

**LAKEVIEW ROAD UTILITY
RELOCATION PROJECT**

**PINELLAS COUNTY JOINT
PROJECT AGREEMENT**

(PROJECT No. 19-0013-UT)

**TECHNICAL SPECIAL
PROVISIONS**

Prepared for



Issued for Bid

AUGUST/2019

City of Clearwater, Florida
LAKEVIEW ROAD UTILITY RELOCATION
PROJECT

PINELLAS COUNTY JOINT PROJECT
AGREEMENT

(PROJECT No. 19-0013-UT)

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DEFINITIONS:

- THE OWNER IS PINELLAS COUNTY'S ENGINEER.
- THE PROJECT REPRESENTATIVE IS PINELLAS COUNTY'S ENGINEER.

NOTE: The definitions are for the option (City of Clearwater Technical Special Provisions) ONLY.

SECTION 01630
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 SCOPE

- A. This section covers methods of measurement and payment for items of Work associated with the relocations of potable water mains (WMs) and gravity sanitary sewer mains owned by City of Clearwater (City).

1.02 GENERAL

- A. The total Bid Price shall cover all Work required by the Contract Documents. All costs in connection with the proper and successful completion of the Work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction equipment and tools; and performing all necessary labor and supervision to fully complete the Work, shall be included in the lump sum and unit prices bid. All Work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of Contractor and all costs in connection therewith shall be included in the prices bid.

1.03 EXCAVATION

- A. The price bid for each item of Work, which involves excavation or trenching, shall include all costs for such Work. No direct payment shall be made for excavation or trenching. All excavation is unclassified and there shall be no separate payment for excavation of rock or for backfill where rock is excavated below subgrade.

1.04 MEASUREMENT AND PAYMENT

- A. Bid Items for the **Potable Water Relocations** of the *Lakeview Road Utility Relocation Project (19-0013-UT)*:
1. Bid Items No. CLW-005-0700-W, CLW-101-0100-W, CLW-102-0100-W – For description of these Bid Items, refer to the latest revision of the Pinellas County Standard Technical Specification for Roadway and General Construction.
 2. Bid Item CLW-005-0900-W - For description of this Bid Item refer to notes on Sheet 2 of the Construction Drawings.

3. Bid Item No. CLW-1-W F&I DI WM by Open Cut
 - a. Description: This Bid Item describe measurement and payment for ductile iron (DI) WM installed by open cut. The pay quantities for the work specified under this Section shall be the number of linear feet of the types and sizes of pipe specified in the applicable pay items, actually constructed and accepted.
 - b. Measurement: Measurement will be horizontally, above the centerline of the pipe, and includes the length of any valves or fittings. The limits of measurement shall be as shown on the plans or as directed by the Owner or the Owner's authorized Project Representative.
 - c. Payment: Payment will be according to the diameter, thickness class, lining material, coating, and type of joint, as set forth on the Proposal. The unit bid price includes furnishing and installing all pipe by open cut, restraining gaskets for pipe joints, excavation, dewatering, backfill, compaction, connecting/tie-ing into existing stubbed out pipes, reconnections, couplings, two 12-gauge solid or stranded copper locator wire, tracer wire testing, polyethylene encasement for DI pipe, materials above or below ground along the pipeline alignment, joints and jointing materials, bracing, shoring and sheeting; exploratory excavation; bedding and backfill, compaction, constructing the specified protection and adjusting of existing above ground and underground utilities and service connections; adjusting/relocating, supporting, protecting, or replacement of existing underground or aboveground utilities including associated utility coordination; flowable fill grout; bollard removal and replacement; signage removal and replacement; disposal of spoil or other materials; hydrostatic testing including water for testing, temporary plugs, taps and blow-offs; pigging; flushing and disinfection of all potable water lines (including existing pipes impacted by construction); erosion control; concrete encasement; underdrain restoration and all other related and necessary materials, work and equipment required to construct a complete operable pipeline. **This bid item shall include all roadway pavement restoration, concrete curb restoration, concrete sidewalk restoration, concrete driveway restoration, and sod restoration work that is above and beyond the limits of the roadway project.**
 - d. Payment shall be made under:
 - i. Item No. CLW-1-W – F&I 6” DI WM by Open Cut

4. Bid Item No. CLW-2-W – Remove & Dispose of Existing DI WM
 - a. Description: This Bid Item describes measurement and payment for removal and disposal of existing buried or above ground potable water pipe. The pay quantities for the work specified under this Section shall be the number of linear feet of the sizes of pipe specified in the applicable pay items actually removed and disposed of.
 - b. Measurement: Measurement will be horizontally, above the centerline of the pipe, and includes the length of any fittings and valves. The limits of measurement shall be as shown on the plans. No overlap with measurement for payment for other Bid Items shall be measured for this bid item.
 - c. Payment: Payment will be according to the diameter of pipe as set forth in the Plans. The unit bid price includes placing out of service and removal and disposal of existing buried or above ground pipes, pipe concrete support structures and all fittings and valves as shown on the Plans including but not limited to excavation, disassembly, removal and proper disposal of pipes, joints and jointing materials; disassembly of casing pipe, grouting and capping of existing sections of pipe, dewatering, bracing, shoring and sheeting; exploratory excavation; constructing the specified protection and adjusting of existing above ground and underground utilities and service connections; adjusting/relocating, supporting, protecting, or replacement of existing underground or aboveground utilities including associated utility coordination; disposal of spoil or other materials; erosion control; and all other related and necessary materials, work and equipment required to safely and properly remove and dispose of the existing potable water pipes, fittings and appurtenances. **This bid item shall include all roadway pavement restoration, concrete curb restoration, concrete sidewalk restoration, concrete driveway restoration, and sod restoration work that is above and beyond the limits of the roadway project.**
 - d. Payment shall be made under:
 - i. Item No. CLW-2-W – Remove & Dispose of Existing 6" DI WM
5. Bid Item No. CLW-3-W – Remove & Store Existing Fire Hydrant
 - a. Description: This Bid Item describes measurement and payment for removing, storing, and delivering to the City of existing fire hydrant assemblies as shown on the plans. The quantity to be paid for under this item is the number of actual fire hydrants acceptably removed, stored, and delivered to the City.

- b. Measurement: Measurement will be per each fire hydrant according to the diameter, type, as set forth on the Plans.
 - c. Payment: The unit price includes removal and storage of existing fire hydrants including but not limited to excavation, backfill, dewatering, sheeting, shoring, removal and disposal of hydrant run pipe, fittings, and bollards; asphalt pavement, driveway, concrete sidewalk, and concrete curb replacement, sod replacement, erosion control, and incidental construction associated with these Items. **This pay item shall include all roadway pavement restoration, concrete curb restoration, concrete sidewalk restoration, concrete driveway restoration, and sod restoration work that is above and beyond the limits of the roadway project.**
 - d. Payment shall be made under:
 - i. Item No. CLW-3-W – Remove & Store Existing Fire Hydrant.
6. Bid Item No. CLW-4-W – F&I Fire Hydrant Assembly
- a. Description: This Bid Item describes measurement and payment for furnishing and installing fire hydrant assemblies as shown on the plans. The quantity to be paid for under this item is the number of actual fire hydrants and all connecting DI pipe, fittings, valves, and restraints between the hydrant and the water main, acceptably furnished and installed.
 - b. Measurement: Measurement will be on a lump sum basis for each fire hydrant assembly regardless of the diameter or type, as set forth on the Plans. Limits of the pay item are identified on the plans.
 - c. Payment: Payment will be made for each assembly and shall include furnishing and installing all fire hydrants, connecting DI pipe, fittings, gate valves, and restraints between the hydrant and the water main as shown on the plans. It shall include full compensation for all labor, materials, machinery, excavation, backfill, dewatering, sheeting, shoring, asphalt pavement, driveway, concrete sidewalk, and concrete curb replacement, sod replacement, erosion control, new bollards, concrete slab, hydrostatic testing, flushing, disinfection, bacteriological testing and incidental construction associated with these Items. No additional payment will be made for furnishing and installing all joint accessories, glands, gaskets, bolts, and joint lubricant for mechanical joints. **This pay item shall include all roadway pavement restoration, concrete curb restoration, concrete sidewalk restoration, concrete driveway restoration, and sod**

restoration work that is above and beyond the limits of the roadway project.

- d. Payment shall be made under:
 - i. Item No. CLW-4-W – F&I Fire Hydrant Assembly.
7. Bid Item No. CLW-5-W - F&I Gate Valve & Valve Box
- a. Description: This Bid Item describes measurement and payment for gate valves and valve boxes, for potable water pipelines. The quantity to be paid for under this item is the number of valves acceptably installed where shown on the drawings.
 - b. Measurement: Measurement will be per each valve according to the diameter, type, and joint requirements, as set forth on the Proposal.
 - c. Payment: The unit bid price includes furnishing and installing gate valves, valve boxes and covers, polywrap, tracer wire access, valve identification tags, concrete valve box pad with welded wire fabric, extension stems, 2-inch schedule 80 PVC pipe, brass coupling and plug, couplings, adjusting, supporting, or replacement of existing underground utilities; excavation, backfill, compaction, dewatering, bracing, sheeting, shoring, sod replacement, erosion control, and incidental construction associated with these Items as shown in the details.
 - d. Payment shall be made under:
 - i. Item No. CLW-5-W – F&I 6” Gate Valve & Valve Box
8. Bid Item No. CLW-6-W – F&I Thrust Restraints for New DI Fittings & Valves to DI Pipe
- a. Description: This Bid Item describes measurement and payment for retainer gland assemblies used in installing restrained joints on proposed DI pipe and associated ductile iron fittings and valves.
 - b. Measurement: The quantity to be paid for under this item is the number of retainer gland assemblies acceptably furnished and installed as shown on the plans.
 - c. Payment will be according to the number of retainer gland assemblies for restraining new fittings and valves, acceptably furnished and installed. The unit bid price includes furnishing and installing all restraining devices along the pipeline alignment, and all other related and necessary materials, work, and equipment required to properly install the restrained joint. Contractor shall restrain proposed fittings and valves, where required, as shown in the drawings. Contractor shall use restrained joints only; no concrete thrust blocks or thrust collars shall be permitted.

- d. Payment shall be made under:
 - i. Item No. CLW-6-W – F&I 6” Thrust Restraint for New Fittings & Valves to DI Pipe
- 9. Bid Item No. CLW-7-W – F&I Thrust Restraint for Existing DI Pipe
 - a. Description: This Bid Item describes measurement and payment for split ring retainer gland assemblies used in restraining joints on existing DI pipe and fittings.
 - b. Measurement: The quantity to be paid for under this item is the number of retainer gland assemblies acceptably furnished and installed as shown on the plans.
 - c. Payment will be according to the number of retainer gland assemblies for restraining joints of existing pipes and fittings, acceptably furnished and installed. The unit bid price includes furnishing and installing all restraining devices along the pipeline alignment, excavation, dewatering, polyethylene encasement for DI pipe, bracing, shoring and sheeting, exploratory excavation, bedding and backfill, compaction, constructing the specified protection and adjusting of existing above ground and underground utilities and service connections, erosion control, and all other related and necessary materials, work, and equipment required to properly install the restrained joint. Contractor shall restrain existing pipe and fittings, where required, as shown in the plans. Contractor shall use restrained joints only; no concrete thrust blocks or thrust collars shall be permitted. **This bid item shall include all roadway pavement restoration, concrete curb restoration, concrete sidewalk restoration, concrete driveway restoration, and sod restoration work that is above and beyond the limits of the roadway project.**
 - d. Payment shall be made under:
 - i. Item No. CLW-7-W – F&I 6” Thrust Restraint for Existing DI Pipe
- 10. Bid Item No. CLW-8-W – F&I Compact Ductile Iron Fittings
 - a. Description: This Bid Item describes measurement and payment for compact ductile iron pressure pipe fittings for the construction of the potable water mains piping as shown on the plans. The quantity to be paid for under this Item will be based on the theoretical weight, in pounds, of actual permanent fittings acceptably furnished and installed.
 - b. Measurement: The quantity to be paid for under this item is the theoretical weight, in pounds, of actual permanent furnished and

