling by taking downhole survey readings at intervals not to exceed 35 feet. These readings shall be used to calculate the horizontal and vertical coordinates of the downhole probe as it progresses along the pilot hole. Calculations shall be performed according to API Bulletin D20. Recorded data and calculations from downhole surveys shall include, but not be limited to the following items:

1. Course length. The distance between two downhole surveys as measured along the drilled path.
2. Measured distance. The total distance of a downhole survey from the entry point as measured along the drilled path; also the summation of the course lengths.
3. Inclination. The angle at which the downhole probe is projecting from the vertical axis at a particular downhole survey point; vertically downward corresponds to zero degrees.
4. Azimuth. The angle at which the downhole probe is projecting in the horizontal plane at a particular downhole survey point; magnetic north corresponds to zero degrees.

5. Station. The horizontal position of a downhole survey measured from an established horizontal control system.

6. Elevation. The vertical position of a downhole survey measured from an established vertical control system.

7. Right. The distance of a downhole survey from the design path reference line; positive values indicate right of the reference line while negative values indicate left of the reference line.

3.4 CONTROL OF THE DRILL LINE AND GRADE

A. Construction Control

1. The CONTRACTOR shall establish and be fully responsible for the accuracy of his own control for the construction of the entire project, including structures, drill line, and grade.

2. The CONTRACTOR's control points shall be established sufficiently far from the drilling operation not to be affected by construction operations.

3. The CONTRACTOR shall maintain daily records of alignment and grade and shall submit three copies of these records to the OWNER and ENGINEER. However, the CONTRACTOR remains fully responsible for the accuracy of his work and the correction of it, as required.

4. The CONTRACTOR shall check his control for the bore alignment against an above ground undisturbed reference at least once for each rod length of bore constructed or more often as needed or directed by the OWNER and ENGINEER. CONTRACTOR shall furnish a "Directional Bore Log" for each bore completed.

3.5 DISPOSAL OF EXCESS MATERIAL

A. Where such effort is necessary, cost for groundwater control during the course of the drilling work shall be included in the unit contract price for the work.

B. Dewatering required during the course of the project to lower water table, to remove standing water, surface drainage seepage, or to protect ongoing work against rising waters or floods shall be considered incidental to the work being performed.

C. CONTRACTOR shall remove all puddled bentonite (drillers mud) and dispose of off-site in a legal manner, at no additional cost to the OWNER.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: The quantity measured for payment shall be per linear foot of HDD and pipe in place installed and as accepted by the Owner.

4.2 PAYMENT: Payment shall be full compensation for all labor, materials, testing, and equipment necessary for drilling and installing product pipe. Includes removal of excavated

materials and spoils, removal and disposal of drilling fluids, backfilling, and complete restoration of the site according to the unit prices submitted in the bid. No payment will be made for failed bore paths, injection of flowable fill, products taken out of service or incomplete installations due to fault of the CONTRACTOR.

A. No payment will be made for the HDD work until the daily construction logs and records of alignment have been delivered to and reviewed by the ENGINEER.

END OF SECTION

SECTION 02400
VALVES AND APPURTENANCES

PART 1 - GENERAL

1.1 SCOPE

A. The Work included in this Section consists of furnishing all labor, materials, equipment and incidentals required to install complete and ready for operation and testing all valves and appurtenances as shown within the Construction Drawings and as specified herein.

B. The Work includes, but not necessarily limited to, all types of valves required for buried, exposed, submerged, and other types of piping, except where otherwise specifically included in other Sections.

C. Where references are made to other standards and codes, unless specific date references are indicated, the latest edition of said standard or code shall govern.

1.2 DESCRIPTIONS OF REQUIREMENTS

A. The Contractor shall furnish and install the gate valves in accordance with the Typical Iron Valve Box Standard Detail as per the Drawings.

B. The Contractor shall furnish and install flush valves in accordance with the Flush Valve details as per the Drawings

C. The Contractor shall install valve markers in accordance with the Marker Standard Detail drawing as per the Drawings.

1.3 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer shall have a minimum of five (5) years of experience in the production of substantially similar equipment, and shall show evidence of satisfactory service in at least five (5) installations.

2. All units of the same type shall be the product of one Manufacturer.

3. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these Specifications as applicable.

1.4 RELATED SECTIONS

A. Section 01230, Excavation and Backfill.

B. Section 01350, Hydrotesting and Disinfection.

C. Section 02660, Ductile-Iron Pipe.

1.5 REFERENCE STANDARDS

A. Comply with the following applicable provisions and recommendations, except as otherwise shown or specified where reference is made to one of the below referenced standards, the revision in effect at the time of bid opening shall apply.

1. ASTM A48 - Specification for Gray Iron Castings

2. ASTM A126 - Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings

3. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, and Threaded Rod 60,000 psi Tensile Strength

4. ASTM A436 - Specification for Austenitic Gray Iron Castings

5. ASTM A536 - Specification for Ductile Iron Castings

6. AWWA C500 – Metal-Seated Gate Valves for Water Supply Service

7. AWWA C504 – Rubber-Seated Butterfly Valves

8. AWWA C507 – Ball Valves, 6-inch through 48-inch

9. AWWA C508 – Swing-Check Valves for Waterwork Service, 2-inch through 24-inch NPS

10. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service

11. AWWA C518 - Double-Disc Swing- Check Valves for Waterworks Service, 2-inch through 48-inch NPS

12. AWWA C520 - Knife Gate Valves, Sizes 2 In. Through 96 In.

13. AWWA C540 – Power Actuating Devices for Valves and Sluice Gates

14. AWWA C541 – Hydraulic and Pneumatic Cylinder and Vane-Type Actuators for Valves and Slide Gates

15. AWWA C542 – Electric Motor Actuators for Valves and Slide Gates

16. AWWA C550 - Protective Interior Coatings for Valves and Hydrants

17. MSS-SP-67 – Butterfly Valves

18. MSS-SP-70 - Gray Iron Gate Valves, Flanged and Threaded Ends

19. MSS-SP-82 - Valve Pressure Testing Methods

20. MSS-SP-98 - Protective Coatings for Interior of Valves and Hydrants

21. Valves shall be NSF-61 certified.

22. AGMA Standards

23. NEMA, National Electrical Manufacturer’s Association.

1.6 SUBMITTALS

A. Shop Drawings

1. Manufacturer's literature, illustrations, paint certifications, specifications, detailed drawings, data and descriptive literature on all valves and appurtenances.

2. Proposed deviations from the Contract Documents.

3. Engineering data including dimensions, materials, sizes and weights.

4. Fabrication, assembly, installation and wiring diagrams.

5. Additional submittal data, where noted, with individual pieces of equipment.

B. Test Reports

1. Provide certified hydrostatic test data, per Manufacturer’s standard procedure or MSS-SP-61 for valve.

2. Hydrostatic tests shall be performed, when required by the valve specifications included herein.

C. Certificates

1. For each valve specified to be manufactured, tested and/or installed in accordance with AWWA and other standards, submit an affidavit of compliance with the appropriate standards, including certified results of required tests and certification of proper installation.

D. Operating and Maintenance Data

1. Operating and maintenance instructions shall be furnished to the Owner. The instructions shall be prepared specifically for the project installation and shall include all required cuts, drawings, equipment lists, descriptions, and other information required to instruct operating and

maintenance personnel that may be unfamiliar with such equipment.

2. Provide copies of all shop drawings, test reports, maintenance data and schedules, description of operation; and, spare parts information.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping

1. Care shall be taken in loading, transporting and unloading to prevent damage to the valves, appurtenances, or coatings. Equipment shall not be dropped. All valves and appurtenances shall be examined before installation and no piece shall be installed which is found to be defective. Any damage to the coatings shall be repaired by the Contractor as acceptable to the Owner.

2. Prior to shipping, the ends of all valves shall be acceptably covered to prevent entry of foreign material. Covers shall remain in place until just before installation and connecting piping is completed.

B. Storage and Protection

1. Special care shall be taken to prevent plastic and similar brittle items from being directly exposed to the sun, or exposed to extremes in temperature, to prevent deformation. See the individual valve specifications and manufacturer's information for further requirements.

C. Delivery

1. Deliver material to the site to ensure uninterrupted progress of the Work.

a. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to not delay Work.

1.8 MAINTENANCE

A. Special tools and the manufacturer’s standard spare parts if required for normal operation and maintenance, shall be supplied with the equipment in accordance with the Contract Documents and where notes, as specified herein.

B. Provide all special tools required for normal maintenance. Tools shall be packaged in a steel case, clearly and indelibly marked on the exterior to indicate equipment for which tools are intended.

C. Provide to the Owner a list of all spare and replacement parts with individual prices and locations where they are available.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Valves shall have manufacturer’s name and working pressure cast in raised letters on valve body.

B. Manual valve operators shall turn clockwise to close, unless otherwise specified.

C. Unless otherwise specified, all flanged valves shall have ends conforming to ANSI B16.1, Class 150 (Class 200 for valves 12 inches or smaller).

D. Buried valves shall have flanged ends with mechanical joint adapters and be installed with a flanged adapter, or have grooved mechanical couplings. All bolts shall be Type 316 stainless steel.

E. Buried valves shall be provided with adjustable two-piece valve boxes and provided with extension stems, operating nuts and covers unless otherwise shown or specified. Extension stems shall terminate 12-inches below furnished grade.

F. All bolts, nuts, and studs on or required to connect buried or submerged valves shall be Type 316 stainless steel.

G. All bolts and studs embedded in concrete and studs required for wall pipe shall be of Type 316 stainless steel.

H. All other bolts, nuts, and studs shall, unless otherwise approved, conform to ASTM A 307, Grade B; or ASTM A 354.

I. Bolts shall have hexagon heads and nuts.

J. Gaskets material and installation shall conform to manufacturer’s recommendations.

K. Identification: Identify each valve 4 inches and larger with a stainless steel nameplate stamped with the approved designation. Nameplate shall be permanently fastened to valve body at the factory. Stenciled designations are acceptable for buried valves.

L. The Contractor shall be responsible to coordinate compatible materials of construction for all wettable parts of all valves for each process application.

M. The use of a manufacturer's name and/or model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

N. Valves shall be of the size shown on the Drawings or as noted; and equipment of the same type shall be identical and from one Manufacturer.

O. Each valve box shall be fitted with a plastic valve ID tag (Blue Emedco 3 ½” x 2 ¾”). Tags shall be securely fastened to valves.

P. Valves and appurtenances shall be marked per AWWA Standards with the Owner name (CCSUD), valve size, flow directional arrows, year of manufacture,

working pressure for which they are designed and standard referenced, cast in raised letters or indelibly marked upon some appropriate part of the body.

Q. Joints, size and material - unless otherwise noted or required by the Owner:

1. Except where noted, all joints referred to herein shall be of the same type, nominal diameter, material, and with a minimum rating equal to the pipe or fittings they are connected to.

2. Valves and appurtenances shall be of the same nominal diameter as the pipe or fittings they are connected to.

3. All valves exposed to view (above-grade), or in vaults (below-grade).

a. 3-inches and smaller - threaded ends

b. 4-inches and larger - flanged ends

R. Provide all special adaptors as required to ensure compatibility between valves, appurtenances and adjacent pipe.

S. Valves located outdoors but not within a building; within maximum 2-ft above liquid; in vaults; or where otherwise noted shall be especially designed for submerged service where water may completely submerge the valve. All other units shall be as a minimum weather tight.

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

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

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

Valve Size	Pressure (psig)
3-inches to 12-inches	200
14-inches to 20-inches	150
24-inches and greater	150

2.2 GATE VALVES

A. Valves shall be iron body, bronze mounted, non-rising stem and in conformance with AWWA C500.

B. Unless otherwise shown or specified, exposed valves shall have flanged ends conforming to ANSI B16.1, Class 150. Buried valves shall be provided with

mechanical joint adapters.

C. Exposed manually operated gate valves shall be equipped with hand wheels. Gate valves located more than five feet above the operating floor shall be provided with chain wheels, sprockets, and aluminum chain. The chain shall extend to three feet above the operating floor.

D. Buried gate valves shall be furnished with valve boxes, nut operated extension stems and tee wrenches as required.

E. Shop painting:

1. Interior metal surfaces of cast iron valves shall be cleaned with a near white blast (SSPC-SP10) and shall be shop painted with two coats of an NSF 61 approved epoxy coating applied in accordance with the manufacturer's recommendations.

2. Exterior surfaces of the valves shall be shop painted as specified hereinafter under Paragraph 2.10 of this Section.

F. Product and Manufacturer: Provide gate valves of one of the following, as listed in the Approved Equipment List (AEL):

1. Mueller Water Products, Inc.

2. American Cast Iron Pipe Company.

3. EJ Group, Inc.

4. Or Approved Equivalent.

G. Exposed gate valves 16-inches and greater in size shall have valve by-pass.

H. All bonnet and packing gland bolts and nuts shall be zinc-coated or made corrosion resistant by some other approved equivalent.

I. Exposed gate valves 16-inches and greater indicated for horizontal stem Installation shall be furnished with rollers, tracks and scrapers and enclosed bevel gear grease case.

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

K. Resilient wedge valves shall be coated, interior and exterior, with fusion bonded epoxy per AWWA C550.

L. Valve Requirements

1. Resilient Wedge

a. Tongue and grooved guides for wedges.

2. Resilient Seated

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

b. No recesses in valve body.

2.3 KNIFE GATE VALVES

A. Valves shall be ductile iron construction, steel gate. Shall be designed, manufactured, and tested in accordance in accordance with AWWA C520.

B. Unless otherwise shown or specified, valves shall have flanged ends conforming to ANSI B16.5, Class 150.

C. Exposed manually operated knife gate valves shall be equipped with hand wheels. Gate valves located more than five feet above the operating floor shall be provided with chain wheels, sprockets, and aluminum chain. The chain shall extend to three feet above the operating floor

D. Shop painting:

1. Interior metal surfaces of cast iron valves shall be cleaned with a near white blast (SSPC-SP10) and shall be shop painted with two coats of an NSF 61 approved epoxy coating applied in accordance with the manufacturer's recommendations.

2. Exterior surfaces of the valves shall be shop painted as specified hereinafter under Paragraph 2.10 of this Section.

E. Product and Manufacturer: Provide knife gate valves of one of the following, as listed in the Approved Equipment List (AEL):

1. Wey Valve

2. Emerson

3. Dezurik

4. Or approved equivalent.

2.4 CHECK VALVES - LIQUID SERVICE

A. General:

1. Check valves shall absolutely prevent the return of water back through the valve when the upstream pressure decreases below the downstream pressure. The valve shall be tight seating.

B. Double Disc Type

1. Valves shall be designed, manufactured, and tested in accordance to ANSI/AWWA C518.

2. Shall be provided with ANSI B16.1 Class 125 flanges for installation

3. Shop Painting:

a. Exterior surfaces of the valve shall be shop painted as specified hereinafter under Paragraph 2.10 of this Section.

4. Product and Manufacturer: provide double disc type check valves of one of the following:

a. Valmatic 8800

b. Or Approved Equivalent.

C. Slanting Disc Type – Pump Discharge (Vertically Oriented)

1. The check valve shall be designed to operate in full open position with a velocity range of 3 to 10 feet per second.

2. Disc position indicator shall be provided.

3. 125 lb. class.

4. Shop Painting:

b. Interior metal surfaces of the valve, except finished or bearing surfaces, shall be cleaned with a near white blast (SSPC-SP10) and shall be shop painted with two coats of an NSF 61 approved epoxy coating applied in accordance with the manufacturer's recommendations.

c. Exterior surfaces of the valve shall be shop painted as specified hereinafter under Paragraph 2.10 of this Section.

5. Product and Manufacturer: Provide tilting disc, slow opening and controlled closing check valves of one of the following:

a. APCO Series 800 T (APCO Willamette Valve & Primer Corp.).

b. Or Approved Equivalent.

