3.03 MISCELLANEOUS RESTORATION

A. Sidewalks or driveways cut or damaged by construction shall be restored in full sections or blocks to a minimum thickness of four inches. Concrete curb or curb and gutter shall be restored to the existing height and cross section in full sections or lengths between joints. RCP pipe shall be repaired or installed in accordance with manufacturer's specifications. Grassed yards, shoulders and parkways shall be restored to match the existing sections with grass sod of a type matching the existing grass.

3.04 SPECIAL REQUIREMENTS

A. The restoration of all surfaces, as described herein, disturbed by the installation of pipelines shall be completed as soon as is reasonable and practical. The complete and final restoration of both paved and shell stabilized roads within a reasonable time frame is of paramount importance. To this end, the Contractor shall, as part of his work schedule, complete the restoration of any area of road within five weeks after removing the original surface. Successful leak testing shall be performed prior to restoring any area of road. All restoration and replacement or repairs are the responsibility of the Contractor.

3.05 CLEANUP

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

3.06 MAINTENANCE OR REPAIR

A. All wearing surfaces shall be maintained by the Contractor in good order suitable for traffic prior to completion and acceptance of the work.

END OF SECTION

SECTION 02590 RIGHT-OF-ENTRY WATER SERVICES - CONSTRUCTION ON PRIVATE PROPERTY

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Where shown on the drawings and when authorized by the Owner, the Contractor shall furnish all labor, materials and equipment necessary to construct water services lines on private property from the County meter to a connection point with the customer's water system. These locations are designated as Right-of-Entry (ROE) water service sites.

B. The Contractor shall not commence work on ROE service line improvements until the right-of-entry approval is obtained by the Manatee County Property Management Division and a copy of the right-of-entry approval is provided to the Contractor.

C. The work shall include furnishing and installing a pipe, fittings, valves and appurtenances necessary to convey water from the customers water meter at the property line to the house service connection, including all restoration of laws, drives, walkways, planting beds, customer private property and other activities necessary to restore the site to a condition equal to or better than that which existed prior to construction. Three types of ROE construction are identified in this specification.

D. The contractor shall establish a work plan to install the new water service lines which results in minimal impact to customer private property features.

1.02 QUALITY ASSURANCE

A. All work on customer service lines conducted on private property shall be performed by a plumber licensed in Manatee County and experienced in furnishing and installing potable water plumbing systems.

B. The Contractor shall obtain appropriate building permits from Manatee County required to perform work on all customer service lines.

C. Upon completion of ROE water service construction on private property, the Contractor shall obtain a building department inspection and approval to place the system into operation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pipe, fittings valves and appurtenances: All pipe, fittings and appurtenances shall be furnished and installed to meet the requirements of this project and the requirements of the Florida Building Code (plumbing).

B. If required by specific ROE site conditions, the backflow preventer and thermal expansion tank shall be in accordance with Manatee County 2009 Utility Standards, latest edition.

PART 3 EXECUTION

3.01 PLANNING AND COORDINATION

A. The Contractor shall coordinate with each property owner to establish a reasonable plan and location for installation of each new ROE customer water service line.

B. The Contractor shall schedule the installation of the new ROE water service lines to coordinate with the installation of the new County water line, water service and water meter as a part of this project. The Contactor shall carefully schedule to work of sub-contractor licensed plumbers to insure that customer water service is not interrupted for longer than the period stipulated in the specifications.

C. The Contractor shall perform exploratory work and have all materials in-hand at the commencement of construction to reduce the risk of delays in completion of the work associated with lack of materials

D. The Contractor shall schedule the inspection of the work by Manatee County Building officials as necessary to allow for timely use of the new customer service.

3.02 NEW CUSTOMER ROE WATER SERVICE LINE CONSTRUCTION

A. The Contractor shall install new ROE 1 inch diameter buried water service lines at a location on the customers property that is agreed to by the property owner, minimizes impact to existing site features and property owner private property and which most directly connects the new water meter location with the connection point for the customers water service.

B. The new ROE water service connection on private property shall include new customer service line from the new meter location to the agreed upon point of connection with the customer house water service line; piping, fittings, valves and appurtenances; excavation and backfill as required; restoration of customer grass, shrubs, drives, walkways and other customer properties damaged by construction and related work required to result in a new customer service line system that meets code requirements.

C. The drawings depict the property locations where new ROE customer service construction is to take place. There are three basic categories of ROE water service construction which are described below. Payment for each type of Right-of-Entry water service connection shall be as stipulated in the measurement and payment section.

1. Type I ROE Service Connection - Short Service Line Extension: This work will generally include extension of a new customer service line from the new meter location in the right-of-way to the old meter location and connection to the existing customer service line requiring the construction of up to 30 lf of new customer service piping, complete.
2. Type II ROE Service Connection - Long Service Line Extension: This work will generally include extension of a new customer service line from the new meter location in the right-of-way to the old meter location and connection to the existing customer service line requiring the construction of up to 70 lf of new customer service piping, complete.
3. Type III ROE Service Connection - Complex: This work will generally include extension of a new customer water service line from the new meter location in the right-of-way to a connection at the customer water service entrance to the structure in question and will include a backflow preventer, thermal expansion tank (located as approved by the owner), and the installation of vacuum breakers on all outside hose bib connections. Service line piping construction will likely exceed 70 linear feet and connections to existing water service entrance may be located on the back yard side of the structure in question.

3.03 RESTORATION

A. Any existing paving, sidewalk, landscape or private property facilities damaged during construction by the Contractor shall be restored or replaced as directed by the Engineer.

END OF SECTION

SECTION 02601 MODIFICATIONS TO EXISTING STRUCTURES, PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Modification or conversion of existing structures as required by the construction drawings. Existing piping and equipment removal, dismantling and disposal, as required.

PART 2 PRODUCTS

2.01 PRODUCTS

A. Epoxy mortar shall be fiberglass fiber mixed with an epoxy filler.

B. Nonshrink grout shall be a sand-cement, non-metallic formulation, having a 28-day strength of 4,000 psi and 0.0 percent shrinkage per ASTM C-1090.

C. Manhole liners to be installed in existing manholes and wet wells shall be spray-applied, monolithic, reinforced urethane resin. Urethane resin-based manhole liner material shall be resistant to hydrogen sulfide gas, and other common contents found in a sanitary sewer environment.