- installed. The theoretical weight for compact fittings shall be calculated based on the weight listed in ANSI/AWWA C153 ductile iron fittings of the 350 psi pressure.
- c. Payment: Payment for pressure pipe fittings will be based on the theoretical weight, in pounds, of actual permanent fittings furnished and installed. The unit bid price includes furnishing and installing all fittings, excavation, backfill, dewatering, sheeting, shoring, erosion control, underdrain restoration and incidental construction associated with these Items. No additional payment will be made for furnishing and installing all joint accessories, gaskets, bolts, and joint lubricant for mechanical joints. No payment shall be made for ductile iron fittings included in other bid items.
 - d. Payment shall be made under:
 - i. Item No. CLW-8-W – F&I Compact DI Fittings.
11. Bid Item No. CLW-9-W – F&I Temporary Line Stop
- a. Description: This Bid Item describes measurement and payment for temporary line stops on water pipelines. The quantity to be paid for under this item is the number of line stops acceptably installed where shown on the drawings or where directed by the Owner or the Owner’s authorized Project Representative.
 - b. Measurement: Measurement will be per each temporary line stop according to the diameter, type, and joint requirements, as set forth on the Proposal.
 - c. Payment: The unit bid price includes furnishing and installing temporary line stops with or without bypass connections, concrete line stop support, pipe saddle, supporting, or replacement of existing underground utilities; excavation, backfill, compaction, dewatering, bracing, sheeting, shoring, sod replacement, erosion control, and incidental construction associated with these items as shown on the drawings. **This bid item shall include all roadway pavement restoration, concrete curb restoration, concrete sidewalk restoration, concrete driveway restoration, and sod restoration work that is above and beyond the limits of the roadway project.**
 - d. Payment shall be made under:
 - i. Item No. CLW-9-W – F&I 6” Temporary Line Stop

12. Bid Item No. CLW-10-W – F&I Wet Tap on Existing 6" DI WM
 - a. Description: This Bid Item describes measurement and payment for furnishing and installing of a wet tap on existing potable water pipelines. The quantity to be paid for under this item is the number of wet taps acceptably installed where shown on the plans.
 - b. Measurement: Measurement will be on a lump sum basis for each wet tap, regardless of pipe size, type or depth.
 - c. Payment: Payment will be made on a lump sum basis for each wet tap and shall include furnishing and installing pipe saddle, tapping valve, performing the wet taping of the pipe, excavation, dewatering, polyethylene encasement for DI pipe, bracing, shoring and sheeting, exploratory excavation, bedding and backfill, compaction, constructing the specified protection and adjusting of existing above ground and underground utilities and service connections, erosion control, and all other related and necessary materials, work, and equipment required to properly perform the wet tap. **This pay item shall include all roadway pavement restoration, concrete curb restoration, concrete sidewalk restoration, concrete driveway restoration, and sod restoration work that is above and beyond the limits of the roadway project.**
 - d. Payment shall be made under:
 - i. Item No. CLW-10-W – F&I Wet Tap on Existing 6" DI WM
13. Bid Items Nos. CLW-11-W, CLW-12-W, CLW-13-W – F&I Potable Water Service Assembly
 - a. Description: This Bid Item describes measurement and payment for furnishing and installing short side (same side of street) or long side (across the street) service assemblies from existing or new sections of WMs to existing meter boxes or above ground meter assemblies. The disconnecting of existing services and the connection of the new services to the existing meters will be completed by City of Clearwater Public Utilities. The size of the new service connection shall match the size of the existing service connection that is being replaced. The quantity to be paid for under this item is the number of actual short side or long side potable water service assemblies acceptably installed where required due to the relocation of the existing WM, where shown on the plans, or as directed by the Owner or the Owner's authorized Project Representative.

- b. Measurement: Measurement will be per each potable water service assembly installed in accordance with the Plans.
 - c. Payment: The unit price includes furnishing and installing of new potable water service assemblies including but not limited to installing service saddles, corporation stops, polyethylene tubing, couplings, fittings, curb stops, PVC casing pipe, 12-gauge tracer wire, excavation, directional drilling, backfill, dewatering, sheeting, shoring, asphalt pavement, driveway, concrete sidewalk, and concrete curb replacement, sod replacement, erosion control, disinfection, bacteriological testing, hydrostatic pressure testing, and incidental construction associated with these Items. **This pay item shall include all roadway pavement restoration, concrete curb restoration, concrete sidewalk restoration, concrete driveway restoration, and sod restoration work that is above and beyond the limits of the roadway project.**
 - d. Payment shall be made under:
 - i. Item No. CLW-11-W – F&I 1-inch Short Side Potable Water Service Assembly in 2” PVC Casing Pipe
 - ii. Item No. CLW-12-W – F&I 2-inch Short Side Potable Water Service Assembly in 4” PVC Casing Pipe
 - iii. Item No. CLW-13-W – F&I 1-inch Long Side Potable Water Service Assembly in 2” PVC Casing Pipe
14. Bid Item No. CLW-14-W – F&I Reverse Deadman
- a. Description: This Bid Item describes measurement and payment for furnishing and installing a reverse deadman on existing water pipelines. The quantity to be paid for under this item is the number of reverse deadmen acceptably installed where shown on the drawings or where directed by the Owner or the Owner’s authorized Project Representative.
 - b. Measurement: Measurement will be per each reverse deadman as set forth in the Plans.
 - c. Payment: The unit bid price includes furnishing and installing reverse deadman including but not limited to excavation, backfill, compaction, dewatering, bracing, sheeting, shoring, erosion control, concrete, pipe restraining glands, and incidental construction associated with these items as shown on the drawings. **This bid item shall include all roadway pavement restoration, concrete curb restoration, concrete sidewalk restoration, concrete driveway restoration, and sod restoration work that is above and beyond the limits of the roadway project.**
 - d. Payment shall be made under:
 - i. Item No. CLW-14-W – F&I Reverse Deadman

15. Bid Item No. CLW-15-W – Root Pruning
 - a. Description: This Bid Item describes measurement and payment for root pruning of trees associated with the installation of the potable or raw water transmission or distribution piping. The quantity to be paid for under this item is the linear feet of trench in which tree roots are acceptably pruned as directed by the Owner or the Owner’s authorized Project Representative.
 - b. Measurement: Measurement will be horizontally, above the centerline of the pipe from beginning to end of root pruning activities in the trench as determined by the Owner or the Owner’s authorized Project Representative.
 - c. Payment: Payment will be according to the linear feet of trench in which tree roots are acceptably pruned as directed by the Owner or the Owner’s authorized Project Representative. The unit bid price shall include the services of a certified arborist, cutting the roots, cutting equipment, plastic barrier, and any other activity or equipment necessary to prune the tree roots until the work is accepted by the Owner or the Owner’s authorized Project Representative.
 - d. Payment shall be made under:
 - i. Item No. CLW-15-W – Root Pruning
 16. Special Bid Item CLW-999-0000-W – Unspecified Work
 - a. The work covered by this Bid Item consists of unspecified items of work not included in other bid items that is directly related to the City potable water mains relocations. For a detailed description of this Bid Item, refer to the latest revision of the Pinellas County Standard Technical Specification for Roadway and General Construction.
- B. Bid Items for the **Sanitary Sewer Work** of the *Lakeview Road Utility Relocation Project (19-0013-UT)*:
1. Bid Items No. CLW-005-0700-S, CLW-101-0100-S, CLW-102-0100-S – For description of these Bid Items, refer to the latest revision of the Pinellas County Standard Technical Specification for Roadway and General Construction.
 2. Bid Item CLW-005-0900-S - For description of this Bid Item refer to Sheet 2 of the Construction Drawings.

3. Bid Item No. CLW-1-S - F&I Gravity Sewer Pipe by Open Cut
 - a. Description: This Bid Item describes measurement and payment for gravity sewer DI pipe installed by open cut. The pay quantities for the work specified under this Section shall be the number of linear feet of the types and sizes of pipe specified in the applicable pay items, actually constructed and accepted.
 - b. Measurement: Measurement will be horizontally, above the centerline of the pipe, and includes the length of any fittings. The limits of measurement shall be as shown on the plans.
 - c. Payment: Payment will be according to the diameter, type of material, thickness class, lining material, coating, and type of joint, as set forth on the Proposal. The unit bid price includes furnishing and installing new gravity sewer pipes, service laterals and fittings by open cut as shown on the Plans including but not limited to bypass pumping and maintenance of flow; excavation; dewatering; joints and jointing materials; sealing of unused manholes penetrations; bedding; backfill; compaction; flowable fill grout; dissimilar pipe materials joint adapters; connecting/tie-ing into existing pipes and manholes; coring existing manholes; service wyes; cleanouts; couplings; exploratory excavation; constructing the specified protection and adjusting of existing above ground and underground utilities and service connections; adjusting/relocating, supporting, protecting, or replacement of existing underground or aboveground utilities including associated utility coordination; replacement of roadway subbase and base; asphalt pavement restoration, driveway, concrete sidewalk, concrete curb replacement; bollard removal and replacement; signage removal and replacement; sod replacement; erosion control; concrete encasement; underdrain restoration and all other related and necessary materials, work and equipment required to construct complete and operable gravity sewer pipes and sewer laterals. **This bid item shall include all roadway pavement restoration, concrete curb restoration, concrete sidewalk restoration, concrete driveway restoration, and sod restoration work that is above and beyond the limits of the roadway project.**
 - d. Payment shall be made under:
 - i. Item No. CLW-1-S – F&I 8” DI Gravity Sewer Pipe by Open Cut

4. Bid Items Nos. CLW-2-S – Remove & Dispose of Existing Pipe
 - a. Description: These Bid Items describe measurement and payment for removal and disposal of existing buried or above ground sanitary sewer pipe. The pay quantities for the work specified under this Section shall be the number of linear feet of the sizes of pipe specified in the applicable pay items actually removed and disposed of.
 - b. Measurement: Measurement will be horizontally, above the centerline of the pipe, and includes the length of any fittings. The limits of measurement shall be as shown on the plans. No overlap with measurement for payment for other Bid Items shall be measured for this bid item.
 - c. Payment: Payment will be according to the diameter of pipe as set forth in the Plans. The unit bid price includes removal and disposal of existing buried or above ground pipes, pipe concrete support structures and all fittings as shown on the Plans including but not limited to excavation, disassembly, removal and proper disposal of pipes, joints and jointing materials; disassembly of casing pipe, grouting and capping of existing sections of pipe where shown on the drawings, dewatering, bracing, shoring and sheeting; exploratory excavation; constructing the specified protection and adjusting of existing above ground and underground utilities and service connections; adjusting/relocating, supporting, protecting, or replacement of existing underground or aboveground utilities including associated utility coordination; disposal of spoil or other materials; erosion control; and all other related and necessary materials, work and equipment required to safely and properly remove and dispose of the existing potable water pipes, fittings and appurtenances.
 - d. Payment shall be made under:
 - i. Item No. CLW-2-S – Remove & Dispose of Existing 8" Gravity Sewer Pipe
5. Special Bid Item CLW-999-0000-S – Unspecified Work
 - a. The work covered by this Bid Item consists of unspecified items of work not included in other bid items that is directly related to the City sanitary sewer mains. For a detailed description of this Bid Item, refer to the latest revision of the Pinellas County Standard Technical Specification for Roadway and General Construction.

- C. Note for: Sod, Asphalt Pavement, Driveway, Concrete Sidewalk and Concrete Curb Replacement, Unsuitable Material Excavation Below Grade, Select Backfill Below Grade and Asphalt Overlay.
1. All costs associated with sod, asphalt pavement, driveway, concrete sidewalk and curb restoration and replacement, unsuitable material excavation below grade, select backfill below grade and asphalt overlay shall be included in the unit prices bid for the potable water or sanitary sewer piping installed. No additional payment will be made for these items unless directed by the Owner or the Owner's authorized Project Representative.
- D. Note for: Erosion Control
1. No additional payment will be made for erosion control features to protect the work areas and adjacent property. All costs associated with erosion control shall be included in the unit prices bid for the linear feet of potable water or sanitary sewer piping.
 2. Erosion control may include sheeting, shoring, trenching boxes, artificial coverings, mowing, sandbagging, slope drains, sediment basins, cleanouts, baled hay and straw, floating silt barrier, staked silt barrier, staked silt fence and seeding.
 3. Erosion control is considered a subsidiary obligation of the Contractor and shall include furnishing and installing material, routine maintenance, mowing and removal of temporary erosion control features upon completion of construction.

END OF SECTION

SECTION 02221

TRENCHING, BEDDING AND BACKFILL FOR PIPE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, equipment and incidentals necessary to perform all excavation, backfill, fill, grading, trench protection or other related work required to complete the piping work shown on the Drawings and specified herein. The work shall include, but not be limited to: vaults; duct conduit; pipe; roadways and paving; backfilling; required fill or borrow operations; grading; disposal of surplus and unsuitable materials; and all related work such as sheeting, bracing and dewatering.
- B. Prior to commencing work, the Contractor shall examine the site and review test borings if available, or undertake his own subsurface investigations and take into consideration all conditions that may affect his work.
- C. The Contractor is responsible for the protection of every tree which is scheduled to remain in the project area. This includes trees which may or may not be shown on the plans. Every tree shall be adequately protected in place at no additional cost to the City. This includes, but is not limited to protecting the root systems and adjusting grades as necessary for tree/root protection.