2.5 BUTTERFLY VALVES – WATER SERVICE

A. Valves shall be short body, except where otherwise shown or required to obtain

required clearances for valve operator or disc. Valves shall conform to AWWA C504.

B. Valves shall be of the 125 psi pressure class.

C. Flanged ends, where required, shall conform to ANSI B16.1, Class 125.

D. Valve seats shall be mounted in cast-iron valve body, made of rubber suitable for water service.

E. Shafts, retaining rings and internal hardware shall be of stainless steel.

F. Shafts seals of non-buried valves shall have a stuffing box and pull down packing gland. Packing shall be replaceable without removing the valve operator. Buried valves shall be furnished with self-adjusting “V” type packing.

G. Provide a stainless steel seating edge on all discs.

H. Product and Manufacturer. Provide butterfly valves (Circular) of one of the following:

1. Mueller Water Products, Inc.

2. DeZurick/APCO/Hilton.

3. Or Approved Equivalent.

I. Valve Operator – Manual:

1. Valves shall be equipped with an enclosed worm gear drive and nut, hand wheel or chain wheel operator.

2. Enclosed worm gear operators shall have a gear ratio designed not to exceed 80 pounds pull to meet the required operator torque.

3. Gears shall be permanently lubricated and totally enclosed.

4. Operators shall be designed to hold the valve disc in any intermediate position without creeping or fluttering.

5. Adjustable stops shall be provided to prevent over-travel in either position, to withstand a pull of 200 pounds.

6. Stops shall be enclosed within the operator housing and be capable of absorbing the full operator torque with minimum safety factor of five (5).

7. Operators shall be equipped with a direct coupled indicator.

8. Valves regardless of size, if installed with the operating wheel more than five feet above the operating floor, shall be provided with a chain wheel, sprocket, and aluminum chain. The chain shall extend to three feet

above the operating floor.

9. Valve operator shall be designed to fully close or fully open the valve in a maximum of 30 turns. Valves shall open counter-clockwise, and shall have a position indicator.

10. Shop Painting:

    a. Interior metal surfaces of the valve, except finished or bearing surfaces, shall be cleaned with a near white blast (SSPC-SP10) and shall be shop painted with two coats of an NSF 61 approved epoxy coating applied in accordance with the manufacturer's recommendations.

    b. Exterior surfaces of the valve shall be shop painted as specified hereinafter under Paragraph 2.10 of this Section.

11. Product and Manufacturer: Provide manual operators of one of the following:

    a. Flowserve Corporation.

    b. Or Approved Equivalent.

2.6 RUBBER SEAT BALL VALVES

A. Valves shall have a cast iron body suitable for 150 psi pressure. Body shall have stainless steel conical seating surfaces to provide abrasion-free, corrosion free surfaces for mating with the resilient seat on the rotor.

B. Ends shall be flanged, conforming to ANSI B16.1, Class 125.

C. Shaft seal shall be of bronze, provided with "O" ring seals.

D. Shaft bearings shall be of bronze, permanently lubricated, sealed with "O" ring seals.

E. Seats shall be of rubber suitable for water service, secured to the rotor by means of ductile Ni-Resist adjusting segments.

F. Rotor shall be of cast iron, secured to stub shafts with stainless steel taper pins.

G. Stub shafts shall be of stainless steel.

H. Provide adjustable thrust bearings for alignment of the rotor in the body.

I. Manufacturer: Provide rubber seat valves of one of the following:

    a. Mueller Water Products, Inc.

    b. Or Approved Equivalent.

2.7 PINCH CHECK VALVES

A. Pinch Check Valves shall be all rubber, and of the flow operated check type with a slip-on end connection.

B. Valve shall be one-piece rubber construction with fabric reinforcement.

C. Valve shall have protective EDPM exterior wrapping for UV protection.

D. Provide stainless steel attachment straps and hardware as needed to securely attach valve to pipe.

E. Manufacturer: Provide rubber pinch check valve of one of the following:

1. Tideflex Technologies.

2. Or Approved Equivalent.

2.8 PINCH VALVES

A. Pipe Automatic Pinch Valves shall be cast iron construction.

B. connections shall be ANSI Class 125/150 flanged.

C. Sleeves shall be made of EDPM.

D. Provide stainless steel bolts and hardware as needed to securely attach the valve to the pipe.

E. Provide manufacturers standard protective exterior coating for outdoor service.

F. Manufacturer: Provide manual pinch valve of one of the following:

1. Red Valve Company, Inc.

2. Or Approved Equivalent.

2.9 SPECIALS

A. Corporation Stops:

1. Where shown or necessary to complete the Work, corporation stops shall be furnished with bronze stem, washer, nut, body, and key.

2. Product Manufacturer: Provide Corporation Stops of one of the following:

a. Ford Meter Corporation Stops: Box Company, Inc.

b. Or Approved Equivalent.

B. Hose Bibbs:

1. House bibbs shall consist of a boiler drain type valve and vacuum breaker.

2. Valve shall be ¾-inch size or 1-inch size as shown on Drawings, bronze bodied, with aluminum hand wheel and renewable composition disc, suitable for 125 psi working pressure.

3. Valve shall have one male copper joint end and one male hose thread end.

4. Product and Manufacturer: Provide House Bibbs of one of the following:

a. NIBCO.

b. Jenkins.

c. Or Approved Equivalent.

2.10 VALVE APPURTENANCES

A. Operators:

1. General: The operators shall be sized based on the maximum expected torque as per valve manufacturer's recommendations and in no case shall the force required to open or close the valve (i.e. rim pull) exceed 40 pounds. The responsibility for proper operation shall reside with the valve supplier.

2. Manual Operators: Manual operators shall be in compliance with AWWA C504, and shall be of the worm gear type and feature a housing that encloses all gearing and can either be buried or is of weatherproof construction for exposed locations. The operator housing shall be constructed of cast iron and shall be permanently grease packed. All housing O-rings, gaskets, and other features shall be designed to ensure permanent water tightness and maintenance free operation. The axis of the worm gear shaft shall remain fixed during operation and stop-limiting devices shall be provided to limit operator travel. Valves scheduled for above ground service shall be equipped with a hand wheel. Buried valves shall be equipped with a 2-inch square AWWA operating nut. Suitable manufacturers include Limitorque, E-I-M, DeZurick, or approved equivalent.

3. Chain Operators:

a. All valves more than 5 feet-0 inches above operating floor level shall be equipped with chain operator and sprocket wheel bolted directly to the valve operating wheel

b. Aluminum chain shall be provided. Equip all operators with a ½-inch hook bolt located to keep chain out of walking areas.

B. Extension Stems, Stem Guides, Wrenches and Keys:

1. Extension stem shall be at least as large as valve stem it operates.

2. Provide intermediate stem guide for extensions more than 7 feet long.

3. Stem brackets and guides shall be made of cast iron and have fully adjustable bronzed bushed guide block. Fasten brackets to walls with approved expansion bolts.

4. Operating buts about 2 inches square shall be included with each extension stem and located in floor box or grating recess, as required.

5. Provide operating key or wrench of suitable length and size for each valve that is not readily accessible for direct operation.

C. Valve Boxes: Provide each buried valve with a valve box as follows:

1. Made of heavy pattern cast-iron, 2-piece adjustable telescoping type.

2. Lower section shall enclose operating nut and stuffing box and rest on bonnet.

3. Inside diameter shall be at least 4 ½ inches.

4. Provide extension stem and operating nut.

5. Cover shall be heavy duty cast iron with direction to open arrow cast in.

6. Provide valve box of adequate size for operation and maintenance of buried air release valves where shown.

7. Square covers shall be provided for all recycled water main valve boxes. Round covers shall be provided for all potable water main valve boxes and labeled “WATER”.

2.11 SURFACE PREPARATION AND PAINTING

A. Notwithstanding any of these Specifications, all coatings, and lubricants in contact with potable water shall be certified as accepted for use with that fluid.

B. If Manufacturer’s requirements are not to provide finished coating on any interior surfaces, then the Manufacturer shall so state and no interior finish coating will be required, if acceptable to the Owner.

C. Clean and prime coat all ferrous metal surfaces of each valve in the shop.

D. Coat all machined, polished and non-ferrous surfaces including gears, bearing surfaces and similar unpainted surfaces with a corrosion prevention compound which shall be maintained during storage and until equipment begins operation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All valves and appurtenances shall be installed per the Manufacturer's instructions in the locations shown, true to alignment and rigidly supported. Any damage to the valves and appurtenances shall be repaired to the satisfaction of the Owner before they are installed.

B. Install all brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings, or otherwise required. Before setting these items, the Contractor shall check all Drawings and figures which have a direct bearing on their location. The Contractor shall be responsible for the proper location of valves and appurtenances during the construction of the Work.

C. All components shall be carefully inspected for defects in construction and materials. All debris and foreign material shall be cleaned out of openings, etc. All valve flange covers shall remain in place until connected piping is in place. All operating mechanisms shall be operated to check their proper functioning and all nuts and bolts checked for tightness. Valves and other equipment which do not operate easily, or are otherwise defective, shall be repaired or replaced at no additional cost to the Owner.

D. All items (including valve interiors) shall be cleaned prior to installation, testing, disinfection and final acceptance.

E. Unless otherwise noted, joints for valves and appurtenances shall be made up utilizing the same procedures as specified under the applicable type connecting pipe joint and all valves and other items shall be installed in the proper position as recommended by the Manufacturer. Contractor shall be responsible for verifying manufacturer’s torqueing requirements for all valves.

F. Install all valves so that operating wheels or wrenches may be conveniently turned from operating floor but without interfering with access, and as approved by the Engineer.

G. Unless otherwise approved, install all valves plumb and level. Install valves free from distortion and strain caused by misaligned piping, equipment or other causes.

H. Set valve boxed plumb, and centered with the bodies directly over the valves. Carefully tamp earth fill around each valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face, if less than 4 feet.

3.2 INSTALLATION OF MANUAL OPERATIONAL DEVICES

A. Unless otherwise noted, all operational devices shall be installed with the units at

the factory, as shown on the Drawings or as acceptable to the Owner, to allow accessibility to operate and maintain the item and to prevent interference with other piping, valves and appurtenances.

B. For manually operated valves 3-inches in diameter and smaller, valve operators and indicators shall be rotated to display toward normal operation locations.

C. Floor boxes, valve boxes, and extension stems shall be installed vertically centered over the operating nut, with couplings as required and the elevation of the box top shall be adjusted to conform with the elevation of the finished floor surface or grade at the completion of the Contract. Boxes and stem guides shall be adequately supported during concrete pouring to maintain vertical alignment.

3.3 INSPECTION, TESTING AND CORRECTION OF DEFICIENCIES

A. Take care not to over pressure valves or appurtenances during pipe testing. If any unit proves to be defective, it shall be replaced or repaired to the satisfaction of the Owner.

B. Functional Test: All items shall be inspected for proper alignment, operation, proper connection and satisfactory performance. All units shall be operated continuously while connected to the attached piping for at least 8 hours, without vibration, jamming, leakage, or overheating and perform the specified function.

C. The various pipe lines in which the valves and appurtenances are to be installed are specified to be field tested. During these tests any defective valve or appurtenance shall be adjusted, removed and replaced, or otherwise made acceptable to the Owner.

D. Various regulating valves, strainers, or other appurtenances shall be tested to demonstrate their conformance with the specified operational capabilities and any deficiencies shall be corrected or the device replaced or otherwise made acceptable to the Owner.

E. Gate valves: Perform shop tests in accordance with AWWA C500, except no leakage shall occur with design pressure held for one minute.

F. Conduct functional field test of each valve in presence of Engineer to demonstrate that each part and all components together function correctly.

3.4 HYDROTESTING AND DISINFECTION

A. Hydrostesting and disinfection shall be in accordance with Section 01350 of these Project Specifications.

B. All 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 ounce per inch of valve diameter per hour. Provide certificates of hydrostatic testing results to Engineer.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: The quantity that is measured, “per each,” for payment shall be the actual number of valves of each class, type, and size (including actuators, valve boxes, and marker posts/signs) that are furnished and installed by the Contractor for acceptance by the Owner.

4.2 PAYMENT: Payment shall include all labor, materials, testing, and equipment necessary for furnishing and installing complete functioning valves and valve boxes of various sizes as per the Drawings and as specified herein. This item shall also include, but not be limited to: all types and sizes of valves; valve stem; valve box and cover; valve box extensions; concrete collar around valve box; base material below the valve per the Drawings; valve marker, project staking; sheeting; gearing; painting; coating; nut operator extension; excavation and backfill; trenching; restraining utility poles; hydrotesting and disinfection; all items related to trench excavation safety; and all other work incidental to the installation of functional gate valve and box with marker sign complete in place and in reliable service.

END OF SECTION

SECTION 02440

COMBINATION AIR RELEASE VALVE

PART 1 - GENERAL

1.1 SCOPE

A. The Work included in this Section consists of furnishing all labor, materials, testing, equipment, and incidentals required to install a complete combination air release valve assembly.

B. Where references are made to other standards and codes, unless specific date references are indicated, the latest edition of said standard or code shall govern.

1.2 DESCRIPTIONS OF REQUIREMENTS

A. The Contractor shall furnish and install combination air valve assemblies in accordance with Section 2.1 of these Specifications and the Air Release Valve Standard Detail as shown within the Drawings.

1.3 QUALITY ASSURANCE

A. Qualifications

1. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these Specifications as applicable.

2. Provide the services of a qualified and factory-trained service representative of the Manufacturer to provide operational and maintenance instructions.

1.4 RELATED SECTIONS

A. Section 01230 – Excavation and Backfill.

B. Section 01350 – Hydrotesting and Disinfection.

1.5 REFERENCE STANDARDS

A. Comply with the following applicable provisions and recommendations, except as otherwise shown or specified where reference is made to one of the below listed standards, the revision in effect at the time of bid opening shall apply.

1. ASTM A48 Class 35 – Gray Iron Castings

2. ASTM A126 Class B – Gray Iron Castings for Valves, Flanges, and Pipe Fittings

3. ANSI/NSF Standard 60 – Drinking Water Treatment Chemicals

4. ANSI/NSF Standard 61 – Drinking Water System Components

1.6 SUBMITTALS

A. Shop Drawings

1. Manufacturer's literature, illustrations, paint certifications, specifications, detailed drawings, data and descriptive literature on combination air valves.

2. Engineering data including dimensions, materials, size, and weight.

3. Additional submittal data, where noted with individual pieces of equipment.

B. Certificates

1. The Manufacturer shall provide certification that products furnished under this specification are manufactured in an ISO 9001 certified facility or documentation from an accredited facility that ISO 9001 certification is in process.

C. Operating and Maintenance Data

1. Operating and maintenance instructions shall be furnished to the Owner. The instructions shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions and other information required to instruct operating and maintenance personnel unfamiliar with such equipment.

2. Copies of all shop drawings, test reports, maintenance data and schedules, description of operation and, spare parts information shall be provided to the Owner.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping

1. Care shall be taken in loading, transporting and unloading to prevent injury to the valves, appurtenances, or coatings. Equipment shall not be dropped. Each combination air valve and assembly components shall be

examined before installation and no piece shall be installed which is found to be defective. Any damage to the coatings shall be repaired as acceptable to the Owner.

2. Prior to shipping, the ends of all valves shall be acceptably covered to prevent entry of foreign material. Covers shall remain in place until after installation and connecting piping is completed.

B. Storage and Protection

1. Special care shall be taken to prevent plastic and similar brittle items from being directly exposed to the sun, or exposed to extremes in temperature, to prevent deformation. See the individual piping specifications and Manufacturer's information for further requirements.

1.8 MAINTENANCE

A. Special tools and the Manufacturer’s standard spare parts, if required for normal operation and maintenance, shall be supplied with the equipment in accordance with the Contract Documents and where noted, as specified herein.

B. Provide all special tools required for normal maintenance. Tools shall be packaged in a steel case, clearly and indelibly marked on the exterior to indicate equipment for which tools are intended.

C. Provide to the Owner a list of all spare and replacement parts with individual prices and location where they are available.