D. Approved manhole liner products are SprayWall, Raven 405, Green Monster, and Sauereisen.

PART 3 EXECUTION

3.01 GENERAL MODIFICATION WORK

A. Cut, repair, reuse, excavate, demolish, or otherwise remove parts of the existing structures or appurtenances, as indicated on the construction drawings, or as necessary to complete the work as required. Dispose of surplus materials resulting from the above work in an approved manner. The work shall include all necessary cutting and bending of reinforcing steel, structural steel, or miscellaneous metal work found embedded in the existing structures.

B. Dismantle and remove all existing equipment, piping, and other appurtenances required for the completion of the work. Where called for or required, cut existing pipelines for the purpose of making connections thereto.

C. Anchor bolts for equipment and structural steel to be removed shall be cut off one inch below the concrete surface. Surfaces shall then be refinished using non-shrink grout or epoxy mortar or as indicated on the construction drawings. Repairs to the interior surfaces of existing concrete structures in sanitary sewers shall be made with epoxy mortar. Repairs to be made on other existing concrete surfaces using non-shrink grout shall be made using a bonding agent such as Acrylbond by Concrete Producers Solutions or an equal approved by the County. Remove all dirt, curing compounds, sealers, paint, rust, or other foreign material, and etch with muriatic acid solution. Flush with clean water and while still damp, apply a coating of the bonding agent. Place the new grout patch onto the treated area immediately.

D. At the time that a new connection is made to an existing pipeline, additional new piping,

extending to and including a new valve, shall be installed. Pipe restraint devices, if required, shall also be installed as required. At the time when a new potable or reclaimed water service is installed, a pipe locator tracer wire shall be installed and connected to the tracer wire at the main.

E. No existing structure, equipment, or appurtenance shall be shifted, cut, removed, or otherwise altered except with the express approval of and only to the extent approved by the County. All existing valve boxes, fire hydrants, air release valve cabinets, and manholes shall be relocated to meet the new finished grade elevations after construction.

F. When removing materials or portions of existing utility pipelines or structures or when making openings in walls and partitions, take all precautions and use all necessary barriers and other protective devices so as not to damage the structures beyond the limits necessary for the new work, and not to damage the structures or contents by falling or flying debris. Unless otherwise approved by the County, saw-cutting, rotary core-boring, or line drilling will be required in removing material from existing concrete structures or pipes.

G. Materials and equipment removed in the course of making alterations and additions shall remain the property of the County, except that items not salvageable, as determined by the County, shall be disposed of off the work site.

H. All alterations to existing utility pipes and structures shall be done at such time and in such a manner as to comply with the approved time schedule. Before any part of the work is started, all tools, equipment, and materials shall be assembled and made ready so that the work can be completed without delays.

I. All cutting of existing concrete or other material to provide suitable bonding to new work shall be done in a manner to meet the requirements of the respective section of these Standards covering the new work. When not covered, the work shall be carried on in the manner and to the extent directed by the County or per the construction drawings.

J. Surfaces of seals visible in the completed work shall be made to match as nearly as possible the adjacent surfaces.

K. Non-shrink cementitious grout shall be used for setting wall castings, sleeves, leveling pump bases, and doweling anchors into existing concrete and elsewhere as shown on the construction drawings. The surface to which grout is to be applied shall be wetted to facilitate good bonding.

L. Where necessary or required for the purpose of making connections; cut existing pipelines in a manner to provide an approved joint. Where required, use flanges, couplings, or adapters, all as required.

M. Provide flumes, hoses, piping, pumps and well points, and other related items to divert or provide suitable plugs, bulkheads, or other means to hold back the flow of water or other liquids, all as required in the performance of the work.

N. Care shall be taken not to damage any part of existing buildings or foundations or outside structures.

O. Prior to entering confined spaces in sanitary sewer structures, conduct an evaluation of the atmosphere within, in accordance with local, state, and federal regulations. Provide ventilation equipment and other equipment as required to assure safe working conditions.

3.02 CONNECTING TO EXISTING PIPING AND EQUIPMENT

A. Verify exact location, material, alignment, joint, etc. of existing piping and equipment prior to making the connections called out in the construction drawings. The verifications shall be performed with adequate time to correct any potential alignment or other problems prior to the actual time of connection. The County Inspector must be present for all tie-ins for a visual inspection.

3.03 REMOVAL AND ABANDONMENT OF ASBESTOS CEMENT PIPE AND APPURTENANCES

A. All work associated with the removal or abandonment of existing asbestos cement pipe and appurtenances shall be performed by a licensed asbestos removal Contractor registered in the State of Florida.

B. The asbestos Contractor shall contact the appropriate regulatory agencies prior to removal or abandonment of any asbestos material and shall obtain all required permits and licenses and issue all required notices. The cost for all fees associated with permits, licenses and notices to the governing regulatory agencies, shall be borne by the asbestos Contractor.

C. All work associated with removal or abandonment of asbestos cement pipe and appurtenances shall be performed in accordance with the standards listed below and all other applicable local, State, or Federal standards.
1. Florida Administrative Code, Chapter 62-257, ASBESTOS PROGRAM.
2. Title 40 CFR, Part 61, Subpart M, NATIONAL EMISSION STANDARD FOR ASBESTOS.
3. Occupational Safety and Health Act, Title 29 CFR.
4. Title 40 CFR, Part 763, ASBESTOS.
5. Florida Statute Title XXXII, Chapter 469, ASBESTOS ABATEMENT.

D. All asbestos cement pipe sections indicated on the construction drawings to be removed, and all related valves, fittings and appurtenances shall be removed in their entirety and disposed of by the asbestos Contractor in accordance with this Section. After removal of the pipelines, all excavations shall be backfilled in accordance with the applicable provisions of the Trenching and Excavation Section of these Standards. The cost of disposing of the removed materials shall be borne by the asbestos Contractor.

E. The cutting of existing asbestos-cement (A/C, a.k.a. "Transite") pipe shall be by hand tools only. No powered machine cutting is allowed. Removal of all fragments of pipe shall be double bagged prior to shipment. Longer sections of pipe removed may be shipped without double bagging. An asbestos manifest form must accompany each shipment of such pipe or pipe material waste to the Manatee County Lena Road Landfill. Prior to each shipment, a minimum of 24 hours notice to the Landfill field office (telephone 941 748 5543) is required.

3.04 IN-PLACE GROUTING OF EXISTING PIPE

A. Where water and wastewater utility pipes are to be abandoned in place, they shall be filled with a non-shrinking sand-cement grout. When such pipes are made of asbestos-cement materials, the abandonment activities shall be performed by a licensed asbestos Contractor. It is completely the Contractor's responsibility to obtain all regulatory clearances and provide documentation in cases where they have determined that an asbestos-cement pipe abandonment activity by in-place grouting does not require a licensed asbestos Contractor.