1.02 PROTECTION

- A. Sheeting and Bracing in Excavations:
 - 1. In connection with construction of underground structures, the Contractor shall properly construct and maintain cofferdams. These shall consist of: sheeting and bracing as required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction and to protect adjacent structures, existing yard pipe and/or foundation material from disturbance, undermining, or other damage. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.
 - 2. 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 foot above the top of any pipe unless otherwise directed by the Engineer. During the progress of the work, the Engineer may direct the Contractor in writing to leave additional wood sheeting in place. 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.

3. 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 on the Drawings or in the Specification, all sheeting and bracing shall be removed after completion of the piping or structure, care being taken not to disturb or otherwise injure the pipeline or finished masonry. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools specifically made for that purpose, by watering, or as may otherwise be directed.
4. The Contractor shall construct, to the extent he deems it desirable for his method of operation, the cofferdams and sheeting outside the neat lines of the pipeline trench or foundation unless otherwise indicated on the Drawings or directed by the Owner/Engineer. 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 pipeline or 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 pipeline or the enclosed masonry. 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.
5. Drawings of the cofferdams and design computations shall be submitted to the Engineer and approved prior to any construction. However, approval of these drawings shall not relieve the Contractor of the responsibility for the cofferdams. The drawings and computations shall be prepared and stamped by a Registered Professional Engineer in the State of Florida and shall be in sufficient detail to disclose the method of operation for each of the various stages of construction, if required, for the completion of the pipeline and substructures.

B. Dewatering, Drainage and Flotation

1. The Contractor shall construct and place all pipelines, concrete work, structural fill, bedding rock and limerock base course, in-the-dry. In addition, the Contractor shall make the final 24" of excavation for this work in-the-dry and not until the water level is a minimum of 6" below proposed bottom of excavation.
2. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavation and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fill, structure, or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.

3. 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.
4. Wellpoints may be required for dewatering the soil prior to final excavation for deeper in-ground structures or piping and for maintaining the lowered groundwater level until construction has been completed to avoid the structure, pipeline, or fill from becoming floated or otherwise damaged. Wellpoints shall be surrounded by suitable filter sand and no fines shall be removed by pumping. Pumping from wellpoints shall be continuous and standby pumps shall be provided.
5. The Contractor shall furnish all materials and equipment to perform all work required to install and maintain the proposed drainage systems for handling groundwater and surface water encountered during construction of structures, pipelines and compacted fills.
6. Where required, the Contractor shall provide a minimum of two operating groundwater observation wells at each structure to determine the water level during construction of the pipeline or structure. Locations of the observation wells shall be at structures and along pipelines as approved by the Engineer prior to their installation. The observation wells shall be extended to 6 inches above finished grade, capped with screw-on caps protected by 24" x 24" wide concrete base and left in place at the completion of this Project.
7. Prior to excavation, the Contractor shall submit his proposed method of dewatering and maintaining dry conditions to the Engineer for approval. Such approval shall not relieve the Contractor of the responsibility for the satisfactory performance of the system. The Contractor shall be responsible for correcting any disturbance of natural bearing soils for damage to pipeline or structures caused by an inadequate dewatering system or by interruption of the continuous operation of the system as specified.
8. As part of his request for approval of a dewatering system, the Contractor shall demonstrate the adequacy of the proposed system and wellpoint filter sand by means of a test installation. Discharge water shall be clear, with no visible soil particles in a one quart sample. Discharge water shall not flow directly into wetlands or Waters of the State as defined by FDEP and SWFWMD.
9. During backfilling and construction, water levels shall be measured in observation wells located as directed by the Engineer.
10. Continuous pumping will be required as long as water levels are required to be below natural levels.

PART 2 PRODUCTS

2.01 MATERIALS

A. General

1. Materials for use as fill and backfill shall be described below. For each material, the Contractor shall notify the Engineer of the source of the material and shall furnish the Engineer, for approval, a representative sample weighing approximately 50 pounds, at least ten calendar days prior to the date of anticipated use of such material.
2. Additional materials shall be furnished as required from off-site sources and hauled to the site.

B. Structural Fill

1. Structural fill shall be used below spread footing foundations, slab-on-grade floors and other structures as backfill within three feet of the below grade portions of structures.
2. Structural fill material shall be a minimum of 60 percent clean sand, free of organic, deleterious and/or compressible material. Minimum acceptable density shall be 98 percent of the maximum density as determined by AASHTO T-180. Rock in excess of 2-1/2" in diameter shall not be used in the fill material. If the moisture content is improper for attaining the specified density, either water shall be added or material shall be permitted to dry until the proper moisture content for compaction is reached.

C. Base Course

1. Asphalt, crushed concrete, soil cement or approved equal, shall be used as base course for bituminous paved roads and parking areas.

D. Common Fill

1. Common fill material shall be free from organic matter, muck or marl and rock exceeding 2-1/2" in diameter. Common fill shall not contain broken concrete, masonry, rubble or other similar materials. Existing soil may be used to adjust grades over the site with the exception of the construction area.
2. Material falling within the above specification, encountered during the excavation, may be stored in segregated stockpiles for reuse. All material which, in the opinion of the Engineer, is not suitable for reuse shall be spoiled as specified herein for disposal of unsuitable materials by the Contractor.

E. Crushed Stone

1. Crushed stone may be used for pipe bedding, manhole bases, as a drainage layer below structures with underdrains and at other locations indicated on the Drawings.
2. Crushed stone shall be size No. 57 with gradation as noted in Table 1 of Section 901 of Florida Department of Transportation, Construction of Roads and Bridges.

PART 3 EXECUTION

3.01 FILL PLACEMENT

A. General

1. Material placed in fill areas under and around pipelines and structures shall be deposited within the lines and to the grades shown on the Drawings or as directed by the Engineer, making due allowance for settlement of the material. Fill shall be placed only on properly prepared surfaces which have been inspected and approved by the Engineer. If sufficient common fill material is not available from excavation on site, the Contractor shall provide borrows as may be required.
2. Limerock base course material, structural fill and screened limerock, may be provided as borrow.
3. Fill shall be brought up in substantially level lifts throughout the site, starting in the deepest portion of the fill. The entire surface of the work shall be maintained free from ruts and in such condition that construction equipment can readily travel over any section. Fill shall not be placed against concrete structures until they have attained sufficient strength.
4. Fill shall be dumped and spread in layers by a bulldozer or other approved method. During the process of dumping and spreading, all roots, debris and stones greater in size than specified under Materials, shall be removed from the fill areas. The Contractor shall assign a sufficient number of men to this work to insure satisfactory compliance with these requirements.
5. If the compacted surface of any layer of material is determined to be too smooth to bond properly with the succeeding layer, it shall be loosened by harrowing or by another approved method before the succeeding layer is placed.
6. All fill materials shall be placed and compacted "in-the-dry". The Contractor shall dewater excavated areas and is required to perform the work in such manner as to preserve the undisturbed state of the natural inorganic soil.

3.02 **COMPACTION**

- A. Structural fill, limerock base course and screened limerock in open areas, shall be placed in layers not to exceed nine inches in depth as measured before compaction. Each layer shall be compacted by a minimum of six coverages (3 passes each way) with the equipment described below, to at least 98 percent of the maximum density, as determined by AASHTO T-180. Incidental compaction due to traffic by construction equipment will not be credited toward the required minimum six coverages.

- B. Common fill shall be placed and compacted in a manner similar to that described above for structural fill, with the following exceptions: layer thickness prior to compaction may be increased to 12-inches in open areas; and common fill except dike fill, required below water level in peat excavation areas may be placed as one lift, in-the-wet, to an elevation one foot above the water level at the time of filling.

- C. Compaction equipment in open areas shall consist of a medium-heavy vibrator roller (minimum static weight of 10 tons) operated at resonant frequency and at a speed of 2 fps or less or other compaction equipment approved by the Engineer.

- D. Areas adjacent to pipelines, structures and other confined areas inaccessible to the vibrator roller shall be compacted with a manually operated sled-type vibratory compactor. The Contractor shall also conform to additional backfill requirements at pipelines and structures as specified in the Contract Documents. Compaction of the fill by such means shall be to the same degree of compaction as obtained by the rubber-tired equipment, and the Engineer may make the necessary tests to determine the amount of compactive effort necessary to obtain equal compaction. Unless such tests indicate that modifications may be made, the fill compacted by mechanical compactors shall be placed in 6-inch layers and thoroughly tamped over the entire surface.

Compaction equipment is subject to approval by the Engineer.

- E. It is the intention that the fill materials with respect to moisture be used in the condition they are excavated insofar as this is practicable. Material which is too wet shall be spread on the fill area and permitted to dry, assisted by harrowing if necessary, until the moisture content is reduced to allowable limits.

- F. If the Engineer shall determine that added moisture is required, water shall be applied by sprinkler tanks or other sprinkler systems, which will insure uniform distribution of the water over the area to be treated and give complete and accurate control of the amount of water to be used. If too much water is added, the area shall be permitted to dry before compaction is continued.

- G. The Contractor shall supply all hose, piping, valves, sprinklers, pumps, sprinkler tanks, hauling equipment and all other materials and equipment necessary to place the water in the fill in the manner specified.

3.03 TRENCH EXCAVATION AND BACKFILLING

- A. Excavation for all trenches required for the installation of pipes and electrical ducts shall be made to the depths indicated on the Drawings and in such manner and to such widths as will give suitable room for laying the pipe or installing the ducts within the trenches.
- B. Rock shall be removed to a minimum 6" clearance around the bottom and sides of all the pipe or ducts being laid.
- C. Where pipes or ducts are to be laid in limerock 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.
- D. 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 grade by machinery. The last of the material being excavated manually, shall be done in such a manner that will give a flat bottom true to grade so that pipe or duct can be evenly supported on undisturbed material. Bell holes shall be made as required.
- E. Backfilling over pipes shall begin as soon as practicable after the pipe has been laid, jointed and inspected and the trench filled with suitable compacted material to the mid-diameter of the pipe.
- F. Backfilling over ducts shall begin not less than three days after placing concrete encasement.
- G. All backfilling shall be prosecuted expeditiously and as detailed on the Drawings.
- H. Any space remaining between the pipe and sides of the trench shall be packed full by hand shovel with selected earth, free from stones having a diameter greater than 2" and thoroughly compacted with a tamper as fast as placed, up to a level of one foot above the top of the pipe.
- I. The filling shall be carried up evenly on both sides with at least one man tamping for each man shoveling material into the trench.
- J. The remainder of the trench above the compacted backfill, as just described above, shall be filled and thoroughly compacted by rolling, ramming, or puddling, as the Engineer may direct, sufficiently to prevent subsequent settling.

3.04

GRADING

- A. Grading shall be performed at such places as are indicated on the Drawings, to the lines, grades and elevations shown or as directed by the 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 directed. During the process of excavation, the grade shall be maintained in such condition that it will be well drained at all times. When directed, 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 pipeline structure, it shall be stockpiled in approved areas for later use.
- C. Minute adjustments in lines or grades may be made if found necessary as the work progresses, due to discrepancies on the Drawings or in order to obtain satisfactory construction.
- D. Stones or rock fragments larger than 2-1/2" in their greatest dimensions shall not be permitted in the top 6" of the subgrade line of all dikes, fills or embankments.
- E. All fill slopes shall be uniformly dressed to the slope, cross-section and alignment shown on the Drawings, or as directed by the Engineer.
- F. In cuts, all loose or protruding rocks on the back slopes shall be barred loose or otherwise removed to line or finished grade of slope. All fill slopes shall be uniformly dressed to the slope, cross section and alignment shown on the Drawings or as directed by the Engineer.
- G. No grading is to be done in areas where there are existing pipelines that may be uncovered or damaged until such lines which must be maintained are relocated, or where lines are to be abandoned and removed, all required valves are closed and drains plugged at manholes.

END OF SECTION

**SECTION 02623
GRAVITY SEWER PIPE**

PART 1. GENERAL

1.1 SCOPE OF WORK

- A. The Contractor shall furnish all labor, equipment, materials, pipe and incidentals and shall construct gravity sewers, complete, as shown on the drawings and as herein specified.
- B. The work shall include furnishing, laying and testing gravity sewer pipe.
- C. Throughout the duration of the project, the Contractor shall continuously maintain sanitary sewer flows and keep all residential and business connections in service.