PART 2 - PRODUCTS

2.1 COMBINATION AIR VALVE ASSEMBLY

A. The valve assembly shall be furnished and installed as per the Combination Air Valve standard detail shown within the Construction Drawings.

B. The use of a Manufacturer's name and/or model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

C. Valves shall be of the size shown on the construction Drawings or as noted; equipment of the same type shall conform to the Approved Equipment List and the models specified in these Specifications.

D. The combination air valve assembly shall be from the list below, also shown in the Approved Equipment List (AEL), or an approved equivalent.

Manufacturer	1” NPT x 5/64”	2” NPTx3/32”
Empire Controls	945 (1” NPT)	945
Val-Matic	201C	202C
Apco	143C	145C

E. The combination air release shall be designed to vent accumulated air automatically. The outlet orifice shall be sized properly to facilitate valve operation at pressures of up to 150 psi. The air release valve shall be simple-lever, compound-lever, ball and orifice, or rolling seal depending upon volume requirements and the design of the valve.

F. The combination air release valve shall be designed with the inlet and outlet of equal cross-sectional area where applicable. The valve shall be capable of automatically allowing large quantities of air to be exhausted during the filling cycle and also capable of automatically allowing air to re-enter the system to prevent a negative pressure at water column separation or during the draining cycle. The float shall be guided to minimize premature closure by air and to provide proper alignment for normal closure by floating on the water surface.

G. Combination air release valves shall provide for both automatic air release under system pressure and to allow air movement during filling or draining operations or water column separation. The combination air valve may be housed in a single casting. The housing shall be designed to incorporate conventional or kinetic flow principles to properly vent the air without premature closure. Flanged sized (4 inch and larger) may be furnished in a dual housing. When dual casings are used a bronze manual isolation valve shall be installed if indicated by the manufacturer. This will allow the air release valve to be serviced when the system is under pressure. Field service of the valve may also be performed by closing the isolation valve between the air valve and the pipe connection.

2.2 SURFACE PREPARATION AND PAINTING

A. Notwithstanding any of these Specifications, all coatings and lubricants in contact with potable water shall be certified as acceptable for use with that fluid.

B. If the Manufacturer's requirement is not to require finished coating on any interior surfaces, then Manufacturer shall so state and no interior finish coating will be required, if acceptable to the Owner.

C. Clean and prime coat all ferrous metal surfaces of each valve in the shop.

D. Coat all machined, polished and non-ferrous surfaces including gears, bearing surfaces and similar unpainted surfaces with a corrosion prevention compound which shall be maintained during storage and until equipment begins operation.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Combination air release valve and vault assembly shall be installed per the Manufacturer's instructions in the locations shown, true to alignment and rigidly supported. Any damage to the items listed above shall be repaired to the satisfaction of the Owner before they are installed.

B. Before setting these items, the Contractor shall check all Drawings and figures which have a direct bearing on their location. The Contractor shall be responsible for the proper location of valves and appurtenances during the construction of the work.

C. All materials shall be carefully inspected for defects in construction and materials. All debris and foreign material shall be cleaned out of openings, etc.

D. All items (including valve interiors) shall be cleaned prior to installation, testing, disinfection, and final acceptance.

E. The galvanized iron pipe on the combination air valve is to be installed next to a fence or property and/or R.O.W. line. A 3” 6-foot tall aluminum post shall be installed to stabilize the galvanized pipe.

3.2 INSTALLATION OF MANUAL OPERATIONAL DEVICES

A. Unless otherwise noted, all operational devices shall be installed with the units at the factory, as shown on the construction drawings or as acceptable to the Owner, to allow accessibility to operate and maintain the item and to prevent interference with other piping, valves and appurtenances.

3.3 INSPECTION, TESTING AND CORRECTION OF DEFICIENCIES

A. Take care not to over pressure valves or appurtenances during pipe testing. If any unit proves to be defective, it shall be replaced or repaired to the satisfaction of the Owner.

3.4 AIR RELEASE VALVE MARKER

A. The Contractor shall furnish and install a combination air release valve marker for each air release valve installed in accordance with the Air Release Valve Standard Detail.

3.5 HYDROTESTING AND DISINFECTION

A. Hydrotesting and disinfection shall be in accordance with Section 01350 of these Project Specifications.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: The quantity measured for payment shall be for each installed complete and functioning combination air valve and assembly of various sizes with valve marker as accepted by the Owner.

4.2 PAYMENT: Payment shall be compensation all labor, materials, testing, and equipment necessary for furnishing and installing a complete and functioning combination air valve assembly of various sizes as per the construction drawings and as specified herein. This item shall also include, but not necessarily be limited to: all sizes of combination air valves and assemblies; combination air valve marker; approved tapping saddle; corporation stop; copper tubing; brass ball valve with lever; brass nipple threaded; box; vault box lid; galvanized iron pipe and fittings; security enclosure; accessories and appurtenances; painting; excavation and backfill;; trenching; selected embedment material; anti-corrosion embedment when specified; hydrotesting and disinfection and all other work incidental to the installation of combination air valve assembly complete and in reliable service.

END OF SECTION

SECTION 02500

ABANDONMENT OF WATER INFRASTRUCTURE

PART 1 – GENERAL

1.1 SCOPE

A. The Work included within this Section consists of furnishing all material, equipment, and labor while performing all operations necessary for abandoning water mains, valves, water service lines and/or fire hydrants as shown within the Drawings and specified herein.

1.2 RELATED SECTIONS

A. Section 01230, Excavation and Backfill

B. Section 02650, PVC Pipe

C. Section 02660, Ductile Iron Pipe

D. Section 02665, HDPE Pipe

E. Section 02670, Ductile Iron Fittings

PART 2 – PRODUCTS

A. A cement-based grout shall be used to fill the void of the existing water main. The grouting material must have strength of at least 100 psi and shall have flow characteristics appropriate for filling the water main. The grout mix design and method of installation shall by approved by the Engineer prior to beginning operation.

B. Plugs and Clamps: Applicable for type of pipe to be plugged

PART 3 – EXECUTION

3.1 WATER MAIN ABANDONMENT

A. The Contractor shall accomplish all cutting, capping, plugging, and blocking necessary to isolate existing mains retained in service from abandoned mains.

B. Do not begin to cut, plug, and abandonment operations until replacement water main has been constructed and tested, all service connections have been installed, and replacement main is approved for use.

C. For water mains that are 8” in diameter and larger, the open ends of abandoned mains and all other openings or holes in such mains occasioned by cutting or

removal of outlets shall be blocked off by pressure forcing cement grout into and around the openings in sufficient quantity to provide a permanent substantially watertight seal.

D. All pipe ends of abandoned water mains (both smaller diameter and larger diameter grouted filled pipe) shall be plugged. Pipes less than 24 inches in diameter shall be plugged with a manufactured plug suitable for the particular type of pipe. The plug provided must be watertight and adequate to seal the pipe from groundwater.

E. When specified or shown within the contract documents, Contractor shall remove the main and all related appurtenances that are to be replaced or will no longer be in service. All effort to accomplish this requirement will be considered subsidiary to the work required, and no direct payment will be made.

F. In no instance shall water mains be abandoned by valve closure.

3.2 WATER VALVE ABANDONMENT

A. Valves to be abandoned in place shall have the rising stem, ductile iron shaft casing and cap removed and backfilled and buried. The valve covers shall be salvaged and returned to the Owner.

3.3 WATER SERVICE LINE ABANDONMENT

A. All water service lines that are being abandoned and not transferred to a new distribution line shall be disconnected at the corporation stop at the main and all other valves and appurtenances, including the water meter and backflow device, removed.

B. Unless otherwise specified, the old service line shall be abandoned after the existing meter has been reset in the existing or new meter box.

C. The Contractor shall accomplish all cutting, capping, and plugging necessary to isolate new service lines transferred to new and existing mains from those abandoned. The corporation stop for an abandoned service line tapped on a ferrous main shall be removed, and the tap at the main shall be plugged with an appropriately sized brass plug. For a non-ferrous main the corporation stop shall not be removed from the main. Instead, the corporation stop shall be closed, and the flared nut shall be removed from the corporation stop. After the appropriately sized copper disc is inserted inside the flared nut, replace the flared nut on the corporation stop. The Contractor shall salvage copper service line tubing, brass fittings, and other materials as directed by the Inspector and return them to Owner.

3.4 FIRE HYDRANTS

A. Fire hydrant branches shall be abandoned by cutting and capping the fire hydrant cast iron tee at the service main and the service restored to its original

condition.

B. The contractor shall salvage the existing fire hydrants and other materials as designated in the field by the Inspector and shall deliver this material to 2370 FM 1979, San Marcos, TX 78666.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: Unless shown on the construction plans or called out within the technical specifications as a pay item, abandonment activities described herein are for informational purposes only. No separate measurement of abandonment activities will be made by the Contractor for this Work.

4.2 PAYMENT: The abandonment of existing water infrastructure will be considered subsidiary to the work required. No separate payment will be made to the Contractor for this Work.

END OF SECTION

SECTION 02640
FIRE HYDRANT ASSEMBLY

PART 1 - GENERAL

1.1 SCOPE

A. The Work included in this Section consists of furnishing all material, equipment, labor, and performing all operations necessary for the supply of fire hydrants, ductile iron pipe, valves, nozzles, markers and accessories as shown within the Construction Drawings and specified herein.

B. Where references are made to other standards and codes, unless specific date references are indicated, the latest edition of said standard or code shall govern.

1.2 DESCRIPTION OF REQUIREMENTS

A. The Contractor shall furnish and install fire hydrants in accordance with the Fire Hydrant Assembly drawing as shown within the Construction Drawings.

1.3 QUALITY ASSURANCE

A. Install fire hydrants to meet current requirements of Owner.

B. Provide manufacturer's certificate for those products that meet or exceed minimum requirements as specified herein.

1.4 RELATED SECTIONS

A. Section 01230, Excavation and Backfill.

B. Section 01350, Hydrotesting and Disinfection

C. Section 02400, Valves and Appurtenances

D. Section 02680, Joint Restraints and Thrust Blocking

1.5 REFERENCED STANDARDS

A. AWWA C502 – Dry-Barrel Fire Hydrants.

B. AWWA C550 – Protective Interior Coatings for Valves and Hydrants.

C. Fire hydrants shall be NSF-61 certified.

1.6 SUBMITTALS

A. Submit Manufacturer’s certificates of conformance to the requirements of these Technical Specifications.

B. Shop Drawings: Submit Manufacturer's drawings and data sheets for material to be supplied under this section. Indicate sizes and types of fire hydrants to be installed.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. During loading, transportation and unloading, exercise care to prevent damage to materials.

B. Handling: Fire hydrants should be unloaded carefully. The hydrant should be carefully lowered from the truck to the ground, not dropped. Only hoists and slings with adequate load capacity to handle the weight of the hydrant shall be used.

C. Storage: Hydrants should be stored in the fully closed position to prevent entry of foreign material that could cause damage to the seating surfaces. Whenever practical, hydrants should be stored indoors. If outside storage is required, means shall be provided to protect the operating mechanism from contamination or weathering. In outside storage, parts and flanges shall be protected from the weather and foreign materials.

PART 2 – PRODUCTS

2.1 STANDARD CRYSTAL CLEAR SUD FIRE HYDRANTS

A. Fire hydrants shall conform to the requirements of the latest revision of AWWA C502 "Dry- Barrel Fire Hydrants" or latest revision thereof. Hydrant barrel shall have safety breakage feature above the ground line. All hydrants shall have 6-inch mechanical joint shoe connections, two (2) 2 ½-inch hose nozzles and one (1) 4 ½-inch pumper nozzle with caps fitted with cap chains. Connection threads shall conform to National Standard Specifications as adopted by the National Board of Fire Underwriters.

Operating nut shall be a 1 ½-inch pentagon, measure from flat to point, and shall open left (counterclockwise). Main valve shall have 5 ¼ -inch fill opening and be of the compression type, opening against water pressure so that valve remains closed should the barrel be broken off.

B. Operating stem shall be equipped with anti-friction thrust bearing to reduce operating torque and assure easy opening. Stops shall be provided to limit stem travel. Stem threads shall be enclosed in a permanently sealed lubricant reservoir with O-ring seals.

C. Fire hydrants shall be designated for 150 psi working pressure and shop tested to 300 psi pressure with main valve both opened and closed. Under test, the valve shall not leak, the automatic drain shall function, and there shall be no leakage into the bonnet.

D. Fire hydrant shall be the following:

1. Mueller Super Centurion 250 (Model A 423).

2. American Darling (Model B-84-B).

3. Approved equivalent.

2.2 FIRE HYDRANTS (INSTALLED WITHIN NEW BRAUNFELS AND SAN MARCOS JURISDICTIONAL AREAS)

A. Lower barrel shall be rigid to assure above ground break at traffic feature. Bury length of hydrant shall be four (4) feet minimum, five (5) feet maximum (hydrant lead pipe may be elbowed up from main using restrained joints; flanged joints in lead pipes are not allowed). Flange type connections between hydrant shoe, barrel sections and bonnet shall have minimum of 6 corrosion resistant bolts.

1. New Braunfels fire hydrant barrel shall have an inside diameter of not less than 7 inches. Hydrant shall have non-rising stem.

B. Hydrant Main Valves (for New Braunfels fire hydrants only) shall be 5 ¼ I.D. Valve stem design shall meet requirements of AWWA C502, with Operating Nut turning clockwise to close. Operating Nut shall be pentagonal, 1 ½ -inch point to flat at base, and 1 7/16 inches at top and 1-inch minimum height. Seat ring shall be bronze (bronze to bronze threading) and shall be removable with light weight stem wrench. Valve mechanisms shall be flushed with each operation of valve; there shall be a minimum of two (2) drain ports.

C. Outlet Nozzles shall be located approximately 18 inches above ground. Each hydrant shall have two (2) 2 ½ inch (63.5 mm) nozzles 180 degree apart with National (American) Standard Fire Hose Coupling Screw Thread NFPA 1963 Nozzles shall be threaded or cam-locked, O-ring sealed and shall have type 302 or 304 stainless steel locking device. Nozzle caps (without chains) and cap gaskets shall be furnished on the hydrant. The cap nut shall have the same configuration as the operating.

1. New Braunfels fire hydrants shall have one (1) 4-inch pumper nozzle with City of New Braunfels standard 4-480.

2. San Marcos fire hydrants shall have one (1) 4-inch pumper nozzle with City of Austin standard thread-six (6) threads per inch “Higbee” cut, 4.8590 inch O.D., 4.6425 inch root diameter.

D. Hydrant shall have double O-ring seals in a bronze stem sheath housing to assure separation of lubricant from water and shall have a weather cap or seal, or both, as approved by the Owner, to provide complete weather protection.

E. All below ground bolts shall be corrosion resistant. The hydrant valve shall be Neoprene, 90 durometer minimum. The seat ring, drain ring, operating nut and nozzles shall be bronze, AWWA C-502 current, containing not over 16 percent zinc. Break-away stem coupling shall be of ferrous material; its retaining pins, bolts, nuts, etc. of type 302 or 304 stainless steel.

F. Fire hydrants shall be designated for 200 psi working pressure and shop tested to 400 psi pressure with main valve both opened and closed. Under test, the valve

shall not leak, the automatic drain shall function, and there shall be no leakage into the bonnet.

G. Fire hydrant shall be the following for San Marcos jurisdictional areas:

1. Mueller Super Centurion 250 Model A 423.

2. American Darling (Model B-84-B-5).

3. Approved equivalent.

H. Fire hydrant shall be the following for New Braunfels jurisdictional areas:

4. Mueller Super Centurion 250 Model A 423.

5. American Darling (Model B-84-B).

6. Approved equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractor shall field stake proposed hydrant installation locations for Owner and/or Engineer confirmation and field relocation, if necessary. The Contractor shall provide a minimum of seven (7) calendar days for the Owner and/or Engineer to review/approve the field stake locations and field relocations.