B. The ends of the pipe sections to be grout-filled shall be capped or plugged with suitable pipe fittings. The grout material shall be of suitable properties and the pumping pressure shall be such that the pipe sections are filled completely with grout.

C. The County shall be given timely notice so that the County's representative may be present to monitor all pipe grouting operations. Provide standpipes and/or additional means of visual inspection as required to determine if adequate grout material has filled the entire pipe sections.

3.05 SPRAY-APPLIED MANHOLE LINERS

A. Use a high-pressure water spray to remove all foreign material from the walls and bench of the manhole. Loose or protruding masonry materials shall be removed using a hammer and chisel. Fill any voids, holes or cracks with epoxy mortar to form a uniform surface. Place covers over all pipe openings to prevent extraneous material from entering the pipes. Block or divert sewer flow from entering the manhole. Any infiltration leaks shall be stopped by using such methods as approved by the County.

B. The liner material shall be sprayed onto the invert, bench and wall areas. The sprayed-on material shall be applied such that the entire manhole is lined with a structurally enhanced monolithic liner. The thickness of the wall liner material shall be such that it will withstand the hydraulic load generated by the surrounding groundwater table, using a factor of safety of two, and using the assumption that the groundwater table is at the level of the top of the structure. The invert and bench liner material shall be the same thickness as that required for the base of the wall.

C. Special care shall be used to provide a smooth transition between the intersecting pipelines and the manhole inverts such that flow is not impaired. Remove concrete material from the existing manhole base channel in depth to the required thickness of the new liner material.

D. No active sewer flow shall be allowed in the newly lined manhole, nor shall any vacuum tests be performed, until the liner material has had adequate time to cure, as recommended by the liner material manufacturer.

3.06 CONNECTION TO EXISTING MANHOLES

A. Where required or as indicated on the construction drawings, make connection of new pipelines to existing manhole structures. If pipe stub-outs of the correct size and position are not available, make connections by removing a portion of the manhole wall by mechanical rotary core boring. The connection between pipe and concrete manhole shall be complete with resilient seals meeting the requirements of ASTM C 923.

B. A new channel shall be formed in the manhole base by removing and reforming or by providing new concrete to convey the new flow into the existing channel in accordance with the standard requirements for new sewer manhole structures. Flow direction shall not change by more than 90 degrees within the manhole base.

C. Repair internal coating of existing manholes cored during tie-in of new sewers by applying approved coating material as listed above in accordance with the manufacturer's recommendations. If existing manhole has an internal coating other than that listed above (e.g. epoxy coating), sandblast the interior of the existing manhole and apply an approved coating in accordance with the manufacturer's recommendations.

3.07 WARRANTY FOR MANHOLE AND WETWELL LINERS

A. Install the coating systems per manufacturer's recommendation and completely protect the structure from corrosion. The liner or coating systems must extend and seal onto manhole ring, seal onto and around pipe openings, and any other protrusions, completely cover the bench and flow invert. Provide a 5-year unlimited warranty on all workmanship and products. The work includes the surface preparation and application of the coating or liner system, and shall protect the structure for at least 5 years from all leaks and from failure due to corrosion from exposure to corrosive gases such as hydrogen sulfide.

END OF SECTION

SECTION 02602 TRENCHING AND EXCAVATION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Excavate for utility pipelines, valves and fittings, manholes, utility vaults and pump stations. Dewater underground soils to elevations as required to allow the installation of pipe lines, beddings, foundations and structures. Store excavated soil materials that are suitable for use as backfill. Dispose of excavated soil materials that are either unsuitable for use as backfill or will not be required for fill on the project site. Import suitable soil materials or granular rock materials as required to provide suitable backfill, bedding or foundation materials. Place and compact bedding and foundation materials and install utility structures. Place and compact backfill materials to finished grades. Provide other materials and labor as required to complete the utility work as indicated on the construction drawings.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CLEARING AND GRUBBING

A. Clear and grub the areas within rights-of-way and utility easements where utility structures will be installed. Completely remove and dispose of all buildings, foundations, materials, rubbish, debris, trees, brush, stumps, roots, or any other obstructions on or buried near the surface of the ground. Remove roots and other obstructions to a depth of at least 12 inches below the surface.

3.02 DEWATERING

A. The construction of pipelines, structures, foundations, beddings, and the placement of backfill materials shall be in dry or dewatered subsurface soil conditions. Where the existing groundwater piezometric elevation is higher than 18 inches below the bottom of the proposed excavation, use well points, wells, pumps and other approved methods to lower the groundwater level to 18 inches below the elevation of the proposed excavation bottom. Excavation for pipelines and structures shall not proceed unless or until the existing groundwater levels have been lowered to at least 18 inches below the intended lowest elevation of the digging operation.

B. Dewatering operations shall continue while the pit is open and while structure placement and construction is taking place and while backfilling and compaction is accomplished. At all times during the construction operations, the groundwater levels shall be maintained at an elevation 18 inches below the lowest level where structures are being installed.

C. Divert surface water flows as necessary to prevent surface water from entering the open excavations.

D. Discharged flows from dewatering operations shall be disposed of in a manner consistent with US EPA, FDEP, and SWFWMD regulations.

3.03 PROTECTION OF EXISTING STRUCTURES

A. Where excavations are made and underground utility structures are constructed in close proximity to existing structures, take all reasonable precautions and measures to prevent damage to such structures. Existing building foundations and existing utility structures shall be monitored during the construction operations and any movement of these structures shall be reported to the County's authorized representative. When any movement of existing structures has been detected, immediately take any and all remedial measures required to effect the protection and prevent damage to the structures.

B. Existing structure protection measures shall include, but shall not be limited to the installation of sheet piling, or other shoring methods or materials as needed, maintenance of the groundwater piezometric elevation, and control of the vibrations from construction operations. Where existing utility pipelines or structures are situated vertically above a line from the base of the excavation pit or trench along an angle of repose of the soil, or where an existing utility crosses a trench transversely, take reasonable measures to protect and support these structures during the construction operations.

3.04 EXCAVATION

A. Excavate trenches and pits for structures to the elevations indicated on the construction drawings. Take special care to avoid over-excavating or disturbing the bottom of the trench or pit, so that the soil at the bottom of the hole remains in a naturally compacted condition. Excavate to widths sufficient to provide adequate working room to install the required structures. Do not excavate the final layer of soil to the designed grade until just before placing the bedding, foundation, pipe, structure, or masonry work required. Remove boulders, rocks, logs or any unforeseen obstacles encountered.