1.2 SUBMITTALS DURING CONSTRUCTION

- A. The Contractor shall submit prior to construction, Shop Drawings, Working Drawings and Samples for approval to the Engineer.
- B. The Contractor shall submit for approval to the Engineer prior to construction shop drawing with maintenance of flow plan.
- C. The Contractor shall submit to the Engineer not less than fourteen (14) calendar days after the date of the Notice to Proceed, a list of materials to be furnished, the names of suppliers and an expected schedule of delivery of materials to the site.
- D. The Contractor shall furnish in duplicate to the Engineer sworn certificates that all tests and inspections required by the Specifications under which the pipe is manufactured have been satisfied.
- E. The pipe manufacturer shall inspect all pipe joints for out-of-roundness and pipe ends for squareness. The Contractor shall furnish to the Engineer, a manufacturer's Notarized Affidavit stating all pipe meets the requirements of ASTM, ASCE, ANSI, the Contract Documents, as well as all applicable standards regarding the joint design with respect to square ends and out-of-round joint surfaces.

PART 2. MATERIALS

2.1 GENERAL

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

2.2 DUCTILE IRON GRAVITY SEWER PIPE

- A. Pipe: ASTM A-746, latest revision, AWWA C150 (ANSI A 21.50), thickness class 52 for all sizes.
- B. Joints: AWWA C111 (ANSI A21.11), push-on joints, push-on restrained joints, and mechanical joints as required, except as otherwise specified or indicated on the Drawings, such as carrier pipe threaded through steel casing under highways and railroads.
- C. Fittings: Conform to AWWA C110 (ANSI A21.10).
- D. Lining: Protecto 401 for all ductile iron pipe, joints, and fittings in accordance with specifications provided by Protecto 401 Ceramic Epoxy Company.
- E. Coat exterior of the pipe and fittings with an asphaltic material approximately one (1) mil thick.
- F. All burial ductile iron pipe shall be provided with a minimum 8 mil thick cross laminated low density polyethylene encasement per ANSI/AWWA A21.5-99. The polyethylene material shall meet the requirements for tensile strength, elongation, and dielectric strength for a cross laminated low density polyethylene. Polyethylene encasement shall solid green color for sewage piping.

2.3 POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE

- A. PVC pipe, sizes 6" through 12", for use in non-pressure gravity sewer mains and laterals shall have an SDR of 26 and conform to ASTM D-3034. PVC pipe shall be made of PVC plastic, homogenous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. The pipe shall be uniform in color, density and other physical properties.
- B. All pipe shall be in compliance with the above standard and be clearly marked as follows at intervals of 5 feet or less:

1. Manufacturer's name or trademark.
2. Nominal pipe size.
3. PVC cell classification (eg. 12454-B).
4. The legend "Type PSM SDR-26 PVC Sewer Pipe" and the designation ASTM D-3034.

In addition to the above mentioned requirements, all PVC sanitary sewer pipe shall be color coded green.

- C. PVC sewer fittings shall conform to the requirements of ASTM D-3034 and shall have an SDR of 26. Six inch PVC fittings for sewer laterals shall be SDR 26. Fittings shall be molded in one piece with elastomeric joints and minimum socket depths as measured in accordance with ASTM D-3034. Fittings not currently available in molded form may be fabricated in accordance with ASTM D-3034 with manufacturer's standard pipe bells and gaskets. Gasket shall have a minimum cross sectional area of 0.20 sq. in. and conform to ASTM F-477 specification.

2.4 JOINING PVC PIPE

- A. The PVC joints shall be of the push-on type so that the pipe and fittings may be connected on the job without the use of solvent cement or any special equipment. The push-on joint shall be a single rubber gasket conforming to ASTM F-477, designed to be assembled by the positioning of a continuous molded rubber ring gasket in an annular recess in the pipe or fitting socket and the forcing of the plain end of the entering pipe into the socket, thereby compressing the gasket radially to the pipe to form a positive seal. The gasket and annular recess shall be designed and shaped so that the gasket is locked in place against displacement as the joint is assembled. The rubber ring joint shall be designed for thermal expansion or contraction with a total temperature change of at least 75 degrees F in each joint per length of pipe. The bell shall consist of an integral wall section with a solid cross-section elastomeric ring which shall meet requirements of ASTM F-477. The thickened bell section shall be designed to be at least as strong as the pipe wall. Lubricant furnished for lubricating joints shall be nontoxic, shall not support the growth of bacteria, and shall have no deteriorating effects on the gasket or pipe material.
- B. Wyes and riser fittings shall be gasketed connections. If female adapters SDR 26 or 35 are unavailable, solvent welds shall be acceptable upon approval by the Engineer.
- C. Rubber doughnuts are not to be used.

2.5 JOINTS FOR DISSIMILAR PIPE

Joints between pipe of different materials shall be made using a flexible connector with stainless steel straps. Couplings shall be manufactured by Fernco or approved equal.

2.6 PIPE BEDDING AND PIPE COVER MATERIALS

- A. Pipe bedding material shall be as specified in the Contract Documents.
- B. Pipe cover material shall be equal to common fill as specified in the Contract Documents.
- C. Pipe bedding and cover material for polyethylene wrapped ductile iron pipe shall be well graded sand.

PART 3 EXECUTION

3.1 PIPE DISTRIBUTION

- A. The Contractor shall not distribute material on the job faster than it can be used to good advantage. He shall unload pipe which cannot be physically lifted by workers from the trucks, by a forklift, or other approved means. He shall not drop pipe of any size from the bed of the truck to the ground. He shall not distribute more than one weeks supply of material in advance of laying, unless otherwise approved by the Engineer.

3.2 PIPE PREPARATION AND HANDLING

- A. The Contractor shall inspect all pipe and fittings prior to lowering them into trench. Cracked, broken, or otherwise defective materials are not acceptable and shall not be used. The Contractor shall clean the ends of the pipe thoroughly. He shall remove foreign matter and dirt from inside of pipe and keep the pipe clean during and after laying.
- B. The Contractor shall use proper implements, tools and facilities for the safe and proper protection of the work. He shall lower the pipe into the trench in a manner to avoid any physical damage to the pipe, remove all damaged pipe from the job site and under no circumstances shall the pipe be dropped or dumped into trenches.

3.3 LINE AND GRADE

- A. The Contractor shall not deviate more than 1/2-inch for line and 1/4-inch for grade from the line design and design grade established by the Engineer provided that such variation does not result in a level or a reverse sloping invert. He shall measure the grade at the pipe invert and not at the top of the pipe. The Contractor shall furnish, set and control the line and grade by laser beam method. Other methods of controlling line and grade may be submitted to the Engineer for approval if using the laser beam method proves to be impractical because of other conditions.
- B. The Contractor shall drive a substantial stake on each side of the trench on a line at right angles to each stake of the primary line. A straight and even-edged 2-inch by 6-inch board shall be nailed or clamped to the stakes in a level position and at an even foot height above the grade line of the proposed sewer. The centerline of the proposed sewer shall be located by measuring the primary line stake marking the board. No less than three lines and grade boards shall be set and immediately checked visually for errors in line and grade. As each additional board is placed, it shall be checked visually for error in line and grade. At least three boards shall be maintained at all times. During the laying of the pipe, a stout twill line shall be fastened to the boards at the center of alignment marks and pulled sufficiently tight to remove any noticeable or measurable sag. The line and grade of each pipe shall be obtained by measuring down from the string line by means of a plumbed grade pole.
- C. The Contractor shall use the laser beam method of maintaining line and grade. The Contractor shall submit evidence to the Engineer that a qualified operator shall handle the equipment during the course of construction. A "Caution-Laser Light" placard shall be displayed in a conspicuous place. When "in the pipe" method is used, grade boards shall be installed for the first 50 feet of pipe. The Contractor shall check the line and grade at any additional points at which offset stakes have been placed and when requested by the Engineer. A fan shall be provided to circulate the air if bending of the beam due to air temperature variations becomes apparent with "in the pipe" units. However excessive air velocity shall not be permitted to cause pulsating or vibrating of the beam. If, in the opinion of the Engineer, the beam cannot be accurately controlled, this method of setting line and grade shall be discontinued. When the above ground method is used, the set-up shall be checked with the three grade boards including one set at the upstream manhole. If the laser has a gradient indicator, two boards may be used to check the set-up. The grade board at the up-stream manhole shall be retained to check into as pipe laying progresses.

3.4 PREPARATION OF TRENCH

- A. The Contractor shall provide pipe bedding material under all the pipe for the full trench width. The minimum depth of bedding material below the pipe barrel shall be as follows:

<u>Pipe Size</u>	<u>Minimum Depth of Bedding Under Pipe Barrel</u>
15" & Smaller	4 inches
18" to 36"	6 inches
42" & Large	9 inches

- B. The depth of pipe bedding material under the pipe bell shall not be less than three inches under normal trench conditions.
- C. The Contractor shall hand-grade bedding to proper grade ahead of the pipe laying operation. The bedding shall provide a firm, unyielding support along the entire pipe length.
- D. Should the Contractor excavate the trench below the required depth for pipe bedding material placement without direction from the Engineer, the Contractor shall fill the excess depth with pipe bedding material as specified herein to the proper subgrade.
- E. The Contractor shall excavate bell holes at each joint to permit proper assembly and inspection of the entire joint.

3.5 DEWATERING

The Contractor shall prevent water from entering the trench during excavation and pipe laying operations to properly grade the bottom of the trench and allow for proper compaction of the backfill. Dewatering of the trench bottom shall be accomplished using adequate means to allow preparation of bedding, placement of the haunching material and pipe in the trench without standing water. Dewatering shall continue until sufficient backfill is placed above the pipe to prevent flotation or misalignment.

3.6 LAYING AND JOINTING PIPE AND FITTINGS

- A. The Contractor shall lay pipe upgrade with spigot ends pointing in direction of flow. After a section of pipe has been lowered into the prepared trench, he shall clean the end of the pipe to be joined, the inside of the joint and, if applicable, the rubber ring immediately prior to joining the pipe. The Contractor shall assemble the joint in accordance with the recommendations of the manufacturer of the type of joint used. He shall provide all special tools and appliances required for the jointing assembly.

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- B. The Contractor shall lay all pipe uniformly to line and grade so that the finished sewer shall present a uniform bore. Variations from line and grade in excess of the tolerances specified under LINE AND GRADE are not acceptable and the work shall be rejected.
 - C. The Contractor shall check the pipe for alignment and grade after the joint has been made. The pipe bedding shall form a continuous and uniform bearing and support for the pipe barrel between joints. Sufficient pressure shall be applied to the joint to assure that the joint is "home" as defined in the standard installation instructions provided by the pipe manufacturer. The Contractor shall place sufficient pipe cover material to secure the pipe from movement prior to installing the next joint to assure proper pipe alignment and joint makeup.
 - D. Pipe 21" and smaller intended to be in straight alignment shall be laid so that the inside joint space does not exceed 3/8" in width. If interior joints on 24" and larger pipe laid either in straight alignment or on a curve are greater than 3/8", the Contractor shall thoroughly clean the joint surfaces and fill and seal the entire joint with premixed mortar conforming to ASTM C-387 only after the trench has been backfilled, unless otherwise approved by the Engineer. Trowel smooth on the inside surface. Water shall not be allowed to rise in or around, or pass over any joint before it has substantially set.
 - E. When the Contractor lays pipe within a movable trench shield, he shall take all necessary precautions to prevent pipe joints from pulling apart when moving the shield ahead.
 - F. The Contractor shall prevent excavated or other foreign material from getting into the pipe during the laying operation. He shall close and lock the open end of the last laid section of pipe to prevent entry of foreign material or creep of the gasketed joints when laying operations cease, at the close of the day's work, or whenever the workers are absent from the job.
 - G. The Contractor shall plug or close off the pipes which are stubbed off with temporary plugs.
 - H. The Contractor shall take all necessary precautions to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation.
 - I. The Contractor shall make connections of non-reinforced pipe to manholes or concrete structures, so that a standard pipe joint is located at a minimum of 18" outside the edge of structure.
 - J. When field cutting and/or machining the pipe is necessary, the Contractor shall use only tools and methods recommended by the pipe manufacturer and approved by the Engineer.

- K. Service lateral shall be constructed by the Contractor as shown on the standard sewer details and located approximately as shown on the Contract Drawings.

3.7 LAYING PLASTIC PIPE

- A. Polyvinyl chloride (PVC) pipe shall be installed by the Contractor in accordance with the instructions of the manufacturer, as shown on the Drawings and as called out in the Contract Documents.
- B. The Contractor shall lay the pipe, bedding and backfill to lines and grade shown on the Drawings and called out in the Contract Documents. Blocking under the pipe will not be permitted.
- C. The Contractor shall use care in the handling, storage and installation of pipe. Storage of pipe on the job site shall be done in accordance with the pipe manufacturer's recommendation.