B. Fire hydrant shall be set plumb with not less than two and one-half (2.50) cubic feet of crushed stone.

C. The Contractor shall place a blue-colored reflective marker at a location in the adjacent roadway in accordance with the Marker Details Standard drawing.

D. Before installing any valve, care shall be taken to see that all foreign material is removed from the interior of the body and the valve is opened and closed to see that all parts are in proper working condition. Valves shall be closed prior to installation. Valves shall be set on gravel or ¾-inch stone with a minimum of one (1) square foot bearing area and four (4) inches thick to support the weight of the valve. Valves shall be set plumb with valve boxes placed directly over the operators. The top section of the valve box shall be set to allow equal movement above and below finished grade. After being correctly positioned, fill shall be carefully tamped around the valve box for a distance of four (4) feet on all sides of the box. In unpaved areas, a 24 inches x 24 inches x 9 inches thick reinforced concrete pad shall be poured around the top of the box as shown in the Typical Iron Valve Box Standard detail drawing as shown within per the Construction Drawings. The box shall be adjusted flush with the finished grade. All fire hydrant valves shall be harnessed or restrained as shown.

E. Fire hydrants shall be set so that the bury line is flush with the surface of the

proposed ground as recommended by the Manufacturer, and shall be connected to the mains with main line tees, ductile iron pipe, gate valve and box, fittings, marker, all being part of the assembly. Hydrants shall be set on gravel or ¾-inch stone pad with a minimum of one (1) square foot bearing area and four (4) inches thick to support the weight of the hydrant. The fire hydrant valve shall be restrained back to the tee. After connections are made, the hydrants shall be set at such elevations that the connecting pipe and the distributing mains shall have the same depth of cover. All backfill around hydrants shall be thoroughly compacted to the surface of the ground. Hydrants shall be turned such that the hose nozzles are parallel with, or at a right angle to the curb with the pumper nozzle facing the curb or street, unless directed otherwise by the Engineer.

3.2 PAINT

A. The interior of the hydrant shoe shall be coated with fusion-bonded epoxy having a normal dry film thickness of 8 mils, conforming to ANSI/AWWA C550 and NSF 61.

B. After the fire hydrant has been installed, the exterior of the fire hydrants shall be painted with suitable primer and finished with oil-based aluminum paint. Paint shall be applied to all exposed metal surfaces above the hydrant base flange.

3.3 TESTING AND INSPECTION

A. All Fire Hydrant tests and inspections shall conform to ANSI/AWWA C502 Section 5.1 “Production Testing”, ANSI/AWWA C502 Section 5.2 “Prototype Testing”, and ANSI/AWWA C502 Section 5.3 “Inspection and Rejection” or latest edition thereof.

3.4 FIRE HYDRANT REPLACEMENT

A. The Contractor shall make every effort to maintain water service to existing fire hydrants throughout the construction period, unless otherwise approved by the Engineer.

PART 4 – MEASUREMENT AN PAYMENT

4.1 MEASUREMENT: Standard Fire Hydrants with 6-inch valve and box with marker sign will be measured by the unit of each fire hydrant, valve and box installed.

4.2 PAYMENT: Payment shall be full compensation for all labor, materials, testing, and equipment necessary for furnishing and installing complete new standard fire hydrant with 6-inch valve and box as shown within the Construction Drawings and as specified herein. This item shall include, but not necessarily be limited to: excavation and backfill, selected material, anti-corrosion embedment when specified, nipples, ductile iron pipe, and fittings exclusive of the tee from the main line pipe, polyethylene wrap, concrete pad, painting, valve marker, hydrotesting and disinfection, inspection and all other work incidental to furnishing and installing a fire hydrant.

END OF SECTION

SECTION 02650

POLYVINYL CHLORIDE (PVC) PIPE

PART 1 - G E N E R A L

1.1 SCOPE

A. The Work included in this Section consists of furnishing all material, equipment, testing, and labor while performing all operations necessary for the installation of Polyvinyl Chloride (PVC) pipe that is compliant with all AWWA C900 and C905 standards as shown within the Drawings and as specified herein.

B. Where references are made to other standards or codes, unless specific date references are indicated, the latest edition of said standard or code shall govern.

1.2 QUALITY ASSURANCE

A. Manufacturer shall have a minimum of 5 years of experience producing PVC pipe, and shall show evidence of at least 5 installations that are currently in satisfactory operation.

B. PVC pipe shall be the product of one manufacturer.

1.3 RELATED SECTIONS

A. Section 01230, Excavation and Backfill.

B. Section 01240, Trench Excavation Safety.

C. Section 01350, Hydrotesting and Disinfection.

D. Section 02670, Ductile Iron Fittings.

E. Section 02680, Joint Restraints and Thrust Blocking.

1.4 REFERENCE STANDARDS

A. Comply with the current Texas Commission on Environmental Quality (TCEQ) rules and the American Water Works Association (AWWA) standards for materials relating to water distribution systems.

1.5 SUBMITTALS

A. Shop Drawings

1. Submit Manufacturer’s certificate of conformance with referenced standards.

2. Submit Manufacturer’s drawings and data sheets for material to be supplied under this Section. Indicate sizes and types to be installed.

3. Submit Manufacturer’s Specifications for the tracer wire.

4. Submit Manufacturer’s Specifications for the detectable marker tape. Indicate size to be installed.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Pipe shall be unloaded and inspected in accordance with the Manufacturer's instructions.

B. Pipe stored on the site shall be contained within the protective unit packages provided by the Manufacturer. If packages need to be opened, the pipe shall be stored on a flat surface and not in direct contact with the ground. Do not stack packages higher than four (4) vertical feet. Keep inside of pipe free from dirt and debris. Care shall be exercised to, avoid compression damage to or deformation of, the pipe.

C. All pipe segments that are stored shall be covered to provide protection from the sunlight.

D. Handle all material carefully at all times. Any pipe having a crack or which has received a severe blow shall be marked as rejected and immediately removed from the jobsite.

PART 2 - P R O D U C T S

2.1 PVC PIPE

A. PVC pressure pipe shall conform to the requirements of AWWA C900 with outside diameter equal to that of cast iron pipe, or to the requirements of AWWA C905 with outside diameter equal to that of cast iron or steel pipe.

B. All PVC pressure pipe shall be a rated DR 18 unless otherwise noted on the plans.

C. PVC pipe shall be colored to designate its end use: blue for water mains, green for sanitary sewer mains, and purple for reuse water mains.

D. PVC pipe shall be furnished in standard laying lengths of 20 feet (plus or minus one inch) unless stated otherwise.

E. PVC pipe marking shall include the following:

1. Manufacturer’s name or trademark.

2. Standard to which it conforms.

3. Pipe dimeter size.

4. Material design code.

5. Pressure rating.

6. Standard Dimension Ratio (SDR) number or schedule number.

7. Laboratory seal or mark attesting to suitability for potable water use.

8. Manufacture date (date of installation shall not exceed one year from this date).

2.2 SLICK BORE INSTALLATION METHOD

A. PVC pipe shall be Certa-Lok C900/RJIB (DR 18) for all pipe diameter sizes.

2.3 PIPE JOINT RESTRAINTS AND THRUST BLOCKING

A. Pipe joint restraints and thrust blocking shall conform to all requirements with all requirements of Section 02680 of these Project Specifications.

2.4 DUCTILE IRON FITTINGS

A. All buried fittings shall be ductile iron with mechanical joints and shall conform to all requirements within Section 02670 of these Project Specifications.

2.5 PIPE JOINT LUBRICANT

A. The joint lubricant shall have been tested and approved for potable water service. No lubricant shall be used that will harbor bacteria or damage the gaskets.

2.6 PIPE TRACER WIRE

A. Tracer wire shall be installed for future use in locating pipe. Tracer wire shall be No. 12 AWG copper-clad steel, extra high-strength with minimum 1,150-lb break load and 30 mil HDPE insulation.

B. Tracer wire shall be taped or zip-tied to the main pipeline in a minimum of 60-inch increments.

C. Tracer wire shall be placed on all new PVC pipe whether it is installed by open trench, slick bore or jack and bore method.

D. A conductivity test shall be made on all wire installed. Tests and visual inspection shall be made at each valve box, meter box and listening port as applicable. Conductivity may be tested by using as electrical conductivity meter by attaching underground locating equipment and tracing the signal to each valve box and meter box. No acceptance or payment will be made on any section or reach of pipe installed that does not have a conductive electrical locator wire installed in accordance with the Drawings.

2.7 MARKER TAPE

A. Marker tape shall be installed as an additional pipe identification device when pipe is installed by open trench method only.

B. During the backfilling process, all water mains, service lines and system appurtenances shall have a continuous warning tape placed immediately above them and throughout their length at a depth of eighteen (18) inches above the utility

line surface. The tape shall be six (6) inches wide. Tape material shall be formulated from 100 percent virgin polyolefin resins. Resins shall be pigmental for chemical stability and resistance to sulfide staining (color fastness). Tape shall be constructed by the mechanical (non-adhesive) lamination of two piles of three layers blown film in such a manner as to produce a bi-axially oriented structure. The tape shall be able to provide a 700 percent elongation prior to rupture as per ASTM-D882.

C. The warning tape shall be manufactured with a permanent American Public Works Administration (APWA) blue color pigment and at a maximum of every thirty (30) inches along its length, be imprinted with a continuous warning message as follows: “CAUTION: POTABLE WATER LINE BURIED BELOW.” Alternatively, the warning tape shall be manufactured with a permanent APWA green color pigment and at a max of every thirty inches along its length, be imprinted with a continuous warning message as follows: “CAUTION: SEWER OR DRAIN LINE BURIED BELOW.”

2.8 WATER MAIN CROSSING MARKER

A. The Contractor shall install the water main crossing marker in accordance with the Marker Standard Detail drawing as shown within the Drawings.

B. The water main crossing marker shall be placed on Right-of-Way or fence line at all road crossings.

C. The water main crossing marker detail shall be used for water main detecting services.

PART 3 - E X E C U T I O N

3.1 PIPE UNLOADING AT THE SITE

A. Inspect each shipment of pipe and make provision for a timely replacement of any damaged material. Unload by hand or use canvas slings to avoid scratching the pipe. Do not slide or drag PVC pipe over an abrasive surface. Pipe with deep scratches shall be replaced with new pipe and removed from the site immediately.

B. Stack pipe packages no higher than four (4) vertical feet and provide support for the pipe barrel to prevent bending of the pipe. Pipe stockpiled for more than thirty (30) days shall be covered to protect it from the sun's rays. Provide for air circulation through the stockpile.

C. Store rubber gasket rings in a cool, dark place out of the direct rays of the sun.

3.2 DISTRIBUTING PIPE ALONG THE TRENCH

A. Distribute pipe by hand. Do not drop or drag pipe. Distribute sufficient pipe for one day's work, and place with bell end in the direction of pipe laying. Prevent dirt and contaminants from entering the pipe.

3.3 ASSEMBLING THE PIPE

A. Closely follow the Manufacturer's recommended procedure for cleaning, setting the

gasket ring, lubricating the spigots end of pipe, and assembling.

3.4 PIPE PLACING IN TRENCH

A. Pipe that is assembled prior to placing in the trench shall be carefully fed by hand (or with the use of approved equipment) on the pipe bed. Provide pockets in the pipe bed material to accommodate bell ends and eliminate a concentration of load at these points.

3.5 PREVENTING TRENCH WATER FROM ENTERING PIPE

A. When pipe laying is not in progress, close the open ends of pipe with a watertight plug and allow no water or other objectionable materials to enter the pipe.

3.6 WATER MAIN INSTALLATION

A. The Contractor shall start his work at a tie-in point or as designated by the Engineer/Owner. Pipe shall be laid with bell ends facing in the direction of the pipe laying, unless otherwise authorized or directed by the Owner. All valves and fire hydrants and valves must be installed as soon as the pipe laying reaches their designated location.

B. All pipes shall be installed to the required lines and grades with fittings, valves, and hydrants placed at the required locations. The pipe shall be laid by inserting the spigot end into the bell flush with the intersection line or as recommended by the Manufacturer. At no time shall the bell end be allowed to go past the “insertion line”. A gap between the end of the spigot, and the adjoining pipe is necessary to allow for expansion and contraction.

C. New water main crossing any other utility shall have a minimum of 30 inches of cover over the top of the pipe, unless otherwise modified by the Engineer. Excavation around other utilities shall be done at least 12 inches all around. Any damage to other utilities shall be reported to their governing entity. In both of these cases of existing utility damage, the Contractor shall promptly notify the Inspector.

D. Water main crossings of other utility lines shall be made in accordance with all applicable TCEQ rules and regulations.

3.7 HYDROTESTING AND DISINFECTION

A. Hydrotesting and disinfection of PVC pipe shall be completed in accordance with Section 01350 of these Project Specifications.

3.8 TRENCH EXCAVATION SAFETY

A. Trench excavation safety shall be provided by the Contractor in accordance with Section 01240 of these Project Specifications.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: The quantity measured for payment shall be per linear foot for each size diameter and type of PVC pipe installed by open cut method regardless of trench depth as

accepted by the Owner.

4.2 PAYMENT: Payment shall be full compensation for all labor, materials, testing, and equipment necessary for furnishing and installing the PVC pipe per linear foot of the various diameter size and types by the open cut method regardless of trench depth as per the Drawings and as specified within. This item shall also include, but not necessarily be limited to: all types and sizes of PVC pipe; tracer wire; marker tape; water main crossing marker; selected embedment; compaction; hydrotesting and disinfection; project staking; excavation and backfill; all items related to trench excavation safety; and all other work incidental to the installation of the PVC pipe complete in place and in reliable service.

END OF SECTION

SECTION 02660

DUCTILE IRON PIPE

PART 1 - GENERAL

1.1 SCOPE

A. The Work included in this Section consists of furnishing all material, equipment, labor, testing and performing all operations necessary for the supply of all ductile iron piping within the limits of work, as shown on the Drawings and specified herein.

B. Where references are made to other standards or codes unless specific date references are indicated, the latest edition of said standard or code shall govern.

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. Manufacturer shall have a minimum of five years of experience producing ductile iron pipe and fittings and shall show evidence of at least five installations in satisfactory operation.

2. Ductile iron pipe and fittings shall be the product of one manufacturer.

B. Material Qualifications

1. All pipe, fittings and other materials supplied under this contract shall be subject to inspection while still on the delivery truck. It is the sole responsibility of the vendor and supplier to make prior contact with the Owner and provide a minimum of 48-hours prior notice of delivery.

2. Materials found to be defective, not in strict compliance with the quality standards of samples supplied, or of these specifications shall be immediately returned to the vendor at no expense of the Owner. If defects are discovered at a later time, the vendor shall be required to remove said items and shall bare all costs for so doing together with any replacement costs. Rejection of items may subject the vendor to liquidated and/or actual damages as specified elsewhere herein.

1.3 RELATED SECTIONS

A. Section 01230, Excavation and Backfill

B. Section 01240, Trench Excavation Safety

C. Section 01350, Hydrotesting and Disinfection

D. Section 02670, Ductile Iron Fittings

E. Section 02680, Joint Restraints and Thrust Blocking

1.4 REFERENCE STANDARDS

A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:

1. AWWA C104, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

2. AWWA C105, Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.

3. AWWA C110, Ductile-Iron and Gray-Iron Fittings, 3 inches through 48 inches, for Water and Other Liquids.

4. AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

5. AWWA C115, Flanged Ductile-Iron Pipe with Threaded Flanges.

6. ANSI B16.1, Cast Iron Pipe Flanges and Flanged Fittings.

7. ANSI B18.2.1, Square and Hex Bolts and Screws Inch Series, Including Hex Cap Screws and Lag Screws.

8. ANSI B18.2.2, Square and Hex Nuts.

9. ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

10. ASTM A 354, Specification for Quenched and Tempered Alloy Steel Bolts, Studs and Other Externally Threaded Fasteners.