B. In case the foundation soil found at the bottom of the trench or pit is soft, plastic or mucky, or does not conform to the soils classification specified as suitable foundation material, over-excavation to a greater depth will be required. Soils not meeting the classification required for foundation material shall be removed to a depth at least four inches below the bottom of the pipe, bedding or structure bottom elevation. Rock, boulders or other hard or lumpy material shall be removed to a depth 12 inches below the bottom of the pipe, bedding or structure bottom elevation. Remove muck, clay or other soft material to a depth as needed to establish a firm foundation.

C. Where possible, the sides of trenches should be vertical up to at least the spring line of the installed pipe.

D. Trench excavation shall be performed in accordance with Florida Statute Title XXXIII, Chapter 553, Part III, Trench Safety Act.

3.05 BACKFILL MATERIALS

A. Bedding: Shall conform to FDOT Standard Specifications for Road and Bridge Construction, Section 901 Coarse Aggregate, and shall be either coarse aggregate of Size No. 57 or coarse sand of Size No. 9. Washed shell may be used as alternate bedding material if it meets Size No. 57 specifications.

B. Structural Fill: Shall be either soil classification A-1, A-2 or A-3, per AASHTO M-145, and shall be free of organic matter, lumps of clay or marl, muck, compressible materials, and rock exceeding 2.5 inches in diameter. Broken concrete, masonry, rubble or other similar materials shall not be used as backfill.

C. Selected Common Fill: Shall have the same material classification and requirements as

Structural Fill, as per Paragraph 2.06B above.

D. Common Fill: Shall be either soil classification A-1, A-2, A-3, A-4, A-5 or A-6, per AASHTO M-145, and shall be free of organic matter, lumps of clay or marl, muck, compressible materials and rock exceeding 2.5 inches in diameter. Broken concrete, masonry, rubble or other similar materials shall not be used as backfill.

E. Unsuitable Material: Soil classification A-7 and A-8, per AASHTO M-145, shall not be used as backfill material.

3.06 BACKFILL

A. Backfill materials shall be placed on solid, firm, naturally compacted or compacted, dry or dewatered in-place soil foundations.

B. Where over-excavation is required due to nonconforming soil classification or rocky, unstable, or otherwise undesirable soil conditions, place Structural Fill or Selected Common Fill in the over-excavated zone up to the base of the bedding material layer. Compact the over-excavated zone to a density approximately the same as the natural material into which the trench or pit was cut.

C. When backfilling in an over-excavated zone where moist or watery conditions exist, backfill shall be coarse No. 9 sand or a mixture of No. 57 coarse aggregate with either No. 9 coarse sand, A-1, or A-3 material.

D. After compaction, backfill material in the over-excavation zone shall form a solid and firm foundation on which to build up successive layers of backfill and structures.

E. Bedding materials shall be placed on solid, firm soil foundations and shall be compacted to a density approximately the same as the natural material into which the trench or pit was cut.

F. Concrete and masonry structures shall be backfilled using Structural Fill. Backfilling and compaction shall be carried up evenly on all walls of an individual structure simultaneously. The maximum allowable difference in backfill elevations shall be two feet. No backfilling shall be allowed against concrete or masonry walls until the walls and their supporting slabs have been in place at least seven days or until the specified 28-day strength has been attained. Compaction of Structural Fill shall be 98 percent of the maximum dry density of the material as determined by AASHTO T-180. The Structural Fill shall be either dried or shall have water added so that the moisture content of the material is within a range that will allow the required density to be achieved.

G. Trenching backfill for pipe installation shall be Selected Common Fill for the pipe bedding zone. The pipe bedding envelope shall begin at the level four inches, six inches, or nine inches, depending on pipe diameter, below the bottom of the pipe, and shall extend vertically up to a level 12 inches above the top of the pipe. Where the in-place soil material within the four inch, six inch, or nine inch pipe bedding zone beneath the bottom of the pipe meets the soil classification for Selected Common Fill, undercutting of the trench below the bottom of the pipe will not be required. In this case, loosen the soil in the bottom of the trench immediately below the middle third of the pipe diameter, and place the pipe upon it. Where the in-place soil material within the pipe bedding zone does not meet the soil classification for Selected Common Fill, undercutting shall be required, and the bedding zone shall be backfilled with Selected Common Fill. In this case, place the pipe bedding

material and leave it in a moderately firm uncompacted condition under the middle third of the pipe diameter, and compact the outer portions of the trench bottom to 98 percent of the maximum dry density. Soils that were over-excavated due to rocky, soft or otherwise unsuitable soil foundation conditions shall also be replaced with Selected Common Fill. Compaction of Selected Common Fill shall be 98 percent of the maximum dry density as determined by AASHTO T-180. Such backfill material shall have an optimized moisture content that will allow the required density to be achieved.

H. Pipe sections for gravity flow systems shall be laid with spigots downstream and bells upstream. Excavate for pipe bells before laying pipe. Lay pipe true to the lines and grades indicated on the construction plans. Place backfill material on both sides of the pipe and compact. Take special care to effect the filling and compaction of material in the haunch areas under the sides of the pipe.

I. For pipes that are not installed under roadways or driveways, trenching backfill for pipe installation shall be Common Fill above the pipe envelope zone, and shall be compacted to 98 percent of the maximum dry density of the material as determined by AASHTO T-180, and shall have moisture content optimized to allow the required density. For pipes that are installed under roadways or driveways, trenching backfill for pipe installation shall be Selected Common Fill above the pipe envelope zone, and shall be compacted to 98 percent of the maximum dry density of the material as determined by AASHTO T-180, and shall have moisture content optimized to allow the required density. Selected Common Backfill shall be placed in layers not to exceed 6 inches. Common Backfill shall be placed in layers not to exceed 12 inches.

J. Backfill compaction tests shall be performed every 500 feet in pipe line trenches and for every fifth structure for utility structures. Test reports shall be presented to the County Inspector.

3.07 GRADING AND CLEANING UP

A. Surplus and unsuitable soil materials not used on-site shall be removed and disposed of off-site in a manner that is consistent with state and local regulations. In no case shall surplus or unsuitable material be deposited on-site or on adjacent lands.

B. The surface of backfilled areas shall be graded smooth and true to the lines and grades indicated on the construction plans. No soft spots or uncompacted areas shall be allowed in the work.

C. Upon completion of the work, leave the work areas and all adjacent areas in a neat and presentable condition, clear of all temporary structures, rubbish and surplus materials. Pile any salvageable materials that have been removed in neat piles for pickup by County crews, unless otherwise directed.