3.8 BACKFILL IN THE PIPE ZONE

- A. The pipe zone shall be considered to include the full width of the excavated trench from the bottom of the trench to a point above the top outside surface of the barrel of the pipe.
- B. The Contractor shall pay particular attention to the area of the pipe zone from the flow line to the springline of the pipe to insure that firm support is obtained to prevent any lateral movement of the pipe during the final backfilling of the pipe zone.
- C. The Contractor shall take care to insure that the pipe does not rest directly on the bell or pipe joint, but is uniformly supported on the barrel throughout its entire length.
- D. After the pipe is laid by the Contractor to line and grade, he shall place and carefully compact pipe bedding material for the full width of the trench to the springline of the pipe. He shall place the material around the pipe in 6-inch layers and thoroughly hand tamp with approved tamping sticks supplemented by "walking in" and slicing with a shovel to assure that all voids are filled.
- E. The Contractor shall backfill and carefully compact the area above the pipe springline with pipe cover material to a point 12" above the top outside surface of the pipe barrel. Pipe bedding material may, at the Contractor's option, be substituted for pipe cover material.

3.9 EXCESS TRENCH WIDTH

- A. The bottom trench width in an unsupported trench shall be limited to the minimum practicable width (typically pipe OD plus 8 to 12-inch on each side) allowing working space to place and compact the haunching material. The use of trench boxes and movable sheeting shall be performed in such a manner that removal, backfill and compaction will not disturb compacted haunching material or pipe alignment.
- B. If the normal trench width below the top of the pipe is exceeded for any reason, the Contractor shall furnish an adequate support for the pipe. The Engineer may determine that the pipe being used is strong enough for the actual trench width or the Contractor may furnish a stronger pipe or a concrete cradle for approval.
- C. Concrete thickness under the pipe shall be one-third of the nominal diameter of the pipe, but not less than four inches. Concrete block or brick may be used for adjusting and maintaining proper grade and elevation of pipe. After the pipe is laid to line and grade, the Contractor shall place 3,000 psi concrete under the pipe for the full width of the trench to form a cradle of the required length and thickness with the concrete brought up to a level equal to 1/4 of the inside pipe diameter below the springline of the pipe. Start and terminate the concrete cradle at the face of a pipe bell or collar. Do not encase pipe joints at the ends of the concrete cradle.
- D. After the concrete has taken initial set, the Contractor shall place cover material over the concrete cradle and up to a level 12" above the pipe barrel and for the full width of the trench. Cover material shall be placed by hand or by equally careful means.

3.10 CONNECTING DISSIMILAR PIPE MATERIALS

The Contractor shall use the following method to connect dissimilar pipe materials. Use concrete closure collars only when approved by the Engineer and then only to make connections between dissimilar pipe when standard rubber gasketed joints or flexible couplings are impracticable. Before the closure collars are poured, wash the pipe to remove all loose material and soil from the surface on which the concrete will be placed. Wet nonmetallic pipe thoroughly prior to pouring the collars. Wrap and securely fasten a light gauge of sheet metal or building-felt around the pipe to insure that no concrete shall enter the line. Place reinforcement as shown on the plans. Make entire collar in one pour using 3,000 psi concrete and extend a minimum 12" on each side of the joint. The minimum thickness around the outside diameter of the pipe shall be 6". No collar shall be poured in water. After the collars are poured and have taken their initial set, cure by covering with well-moistened earth.

3.11 PIPE BULKHEADS

- A. Connections for future sewers shall be bulkheaded by the Contractor in the following manner:
1. All wyes and bell-and-spigot pipe sewers 18" in diameter or smaller shall be bulkheaded with caps or disc stoppers with factory-fabricated resilient joints. The disk or cap shall be banded or otherwise secured to withstand all test pressures without leakage.
 2. Connections 21" and 24" in diameter shall be bulkheaded with a four-inch brick wall, using clay brick or concrete brick. The wall shall be capable of withstanding all test pressures without leakage.
 3. Connections 27" in diameter and larger shall be bulkheaded with an eight-inch wall, using clay brick or concrete brick. The wall shall be capable of withstanding all test pressures without leakage.

3.16 FINAL SEWER CLEANING

- A. Prior to final acceptance and final manhole-to-manhole inspection of the sewer system by the Engineer, the Contractor shall flush and clean all parts of the system, remove all accumulated construction debris, rocks, gravel, sand, silt and other foreign material from the sewer system at or near the closest downstream manhole. If necessary, he shall use mechanical rodding or bucketing equipment.
- B. During the final manhole-to-manhole inspection of the sewer system, the Engineer may require the Contractor to reflush and clean any section or portion of the line if any foreign matter is still present in the system.

END OF SECTION 02623

**SECTION 09900
PAINTINGS AND COATINGS**

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all materials, labor equipment, and incidentals required to provide a protective coating system for the surfaces listed herein and not otherwise excluded.
- B. The work includes painting and finishing of exterior exposed items and surfaces such as bollards, pipes, fittings, valves and all other work obviously required to be painted unless otherwise specified herein or on the Drawings. The omission of minor items in the schedule of work shall not relieve the Contractor of his obligation to include such items where they come within the general intent of the Specifications as stated herein.
- C. "Paint" as used herein means all coating systems, materials, including primers, emulsions, enamels, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- D. The following items shall not be painted:
 - 1. Stainless steel
 - 2. Products with polished chrome, aluminum, nickel or stainless steel finish.
 - 3. Flexible couplings lubricated bearing surfaces, insulation and metal and plastic pipe interiors.
 - 7. Signs and nameplates.
 - 5. Any packing glands, unless otherwise indicated.
 - 6. Surfaces coated with cementitious coating.

1.02 REFERENCE STANDARDS

- A. NACE, National Association of Corrosion Engineers
- B. ASTM, American Society of Testing and Materials
- C. SSPC, Steel Structures Painting Council

1.03 QUALITY ASSURANCE

- A. Provide the best quality grade of the various types of coatings as regularly manufactured by approved paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard, best-grade product shall not be acceptable. Brand identification is keyed to products of Tnemec Co., Inc., Kansas City, MO, to establish standard of quality or approved equal.
- B. Provide an undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only within recommended limits.
- C. Undercoat and finish coat paints shall be compatible.
- D. Painting shall be accomplished by experienced painters specializing in industrial painting familiar with all aspects of surface preparations and applications required for this project.

1.04 SYSTEM DESCRIPTION - NOT USED

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All paint shall be manufactured by one of the following and shall be their highest grade of paint: Tnemec, Koppers, Ameron, Porter, or Rustoleum. Requests to use other paint manufacturers and materials other than specified shall be submitted to the Engineer for approval.
- B. The following coating systems list a product by name to establish a standard of quality; other products of the same generic types may be submitted to the Engineer for approval. When other than the specified coating system is proposed, the Contractor shall submit a typewritten list giving the proposed coatings, brand, trade name, generic type and catalog number of the proposed system for the Engineer's approval.
- C. Paint used in successive field coats shall be produced by the same manufacturer. Paint used in the first field coat over shop painted or previously painted surfaces shall cause no wrinkling, lifting, or other damage to underlying paint.
- D. Emulsion and alkyd paints shall contain a mildewcide and both the paint and mildewcide shall conform to OSHA and Federal requirements, including Federal Specification TT-P-19.

E. Finish coats containing lead shall not be allowed. Oil shall be pure boiled linseed oil.

F. Rags shall be clean painters' rags, completely sterilized.

2.02 SHOP COATINGS

A. Shop priming shall be done with primers that are guaranteed by the manufacturer to be compatible with the finish paints to be used. The Contractor shall coordinate and ascertain such compatibility with his subcontractors and suppliers.

B. No paint containing lead shall be allowed.

2.03 COATING SYSTEMS

A. Metal (Non-submerged Exterior)
Exterior surfaces and shall include the following:

1. Surfaces to Be Coated

- a. Bollards
- b. Aboveground piping
- c. Miscellaneous steel shapes, angles, etc.

2. Coating System

a. Surface Preparation - Sandblast clean (SSPC-SP6). Hand or power tool clean items are not suitable for sandblast cleaning. All metal surfaces shall be completely degreased by solvent cleaning in compliance with SSPC-SP1. Ductile iron pipe surface prep – NAPF 500-03-04.

b. Prime Coat
Epoxy (3 mils dry) Tnemec Series 66-1211 Epoxoline
New Galvanized Surfaces - SSPC-SP1 Solvent Cleaning
Tnemec Series 66-1211 Epoxoline Primer

c. Intermediate Coat
66-color Hibuild EP
(3 mils)

d. Finish Coat
Aliphatic Polyurethane - Tnemec Series 73 Color Endura

Shield (2.5 mils dry)
Exposed potable water ductile iron pipe shall be painted blue.
Bollards shall be painted OSHA safety yellow.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

- A. In addition to the aforementioned preparations, all dirt, rust, scale, splinters, loose particles, disintegrated paint, grease, oil, and other deleterious substances shall be removed from all surfaces, which are to be coated.
- B. Before commencing work, the painter must make certain that surfaces to be covered are in perfect condition. Should the painter find such surfaces impossible of acceptance, he shall report such fact to the Engineer. The application of paint shall be held as an acceptance of the surfaces and working conditions and the painter shall be held responsible for the results reasonably expected from the materials and processes specified.
- C. Clean ferrous substances, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale, and other foreign substances by solvent or mechanical cleaning. All welds, blisters, etc., shall be ground and sanded smooth. All pits and dents shall be filled and all imperfections shall be corrected so as to provide a smooth surface for painting.
- D. Surface profile as obtained from sandblasting shall be as recommended by the coating manufacturer.

3.02 MATERIALS PREPARATION

- A. Mix and prepare painting materials in strict accordance with manufacturer's recommendations and directions, stirring materials before and during application to maintain a mixture of uniform density, free of film, dirt and other foreign materials.
- B. No thinners shall be used except those specifically mentioned and only in such quantity as directed by the manufacturer in his instructions. If thinning is used, sufficient additional coats shall be applied to assure the required dry film thickness is achieved. The manufacturer's recommended thinner or cleanup solvent shall be used for all clean up. Application by brush, spray, airless spray or roller shall be as recommended by the manufacturer for optimum performance and appearance.

3.03 APPLICATIONS

- A. All painting shall be done by skilled and experienced craftsmen and shall be of highest quality workmanship.

- B. Apply paint in accordance with the manufacturer's directions. Use applicators and techniques best suited for the type of material being applied.
- C. All paint shall be at room temperature and the surface to be painted shall be dry and clean.
- D. Apply additional coats when undercoats, stains or other conditions show through the final coat of paint, until the paint is of uniform finish, color and appearance.
- E. Paint shall be applied in a neat manner with finished surfaces free of runs, sags, ridges, laps and brush marks. Each coat shall be applied in a manner that shall produce an even film of uniform and proper thickness.

3.04 APPLICATION RESTRICTIONS

- A. Application of materials shall be done only on properly prepared surfaces as herein specified, and all exterior painting shall be done only in dry weather. Any surface coating damaged by moisture or rain shall be removed and redone as directed by the Engineer.
- B. In no case shall paint be applied to surfaces that show a moisture content greater than 15 percent.

3.05 CLEANING

- A. Cleaning - All paint brushed, splattered, spilled or splashed on any surface not specified to be painted shall be removed.

END OF SECTION

SECTION 15062
DUCTILE IRON PIPE AND FITTINGS

PART – GENERAL

1.01 SCOPE OF WORK

- A. Install within the project site all materials and incidentals including flanged joint, mechanical joint, push-on joint, and restrained joint ductile iron pipe and/or ductile iron restrained, flanged, or mechanical joint fittings for reclaimed water and potable water mains, sewage force mains and sewer fittings, complete, as shown on the project drawings.
- B. The Contractor shall coordinate all deliveries with the related Vendor(s) in a manner not to impede construction on individual projects.

1.02 SEPARATION OF RAW WATER, POTABLE WATER, AND WASTEWATER LINES

- A. A minimum horizontal separation of 6 feet outside to outside shall be maintained between raw water or potable water mains and sanitary sewers or sanitary force mains. Where a raw or potable water main crosses a sanitary sewer or a sanitary force main, a minimum of 18 inches vertical clearance shall be maintained. Where 18 inches of vertical clearance cannot be maintained, the crossing shall be arranged so that the joints of the two pipes are equidistant from the point of crossing with no less than 10 feet between any two joints. Alternatively, the raw water main may be placed in a casing to obtain the equivalent of the required 10 feet separation.
- B. A minimum horizontal separation of 3 feet outside to outside shall be maintained between raw and potable water mains and reclaimed water mains or storm water mains. Where a raw or potable water main crosses a reclaimed water or a storm water main, a minimum of 18 inches vertical clearance shall be maintained.