1.5 SUBMITTALS

A. Submit Manufacturer’s certificate of conformance with Standards.

B. Submit Manufacturer’s drawings and data sheets for material to be supplied under this section. Indicate sizes and types to be installed.

C. Submit Manufacturer’s specifications for marker tape.

1.6 DELIVERY, STORAGE AND HANDLING

A. During shipping, delivery and installation of pipe and accessories, handle in a

manner as to ensure a sound, undamaged condition.

B. Exercise particular care not to injure pipe coatings.

PART 2 – PRODUCTS

2.1 DUCTILE IRON PIPE

A. Ductile iron pipe shall conform to ANSI/AWWA Standard C151/A21.51- “Ductile-Iron Pipe, Centrifugally Cast, for Water", or latest revision thereof.

B. Ductile iron pipe for water applications shall be in full compliance with ANSI/NSF 61, "Drinking Water System Components-Health Effects". Manufacturers shall maintain their NSF certification for the duration of the Contract and any extensions thereof.

C. All pipes thickness and outside diameter of pipe for water usage shall conform to Table 1 (Standard dimensions of push-on-joint and mechanical-joint ductile-iron pipe) and Table 2 (Dimensions for special thickness classes of push-on-joint ductile-iron pipe and mechanical-joint ductile-iron pipe) from ANSI/AWWA Standard C151/A21.51 for the following sizes. (The pressure class specified is the minimum permitted):

Pipe Diameter Size	Pressure Class (psi)
3-inches through 12-inches	350
14-inches through 20-inches	250
24-inch	200
30-inches through 64-inches	150

D. For restrained joint pipe, the thickness of the pipe barrel remaining after grooves are cut, if required in the design of restrained end joints, shall not be less than the nominal wall thickness of equal sized non-restrained joint pipe as shown above.

E. Each piece of pipe shall be marked as required in Section 4.7 of AWWA C151- Letters and numerals on pipe sizes 12-inch and smaller shall be not less than 3/8-inch.

F. The single gasket push-on pipe shall be shipped in standard 20-foot lengths, but not both. The restrained single-gasket push-on joint pipe shall be shipped in standard 20-foot lengths as specified above or fabricated lengths as noted in each order. At least two lengths of each size of single gasket push-on pipe furnished under each order shall be tested with circumferential gauges to ensure that the pipe may be cut at any point along its length and have an outside diameter which will be within the Manufacturer's standard design dimensions and tolerances for plain pipe. These lengths shall be identified with an easily distinguished, painted

marking, longitudinally along the full length of the pipe.

2.2 DUCTILE IRON FITTINGS

A. Ductile iron fittings shall be in accordance with Section 02670 of these Technical Specifications.

2.3 LININGS AND COATINGS

A. Asphaltic Coating

1. All pipe and fittings shall be outside coated with an asphaltic material applied by means of the airless spray method. The exterior coating shall meet AWWA Specifications for this type of coating, shall be smooth without pinholes, thin, bare, or overly thick areas. Smoothness shall be such that when hand rubbed, no “sandpaper” feeling will be experienced and such that the spigot area will readily slide through the gasket without pulling, tearing, rolling, or otherwise disturbing the sealing capabilities of the gasket. Spigot ends shall be beveled prior to painting and to an extent that will permit ready insertion of the spigot through the gasket area.

B. Interior Cement-Mortar Lining

1. Pipe and fittings for potable water use shall be cement-lined and seal-coated in accordance with ANSI/AWWA Standard C104/A21.4-95, "Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water."

C. Exterior Painting

1. All exterior, above grade ductile iron piping, valves, and fittings, excluding stainless steel hardware, shall be prepared for painting by:

   a. Cleaning all surfaces as per NAPF 500-03-01 Solvent Cleaning to remove all oil, grease, factory-applied tars and/or bitumastic coatings and all other soluble contaminants.

   b. Preparing ductile iron pipe as per NAPF 500-03-04 Abrasive Blast Cleaning for Ductile Iron Pipe providing a minimum 1.5 mil angular anchor profile.

   c. Preparing ductile iron valves and fittings as per NAPF 500-03-05 Abrasive Blast Cleaning for Cast Ductile Iron Fittings.

2. Following surface preparation, the following coating system shall be applied:

   a. First Coat: Tnemec Series 27WB Typoxy applied at 6.0 to 8.0 dry mils.

b. Second Coat: Tnemec Series 27WB Typoxy applied at 6.0 to 8.0 dry mils.

c. Third Coat: Tnemec Series 740 UVX applied at 3.0 to 5.0 dry mils.

d. Total minimum dry film thickness shall be 13.0 mils.

e. The Coatings colors shall be selected by the Owner using a color chart supplied by the Contractor with shop drawing submittals.

2.4 PIPE MARKER TAPE

A. Marker tape shall be used as a buried pipe identification service.

B. During the backfilling process, all Ductile Iron water mains, service lines and system appurtenances shall have a continuous warning tape placed immediately above them and throughout their length at a depth of eighteen (18) inches above the utility line surface. The tape shall be six (6) inches wide. Tape material shall be formulated from 100 percent virgin polyolefin resins. Resins shall be pigmential for chemical stability and resistance to sulfide staining (color fastness). Tape shall be constructed by the mechanical (non-adhesive) lamination of two plies of three layers blown film in such a manner as to produce a bi-axially oriented structure. The tape shall be able to provide a 700 percent elongation prior to rupture as per ASTM-D882.

C. The warning tape shall be manufactured with a permanent American Public Works Administration (APWA) blue color pigment at a maximum of every thirty (30) inches along its length, be imprinted with a continuous warning message as follows: “CAUTION: POTABLE WATER LINE BURIED BELOW.” At tees, tape ends, etc., the warning tape shall be tied together (spliced) with a knot to create a continuous warning tape throughout the length of the pipeline and associated branch lines, appurtenances, etc.

2.5 WATER MAIN CROSSING MARKER

A. The Contractor shall install the water main crossing marker in accordance with the Marker standard detail drawing as shown within the Drawings.

B. The water main crossing marker shall be placed on the Right of Way or fence line at all road crossings.

C. The water main crossing marker detail shall be used for water main detecting services.

PART 3 - EXECUTION

3.1 General

A. The Contractor shall provide all barricades and/or flashing warning lights necessary to warn of the construction throughout the Project.

B. Pipe and fittings shall at all times be handled with great care to avoid damage. In loading and unloading, they shall be lifted with cranes or hoists or slid or rolled on skidways in such manner as to avoid shock. Under no circumstances shall this material be dropped or allowed to roll or slide against obstructions.

C. All work shall be performed by skilled workmen experienced in similar installations.

D. All pipes shall be adequately supported by clamps, brackets, straps, concrete supports, rollers, or other devices as shown and/or specified. Supports or hangers shall be spaced so that maximum deflection between supports or hangers shall not exceed 0.05 inches for pipe filled with liquid, but shall not be further than 6 feet apart, whichever is closer, unless otherwise shown.

E. All pipe supports shall be secured to structures by approved inserts or expansion shields and bolts.

F. All pipe shall be thoroughly cleaned internally before being installed. All pipes, except oxygen service, air and gas, shall be flushed with water and swabbed to assure removal of all foreign matter before installation. Air and gas piping shall be tapped with a hammer to loosen scale or other foreign matter that might be within the pipe, then thoroughly blown with a high-pressure air hose. Air shall be from the Contractor's air compressor.

G. Whenever possible, the pipe will be installed with minimum 48-inches of cover, however, due to the numerous utilities in the area, this burial depth could change substantially.

H. At all horizontal or vertical pipe deviations, the Contractor shall install both restrained pipe and thrust blocks. Joints may only be opened to adjust alignment by half of the AWWA or Manufacturer's recommended opening (which is smaller).

3.2 INSTALLATION OF PIPE, FITTINGS AND VALVES

A. All bends, tees, and plugs, unless otherwise specified, shall be backed with concrete thrust blocks to undisturbed ground. Provision shall be made to prevent concrete from adhering to plugs or bolts.

B. Bolts, nuts, and rubber gaskets for use in flanged and mechanical joints shall be stored under cover. Gaskets shall not be exposed to heat, light or any petroleum products, shall be kept clean and shall not be handled with greasy or dirty hands.

C. Before making up flanged joints in cast iron pipe and fittings, the back of each flange under the bolt heads, and the face of each flange shall have all lumps, blisters and excess bituminous coating removed and shall be wire brushed and wiped clean and dry.

D. Before laying the ductile iron pipe, all lumps, blisters and excess coal-tar coating shall be removed from the bell and spigot ends of each pipe and the outside of the spigot and the inside of the bell wire brushed and wiped clean and dry. The entire gasket groove area shall be free of bumps or any foreign matter which might displace the gasket.

E. The cleaned spigot and gasket shall not be allowed to touch the trench walls or trench bottom at any time. Vegetable soap lubricant shall be applied in accordance with the pipe Manufacturer's recommendations, to aid in making the joint. The workmen shall exercise caution to prevent damage to the gasket or the adherence of grease or particles of sand or dirt. Deflections shall be made only after the joint has been assembled.

F. Cutting of ductile iron pipe for inserting valves, fittings, etc., shall be done by the Contractor with a mechanical pipe saw in a neat and workmanlike manner without damage to the pipe, the lining, or the coating.

G. Unless otherwise directed, ductile iron pipe shall be laid with the bell ends facing in the direction of laying; and for lines on an appreciable slope, the bells shall, at the discretion of the Engineer, face upgrade.

H. Push-on and mechanical joints in ductile iron pipe and fittings shall be made in accordance with the Manufacturer's standards except as otherwise specified herein. Joints between push-on and mechanical joint pipe and/or fittings shall be made in accordance with AWWA Standard Specifications, "Installation of Ductile-Iron Mains and Their Appurtenances," C600-10, except that deflection at joints shall not exceed one-half of the Manufacturer's recommended allowable deflection, or one-half of the allowable deflection specified in AWWA C600-10, whichever is the lesser amount.

I. Flanged joints shall be used only where indicated on the Drawings. Before making up flanged joints in the pipeline, the back of each flange under the bolt heads and the face of each flange shall have all lumps, blisters and excess bituminous coating removed and shall be wire brushed and wiped clean and dry. Flange faces shall be kept clean and dry when making up the joint, and the workmen shall exercise caution to prevent damage to the gasket or the adherence of grease or particles of sand or dirt. Bolts and nuts shall be tightened by opposites in order to keep flange faces square with each other, and to ensure that bolt stresses are evenly distributed.

J. Bolts and nuts in flanged and mechanical joints shall be tightened in accordance with the recommendations of the pipe Manufacturer for a leak-free joint. The workmen shall exercise caution to prevent overstress. Torque wrenches shall be used until, in the opinion of the Engineer, the workmen have become accustomed to the proper amount of pressure to apply on standard wrenches.

3.3 PIPE PROTECTION

A. Paint all uninsulated metal (ductile iron or steel) piping underground with two coats of asphaltic paint.

B. Wrap soil pipe that touches metal or is exposed to masonry with a layer of 6 mils polyethylene.

C. Spirally wrap all pipelines embedded in concrete with two layers of 30 lb. felt.

D. Coat all exposed threads on galvanized steel pipe after assembly with two coats of zinc chromate.

E. Cleaning and Testing: All of the piping installed under this project shall be tested as follows and as directed by the Engineer.

1. All potable water piping shall be disinfected per AWWA standards.

2. No leakage shall be permitted for flanged or any other type of above ground piping.

F. Installation of Aboveground and Exposed Piping

1. Aboveground and exposed pipe fittings, valves and accessories shall be installed as shown or indicated on the drawings.

2. Piping shall be cut accurately to measurements established at the job site and shall be worked into place without springing or forcing, properly clearing all equipment access areas and openings. Changes in sizes shall be made with appropriate reducing fittings rather than bushings. Pipe connections shall be made in accordance with the details shown and Manufacturer's recommendations.

3. Open ends of pipelines shall be properly capped or plugged during installation to keep dirt and other foreign material out of the system. Pipe supports and hangers shall be provided where indicated and as required to insure adequate support of the piping.

4. Welded connections shall be made in conformity with the requirements of AWWA Standard C206 and shall be done only by qualified welders. The Engineer may, at his option, require certificates that welders employed on the work are qualified in conformity with the requirements of this standard and/or sample welds to verify the qualifications of the welders. Before testing, field welded joints shall be coated with the same material as used for coating its pipe in accordance with the requirements of AWWA.

5. Flanged joints shall be made up by installing the gasket between the flanges. The threads of the bolts and the faces of the gaskets shall be coated with a suitable lubricant immediately before installation.

6. Use of perforated band iron (plumber's strap), wire or chain as pipe hangers will not be acceptable. Supports for pipe less than 1-1/2 inches nominal size shall not be more than 9-feet on centers and pipe 2-inches nominal size and larger shall be supported at not more than 10-feet on centers, unless otherwise indicated. Supports for PVC pipe shall be spaced one-half the distance specified above unless otherwise indicated. Any noticeable sagging shall be corrected by the addition of extra supports at the Contractor's expense.

3.4 EXCAVATION AND BACKFILL

A. Excavation and backfill on all potable water lines and where otherwise noted, shall be in accordance with Section 01230 of these Project Specifications.

3.5 TRENCH SURFACE RESTORATION

A. The surface of the backfilled trench shall be restored to match the previous conditions. This shall include final grading, placement of topsoil and seeding, placement of sod, or other prepared or unprepared surfaces. Existing above grade items shall be replaced in-kind, including but not limited to fencing, concrete/asphalt surfaces, curbing, vegetation (shrubs, plantings, trees, etc.) mailboxes, signage, etc.

3.6 FIELD QUALITY CONTROL

A. All water mains shall be flushed to remove all sand, debris, rock and other foreign matter.

B. Dispose of the flushing water without causing a nuisance or property damage.

C. Pressure and Leakage Testing: All pumps, piping and gauges shall be furnished, installed and operated by the Contractor and all such equipment and devices and their installation shall be approved by the Engineer.

D. Pump shall be of a non-pulsating type suitable for this application and gauge accuracy certification may be required at the Engineer's discretion. All pressure and leakage testing shall be done in the presence of a representative of the Owner as a condition precedent to the approval and acceptance of the system.

3.7 HYDROTESTING AND DISINFECTION

A. Hydro testing and disinfection shall be in accordance with Section 01350 of these Technical Specifications.

3.8 TRENCH EXCAVATION SAFETY

A. Trench and excavation safety shall be in accordance with Section 01240 of these Technical Specifications.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: The quantity measured for payment shall be per linear foot for each size diameter of ductile iron pipe installed regardless of trench depth and as accepted by the Owner.

4.2 PAYMENT: Payment shall be full compensation for all labor, materials, testing, and equipment necessary for furnishing and installing the ductile iron pipe per linear foot of the various diameter sizes using the open cut method regardless of trench depth as per the Drawings and as specified within. This item shall also include, but not necessarily be limited to: all types and sizes of ductile iron pipe; marker tape; water main crossing marker; compaction; polyethylene sleeves and wraps; hydro testing and disinfection; project staking; excavation and backfill; dewatering; trenching; all items related to trench safety excavation; and all other work incidental to the installation of the ductile iron pipe complete and in place and in reliable service.

END OF SECTION

SECTION 02665
HIGH DENSITY POLYETHYLENE (HDPE) PIPE

PART 1 – GENERAL

1.1 SCOPE

A. The Work included in this Section consists of all material, equipment, testing, labor and performing all operations necessary for the installation of High Density Polyethylene (HDPE) pipe as shown in the Drawings and specified herein.

B. Where references are made to other standards or codes, unless specific date references are indicated, the latest edition of said standard or code shall govern.

1.2 QUALITY ASSURANCE

A. Manufacturer shall have a minimum of 5 years of experience producing HDPE pipe, and shall show evidence of at least 5 installations in satisfactory operation.