END OF SECTION

SECTION 02603 DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install ductile iron pipe, restrained joint ductile iron pipe and cast iron or ductile iron fittings, complete, as indicated on the construction drawings.

B. Provide and install complete, all fittings and appurtenances not noted specifically on the construction Drawings as required to complete the utility system in accordance with these Standards.

PART 2 PRODUCTS

2.01 MATERIALS

A. Ductile iron pipe shall conform to AWWA C150 and AWWA C151. Pipe shall be Pressure Class 350. All ductile iron pipe used in above ground applications shall be Special Thickness Class 53. The pipe exterior coating shall be a standard 1 mil asphaltic coating per AWWA C151. All ductile iron pipe shall be clearly marked on the outside pipe barrel to readily identify it. All pipe materials used in potable water systems shall comply with NSF Standard 61.

B. Unrestrained joint pipe shall be supplied in lengths not to exceed 21 feet and shall be either the rubber-ring compression-type push-on joint or standard mechanical joint pipe as manufactured by the American Cast Iron Pipe Company, U.S. Pipe and Foundry Company, or an approved equal.

C. All fittings shall be pressure rated for 350 psi for sizes 4 to 24 inches and 250 psi for sizes 30 inches and larger and shall meet the requirements of AWWA C110 or AWWA C153.

D. Rubber gaskets shall conform to AWWA C111 for mechanical and push-on type joints and shall be Ethylene Propylene Diene Monomer (EPDM) rubber for potable water and reclaimed water pipelines. Standard gaskets shall be such as Fastite as manufactured by American Cast Iron Pipe Company, or an approved equal. Acrylonitrile butadiene (NBR) gaskets shall be used for potable water mains that are located in soil that is contaminated with low molecular-weight petroleum products or non-chlorinated organic solvents or non-aromatic organic solvents. Fluorocarbon (FKM) gaskets shall be used for potable water mains that are located in soil that is contaminated with aromatic hydrocarbons or chlorinated hydrocarbons. Fluorocarbon (FKM) gaskets shall be used for potable water mains if the soil is contaminated with aromatic hydrocarbons or chlorinated hydrocarbons, and is also contaminated with low molecular-weight petroleum products or organic solvents.

E. Water Mains and Reclaimed Water Mains: All ductile iron pipe used in water and reclaimed water systems shall have a standard thickness cement lining on the inside in accordance with AWWA C104. All ductile iron or gray iron fittings used in water and reclaimed water systems shall have standard thickness cement linings on the inside per AWWA C104 and an asphaltic exterior coating or they shall have factory-applied fusion bonded epoxy coatings both inside and outside in accordance with AWWA C550.

F. Sewer Mains: All ductile iron pipe and all ductile iron and cast iron fittings used in wastewater sewer systems shall have a factory applied fusion bonded minimum dry film thickness 40-mil Protecto 401 or 40-mil SP2000W Amine Cured Novalac ceramic epoxy lining on the inside in accordance with the manufacturer's specifications. The interior lining application is to be based on the manufacturer's recommendation for long-term exposure to raw sewage. To ensure a holiday-free lining, documentation must be provided, prior to shipment, showing each section of lined pipe has passed holiday testing at production per ASTM G62 with a minimum 10,000 volt charge. The lining shall have a minimum ten year warranty covering failure of the lining and bond failure between liner and pipe.

G. Ductile iron or cast iron pipe and fittings used in sewer systems shall have either an asphaltic coating per AWWA C151 or a factory-applied fusion-bonded epoxy exterior coating.

H. Thrust restraint devices shall be provided at all horizontal and vertical bends and fittings, in casings under roads and railroads and at other locations as indicated on the construction drawings. Thrust restraint devices shall be either concrete thrust blocks or restraining glands as manufactured by Star Pipe Products, Stargrip 3000 and 3100, Allgrip 3600, or as manufactured by EBAA Iron Sales, Megaflange, 2000 PV, or other approved equal restraining gland products. Restrained joints, where used, shall be installed at bend and fitting locations and at pipe joint locations both upstream and downstream from the bends or fittings at distances as required by these Standards. Restrained joint pipe fittings shall be designed and rated for the following pressures:

1. 350 psi for pipe sizes up to and including 24-inch diameter.
2. 250 psi for pipe sizes 30-inch diameter and above.

PART 3 EXECUTION

3.01 DETECTION

A. Pipe shall have a 3-inch wide warning tape of the proper color placed directly above the pipe 12 inches below finished grade or a 6-inch warning tape between 12 inches and 24 inches below finished grade.

B. Pipe shall have a No. 10 gauge solid, insulated wire of proper color installed along the pipe alignment as detailed in these standards.

3.02 IDENTIFICATION

A. Each length of pipe and each fitting shall be marked with the name of the manufacturer, size and class, lining type, and shall be clearly identified as ductile iron pipe. All gaskets shall be marked with the name of the manufacturer, size and proper insertion direction.

B. Pipe shall be polyethylene-wrapped blue for water mains, purple (Pantone 522 C) for reclaimed water mains and green for sewer mains, per AWWA C105. Pipe may not be entirely polyethylene wrapped if soil testing, which is performed by the Engineer of Record or the Contractor in accordance with AWWA C105, indicates that the soil at the site is not corrosive. If soil testing indicates that the soil at the site is not corrosive, polyethylene may be spiral wrapped with a six-inch minimum spacing or the ductile iron pipe (DIP) may be painted with a minimum 1-inch wide color coded stripe on the top and both sides of the DIP.

END OF SECTION

SECTION 02604 POLYETHYLENE (HDPE) PIPE AND FITTINGS 4-INCH DIAMETER AND LARGER

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install high density polyethylene (HDPE) pressure pipe, fittings and appurtenances as indicated on the construction drawings.

B. Provide and install complete all fittings and appurtenances not noted specifically on the construction plans as required, to complete the utility system in accordance with these Standards.

PART 2 PRODUCTS

2.01 MATERIALS

A. Polyethylene pipe, 4-inch diameter and larger, shall be high-density PE 3408 polyethylene resin per ASTM D3350, Cell Classification 345464C, Class 160, DR 11, CPChem DriscoPlex 4000, 4300 or 4500 or an approved equal, meeting the requirements of AWWA C906. All pipe materials used in potable water systems shall comply with NSF Standard 61.

B. Outside diameters of water, reclaimed water and pressure sewer HDPE pipes shall be ductile iron size (DIPS).

C. Where PE pipe is joined to PE pipe, it shall be by thermal butt fusion. Thermal fusion shall be accomplished in accordance with the written instructions of the pipe manufacturer and fusion equipment supplier. The installer of the thermal butt fused PE pipe shall have received training in heat fusion pipe joining methods and shall have had experience in performing this type of work.