1.03 SYSTEM IDENTIFICATION

- A. The following features shall be included in the design of potable water facilities:
 - 1. All buried potable water transmission and distribution piping shall be color coded blue. All ductile iron potable water pipes shall be enclosed in a polyethylene wrap colored blue.
 - 2. All above ground valves, meters, and other devices, and other appurtenances shall be painted blue.
 - 3. Covers for all valve boxes, meter boxes, and other below ground devices on the potable water system shall be painted blue. Covers shall be permanently embossed with the wording “Water”. Valve boxes shall be square, U.S. Foundry or approved equal.

- B. The following features shall be included in the design of sanitary sewer facilities:
1. All buried sanitary sewer piping shall be color coded green. All ductile iron force mains shall be enclosed in a polyethylene wrap colored green.
 2. All above ground valves, meters, and other devices, and other appurtenances shall be painted green.
 3. Covers for all valve boxes, meter boxes, and other below ground devices on the sanitary sewer system shall be painted green. Covers shall be permanently embossed with the wording "Sanitary Sewer". Valve boxes shall be square, U.S. Foundry or approved equal.

PART 2 – PRODUCTS

2.01 MATERIALS

A. DUCTILE IRON PIPE

1. General
 - a. Ductile iron pipe shall be minimum thickness class 50 or greater as required by load conditions or as called out on the plans conforming to AWWA C150 and ANSI A21.50.
 - b. All pipe shall conform to AWWA C151.76 (ANSI A21.51-76 or latest revision thereof). Pipe shall be furnished in standard 18 or 20-foot lengths. All pipe and fittings shall have standard bituminous enamel coating outside and shall have an internal cement-mortar lining in accordance with ANSI A21.4 (AWWA C104) for potable or reclaimed water. For sewage pipe and fittings, internal coating shall be ceramic epoxy, Protecto 401 or equal.
 - c. All materials shall be new and have a manufacturer's certificate verifying compliance to all tests and inspections as required herein. The weight, class and casting period shall be shown on each piece of pipe. The manufacturer's "mark", the year produced and the word "Ductile" or letters "DI" shall be cast or stamped on all pipe. All fittings, furnished by the approved manufacturer(s), shall be cast and machined at one foundry location to assure quality control and provide satisfactory test data.
 - d. All tests as required by AWWA C151-76 shall be performed by the manufacturer and records of all such tests shall be retained for a period of one year and shall be available to the Owner upon request.

- e. All pipe shall be installed according to the manufacturer's requirements with lubricants, gaskets and accessories furnished by the manufacturer.
- f. Restrained joint shall be provided at all horizontal and vertical bends and fittings, and at other locations indicated by the ductile iron pipe restraint detail on the drawings. Restraining devices shall be Megalug by EBBa Iron, or approved equal.
- g. Except as otherwise shown on the Drawings, either mechanical, restrained, or flanged joints shall be used. Prior to commencing work, jointing systems for pipe shall be submitted to the Engineer for approval.
- h. All burial ductile iron pipe and fittings shall be provided with a minimum 8 mil thick cross laminated low density polyethylene encasement per ANSI/AWWA A21.5-99. The polyethylene material shall meet the requirements for tensile strength, elongation, and dielectric strength for a cross laminated low density polyethylene. Polyethylene encasement shall be either:
 - 1) Solid purple color for reclaimed water piping and fittings, or
 - 2) Solid blue color for potable water piping and fittings, or
 - 3) Solid green color for sewage piping and fittings, or
 - 4) Solid olive green color for raw water piping and fittings.
- i. Pipe and fittings exposed to view in the finished work to be painted shall not receive the standard tar or asphalt coat on the outside surfaces but shall be shop primed on the outside with one coat of Koppers No. 621 Rust Inhibitive Primer or approved equal. All other pipe and fittings shall be shop coated on the outside with a 1.0 mils thick bituminous coat in accordance with ANSI A21.51.
- j. Should portions of the pipe inadvertently be given the outside coating of coal tar enamel instead of the rust inhibitive primer as required for exposed piping the surfaces shall be sealed with a non-bleeding sealer coat such as Inertol Tar Stop, or Mobil Anti-Bleeding Aluminum Sealer. Sealing shall be a part of the work of this Section.

2. PUSH-ON JOINT

- a. Push-on joints shall conform with the latest revision of ANSI/AWWA C111/A21.11.
- b. Joint material shall be made up with rubber gaskets conforming to ANSI standard A21.11.

3. MECHANICAL JOINT

- a. Mechanical joints shall conform with the latest revision of ANSI/AWWA C110/A21.
- b. Joint material shall be made up with rubber gaskets conforming to ANSI Standard A21.11. Glands for mechanical joint pipe shall be bituminous coated and bolts and nuts shall be of high strength cast iron, or high strength low alloy steel as specified in ANSI Standard A21.11.
- c. Align bolt holes and insert bolts, with bolt heads behind the bell flange, and tighten opposite nuts to keep the gland square with the socket. Tighten the nuts in accordance with following table:

Bolt Diameter (in.)	Torque (ft-lb)
5/8	45-60
3/4	75-90
1	85-100
1¼	105-120

4. FLANGED JOINT

- a. Flanged joints shall conform with the latest revision of ANSI/AWWA C110/A21.
- b. Flanged connections shall comply with the requirements of ANSI Standard B16.1, 125 pound class. Flanges for ductile iron pipe shall be of ductile iron. Machine bolts shall be the best commercial quality steel with hexagonal nuts of the same quality metal. Nuts, bolts and gaskets for flanged fittings and blind flanges shall be designed to withstand the design and test pressures for the pipe.
- c. Gaskets shall be 1/8 inches thick red rubber, flat ring gaskets unless otherwise specified on the drawings.

- d. Bolts and nuts shall be low carbon steel as per ASTM A- 307 Grade B. Threads shall be as per ANSI B1.1 course thread series, Class 2A external and Class 2B internal.
- e. Bolt requirements are as follows:

PIPE SIZE (in.)	NUMBER PER JOINT	BOLT SIZE (in.)	THREADS PER INCH	TORQUE (ft-lbs)
4	8	5/8 x 3	11	60
6	8	3/4 x 3½	10	100
8	8	3/4 x 3½	10	100
10	12	7/8 x 4	9	160
12	12	7/8 x 4	9	160
16	16	1 x 4½	8	245
20	20	1⅛ x 3	7	390
24	20	1¼ x 5½	7	545
30	28	1¼ x 6½	7	545
36	32	1½ x 7	6	875
42	36	1½ x 7½	6	875
48	44	1½ x 8	6	875
54	44	1¾ x 8½	5	1550

B. DUCTILE IRON FITTINGS: All fittings shall be new. Previously used or refurbished fittings will not be allowed.

1. DUCTILE IRON FITTINGS

- a. Fitting from 4-inch through 16-inch in size will be compact ductile iron cast in accordance with ANSI/AWWA C153/A 21.53 with mechanical joint bells. Bolts, nuts and gaskets shall be in accordance with requirements of ANSI/AWWA C153/A 21.53. The working pressure rating shall be 350 P.S.I. Ductile iron fittings shall be coated and lined in accordance with require requirements of ANSI/AWWA C104/A21.4. Mechanical joint glands shall be ductile iron in accordance with ANSI/AWWA C111/A 21.11. When reference is made to ANSI/AWWA Standards, the latest revisions apply. Only those fittings and accessories that are of domestic (USA) manufacture will be acceptable.
- b. All fittings shall be furnished with all joint material (bolts, nuts, gaskets and glands) complete, ready for installation. Nuts, bolts and gaskets for flange fittings and blind flanges shall be designed to withstand the design and test pressures for the pipe.

- c. All fittings shall have distinctly cast upon them the manufacturer's identification, pressure rating, nominal diameter and the number of degrees or fraction of a circle on all bends. Ductile iron fittings shall have the letters "DI" or "DUCTILE" cast on them. Only castings that have been poured in a foundry located in the USA will be allowed and the Contractor shall provide an affidavit to prove the origin of those fittings.

PART 3 – EXECUTION

3.01 HANDLING PIPE AND FITTINGS

- A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe or coatings. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before installation, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the Engineer.
- B. All pipe and fittings shall be subjected to a careful inspection and hammer test just prior to being installed.
- C. If any defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the Owner.

3.02 UNDERGROUND PIPE INSTALLATION

- A. **Alignment and Grade:** The pipelines shall be laid and maintained to lines and grades established by the Drawings and Specifications, with fittings, valves and hydrants at the required locations unless otherwise approved by the Engineer. Valve-operating stems shall be oriented to allow proper operation. Hydrants shall be installed plumb.
- B. **Underground Conflicts:** Prior to excavation, investigation shall be made to the extent necessary to determine the location of existing underground structures and conflicts. Care shall be exercised to avoid damage to existing structures. When obstructions that are not shown on the drawings are encountered during the progress of the work and interfere so that an alteration of the Drawings is required, the Engineer will alter the Drawings or order a deviation in line and grade or arrange for removal, relocation, or reconstruction of the obstructions. When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary, with the approval of the Engineer, to provide clearance as required by federal, state, or local regulations or as deemed necessary by the Engineer to prevent future damage or contamination of either structure.

C. Trench Construction:

1. Trench preparation shall proceed in advance of pipe installation for only as far as necessary to allow proper pipe installation. The width of the trench at the top of the pipe shall be ample to permit the pipe to be laid and joined properly and allow the backfill to be placed as specified.
2. Holes for the bells shall be provided at each joint but shall not be larger than necessary for joint assembly and assurance that the pipe barrel will lie flat on the trench bottom. Other than noted previously, the trench bottom shall be true and even in order to provide support for the full length of the pipe barrel, except that slight depression may be provided to allow withdrawal of pipe slings or other lifting-tackle.
3. When excavation of rock is encountered, all rock shall be removed to provide a clearance of at least 6-inches below and on each side of all pipe, valves, and fittings for pipe sizes 24 inches or smaller, and 9 inches for pipe 30 inches and larger. When excavation is completed, a bed of sand, crushed stone or earth that is free from stones, large clods, or frozen earth shall be placed on the bottom of the trench to the previously mentioned depths, leveled, and tamped. These clearances and bedding procedures shall also be observed for pieces of concrete or masonry and other debris or subterranean structures, such as masonry walls, piers, or foundations that may be encountered during excavation.
4. This installation procedure shall be followed when gravel formations containing loose boulders greater than 8 inches in diameter are encountered. In all cases, the specified clearances shall be maintained between the bottom of all pipe and appurtenances and any part, projection, or point of rock, boulder, or stones of sufficient size and placement which, in the opinion of the Engineer could cause fulcrum point.
5. Should the trench pass over a sewer or other previous excavation, the trench bottom shall be sufficiently compacted to provide support equal to that of the native soil or conform to other regulatory requirements in a manner that will prevent damage to the existing installation.
6. When the subgrade is found to be unstable or to include ashes, cinders, refuse, organic material, or other unsuitable material, such material shall be removed, to a minimum of at least 3 inches, or to the depth ordered by the Engineer and replaced under the directions of the Engineer with clean, stable backfill material. The bedding shall be consolidated and leveled in order that the pipe may be installed as specified.
7. When the bottom of the trench or the subgrade is found to consist of material that is unstable to such a degree that, in the judgment of the Engineer it cannot be removed, a foundation for the pipe and/or

appurtenance shall be constructed using piling, timber, concrete, or other materials at the direction of the Engineer.

3.03 PIPE INSTALLATION

- A. Proper implements, tools, and facilities shall be provided and used for the safe and convenient performance of the work. All pipe, fittings, valves, and hydrants shall be lowered carefully into the trench by means of a derrick, ropes, or other suitable tools or equipment in such a manner as to prevent damage to pipeline material and protective coatings and linings. Under no circumstances shall pipeline materials be dropped off or dumped into the trench. The trench should be dewatered prior to installation of the pipe.
- B. All pipe fittings, valves, hydrants, and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the engineer who may prescribe corrective repairs or reject the materials.
- C. All lumps, blisters, and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and be free from dirt, sand, grit, or any foreign material before the pipe is laid.
- D. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. During laying operations, no debris, tools, clothing, or other materials shall be placed in the pipe.
- E. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.
- F. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the Engineer. When practical, the plug shall remain in place until the trench is pumped completely dry. Care shall be taken to prevent pipe flotation should the trench fill with water.
- G. Trench width at the top of pipe, bedding conditions, and backfill placement and compaction shall be such that design loadings on the pipe will not be exceeded.
- H. Joint Assembly: Pipe joints shall be assembled in accordance with the Manufacturer's instructions and the requirements of ANSI/AWWA C600.
- I. Pipe Deflection: When it is necessary to deflect pipe from a straight line in either the vertical or horizontal plane, or where long radius curves are permitted, the amount of deflection shall not exceed that shown in ANSI/AWWA C600.