B. HDPE pipe shall be the product of one Manufacturer.

1.3 RELATED SECTIONS

A. Section 01230, Excavation and Backfill.

B. Section 01240, Trench Excavation Safety.

C. Section 01350, Hydrotesting and Disinfection.

D. Section 02670, Ductile Iron Fittings.

E. Section 0280, Joint Restraints and Thrust Blocking.

1.4 REFERENCE STANDARDS

A. AWWA C651-14 – Disinfection Water Mains

B. AWWA C901 – Polyethylene (PE) Pressure Pipe and Tubing, 3/4 In. (19 mm) Through 3 In. (76 mm), for Water Services.

C. AWWA C906 – Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm) for Waterworks.

D. ASTM D2239 – Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

E. ASTM D2737 – Standard Specification for Polyethylene (PE) Plastic Tubing.

F. ASTM D3035 – Standard Specification for Polyethylene (DR-PR) Based on Controlled Outside Diameter.

G. ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

H. ASTM F714 – Standard Specification for Polyethylene (DR-PR) Based on Outside Diameter.

1.5 SUBMITTALS

A. Submit Manufacturer’s certificate of conformance.

B. Contractor shall submit Manufacturer’s drawings and data sheets for materials to be supplied under this Section. Indicate sizes and types to be installed.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Pipe shall be unloaded and inspected in accordance with the Manufacturer's instructions.

B. Pipe and fittings stored on the site shall be stored in the protective unit packages provided by the Manufacturer. If packages need to be opened, the pipe shall be stored on a flat surface and not in direct contact with the ground. Do not stack higher than four (4) feet. Keep inside of pipe and fittings free from dirt and debris. Care shall be exercised to avoid compression damage or deformation to the pipe.

C. All pipe, fittings, and adaptors that are stored shall be covered to provide protection from the sunlight.

D. Handle all material carefully at all times. Any pipe or fitting having gouges or cracks, or which has received a severe blow shall be marked rejected and immediately be removed from the work.

PART 2 - PRODUCTS

2.1 HIGH-DENSITY POLYETHYLENE (HDPE) PIPE

A. Materials

1. Pipe shall be a high density, extra high molecular weight polyethylene manufactured from first-quality high density polyethylene resin containing no additives, fillers, or extenders. The HDPE pipe shall have an ASTM D3350 cell classification of PE 345434C, and shall meet or exceed the properties listed in table below.

2. The HDPE pipe shall be SDR-11 DriscoPlex 4000 (blue stripe) for water mains or approved alternate and shall bear the seal of approval of the National Sanitation Foundation (NSF).

Property	Specification	Unit	Nominal Value
Material Designation			PE 4710
Material	ASTM D-1248		III C 5 P34
Cell Classification	ASTM D-3350		445574C
Density	ASTM D-1505	gm/cm^3	0.960
Melt Index	ASTM D-1238	gm/10 min.	0.08
Flex Modulus	ASTM D-790	Psi	120,000
Tensile Strength	ASTM D-638	Psi	3,500
Compressive Strength	ASTM D-695	Psi	1,600
Tensile Strength @ Yield (Type VI Spec.)	ASTM D-638 (2"/min.)	Psi	3,500
Elongation @ Yield	ASTM D-638	%, minimum	8
Tensile Strength @ Break (Type VI	ASTM D-638	Psi	5,000
Elongation @ Break	ASTM D-638	%, minimum	800
Modulus of Elasticity	ASTM D-638	Psi	175,000

A. The inside and the outside surface of each length of pipe shall be free from nicks, scratches, and other surface defects and blemishes. The pipe shall be homogeneous throughout, free of any bubbles, voids, or inclusions.

B. The jointing areas of the barrel of each length of pipe shall be free from dents and gouges.

2.2 PIPE ADAPTORS

A. HDPE to PVC - Mechanical Compression Coupling with restraint – HDPE shall be restrained by electrofusion flex restraints; PVC pipe restrained using a tapered gripping ring. Stiffener inserts in the pipe bore are required for both HDPE and PVC pipes.

2.3 PIPE TRACER WIRE

A. Tracer wire shall be installed for future use in locating pipe. Tracer wire shall be No. 12 AWG copper-clad steel, extra high-strength with minimum 1,150-lb break load and 30 mil HDPE insulation.

B. Tracer wire shall be taped or zip-tied to the main pipeline in a minimum of 60-inch increments.

C. Tracer wire shall be placed on all new HDPE pipe whether it is installed by open trench, slick bore or jack and bore method.

D. A conductivity test shall be made on all wire installed. Tests and visual inspection shall be made at each valve box, meter box and listening port as applicable.

Conductivity may be tested by using as electrical conductivity meter by attaching underground locating equipment and tracing the signal to each valve box and meter box. No acceptance or payment will be made on any section or reach of pipe installed that does not have a conductive electrical locator wire installed in accordance with the Drawings.

2.4 MARKER TAPE

A. Marker tape shall be installed as an additional pipe identification device when pipe is installed by open trench method only.

B. During the backfilling process, all water mains, service lines and system appurtenances shall have a continuous warning tape placed immediately above them and throughout their length at a depth of eighteen (18) inches above the utility line surface. The tape shall be six (6) inches wide. Tape material shall be formulated from 100 percent virgin polyolefin resins. Resins shall be pigmental for chemical stability and resistance to sulfide staining (color fastness). Tape shall be constructed by the mechanical (non-adhesive) lamination of two piles of three layers blown film in such a manner as to produce a bi-axially oriented structure. The tape shall be able to provide a 700 percent elongation prior to rupture as per ASTM-D882.

C. The warning tape shall be manufactured with a permanent American Public Works Administration (APWA) blue color pigment and at a maximum of every thirty (30) inches along its length, be imprinted with a continuous warning message as follows: "CAUTION: POTABLE WATER LINE BURIED BELOW."

2.5 WATER MAIN CROSSING MARKER

A. The Contractor shall install the water main crossing marker in accordance with the Marker Standard Detail drawing as shown within the Drawings.

B. The water main crossing marker shall be placed on Right-of-Way or fence line at all road crossings.

C. The water main crossing marker detail shall be used for water main detecting services.

PART 3 - EXECUTION

3.1 PIPE UNLOADING AT THE SITE

A. Inspect each shipment of pipe and fittings and make provision for a timely replacement of any damaged material. Unload by hand or use canvas slings to avoid scratching the pipe. Do not slide or drag HDPE pipe over an abrasive surface. Pipe with deep scratches shall be replaced with new pipe and removed from the site.

B. Pipe stockpiled for more than thirty (30) days shall be covered to protect it from the

sun's rays. Provide for air circulation through the stockpile.

3.2 ASSEMBLING THE PIPE

A. Closely follow the Manufacturer's recommended procedure for cleaning, installing, and assembling the pipe.

3.3 MAKING HEAT FUSED JOINTS

A. Follow Manufacturer's recommended procedure and use only the recommended tools for prepping piping for heat fusion. All joints shall be made in strict conformance to ASTM F2620 - Standard Practice for Heat Fusion Jointing of Polyethylene Pipe and Fittings and ASTM D3261 – Standard Specification for Butt Heat Fusion Polyethylene Plastic Fittings for Polyethylene Plastic Pipe and Tubing.

3.4 PREVENTING TRENCH WATER FROM ENTERING PIPE

A. When pipe laying is not in progress, close the open ends of pipe with a watertight plug and allow no water or other objectionable materials to enter the pipe.

3.5 HYDROTESTING AND DISINFECTION

A. Hydrotesting and disinfection of HDPE pipe shall be completed in accordance with Section 01350 of these Project Specifications.

3.6 TRENCH EXCAVATION AND SAFETY

A. Trench excavation safety shall be provided by the Contractor in accordance with Section 01240 of these Project Specifications.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: The quantity measured for payment shall be per linear foot for each size diameter of HDPE installed regardless of trench depth and as accepted by the Owner.

PAYMENT: Payment shall be full compensation for all labor, materials, testing, and equipment necessary for furnishing and installing the HDPE per linear foot of the various diameter sizes using the open cut method regardless of trench depth as per the Drawings and as specified within, unless otherwise paid for by another pay item. This item shall also include, but not necessarily be limited to: all types and sizes of HDPE; tracer wire; marker tape; water main crossing markers; hydro testing and disinfection; project staking; excavation and backfill; dewatering; trenching; selected embedment; compaction; all items related to trench excavation safety; and all other work incidental to the installation of the HDPE pipe complete and in place and in reliable service.

END OF SECTION

SECTION 02670

DUCTILE IRON FITTINGS

PART 1 - GENERAL

1.1 SCOPE

A. The Work included in this Section consists of furnishing all labor, materials, equipment and incidentals for performing operations necessary to furnish and install ductile iron fittings (3-inches through 48-inches) designed and manufactured for the use of ductile iron pipe or PVC pipe (C900 and/or C905) as shown on the Drawings and as specified herein.

B. Where references are made to other standards and codes, unless specific date references are indicated, the latest edition of stated standard or code shall govern.

1.2 DESCRIPTIONS OF REQUIREMENTS

A. Except as otherwise modified or supplemented herein, the latest revision of AWWA Standard C110 for Gray-Iron and Ductile-Iron Fittings, 3 inch through 48 inch for Water and other Liquids and AWWA Standard C153 for Ductile-Iron Compact Fittings, shall govern the design, manufacture, and testing for all fittings under this Section.

1.3 QUALITY ASSURANCE

A. The Owner/Engineer may inspect materials for conformance to the Drawings and specifications herein.

1.4 RELATED SECTIONS

A. Section 02680, Joint Restraint and Thrust Blocking

B. Section 01350, Hydrotesting and Disinfection

1.5 REFERENCE STANDARDS

A. AWWA C110 – Ductile-Iron and Gray-Iron Fittings.

B. AWWA C116 – Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings.

C. AWWA C153 – Ductile-Iron Compact Fittings.

D. ASTM F1674 – Standard Test Method for Joint Restraint Products for Use with PVC Pipe.

E. ASTM D4976 – Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.

F. ASTM A536 – Standard Specification for Ductile Iron Castings.

1.6 SUBMITTALS

A. Shop Drawings

1. Submit Manufacturer's certificate of conformance with referenced standards.

2. Submit Manufacturer's drawings and data sheets for materials to be supplied under this Section. Indicate dimensions, materials, size, and weight.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site to ensure uninterrupted progress of the Work.

B. Handle all fittings and accessories carefully with approved handling devices. Do not drop or roll material off trucks.

C. Unload fittings and accessories to or as close to the place where they are to be installed as is practical to avoid unnecessary handling. Keep pipe interiors completely free from dirt and foreign matter.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON FITTINGS

A. Full body fittings shall conform with AWWA C110 - "Ductile-Iron and Gray-Iron Fittings" for 3 inch through 48 inch for Water and other Liquids.

B. Compact fittings shall conform with AWWA C153 - "Ductile-Iron Compact Fittings".

C. Fittings shall be manufactured conforming to the requirements of ASTM A536.

D. Fittings designated for raw water or wastewater service shall be fusion bonded epoxy coated inside and outside meeting all the requirements of AWWA C116 – "Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings."

E. Fittings, including the joints and restraint systems, shall have a minimum pressure rating of 350 psi for 3-inch through 24-inch in diameter fittings. Minimum pressure ratings of 250 psi for all fittings of size greater than 24-inches in diameter. Testing shall be done in accordance with the procedures found in ASTM F1674.

F. The exterior of all fittings designated for finished or potable water service shall be provided with a petroleum asphaltic coating in accordance with the latest revision of AWWA C110. The interior of all fittings designated for finished or potable water service shall be cement mortar lined in accordance with the latest revision of AWWA C104.

G. Fittings for 2-inch size shall be of manufacturers' standard design in accordance with applicable design standards of AWWA C110.

PART 3 - EXECUTION

3.1 DUCTILE IRON FITTINGS

A. Joint restraints and thrust blocking for ductile iron fittings shall be provided in accordance with Section 02680 of these Project Specifications.

B. Anti-corrosion protection consisting of polyethylene sleeve and asphaltic material for ferrous surfaces shall be applied to exterior surfaces of all fittings installed.

C. Approved adapters shall be used when necessary to provide a transition between pipes and/or fittings of different diameters.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: The quantity determined for payment shall be as measured by the total fittings weight in tons for the various sizes of fittings installed and as specified in the Drawings.

4.2 PAYMENT: Payment shall be full compensation for all labor, materials, testing, and equipment necessary for furnishing and installing various sizes of fittings made at the unit price bid for each ton of fittings to the nearest one-hundredth of a ton of fitting weight installed. Subsidiary items at no separate cost shall include, but not necessarily be limited to the following: weights of glands, bolts, nuts, washers, gaskets (all types). These are considered subsidiary to the installation of fittings and no separate payment will be made for anti-corrosion protection; select anti-corrosion embedment material; joint restraints and thrust blocking; hydrotesting and disinfection, and all other work incidental to the installation various sizes of fittings in place and in reliable service.

END OF SECTION

SECTION 02675

PIPE ENCASEMENT

PART 1 - GENERAL

1.1 SCOPE

A. The Work included in this Section consists of furnishing all material, equipment, labor, and performing all operations necessary to install casing pipe and carrier pipe by the method of jack and bore or open trench, as shown on the Construction Drawings and specified herein.

B. Casing pipe for carrier pipe shall be provided and installed in accordance with the Casing Standard Detail drawing as shown within the Drawings.

C. Where references are made to other standards or codes, unless specific date references are indicated, the latest edition of said standard or code shall govern.

1.2 RELATED SECTIONS

A. Section 01140, Dewatering

B. Section 01220, Exploratory Excavation

C. Section 01230, Excavation and Backfill

D. Section 02650, PVC Pipe

E. Section 02680, Joint Restraints and Thrust Blocking

1.3 REFERENCED STANDARDS

A. AWWA C206 – Field Welding of Steel Water Pipe

B. AWWA C210 – Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines

C. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4-In. Through 60-In. (100 mm Through 1,500 mm)

D. ASTM A36 – Standard Specification for Carbon Structural Steel

E. ASTM A135 - Standard Specification for Electric-Resistance-Welded Steel Pipe

F. ASTM A139 – Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)

1.4 SUBMITTALS

A. Shop Drawings

1. Submit Manufacturer's certificate of conformance with referenced standards.

2. Submit Manufacturer's drawings and product data sheets for the materials to be supplied under this Section. Indicate sizes and types to be installed.

3. Submit Manufacturer's specifications for tracer wire and marker tape.

PART 2 – MATERIALS

2.1 CARRIER PIPE

A. Polyvinyl Chloride (PVC) carrier pipe shall be Certa-Lok C900/RJ (DR 18) for all pipe diameter sizes.

B. High-Density Polyethylene (HDPE) carrier pipe as specified on the Construction Drawings for all pipe diameter sizes.

2.2 STEEL CASING

A. Steel casing shall be new or used pipe in good condition, and acceptable to Crystal Clear Special Utility District and to the governing roadway authority.

B. Casing pipe shall extend a minimum of 10 linear feet, past the edge of pavement along TxDOT roadways, and a minimum of 5 linear feet, past the edge of pavement along all other roadways, unless otherwise directed by the Engineer or regulatory authority.

C. Steel casing pipe shall be standard weight or heavier conforming to ASTM A36, ASTM A135, ASTM A139, or other acceptable standard specification.

D. Pipe joints shall be welded together in accordance with AWWA C206.

2.3 PVC CASING

A. PVC casing shall be new or used pipe in good condition, and acceptable to Crystal Clear Special Utility District and governing authority.

B. The diameter of the PVC casing shall be per Casing Standard Detail under steel casing minimum nominal size (in) in correspondence to the pipe nominal size (in) specified or otherwise noted in the Construction Drawings.

2.3 CASING SPACERS

A. Casing spacers are required for all carrier pipe lines 4-inch and larger in diameter.

B. Casing spacers shall be placed within 2 feet of the ends of casing pipe. Subsequent spacers shall be placed a maximum of 10 feet apart within the casing, with at least 3 spacers per joint of pipe.