D. Flanged joints, mechanical joints and molded fittings shall be in accordance with AWWA C906.

PART 3 EXECUTION

3.01 DETECTION

A. Direct buried HDPE pipe shall have 3-inch warning tape of the proper color placed directly above the pipe and 12 inches below finished grade or 6-inch warning tape between 12 inches and 24 inches below finished grade.

B Direct buried or horizontal directional drilled HDPE pipe shall also have a No. 10 gauge solid, insulated wire of proper color installed along the pipe alignment as detailed in these Standards.

3.02 IDENTIFICATION

A. Pipe shall bear identification markings in accordance with AWWA C906.

B. Pipe shall be color coded blue for water, purple (Pantone purple 522 C) for reclaimed water or green for pressure sewer using a solid pipe color or embedded colored stripes. Where stripes are used, there shall be a minimum of three stripes equally spaced.

END OF SECTION

SECTION 02605 POLYETHYLENE (HDPE) PIPE AND FITTINGS 4-INCH DIAMETER AND LARGER

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install high density polyethylene (HDPE) pressure pipe or tubing, fittings and appurtenances as indicated on the construction drawings.

B. Provide and install complete all fittings and appurtenances not noted specifically on the construction plans as required to complete the utility system in accordance with these Standards.

PART 2 PRODUCTS

2.01 MATERIALS

A. Polyethylene tubing 2 inches in diameter and smaller for potable water and reclaimed water shall be high-density PE 3408 polyethylene resin per ASTM D2737, Pressure Class 200, Copper Tube Size (CTS), SDR 9, CPChem DriscoPlex 5100 Ultra-Line, Endot Endopure or Charter Plastics Reclaimed Water Tubing, Charter Blue Ice, Vanguard Bruiser or an approved equal, meeting the requirements of AWWA C901. Butt fusion or CTS brass connections shall be used. All pipe materials used in potable water systems shall comply with NSF Standard 61.

B. Polyethylene pipe 3 inches in diameter (for potable water and reclaimed water), and 3 inches in diameter and smaller (for wastewater force mains) shall be high-density PE 3408 polyethylene, per ASTM D 2737, Pressure Class 160, iron pipe size (IPS) outside diameter, DR 11, CPChem DriscoPlex 4100 or an approved equal, meeting the requirements of ASTM D 3035 and AWWA C901.

C. Where PE pipe is joined to PE pipe, it shall be by thermal butt fusion. Thermal fusion shall be accomplished in accordance with the written instructions of the pipe manufacturer and fusion equipment supplier. The installer of the thermal butt fused PE pipe shall have received training in heat fusion pipe joining methods and shall have had experience in performing this type of work.

D. Mechanical joints and fittings shall meet the requirements of: AWWA C901, ASTM D 3350 and ASTM D 3140.

PART 3 EXECUTION

3.01 DETECTION

A. Direct buried HDPE pipe shall have 3-inch warning tape of the proper color placed directly above the pipe and 12 inches below finished grade, or 6-inch warning tape between 12 inches and 24 inches below finished grade.

B. Direct buried or horizontally directional drilled HDPE pipe or tubing shall also have a No. 10 gauge solid, insulated wire of proper color installed along the pipe alignment as detailed in these Standards.

3.02 IDENTIFICATION

A. Pipe or tubing shall bear identification marking in accordance with AWWA C901.

B. Pipe or tubing shall be color coded blue for water, purple (Pantone purple 522C) for reclaimed water or green for pressure sewer using a solid pipe color or a minimum of three colored stripes equally spaced.

END OF SECTION

SECTION 02606 POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install the PVC piping, iron fittings and other appurtenances complete and ready for use as indicated on the construction drawings.

B. Provide and install complete all fittings and appurtenances not noted specifically on the construction plans as required, to complete the utility system in accordance with these Standards.

PART 2 PRODUCTS

2.01 MATERIALS

A. Polyvinyl chloride (PVC) pressure pipe, 4 to 12 inches in diameter, shall be Class 235, DR 18, meeting the requirements of AWWA C900 and shall have cast-iron pipe-equivalent (CI) outside diameters (also known as ductile iron pipe size (DIPS) outside diameter). Each length of pipe shall be hydrostatically tested to four times its pressure class of the pipe by the manufacturer in accordance with AWWA C900.

B. Polyvinyl chloride (PVC) pressure pipe, 14 to 48 inches in diameter, shall be cast-iron-pipe-equivalent (CI) outside diameter and shall meet the requirements of AWWA C905. Pipe used in water and reclaimed water service shall be DR 18 and Pressure Rated 235. Pipe used in sewer force mains shall be DR 21 and Pressure Rated 200. Each length of pipe shall be hydrostatically tested at twice its Pressure Rating in accordance with AWWA C905. Pipe shall be furnished in standard lengths of approximately 20 feet.

C. Polyvinyl chloride (PVC) pressure pipe, 2 to 3 inches in diameter, shall be Pressure Rated 200, SDR 21, conforming to ASTM D 2241, and shall have Iron Pipe Size (IPS) outside diameters. SDR 21 PVC pipe 2 to 3 inches in diameter shall not be used for working pressures greater than 125 psi. PVC pipe shall not be used in applications which require pipes that are less than 2 inches in diameter for wastewater force mains. PVC pipe shall not be used in applications which require pipes that are less than 3 inches in diameter for potable water piping and reclaimed water piping.

D. Standard PVC pressure pipe joints shall be bell and spigot push-on type with elastomeric ring seals. Ring seal gaskets used at push-on joints shall conform to ASTM F477 and shall be EPDM rubber for potable and reclaimed water pipes.

E. Lubricant furnished for lubricating the push-on joints in potable water pipes shall be nontoxic, water soluble, shall not support the growth of bacteria, shall have no deteriorating effects on the gasket or pipe material, and shall not impart color, taste, or odor to the water, and shall be an approved substance per NSF 61.

F. Thrust restraint devices shall be provided at all horizontal and vertical bends and fittings, in casings under roads and railroads and at other locations as indicated on the construction drawings. Thrust restraint devices for PVC pipe and fittings shall be either concrete thrust blocks or restraining glands as manufactured by Star Pipe Products, Stargrip 3000 and 3100, Allgrip 3600, or as manufactured by EBAA Iron Sales, Megaflange, 2000PV, or other approved equal restraining gland products. Restrained joints, where used, shall be installed at bend and fitting locations and at pipe joint locations both upstream and downstream from bends or fittings at distances as required by these Standards.