- J. Pipe Cutting: Cutting pipe for the insertion of valves, fittings, or closure pieces shall be done in a neat, workmanlike manner without creating damage to the pipe or lining. Ductile cast iron may be cut using an abrasive pipe saw, rotary wheel cutter, guillotine pipe saw, milling wheel saw, or oxyacetylene torch. Cut ends and rough edges shall be ground smooth and for push-on joint connections, the cut end shall be beveled.
- K. Thrust Restraint:
 - 1. All plugs, caps, tees, and bends shall be suitably restrained by attaching clamps or restrained joints as specified.
 - 2. Thrust-restraint design pressure shall be equal to the test pressure of the line.
 - 3. Restrained push-on joints, mechanical joints utilizing approved joint restraints shall be used in place of concrete backing. Tie rods clamps, or other components of dissimilar metal shall be protected against corrosion by hand application of a bituminous coating or by encasement of the entire assembly with 8-mil thick, loose polyethylene film in accordance with ANSI/AWWA C105.

3.04 ABOVE GROUND PIPE INSTALLATION

- A. Install pipe in horizontal or vertical planes, parallel or perpendicular to building surfaces unless otherwise shown. Support pipe and fittings to prevent strain on joints, valves and equipment. Install flanged joints so that contact faces bear uniformly on the gasket. Tighten bolts with relatively uniform stress.

3.05 PREPARATION PRIOR TO MAKING CONNECTIONS INTO EXISTING PIPING SYSTEMS

- A. Approximate locations for existing piping systems are shown in the construction documents. Prior to making connections into existing piping systems, the Contractor shall:
 - 1. Field – verify location, size, piping material and piping system of the existing pipe.
 - 2. Obtain all required fittings, which may include saddles, sleeve type couplings, flanges, tees, or others as shown in the construction documents.
 - 3. Have installed all temporary pumps and/or pipes in accordance with established connection plans.
- B. Unless otherwise approved, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

3.06 PIPE SYSTEM CONNECTIONS

- A. Pipe connections shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines and as indicated in the construction documents. Pipe connections to structures shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines.

3.07 TAPPING FOR POTABLE AND NON-POTABLE WATER APPLICATIONS

- A. Tapping shall be performed using standard tapping saddles for use on ductile iron piping. Tapping shall be performed only with use of tap saddles or sleeves. **NO DIRECT TAPPING WILL BE PERMITTED.** Steel body tapping sleeves shall be JCM Industries Inc., JCM 412 or Smith-Blair 622. All steel body tapping sleeves shall have heavy welded ASTM A 285, Grade C steel body, stainless steel bolts, manufacturer's epoxy coated body, and 3/4-inch bronze test plug.
- B. All connections requiring a larger diameter than that recommended by the pipe supplier, shall be made with a pipe connection as specified and indicated on the drawings.
- C. Taps may be performed while the pipeline is filled with water and under pressure ('wet' tap), or when the pipeline is not filled with water and not under pressure ('dry' tap).

3.08 PIGGING, FLUSHING AND CLEANING

- A. All existing and proposed mains shall be pigged, cleaned and flushed to remove all sand and other foreign matter. The Contractor shall be responsible for developing a pigging and flushing plan to be submitted to the Engineer for approval prior to pigging and flushing. The Contractor is responsible for providing the required water and pressure to push the pig through the line. The cost of this water shall be included with the pigging cost in the piping bid items. The Contractor shall dispose of all water used pigging and for flushing without causing a nuisance or property damage.
- B. Pigs shall be of sufficient size to clear the pipelines of any sand, debris and construction materials. In addition, Engineer approval is required prior to placing the pipeline into service to ensure that the pipeline has been sufficiently cleaned of any sand and debris. The Contractor shall be required to re-apply a series of individual swabs in varying diameters and/or densities as required, to attain proper cleanliness of the pipeline. Pigs for existing mains shall be scrubbing pigs. Pigs for all proposed piping shall be polyurethane of varying dimensions, coatings, and densities (poly pig) determined by:
 - 1. The particulars of the system to be cleaned.
 - 2. The recommendation of the Design Engineer.

3. The recommendation of the manufacturer of the poly pig
4. The recommendation of the Contractor whose specialty is in the use and application of the poly pig for cleaning the piping systems.
5. application of the poly pig for cleaning the piping systems.

3.09 STERILIZATION

- A. Before the system is put into operation, all water mains and appurtenances and any item of new construction with which the water comes in contact, shall be thoroughly sterilized in accordance with AWWA C651.
- B. Sterilizing Agent
 1. The sterilizing agent shall be liquid chlorine, sodium hypochlorite solution conforming to Federal Specification 0-S-602B, Grade D, or dry hypochlorite, commonly known as "HTH" or "Perchloron".
- C. Flushing System
 1. Prior to the application of the sterilization agent, all mains shall be thoroughly flushed. Flushing shall continue until a clean, clear stream of water flows from the hydrants. Where hydrants are not available for flushing, such flushing shall be accomplished at the installed blow off devices generally at the ends of the lines.
- D. Sterilization Procedure
 1. All piping, valves, fittings and all other appurtenances shall be sterilized with water containing a minimum chlorine concentration of 75 ppm at any point in the system. This solution shall then remain in the distribution system for a minimum contact period of eight (8) hours and never more than 24 hours before it is flushed out. All valves in the lines being sterilized shall be opened and closed several times during the contact period.
- E. Residual Chlorine Tests
 1. After the sterilization outlined above has been accomplished, flushing shall continue until free residual chlorine tests not less than 0.2 ppm nor more than 3.0 ppm. Residual chlorine test shall be in accordance with standard methods using a standard DPD test set.
- F. Bacterial Tests
 1. After the water system has been sterilized and thoroughly flushed as specified herein, City of Clearwater Water Division shall take samples of water from remote points of the distribution system in suitable sterilized containers. The City shall forward the samples to a laboratory certified by the Florida State Board of Health for bacterial examination in accordance with AWWA C651. If tests of such samples indicate the presence of coliform organisms, the sterilization as outlined above shall be repeated until tests indicate the absence

of such pollution. The bacterial tests shall be satisfactorily completed before the system is placed in operation and it shall be the Contractor's responsibility to perform the sterilization as outlined above.

2. If methods of sterilization differ materially from those outlined above, such methods shall be in accordance with directives of the Florida State Board of Health and all methods employed shall have the approval of that agency. Definite instructions as to the collection and shipment of samples shall be secured from the laboratory prior to sterilization and shall be followed in all respects. The City of Clearwater shall secure clearance of the water main from the Florida Department of Environmental Protection before the water distribution system is put into operation.

3.10 PRESSURE AND LEAKAGE TESTS

A. Pressure Testing:

1. The Contractor shall backfill all pipe and thrust blocking before pressure testing unless the Project Representative directs certain joints or connections left uncovered. Where thrust blocking is provided the pressure test shall not be made until at least five (5) days after the thrust blocking has been installed. A high early strength concrete may be used to reduce this time.
2. All newly laid pipe, including fitting and valves shall be pressure tested in accordance with the latest edition of AWWA C-600. The duration of each such test will be at least two hours.
3. Each valved section of pipe shall be slowly filled with water and a pump shall be hooked to the pipe in a manner satisfactory to the Project Representative to supply the test pressure of 150 psi. The pump, pipe connection and all necessary apparatus shall be furnished by the Contractor. The gauges used shall be furnished by the Contractor. The Contractor shall, upon request of the Project Representative, furnish to the Utilities Department certified test data for pressure gauges used for pressure testing.
4. Before applying the specified test pressure, all air shall be expelled from the pipe. Permanent air relief valves shall be located as shown on the plans. If air relief valves are not furnished the Contractor shall install corporation cocks for this purpose.
5. All exposed pipe, fittings, valves, joints and appurtenances shall be carefully examined during the open-trench test. Any cracked or defective pipe, fittings, valves or appurtenances discovered in consequence of this test shall be removed and replaced with acceptable material and the test shall be repeated to the satisfaction of the Project Representative.

B. Leakage Test:

1. A leakage test shall be conducted after the pressure test has been satisfactorily completed. The Contractor shall, as before, furnish all pumps, pipe, connections and other items required to satisfactorily complete the leakage test. The leakage test shall have a duration of two hours at the pressure specified for the pressure test. No pipe installation will be accepted if the leakage is greater than that determined by the formula for mechanical and push-on joints:

$$L = \frac{SDP^{1/2}}{148,200}$$

L= Allowable leakage [gph]
S= Length of pipe tested [feet]
D= Nominal diameter of pipe [inches]
P= Average pressure during test [psig]

2. The Project Representative, or his duly authorized representative, shall witness these tests. The Contractor shall be responsible for finding and repairing leaks. No additional cost may be incurred by the Owner due to repairs because of failure of either test. The Project Representative has the authority to determine the number of repairs that will be made within a given length of pipe and has the right to request the Contractor to remove and relay a section of pipe if such does not comply with the established leakage rates as shown in the following table:

**ALLOWABLE LEAKAGE IN GALLONS PER HOUR
(Test Pressure = 150 psi)**

<u>Pipe Diameter</u>	<u>Leakage per 1,000 feet</u>
3	0.25
4	0.33
6	0.50
8	0.66
10	0.83
12	0.99
16	1.32

- C. Notice of Test: The Contractor shall give the Owner 48 hours advance notice of the time when the installation is ready for hydrostatic testing.

END OF SECTION

**SECTION 15065
TRACER WIRE**

PART 1 - GENERAL

1.01 TRACER WIRE FOR PIPELINES

- A. All pipe (HDPE, PVC and DI) 4-inches and greater installed by open cut shall have two (2) 12-gauge minimum solid or stranded copper locator wire taped to the top of the pipe at intervals no greater than 4-feet.
- B. All pipe (HDPE, PVC or DI) installed by directional bore shall have (2) 10-gauge high-carbon steel inner core reinforcement directional drilling tracer wires taped to the top of the pipe at intervals no greater than 4-feet. The tracer wire shall be Copperhead Extra High Strength copper-clad steel tracer wire as manufactured by Copperhead Industries or Pro-Trace HD-CCS PE45 tracer wire manufactured by Pro-Line Safety Products Company or approved equal.
- C. All potable water service lines will have one (1) 12-gauge minimum solid or stranded copper locator wire installed together with the service line in a PVC casing pipe.
- D. The locator wires shall have colored insulation matching the type of service provided in the main and be acceptable for direct burial.
- E. All splices of the wires shall be made with watertight shrink wrap connections, as approved by the Engineer.
- F. The wires shall each be continuous throughout the project, with splices made only by methods approved by the Project Representative.
- G. The wire is to be tied to all valves, tees and elbows.
- H. The locator wires shall be brought up to the surface through a 2-inch PVC pipe.
- I. The locator wires shall be brought up into all valve boxes with enough slack provided to extend 10 to 12 inches out of each box and installed as shown in the Standard Details.
- J. Contractor shall perform a 12-volt DC electrical continuity test on each of the wires. Test each wire with both positive and negative charge. No more than one volt of loss per 1000 feet of wire will be acceptable. The locator wire system shall pass the 12-volt DC electrical continuity test for at least one wire prior to

final acceptance of the pipeline. Any cuts or breaks in the wire shall be repaired by the Contractor at his expense.

- K. The locator wire shall be tested by the Owner at the time of pressure testing. If this test fails, the Contractor is responsible for repairing the locator wire and the pressure test will be rescheduled when the wire passes the continuity test.

1.02 ALARMING TAPE

- A. Provide underground warning tape constructed of heavy gage 0.004-inch polyethylene film to identify all buried utilities except 3-inch and smaller irrigation pipe. Provide 6-inch wide tape as follows:

<u>Film Legend</u>	<u>Film Color</u>
Electric line below	Red
Telephone line below	Orange
Water line below	Blue
Raw Water	Olive Green
Sewer line below	Green
Nonpotable water below	Brown
Reclaimed water below	Purple (Pantone 522C)

- 1. Install tape directly above each buried utility at a depth of 18-inches below final grade.

PART 2 - PRODUCTS

2.01 12-GAUGE EXTRA HIGH STRENGTH HARD DRAWN TRACER WIRE

A. Conductor Specifications

- 1. Material Description: Copperweld® Copper-clad steel wire composed of a steel core with a uniform and continuous copper cladding thoroughly bonded to the steel throughout.
 - a. Cladding: The steel and copper interface must have a metallurgical bond achieved through a high heat and pressure bonding process. Established process for porosity-free material.
 - b. Steel: Extra High Strength with 0.54 carbon or greater. Verified to meet required mechanical properties.