C. Casing spacers shall be made from T-304 stainless steel of a minimum 14-gauge thickness.

D. Casing spacers shall have a synthetic rubber or PVC liner to insulate the carrier pipeline from the spacer.

E. Casing spacers shall have 1.5-inch-wide glass reinforced plastic or UHMW polymer runners to insulate the spacer from the casing pipe interior.

2.4 PIPE TRACER WIRE AND MARKER TAPE

A. Tracer wire shall be installed for future use in locating pipe. Tracer wire shall be No.12 AWG copper-clad steel, extra high-strength with minimum 1,150-lb break load and 30 mil HDPE insulation.

B. Tracer wire shall be taped or zip-tied to the main pipeline in a minimum of 60-inch increments.

C. Tracer wire shall be installed by open trench, slick bore, and jack and bore method.

D. Marker tape shall be installed as an additional buried pipe identification device when pipe is installed by open trench method only.

E. During the backfilling process, all water mains, service lines and system appurtenances shall have a continuous warning tape placed immediately above them and throughout their length at a depth of eighteen (18) inches above the utility line surface. The tape shall be six (6) inches wide. Tape material shall be formulated from 100 percent virgin polyolefin resins. Resins shall be pigmental for chemical stability and resistance to sulfide staining (color fastness). Tape shall be constructed by the mechanical (non-adhesive) lamination of two piles of three layers blown film in such a manner as to produce a bi-axially oriented structure. The tape shall be able to provide a 700 percent elongation prior to rupture as per ASTM-D882.

F. The warning tape shall be manufactured with a permanent American Public Works Administration (APWA) blue color pigment and at a maximum of every thirty (30) inches along its length, be imprinted with a continuous warning message as follows: “CAUTION: POTABLE WATER LINE BURIED BELOW.” Alternatively, the warning tape shall be manufactured with a permanent APWA green color pigment and at a max of every thirty inches along its length, be imprinted with a continuous warning message as follows: “CAUTION: SEWER OR DRAIN LINE BURIED BELOW.”

2.5 WATER MAIN CROSSING MARKER

A. The Contractor shall install the water main crossing marker in accordance with the Marker Standard Detail drawing as shown within the Construction Drawings.

B. The water main crossing marker shall be placed on Right-of-Way or fence line at all roads and gas pipeline crossings.

C. The water main crossing marker detail shall be used for water main detecting services.

2.6 HYDROTESTING AND DISINFECTION

A. Hydrotesting and disinfection of carrier pipe shall be completed in accordance with Section 01350 of these Project Specifications.

PART 3 – CONSTRUCTION

3.1 JACKING

A. Suitable bore pits or trenches shall be excavated on each side of the roadway for the purpose of jacking operations, and for placing end joints of the pipe.

B. Bore and receiving pits shall be sheeted, shored, and braced according to OSHA minimum requirements. All excavations shall be adequately dewatered.

C. Jacking work should in no way interfere with the operation of streets, highways, railroads, and other facilities. Jacking operations shall not damage or weaken such facilities.

D. The pipe to be jacked shall be set on guides to support the section of the pipe being jacked, and to direct it in the proper line and grade.

E. Generally, the pipe shall be jacked from the downstream end towards the upstream end.

F. Any pipe that cannot be repaired to its original condition or is damaged in jacking operations shall be removed and replaced at the Contractor’s expense.

G. Jacking pits shall be backfilled and compacted immediately upon completion of jacking operations.

3.2 EXCAVATION AND BACKFILL

A. Excavation and backfill shall be completed in accordance with Section 01230 of the Project Specifications.

B. Boring operations may include creating of a pilot hole which shall be bored for the entire length of roadway crossing. This shall be used as a guide for the larger

hole to be bored. Water or drilling fluid may be used to lubricate cuttings.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: The quantity measured for payment shall be per linear foot of casing pipe and carrier pipe installed with jack and bore or open trench method as accepted by Owner. Jack and bore method shall be measured from face to face of jacking pits.

4.2 PAYMENT: Payment shall be full compensation for all labor, materials, tools, and equipment necessary for jacking and boring operations, and furnishing pipe casing and carrier pipe as per the Construction Drawings and as specified within. This item shall include, but not necessarily limited to: jack and bore (if method used); carrier pipe; casing pipe; casing spacers; liners; end seals; pipe tracer wire; marker tape; water main crossing marker; excavation and backfilling; bracing, sheeting, and shoring; grout; compaction; hydrotesting and disinfection; and all other incidental work incidental for furnishing and installing pipe casing and carrier pipe in reliable service.

END OF SECTION

SECTION 02680

JOINT RESTRAINTS AND THRUST BLOCKING

PART 1 - GENERAL

1.1 SCOPE

A. The Work included in this Section consists of furnishing all labor, materials, equipment and incidentals for thrust blocking installation and adjustment, as shown on the Drawings and as specified herein.

B. Water pipe joint restraints system components shall be installed as shown on the Drawings and as specified herein.

C. Where references are made to other standards and codes, unless specific date references are indicated, the latest edition of stated standard or code shall govern.

1.2 DESCRIPTIONS OF REQUIREMENTS

A. The Contractor shall furnish and install thrust blocking and anchorage in accordance with the Thrust Block Anchoring standard detail shown within the Construction Drawings.

B. Underwriter Laboratories (U.L.) and Factory Mutual (F.M.) certifications are required on all restraint systems.

C. Unless otherwise noted, restraint systems to be used on Polyvinyl Chloride (PVC) pipes (AWWA C900 and C905) shall meet or exceed the ASTM Standard F1674, “Standard Test Methods for Joint Restraint Products for Use with PVC Pipe,” or the latest revision thereof. Restraint system used on ductile iron pipe shall meet or exceed AWWA Standard C111.

D. Each restraint system shall be packaged individually and include installation instructions.

1.3 QUALITY ASSURANCE

A. The Owner/Engineer may inspect materials of conformance to the Drawings specifications herein.

1.4 RELATED SECTIONS

A. Section 02670, Ductile Iron Fittings

1.5 REFERENCE STANDARDS

A. AWWA C105 – Polyethylene Encasement for Ductile-Iron Pipe Systems.

B. AWWA C110 – Ductile-Iron and Gray-Iron Fittings.

C. AWWA C111 – Rubber-Gasket Joints for Ductile – Iron Pressure Pipe and Fittings.

D. AWWA C116 – Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings.

E. ASTM A536 – Standard Specification for Ductile Iron Castings.

F. ASTM F1674 – Standard Test Method for Joint Restraint Products for Use with PVC Pipe.

1.6 SUBMITTALS

A. Shop Drawings

1. Pipe joint restraint system.

2. Polyethylene wrapping.

3. Poly tape.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Joint restraints, gaskets, glands, bolts, nuts, and accessories shall be shipped in suitable protective containers.

B. Handle all joint restraints and accessories carefully with approved handling devices. Do not drop or roll material off trucks.

C. Unload joint restraints and accessories to or as close to the place where they are to be installed as is practical to avoid unnecessary handling. Keep all items completely free from dirt and foreign matter.

PART 2 - PRODUCTS

2.1 PIPE JOINT RESTRAINT SYSTEM AND THRUST BLOCKING

A. Suitable thrust blocking and anchorage or joint restraints shall be provided at all the following water main locations: plugs, caps, tees, crosses, valves, bends, reducers, dead ends, and as specified in the Drawings.

B. All mechanical (joint) restraints shall be bidirectional.

C. Restraining joint types shall be as manufactured by EBAA Iron Sales, Inc. as listed on the Approved Equipment List.

D. Pipe joint restraints shall be made of ductile iron material in accordance with ASTM A536 and shall be compatible with mechanical joint conforming to AWWA C111.

E. Connecting pieces with one end flanged and the other end either plain-end or mechanical joint, shall conform with AWWA C110.

F. Flange adaptors shall be used only on a restricted basis and **shall not** be used as a general substitute for regular flanged joints, except where indicated in the Drawings. Flanges shall be made of ductile iron conforming with ASTM 536. Adapters shall be restrained by a number of individual gripping wedges operated by torque-limiting actuating screws.

G. Restraint rings for PVC pipe bells (AWWA C900 and C905) shall be made of ductile iron components. All ductile iron shall conform to ASTM A536. A split ring shall be used behind the bell and a serrated restraint ring shall be used to grip the pipe. A sufficient number of bolts shall be used to connect the bell ring and the pipe ring. The combination shall have a minimum working pressure rating of 150 psi.

H. Pipe four (4) inches in diameter or larger shall have an integral bell formed with a race designated to accept the gasket in accordance with AWWA C900 and C905. The spigot end shall have a bevel and a stop mark on the outside diameter to indicate insertion depth. Provisions shall be made for expansion and contraction at each joint. All surfaces of the joint upon or against which the gasket may bear shall be smooth, free of cracks, fractures, or imperfections that could adversely affect the performance of the joint.

I. The gasket shall be molded to a circular form and to the proper cross section and shall consist of a vulcanized high grade elastomeric compound conforming to ASTM F4777.

1. Quality Control Test Requirements

a. The Manufacturer shall take adequate measures in the production of PVC and couplings to assure product compliance with the requirements of AWWA C900 and C905.

b. All of the tests specified in AWWA C900 and C905 shall be performed at the intervals indicated therein.

J. Underground mechanical joint or push-on joint applications may not be used above grade or as substitute for flanged joints. Any above grade applications will require submission of shop drawings of the piping system where they are utilized, reasoning for use, and approval from both the Owner and Engineer.

K. Push-on Type Joints (Single Gasket and Single Gasket with Gasket Restraint)

1. Push-on joints shall conform to AWWA C111, except that the gaskets for pipe and fittings shall be neoprene where so specified.

2. The required number of gaskets for each push-on joint pipe plus one extra for every 50 joints or fraction thereof, shall be furnished with each order. The gaskets shall be shipped in suitable protective containers.

2.2 POLYETHYLENE WRAPPING

A. Polyethylene wrapping shall conform to the material requirements of the latest revisions of AWWA C105 and ASTM D4976.

B. The following physical properties shall be meet:

1. Wrapping film shall be a nominal thickness of 8 mils.

2. Tensile strength shall meet or exceed 3600 psi in accordance with ASTM D882.

3. Minimum elongation shall not be less than 800% of the test strip minimum test per the latest ASTM D882 test.

4. Minimum dielectric strength shall be 800V/mil thickness minimum in accordance with ASTM D149.

5. Minimum impact resistance shall be 600 grams in accordance with ASTM D1709 Method B.

6. Minimum propagation tear resistance shall be 2550 gf machine and transverse direction in accordance with ASTM D1922.

2.3 POLY TAPE

A. Poly tape shall consist of an elastomeric film backing of either polyethylene or plasticize polyvinyl chloride, coated on one side with a homogenous pressure-sensitive adhesive. Tape shall conform to Federal Specifications L-T-1512a and AWWAA C209.

PART 3 - EXECUTION

3.1 RESTRAINER FOR PVC PIPE (C900 and C905) AND DUCTILE IRON PUSH-ON TYPE CONNECTIONS

A. Mechanical pipe joint restraints shall include strapping logs, tie rods, retainer glands, joint harnesses, split clamping rings, threaded flanges and other mechanical restraints as approved by the Owner.

B. All mechanical restraint systems shall be capable of preventing movement of the pipe and withstanding the thrust in pounds for various line sized as follows:

Nominal Pipe Diameter (inches)	Thrust (lbs. force)
2	750
3	1,500
4	2,700
6	6,000
8	10,400
10	16,800
12	24,000

C. Bolts and nuts used to attach the split retainer ring shall comply with ANSI B 18.2/18.2.2, SAW Grade 5. Restraining rods and bolts shall be of low alloy corrosion resistant high strength steel conforming to AWWA C111.

D. Pipe restraints shall be utilized to prevent movement for push-on ductile iron or PVC (compression type) bell and spigot pipe connections or where a flexible coupling has been used to join two sections of plain-end pipe ductile iron or PVC pipe. The restrainer may be adapted to connect a plain end ductile iron or PVC pipe to a ductile iron mechanical joint (MJ) bell fitting. The restrainer must not be directionally sensitive.

E. The pipe shall be restrained by a split retainer band. The band shall be cast iron or ductile iron, meeting or exceeding ASTM A536, Grade 65. The inside face or contact surface of the band shall be of sufficient width to incorporate cast or machined non-directionally sensitive serration to grip the outside circumference of the pipe. The serration shall provide full (360 degrees) contact and maintain pipe roundness and avoid any localized points of stress. The split band casting shall be designed to “bottom-out” before clamping bolt forces (110 ft-lb minimum torque) can over-stress the pipe, but will not provide full non-directionally sensitive restraint at the rated pressures.

3.2 NON-METALLIC RESTRAINED JOINT PIPE AND COUPLINGS FOR PVC PIPE CONNECTIONS

A. Gaskets for restrained coupling connections shall join two sections of factory grooved PVC (C900 and C905) pipe.

B. The coupling shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F-477 in all applications, meeting or exceeding the performance requirements of AWWA C900 and C905, latest revisions.

C. The inside face or contact surface of the coupling connection shall be of sufficient width to incorporate a factory machined non-directionally sensitive groove in both pipe and coupling the grip the outside circumference of the pipe. The couplings shall provide full (360 degrees) contact and maintain pipe roundness and avoid and localized points of stress. The coupling shall be designed with an internal stop to align the precision-machined grooves in the coupling and pipe prior to installation of a non-metallic thermoplastic restraint spleen, and will provide full non-directionally sensitive restraint at the rated pressures.

D. The non-metallic restrained joint pipe and couplings for PVC (C900 and C905) restraint system shall consist of a pipe and couplings system produced by the same Manufacturer meeting the performance qualifications of U.L. and F.M. required on all restraint systems.

3.3 FITTING RESTRAINT FOR DUCTILE IRON PIPE (ONLY)

A. Radial bolt type restrainer systems shall be limited to ductile iron pipe in conjunction with Mechanical Joint (MJ) bell end pipe of fittings. The system shall utilize a standard MJ gasket with a ductile iron replacement gland conforming to Standard MJ bolt circle criteria.

B. The wedge screws shall be compressed to the outside wall of the pipe using a shoulder bolt and twist-off nuts to insure proper actuating of the restraining system.

C. Standard MJ fitting tee-bolts and nuts shall be high strength steel conforming to AWWA C111 and AWWA C153.

D. Standard MJ gasket shall be virgin SBR meeting ASTM D-2000 3 BA 715 or 3 BA 515.

3.4 POLYETHYLENE WRAPPING AND TAPE

A. Polyethylene wrap shall be installed at ductile iron pipe joints as a sleeve 2 feet longer than the pipe joint. The sleeve shall cover the full length of the pipe joint, lap over 1 foot on each end of the adjoining pipe joint, lap over 1 foot on each end of the adjoining pipe joints, and be secured with the minimum of two circumferential turns of poly tape.

B. Completely wrap ductile iron fittings and valves with a minimum of 1-foot overlap on each end and appropriately taped using poly tape. No duct tape shall be used.

C. Polyethylene wrap shall be installed on joints and restraint system components for corrosion protection.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: Joint restraints and thrust blocking are considered subsidiary to Section 02670 – Ductile Iron Fittings, and no separate measurement will be made by the Contractor for this Work.

4.2 PAYMENT: Joint restraints and thrust blocking are considered subsidiary to Section 02670 – Ductile Iron Fittings, and no separate payment will be made to the Contractor for this Work.

END OF SECTION

SECTION 02690
TAPPING SLEEVES AND VALVES

PART 1 - GENERAL

1.1 SCOPE

A. The Work included in this section consist of furnishing all material, equipment, testing, labor and performing all operations necessary for the installation tapping sleeves and valves as shown on the Drawings and specified herein.

1.2 QUALITY ASSURANCE

A. Provide manufacturer's affidavit that all valves purchased for tapping of existing waterlines conform to applicable requirements of AWWA C500 and that they have been satisfactorily tested in accordance with AWWA C500.