G. All fittings for PVC pipe shall be ductile iron or gray iron with mechanical joints and shall conform to AWWA C110 or AWWA C153 and to the applicable sections of these Standards for ductile iron and gray iron fittings.

H. All pipe materials used in potable water systems shall comply with NSF Standard 61.

I. With the exception of air vent piping for force main above ground air release valves, no plastic piping shall be threaded into metal valves, fittings, or couplings.

PART 3 EXECUTION

3.01 DETECTION

A. Direct buried pipe shall have 3-inch warning tape of the proper color placed directly above the pipe 12 inches below finished grade or 6-inch warning tape between 12 inches and 24 inches below grade.

B. PVC pipe shall have a No. 10 gauge solid, insulated wire of proper color installed along the pipe alignment as detailed as detailed in these Standards.

3.02 IDENTIFICATION

A. PVC pipe shall bear identification markings in accordance with AWWA C900, AWWA C905 or ASTM D2241.

B. PVC pipe shall be color coded blue for water, purple (Pantone purple 522C) for reclaimed water or green for pressure sewer using a solid pipe color pigment.

END OF SECTION

SECTION 02608 TESTING AND INSPECTIONS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Timely notice shall be given to the County Inspector of approvals or observations which may be required, and a time and date for a field visit shall be scheduled. Provide all materials, equipment, supplies and labor as required to complete the testing or inspection operations. Should any test fail, the causes of failure shall be corrected, and the work shall be retested until all test requirements have been successfully met.

B. Field tests or observations which require the presence of a County Inspector shall be scheduled on week days during normal working hours. A minimum of two full days' notice, not counting weekends, shall be provided to the inspector in advance of when the test is to be conducted. Any requests for emergency test scheduling must be made in writing, stating why the test should be scheduled ahead of tests for other jobs.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PIPELINE INSPECTIONS

A. During the County Inspector's routine inspections of construction, the County Inspector shall observe that the pipe interior, fittings, valves and other appurtenances are thoroughly cleaned of all dirt, debris and obstructions before being lowered into the trenches; and that the interior of all pipelines are kept clean during and after installation; and that all open pipe ends are securely plugged or capped water-tight when construction stops during the day, or during lunch, or overnight or during long periods of inactivity.

B. Pipelines bedded and laid in the trenches shall be observed by the County Inspector prior to beginning backfill and compaction operations. All thrust restraint devices on pressure pipelines shall be checked and approved by the County Inspector before backfilling.

3.02 COMPACTION TESTING

A. Granular earth backfill materials shall be tested for percentage of compaction every 500 feet in pipeline trenches and for every fifth excavation for structures.

B. Backfill compaction testing shall be done in accordance with either AASHTO T-180, the Modified Proctor Method, unless otherwise approved by the County.

3.03 MATERIALS CLASSIFICATION

A. Soils and soil-aggregate mixtures used as backfill materials shall be identified according to the AASHTO system, designation M-145.

3.04 FLOW TESTS

A. Measurements of static, pitot, and residual pressures and available fire flow, for use in the design of water distribution systems, shall be made using the two-hydrant method (or additional hydrants as required) as described in AWWA Publication M17, "Installation, Field Testing, and Maintenance of Fire Hydrants".

3.05 HYDROSTATIC TESING OF PRESSURE PIPELINES

A. After the water mains, reclaimed water mains or sewer force mains are installed complete, and the fire hydrants, valves, fittings, blow-offs and restraining devices are permanently installed, and the trenches are backfilled, the new pipelines shall be tested hydrostatically for leakage.

B. The County Inspector shall have been notified and shall be present during hydrostatic testing procedures. The Contractor and an Engineer of Record representative shall also be present during the tests.

C. All excavations for any utility pipes or cables within the rights-of-way or easements must be complete before a hydrostatic test is performed. Any subsequent digging or boring across the water, sewer or reclaimed pipelines after they have been tested shall result in a requirement for the pipelines to be retested.

D. All mains to be tested shall be cleaned as specified in these Standards to remove all dirt, stones, pieces of wood or any other material which may have entered the lines during construction. Refer to Section 02609.03 of these Standards. For reclaimed water mains and potable water mains also refer to Section 02609.04O of these Standards. Any obstructions remaining shall be removed.

E. Pipelines to be tested shall have been allowed to remain in place undisturbed for at least 24 hours to allow time for all joints to develop a complete seal. All potable water services and reclaimed water services are to be connected to the curb stop and meter resetter, with meter box set at grade, as shown in standard details UW-19, and UW-18, during the test. The service lines should be the correct length so that they will be one foot inside the right-of-way line when they are installed. Gate valves on fire hydrant laterals shall be opened so that the test pressure bears against the closed hydrant valve.

F. Discharged flows from cleaning or flushing operations shall be disposed of in a manner consistent with US EPA, FDEP, and SWFWMD regulations.

G. Only one connection to the existing water supply system shall be allowed prior to acceptance of the main. Connection shall be made through an approved backflow prevention device. Air shall be expelled completely from the section of pipeline to be tested. If permanent air venting valves are not installed at high points along the line, corporation cocks shall be installed at these points to expel the air completely as the line is filled with water. After the hydrostatic test has been successfully completed, the corporation stops, located at the temporary jumper connection, are to be closed and plugged with brass or PVC stops.

H. The hydrostatic test duration shall be at least two hours. The test pressure at the beginning of the test shall be 180 psi for water mains and reclaimed water mains, and shall be 150 psi for sewer force mains. The water supply, and the water supply pump, shall be disconnected during the test. The test pressure shall not vary by more than plus or minus 5 psi during the test. If the pressure drops 5 psi, makeup water shall be pumped into the test pipeline section during the test duration to maintain the pressure to within 5 psi of the test pressure and the amount of leakage measured. At the end of the test, the line shall be repumped again back to 180 psi for water mains and reclaimed water mains, and shall be 150 psi for sewer force mains and the amount of leakage measured and added to any previous leakage determined during an earlier portion of the test. The total amount of makeup water added shall be measured and shall be compared to the allowable leakage.

I. The allowable leakage measured during the test duration for DI and PVC pipe shall be as determined by the following formula:

$L = SD\sqrt{P}/133{,}200$ where,

L = testing allowance (makeup water), gallons per hour
S = length of pipe tested, feet
D = nominal pipe diameter, inches
P = test pressure, psi (gage)

or, as determined by Table 6A of the Hydrostatic Testing section of AWWA C600.