- c. Copper: UNS-C10200; OF Copper according to ASTM B-170 (latest revision). High conductivity, oxygen free copper to achieve optimal signal performance.
- 2. Surface Condition: Wire surface shall be free of any defects, including flakes, grooves, pits, and voids. Wire surface shall be smooth, bright and shiny, and free of excessive copper dust and residual drawing lubricants.
- 3. Physical, Mechanical, and Electrical Properties

The wire shall conform to the properties listed in Table 1.

TABLE 1: Physical, Mechanical, and Electrical Properties

#12 CCS 1055 Hard Drawn 21% Conductivity	CCS Conductor
Conductor Size	12 AWG
Conductor Type	Copper Clad Steel (CCS)
Temper	Hard Drawn (HD)
Average Break Load	1150 lbs.
Minimum Tensile Strength	200,000 psi
Minimum Elongation	1.0%
Copper Thickness (% of Diameter)	3.0%
Minimum Copper Weight	13%
Nominal DC Resistance (ohms/1000 ft.)	7.5648

**Diameter tolerances: ± 1%*

B. Insulating Jacket Specifications

- 1. Material Description: insulating jacket is comprised of a co-polymer high molecular weight natural high density polyethylene (HDPE) designed specifically for high-speed copper wire insulating. It contains the required levels and types of primary antioxidant and metal deactivator additives to satisfy most Wire and Cable industry requirements. HDPE material will be produced with an excellent balance of surface smoothness, processing ease, tensile and elongation properties, abrasion toughness, environmental stress crack, thermal stress crack resistance, and electrical consistency.
- 2. Physical, Mechanical, and Electrical Properties

The wire shall conform to the properties listed in Table 2.

TABLE 2: Physical, Mechanical, and Electrical Properties

High Density Polyethylene Insulator	Value
Density (ASTM D 792)	0.943 g/cc
Bulk Density (ASTM D 1895)	0.58 g/cc
Melt Index (ASTM D 1238/E)	0.70 dg/min
Tensile-Yield (ASTM D 638)	4300 psi
Tensile-Ultimate (ASTM D 638)	2900 psi
Tensile-Elongation (ASTM D 638)	850%
Flexural Modulus (ASTM D 790/1)	120,000 psi
Hardness (ASTM D 2240)	63 Shore D
Environmental Stress-Crack (ASTM D 1693/B)	F20 > 48 h
Thermal Stress-Crack (ASTM D2951)	F0 > 1000 h
Brittleness Temperature (ASTM D 746)	< -95° F
Melting Point (DSC) (ASTM D 3417)	262° F
Softening Point (Vicat) (ASTM D 1525)	250° F
Oxidative Induction Time (ASTM D 3895)	> 50 min. @ 200° C
Dielectric Constant (ASTM D 1531)	2.34 @ 1MHz
Dissipation Factor (ASTM D 1531)	0.00007 @ 1 MHz
Volume Resistivity (ASTM D 257)	5 x 10 ¹⁷ ohm-cm
Dielectric Strength (ASTM D 3755)	1000 volts @ 20 mils

END OF SECTION

**SECTION 15100
VALVES AND APPURTENANCES**

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install complete and ready for operation all valves and appurtenances as shown on the Drawings and as specified herein.
- B. All valves and appurtenances shall be of the size shown on the Drawings and to the extent possible, all equipment of the same type shall be from one manufacturer.
- C. All valves and appurtenances shall have the name of the maker and the working pressure for which they are designed cast in raised letters upon some appropriate part of the body.
- D. The equipment shall include, but not be limited to, the following:
 - 1. Gate Valves
 - 2. Valve Boxes
 - 3. Service Saddles

1.02 HANDLING

- A. All valves, unless otherwise directed, shall be loaded and unloaded by lifting, and under no circumstances shall valves be dropped, skidded, or rolled. Valves shall not be stacked or placed under pipe, fittings or other valves in such a manner that damage could result.
- B. Slings, hooks, or tongs used for lifting shall be padded in such a manner as to prevent damage to exterior surface or interior linings and valve components. If any part of the valve's coating, lining or components is damaged, the repairs or replacement shall be made by the Contractor at his expense and in a manner satisfactory to the Engineer prior to attempting installation of such valves.
- C. Only new valves will be allowed for installation and all valves shall be stored in a manner that they won't be damaged and kept free of dirt, mud, or other foreign matter that will be deemed detrimental to the proper performance of the valve.

1.03 INSTALLATION

- A. Valves shall be set and joined to the pipe and each type of joint as described in Section 15062 and this Section of these specifications.
- B. All valves shall be permanently stamped or tagged with stainless steel tags on the extension stem which differentiate reclaimed water valves from potable water valves.
- C. Cast iron valve boxes shall be firmly supported, maintained centered and plumb over the operating nut of the valve and set in a 2-foot by 2-foot by 6-inches thick concrete collar as shown on standard details. The box cover shall be flush with the surface of the finished pavement. All box lids shall be painted to type of service.

1.04 DESCRIPTION OF SYSTEMS

- A. All of the equipment and materials specified herein are intended to be standard for use in controlling the flow of reclaimed water.

1.05 QUALIFICATIONS

- A. All of the types of valves and appurtenances shall be products of well established reputable firms who are fully experienced, reputable and qualified in the manufacture of the particular equipment to be furnished. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these Specifications as applicable.

1.06 TOOLS

- A. Special tools, if required for normal operation and maintenance shall be supplied with the equipment.

PART 2 – PRODUCTS

2.01 RESILIENT SEATED GATE VALVES

- A. Gate Valves 4 in. – 12 in.
 - 1. Valves 4 in. – 12 in. in size shall be of a resilient wedge design. The valve shall have a cold water rated working pressure of 250 psig. All cast ferrous components shall be ductile iron and shall be manufactured in compliance with the latest edition of ANSI/AWWA C515. The valve shall also be UL Listed and FM Approved, in applicable configurations. All valves shall be certified to NSF/ANSI 61 and NSF/ANSI 372.

2. The valve design shall be lightweight, easy to handle, and constructed with wall thickness per Table 2, of ANSI/AWWA C515. Heavy wall and/or cast gray-iron bodies are not acceptable. The valve shall have a smooth and oversize waterway and have the marking "D.I." or "Ductile Iron" cast onto the body. The valve wedge shall be constructed of ductile iron in sizes 4 in.–12 in. All 4 in.–12 in. wedges shall be fully encapsulated with EPDM rubber and provided with male type guides and polymer guide covers.
 3. Valve stems shall be sealed by three O-rings. Two of the O-rings shall reside above the thrust collar. O-rings set in a cartridge shall not be allowed.
 4. The valve shall also be equipped with thrust washers above and below the stem thrust collar for reduced operating torque.
 5. All exterior valve body bolting shall be Type 304 stainless steel and shall be provided with hexagonal heads with dimensions conforming to ANSI B18.2.1. Metric size and/or socket head cap screws, or bolts, are not allowed. The operating nut shall be 2 in. square and shall be constructed of ductile iron fitted to a square tapered stem to help ensure even distribution of input torque. All body gaskets shall be of the pressure energized O-ring style design.
 6. All internal and external ferrous surfaces of the valve body and bonnet shall have fusion-bonded epoxy coating, complying with ANSI/AWWA C550.
- B. Gate Valves 14 in. – 66 in
1. This Section supersedes Specification 502-3 of Section IV – Technical Specifications.
 2. Valves 14 in.–66 in. shall be resilient wedge type rated for 250 psig cold water working pressure. All cast ferrous components shall be ductile iron, ASTM A536. Valves 14 in. - 66 in. shall meet or exceed all applicable requirements of ANSI/AWWA C515. The words "Ductile Iron" or "D.I." shall be cast on the valve. The wedge shall be constructed of ductile iron fully encapsulated with EPDM rubber.
 3. The wedge shall be symmetrical and seal equally well with flow in either direction. Wedge guides shall be equipped with male guide covers. The use of auxiliary bronze rollers and plow-style shoes are not acceptable. The wedge nut shall be independent of the wedge and held in place on three sides by the wedge to prevent possible misalignment. Valves 16 in. and larger shall be furnished with spur gears for vertical installations and bevel gears for horizontal installations.

4. Body bolting material shall be 304 stainless steel unless otherwise specified. Bolts may have either regular square or hexagonal shaped heads with dimensions conforming to ANSI B18.2.1. Metric size and/or socket head cap screws, or bolts, are not allowed. The operating nut shall be constructed of ductile iron. All gaskets shall be pressure energized O-ring type seals. Stem shall be sealed by three O-rings. O-rings set in a cartridge shall not be allowed. The valve shall have thrust washers located with 1 above and 1 below the thrust collar to assist operation of the valve. All internal and external surfaces of the valve body and bonnet shall have an epoxy coating, complying with ANSI/AWWA C550. Valves shall be AMERICAN Flow Control's Series 2500 Resilient Wedge Gate Valve.

2.02 VALVE BOXES

- A. Valve boxes shall be of standard extension design and manufacture and shall be made of cast iron. No PVC Risers or Derisers are allowed as part of a valve box assembly. They are to be 3-piece valve box assemblies. The lower part of the assembly can be ordered in various heights to accommodate different depths. Suitable sizes of valve boxes and extension pieces shall be provided where shown. The valve box cover shall be of cast iron. Valve boxes and their installation shall be included in the bid price for valves. Refer to City Index No. 402; Sheet 1 of 5 & Sheet 2 of 5 for potable water valve pad detail, and City Index No. 502; Sheet 1 of 2 & Sheet 2 of 2 for reclaimed water valve boxes and pad detail.

2.03 SERVICE SADDLES

- A. Service saddles shall be used on all service taps to 4-inch P.V.C. water main. The largest service connection allowable on 4-inch main shall be 1-1/2-inch. Service saddles shall be used on all 2-inch service connections to 6-inch and larger mains. Service saddles (JCM 406 series or Ford FC 202 series) shall be wide bodied ductile iron with epoxy or nylon coating and shall have stainless steel straps.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. All valves and appurtenances shall be installed in the location shown, true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the Engineer before they are installed.
- B. After installation, all valves and appurtenances shall be tested at least two hours at the working pressure corresponding to the class of pipe, unless a different test pressure is specified. If any joint proves to be defective, it shall be repaired to the satisfaction of the Engineer.

- C. Install all floor boxes, brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings that are in masonry floors or walls, and install concrete inserts for hangers and supports as soon as forms are erected and before concrete is poured. Before setting these items, the Contractor shall check all plans and figures which have a direct bearing on their location and he shall be responsible for the proper location of these valves and appurtenances during the construction of the structures.
- D. Pipe for use with flexible couplings shall have plain ends as specified in the respective pipe.
- E. Alloy steel bolts and nut for flanged joints shall be made with high strength, low alloy Cor-Ten bolts, nuts and washers. Cor-Ten for mechanical joints shall be made with mild corrosion resistant alloy steel bolts and nuts. All exposed bolts shall be painted the same color as the pipe. All valves and joints to be wrapped with 8 mil. Color coded poly wrap.
- F. Prior to the installation of sleeve-type couplings, the pipe ends shall be cleaned thoroughly for a distance of 8 inches. Soapy water may be used as a gasket lubricant. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6 inches from the end, and the middle ring shall be placed on the substantial completion date unless otherwise requested by the Owner.
- G. Valve boxes with concrete collars shall be installed as shown on the Drawings. Mechanical joints shall be made in the standard manner. Valve stems shall be vertical in all cases. Place cast iron box over each stem with base bearing on compacted fill and top flush with final grade. Boxes shall have sufficient bracing to maintain alignment during backfilling. Knobs on cover shall be parallel to pipe. Remove any sand or undesirable fill from valve box.

3.02 SHOP PAINTING

- A. Ferrous surfaces of valves and appurtenances shall receive a coating of rust-inhibitive primer. All pipe connection openings shall be capped to prevent the entry of foreign matter prior to installation.
- B. All exposed piping, valves and meters shall receive one (1) primer coat of Tnemec Series 66 or equal (4-5 dry mils) and two (2) coats of Tnemec Series 72 or equal (2-3 dry mils each). The color shall be blue.

3.03 INSPECTION AND TESTING

- A. Completed valves and appurtenances shall be subjected to hydrostatic pressure test as described in other sections of these specifications. All leaks in valves and appurtenances shall be repaired and lines retested as approved by the Project Representative. Prior to testing, the pipelines shall be supported in an approved manner to prevent movement during tests.

END OF SECTION