1.3 RELATED SECTIONS

A. Section 01230, Excavation and Backfill

B. Section 01350, Hydrotesting and Disinfection

C. Section 02670, Ductile Iron Fittings

D. Section 02680, Joint Restraints and Thrust Blocking

E. Section 02400, Valves and Appurtenances

1.4 REFERENCE STANDARDS

A. American Water Works Association (AWWA):

1. AWWA C500, Gate Valves 3 through 48 inches for water and wastewater service.

2. AWWA C110, Ductile-Iron and Gray Iron Fittings for water service.

3. AWWA C207, Steel Pipe Flanges for Waterworks Service – Sized 4 inch through 144 inch.

4. AWWA C223, Fabricated Steel and Stainless Steel Tapping Sleeves.

1.5 SUBMITTALS

A. Shop Drawings

1. Submit Manufacturer’s certificate of conformance.

2. Submit Manufacturer's drawings and data sheets for material to be supplied under this section. Indicate sizes and types to be installed.

PART 2 - P R O D U C T S

2.1 MATERIALS

A. Tapping Sleeves:

1. Tapping Sleeve Bodies: Stainless steel; in two sections to be bolted together with high-strength, corrosion-resistant, low-alloy, steel bolts; mechanical joint ends.

a. 12 inch and smaller: stainless steel; Smith-Blair Style 665, Ford Meter Box Style FTSS, Mueller Style H-304, or approved equivalent.

b. 16 inch and larger: epoxy coated carbon steel; Smith-Blair Style 663, Ford Meter Box Style FTSC, Mueller Style H-306, or approved equivalent.

2. Branch Outlet of Tapping Sleeve: Flanged; machined recess; AWWA C207, Class D, ANSI 150 lb. drilling. Gasket: Affixed around recess of tap opening to preclude rolling or binding during installation.

3. Where fire service from 6-inch main is approved, use cast iron split sleeve.

B. Tapping Valves: Meet all requirements of Section 02400 – Valves and Appurtenances with following exceptions:

1. Inlet Flanges:

a. AWWA C110; Class 125.

b. AWWA C110; Class 150 and higher: Minimum eight-hole flange.

2. Outlet: Standard mechanical or push-on joint; to fit any standard tapping machine.

3. Valve Seat Opening: Accommodate full-size shell cutter for nominal size tap without any contact with valve body; double disc.

4. Open Left (CCW) operation only.

PART 3 – EXECUTION

3.1 GENERAL

A. Install tapping sleeves and valves at locations and of sizes as shown on Drawings.

B. Thoroughly clean tapping sleeve, tapping valve and pipe prior to installation and in

accordance with manufacturer's instructions.

C. When tapping concrete pressure pipe, size on size, use shell cutter one standard size smaller than waterline being tapped.

D. Do not use Large End Bell (LEB) increasers with a next size tap unless existing pipe is asbestos-cement.

3.2 INSTALLATION

A. Tighten bolts in proper sequence so that undue stress is not placed on pipe.

B. Align tapping valve properly and attach it to tapping sleeve.

C. Make tap with sharp, shell cutter:

1. For 12-inch and smaller tap, use minimum cutter diameter one-half inch less than nominal tap size.

2. For 16-inch and larger tap, use manufacturer's recommended cutter diameter.

D. Withdraw coupon and flush all cuttings from newly-made tap. Coupon shall be submitted to Owner.

E. Wrap completed tapping sleeve and valve in accordance with Section 02680 – Joint Restraints and Thrust Blocking.

F. Place concrete thrust block behind tapping sleeve (NOT over tapping sleeve and valve).

G. Block under valve using concrete blocks.

H. Request inspection of installation prior to backfilling.

I. Backfill in accordance with Section 01230 – Excavation and Backfill.

3.3 HYDROTESTING AND DISINFECTION

A. Hydrotesting and disinfection of Tapping Sleeves and Valve shall be completed in accordance with Section 01350 of these Project Specifications.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: Measurement for installation of tapping sleeves and valves as a single unit assembly is on a, “per each,” basis.

4.2 PAYMENT: Payment shall be full compensation for all labor, equipment, and materials required for installation of each tapping sleeve and valve assembly of varying size as indicated within the Construction Drawings and described within the Technical Specifications. This item shall also include all items related to trench excavation and safety;

and all other work incidental to the installation of the tapping sleeves and valves complete in place and in reliable service.

END OF SECTION

SECTION 02700

WATER MAIN TIE-INS

PART 1 – GENERAL

1.1 SCOPE

A. The Work included within this Section consists of furnishing all material, equipment, and labor while performing all operations necessary for water main tie-ins as shown within the Drawings and specified herein.

1.2 RELATED SECTIONS

A. Section 01140, Dewatering

B. Section 01230, Excavation and Backfill

C. Section 01350, Hydrotesting and Disinfection

D. Section 02400, Valves and Appurtenances

E. Section 02650, PVC Pipe

F. Section 02660, Ductile Iron Pipe

G. Section 02665, HDPE Pipe

H. Section 02670, Ductile Iron Fittings

I. Section 02690, Tapping Sleeves and Valves

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.1 WATER MAIN TIE-INS

A. The Contractor shall make a water main tie-in from the new water main to the existing water main as shown within the Drawings or as directed by the Engineer.

B. The Contractor shall be responsible for all shutdowns and isolation of the existing water mains, and this includes the following:

1. Customer notification of service shutdown.

2. Dewatering the excavation.

3. Cutting the pipe for connections.

4. Any other requirements as recommended by the Inspector or Engineer in order to safely and accurately complete this effort.

C. All water main tie-ins shall be completed during normal work hours from 8 A.M.-5 P.M., unless the Contractor is otherwise directed by the Owner or the Engineer.

D. During construction, the planned shutdown and tie-in work shall be coordinated through and approved by the Inspector or Engineer with a minimum of two weeks prior notice of such activity, and accomplished at a time where it will be the least inconvenient for the customers.

E. No additional compensation will be provided to the Contractor for tie-ins that must be accomplished after normal working hours.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT: Unless shown on the Drawings or called out within these Technical Specifications as a pay item, water main tie-in activities described herein are for informational purposes only. No separate measurement of water main tie-in activities will be made by the Contractor for this Work.

4.2 PAYMENT: Unless specified as a pay item, water main tie-in activities performed and materials furnished in accordance with this Section will not be paid for directly, but are considered to be subsidiary to the pertinent items associated with other water main construction activities. No separate payment will be made to the Contractor for this Work.

END OF SECTION

SECTION 02710

WATER SERVICES

PART 1 – GENERAL

1.1 SCOPE

A. The Work included in this Section consists of furnishing all material, equipment, labor, and performing all operations that consist of water service supply lines adjustment and installation as shown within the Construction Drawings and specified herein.

B. Water services shall be installed in accordance with the Service Standard Detail drawing as shown within the Construction Drawings.

C. Where references are made to other standards or codes, unless date references are indicated, the latest edition of said standard or code shall govern.

1.2 SUBMITTALS

A. Not Included.

1.3 RELATED SECTIONS

A. Texas Department of Transportation (TxDOT) Item 00340, Dense-Graded Hot-Mix Asphalt (Small Quantity)

B. Section 01230, Excavation and Backfill

PART 2 – PRODUCTS

2.1 SERVICE SADDLES

A. Service Saddle shall have an epoxy coated body with double stainless-steel straps and nuts with a pressure rating of not less than that of the pipe to which it is to be connected.

B. Saddle shall have a rubber gasket cemented to the body, with compatible threading between the saddle and corporation stop.

C. Saddle shall conform to AWWA C800 standards. The service saddle shall provide full support around the circumference of the outside diameter pipe size, providing a bearing area of sufficient width to ensure that the pipe will not distort when the saddle is tightened.

D. Single strap saddles are not acceptable for use of this application.

E. Approved Manufacturer, also shown within the Approved Equipment List (AEL), are listed below:

1. Smith - Blair.

2. The Ford Meter Box Company, Inc.

3. Mueller Water Products, Inc.

4. Or Approved Equivalent.

2.2 CORPORATION STOPS

A. Corporation stops shall be 1-inch or 2-inch brass, equipped with connections compatible with the polyethylene (or copper) tubing and threaded in accordance with Specifications in AWWA C901.

B. The outlet shall be composed of a compression joint.

C. The corporation stop shall be pressure rated at 150 psi.

D. Approved corporation stop shall be ¾-inch (I.P. x Comp) Ford #F-1100-3G-NL, or approved equivalent.

2.3 METER (CURB) STOPS

A. A curb stop shall be installed at the end of every customer service pipe at the customer's property line.

B. Meter (curb) stop brand shall be Ford as the approved Manufacturer, or approved equivalent.

C. Meter (curb) stops shall be angle style, ball type, with full port, tee handle, meter nut and lock wing without drain.

D. Pipe connections shall be suitable for the type of service pipe used.

E. All parts shall be brass with female iron pipe size connections or compression-pattern and shall be designed for a hydrostatic test pressure not less than 150 psi.

F. Curb stops shall be sized to match the meter size and conform to AWWA C800 and AWWA C901.

2.4 POLYETHYLENE (OR COPPER) TUBING

A. Polyethylene tubing shall be provided in compliance with AWWA C901. Copper tubing shall be provided in compliance with ASTM B88.

B. All polyethylene and copper tubing shall be rated at 200 psi working pressure.

2.5 WATER METERS

A. Water meters shall be provided by the Owner.

2.6 METER BOXES

A. Meter boxes shall be as manufactured by DFW Plastics, Model No. DFW1300.12.1C or DFW 1600X.12.1C, or approved equivalent.

2.7 METER BOX LIDS

A. Meter box lids shall be Model No. DFW1200.1C.LID or DFW1500.1C.LID, or approved equivalent.

B. The word “WATER” shall be cast into the cover or the lid.

PART 3 – EXECUTION

3.1 WATER SERVICE LINE INSTALLATION

A. A service supply line located between the water main and the inlet side of the water meter is designated as a “water service line.” A service supply line located between the outlet side of the water meter to the point of connection within the limits of the customer’s lot or property is designated as the “customer’s yard piping.”

B. Existing meter and meter box relocation shall be included in the service line installation.

C. The Contractor shall trench and backfill in accordance with the Typical Trench Backfill Standard Detail drawing as shown within the Construction Drawings.

D. Saw cutting, excavation, backfill, and replacement of pavement shall be completed in accordance with the following Project Specifications, whichever are applicable:

1. TxDOT Item 0340, Dense-Graded Hot-Mix Asphalt (Small Quantity)

2. Section 01230, Excavation and Backfill

3.2 BORING SERVICE LINES

A. Bored casing inside diameter shall be 4-inches for 2-inch service lines in accordance with the Service Connection Standard Detail drawings as shown within the Construction Drawings.

B. Steel casing must be used for lateral encased crossings at all TxDOT roadways.

C. HDPE casing may be used for County or residential roadways if approved by Owner/Engineer.

3.3 TAPPING PVC WATER MAINS

A. Single meter service shall include PVC adaptor coupling with corporation stop.

3.4 SINGLE SERVICE LINE- SINGLE AND DUAL METERS

A. Single service lines with single and dual meters shall conform to the Service Connection Standard Detail drawings as shown within the Construction Drawings.

3.5 TAPPING ASBESTOS CEMENT WATER MAINS (AC PIPE)

A. Service line tapping of AC pipe shall be completed during the period immediately before or after hydrostatic pressure testing operations so that subsequent flushing will maximize the elimination of contaminants associated with the tapping process.

B. Direct tapping into the pipe wall without use of a service saddle will not be allowed.

C. Service saddles must be used when tapping AC pipe.

D. Drill tools shall be used for services less than 2-inches in size.

E. Shell type drills shall be used for all services 2-inches and greater in size.

3.6 RECONNECTING SHORT AND LONG SERVICE LINES

A. New water main(s) to which services are to be reconnected on the same side of the street as the old main, are defined as “short reconnects.” Existing services on the opposite side of the street of the new main shall be defined as “long reconnects.”

B. Both old and new water mains at existing service line connections shall be exposed.

C. The old water main shall be exposed for the purpose of gaining access to the existing service corporation stop and the new main for the purpose of installing the new corporation stop.

D. The new main shall be exposed for the purpose of being drilled and tapped with an approved tapping machine, a new corporation stop installed under pressure, and the trench extended laterally to expose a sufficient length of the existing service line to provide slack to bend it into position for tying to the new corporation stop.

E. After suitable notification to the customer, the Contractor shall “kill” the existing

service by closing the corporation stop, removing the existing flare nut, inserting inside the existing flared nut an appropriately-sized copper disc and replacing the existing flared nut on the corporation stop if the main is non-ferrous, or plugging the existing service line at the main if the main is ferrous.

3.7 RELOCATING SHORT AND LONG SERVICES

A. Service relocates are defined as services that are relocated from an alley or street to a side yard or front of street.

B. New water main(s) to which services are to be relocated, and are on the same side yard of the street as the customer's new meter box location, are designated as "short relocates."

C. New water main(s) to which services are to be relocated, and are on the opposite side of the street from the customer's new meter box location, are designated as "long relocates."

3.8 NEW SHORT AND LONG SERVICES

A. If a new water main is required to be extended to provide water service for new customers, the service lines laid to be connected to the new water main shall be designated as "new services."

B. Newly laid water main(s) to which new services are on the same side of the street as the customer's new meter box location, are designated as "new short services."

C. Newly laid water main(s) to which new services are on the opposite side of the street from the customer's new meter box location, are designated as "new long services."

D. New services shall be installed in accordance with the Service Connection Standard Detail drawing as within the Construction Drawings.

3.9 ABANDONMENT OF SERVICE LINES

A. The Contractor shall accomplish all cutting, capping, and plugging necessary to isolate new service lines transferred to new and existing mains from those that are to be abandoned.

B. The corporation stop for an abandoned service line tapped on a ferrous main shall be removed, and the tap at the main shall be plugged with an appropriately sized brass plug.

C. For a non-ferrous main, the corporation stop shall not be removed from the main. Instead, the corporation stop shall be closed and the flared nut shall be removed from the corporation stop. After the appropriately sized copper disc is inserted inside the flared nut, replace the flared nut on the corporation stop.

PART 4 – MEASUREMENT AND PAYMENT

4.1 MEASUREMENT:

A. Reconnect short service will be measured by the unit of the various types and sizes of each service line reconnected.

B. Reconnect long service will be measured by the unit of the various types and sizes of each service line reconnected.

C. Relocate short service will be measured by the unit of the various types and sizes of each service line relocated.

D. Relocate long service will be measured by the unit of the various types and sizes of each service line relocated.

E. New short service will be measured by the unit of the various types and sizes of each new service line installed.

F. New long service will be measured by the unit of the various types and sizes of each new service line installed.

4.2 PAYMENT:

A. Payments shall be full compensation for all labor, materials, testing, and equipment necessary for reconnecting short and long services made at the price bid unit for each service line of the various sizes reconnected as shown within the Construction Drawings and as specified herein. This item shall also include, but not necessarily be limited to: excavation and backfilling; dewatering; cutting pavement and surface structures of whatever type encountered and replacement with whatever type specified, polyethylene or copper, corporation stop, and service saddle for short or long service line reconnections.

B. Payments shall be full compensation for all labor, materials, testing, and equipment necessary for relocating short and long services made at the price bid unit for each service line of the various sizes relocated as shown within the Construction Drawings and as specified herein. This item shall also include, but not necessarily be limited to: excavation and backfilling; dewatering; cutting pavement and surface structures of whatever type encountered and replacement with whatever type specified, and polyethylene or copper tubing, meter box and lid (if meter box and lid need to be replaced) for short or long service line relocations.

C. Payments shall be full compensation for all labor, materials, testing, and equipment necessary for new short and long services made at the price bid unit for each service line of the various sizes installed as shown within the Construction Drawings and as specified herein. This item shall also include, but not necessarily be limited to: excavation and backfilling; dewatering; cutting pavement and surface structures of whatever type encountered and replacement with whatever type specified; casing; polyethylene or copper tubing, service saddle, corporation stop, meter box and lid, and ball valve for new short or long service line installations.

END OF SECTION