J. The maximum length of pipe to be hydrostatically tested shall be 2,600 feet. If an exception to this rule is granted by the County's authorized Public Works Department representative, and a length of pipeline greater than 2,600 feet is tested, the allowable leakage will still be figured for a 2,600 foot length of pipe line.

K. Forcemains shall be pressurized for testing between the valve vault valves at the pumping station and the valve at the termination to the existing forcemain system or at the termination to the gravity system manhole.

L. Any exposed pipe sections, valves, fittings, hydrants, services and pipe joints shall be carefully observed during the test duration. All visible leaks shall be repaired, regardless of the amount of leakage.

M. Any damaged or defective pipeline components that are discovered after the hydrostatic testing shall be repaired or replaced with standard materials, and the test shall be repeated until a satisfactory test result is achieved. Any modifications to the new pipeline made after a successful hydrostatic test has been performed shall be cause for a new hydrostatic test of the same pipeline to be performed again.

N. No pipeline installation shall be accepted if the amount of make up water is greater than the allowable leakage. In the event of a failed test result, locate all leaks and make repairs or replacements as required, and retest the pipeline until the leakage is within the allowable limit.

O. When the test has been completed successfully, blow off the pressure from the opposite end of the line from the water supply connection, to demonstrate the limits of the length of pipeline subjected to testing. Also flush water from all hydrants, services and blow-offs, to demonstrate that they were on-line during the test.

P. The section of pipeline being tested shall be identified on the charge sheet. The Station numbers from the construction survey shall be used to describe the extent of the tested pipelines, if available. The exact lengths and sizes, and the precise extents of the tested pipelines, and the particular valves being tested against, must all be identified clearly on the charge sheet. A copy of the charge sheet shall be provided to the Engineer of Record's and the Contractor's representative.

Q. A punch list shall be made at the end of all tests.

R. Hydrostatic Testing for HDPE Pipelines:

1. For pressure pipelines laid wholly or partly using HDPE pipe, a modified hydrostatic test is required. In the modified test, the pipeline shall be cleaned, flushed, filled and vented, and otherwise prepared for testing similar to other types of pipeline materials; but, prior to the test, an initial expansion period at test pressure shall be allowed, during which the HDPE pipe shall be allowed to stretch and assume an equilibrium volume against the applied pressure. During the expansion period, make-up water shall be added to the pipeline to maintain the test pressure.
2. After the initial expansion period, the test shall commence, and shall proceed in accordance with the methods presented in Chapter 2, "Inspections, Tests and Safety Considerations" of the Handbook of Polyethylene Pipe, Plastics Pipe Institute, or with the pipe manufacturer's written directions for the size and class of pipe installed, unless otherwise approved by the County. The allowable volume of make-up water shall be as prescribed in Table 3, "Test Phase Make-up Amount" of Chapter 2. If the amount of make-up water exceeds the amounts listed in the Table, the pipeline shall not be accepted. Locate and repair the cause of the excessive leakage and retest the pipeline. Repair all visible leaks regardless of the amount of leakage.

3.06 BACTERIOLOGICAL TESTING

A. After the new potable water pipelines have been hydrostatically tested, or after existing potable water pipelines have been modified or repaired, they shall be cleaned, disinfected and sampled and tested for the presence of coliform organisms in accordance with AWWA C651.

B. The County Inspector shall have been notified and shall be present at the time of the introduction of the chlorine disinfectant and water from the supply system into the main, refer to Standard Details UW-21 and UW-22.

C. At the end of the chlorine contact period, the chlorine residual shall be determined by sampling and testing, and the results shall be reported to the regulatory agencies with the County and State. The pipelines shall then be flushed thoroughly with clean potable water until chlorine measurements show that the concentration is no higher than the chlorine concentration that is acceptable for domestic use, refer to Standard Details UW-21 and UW-22.

D. Discharge flows from cleaning or flushing operations, and heavily chlorinated water from disinfecting operations, shall be disposed of in a manner consistent with US EPA, FDEP and SWFWMD regulations.

E. After final flushing and before the new main is connected to the distribution system, sampling and analysis of the replacement water shall be performed by an approved laboratory or by the Department of Health. Sampling locations shall be as required by AWWA C651 or as determined by the Health Department representative. Pipelines that are tested and return an unsatisfactory test result shall be reflushed and resampled, or re-disinfected, or otherwise reconditioned, until a satisfactory result is attained, refer to Standard Details UW-21 and UW-22.

F. No potable water main shall be placed into service until the results of the bacteriological tests are satisfactory and the Department of Health has provided the County with a written letter of acceptance. Potable water services and fire hydrant leads that are exempt from a permit from the Florida Department of Health but still require bacteriological sampling, in accordance with Chapter 62-555, Florida Administrative Code, shall not be placed into service until the results of the bacteriological tests are satisfactory and the Manatee County Public Works Department Engineering Division has provided written acceptance.

3.07 INSPECTION OF PRECAST CONCRETE STRUCTURES

A. Precast concrete manhole bases, sections and tops, utility vaults, and wet wells shall be subject to inspection and approval by the County.

B. The County Inspector will carefully examine the structures for compliance with ASTM C 478, these Standard, and the manufacturer's Shop Drawings. All structures will be inspected for dimensions, cracks, voids, blisters, roughness, soundness, scratch strength, and general appearance. There shall be no visible leaks within the manholes, utility vaults and wet wells.

C. Structures with minor imperfections may be repaired, subject to the approval of the County's Representative, after demonstration by the manufacturer that such repairs will result in strong and permanent restorations. All visible leaks in the manhole structures shall be repaired. Repair leaks by injecting grout using Avanti Multi-Grout AV-202, AV-118, or equal approved by Manatee County. The County Inspector shall have been notified and shall be present during the repair and retesting. Repairs shall be carefully examined by the County Inspector before final approval by the County.

3.08 AIR TESTING OF GRAVITY SEWER MAINS

A. Gravity sewer pipes shall be tested for leakage by performing the low-pressure air test. The County Inspector shall have been notified and shall be present during the pressure test.

B. All excavations for any utilities or cables within the rights-of-way or easements must be complete before a low-pressure air test is performed. Any subsequent digging or boring across the gravity sewer pipes after they have been tested shall result in a requirement for the sewer system to be retested.

C. The sewer pipes to be tested shall be flushed and cleaned prior to the test to remove dirt, debris or obstructions.

D. Each pipe section tested shall be the length of pipe between two manholes. The ends of all branches, laterals, tees, wyes and stub-outs included in a test section, as well as the ends of the pipe section to be tested, shall be plugged to prevent any air leakage, and all plugs shall be secured in place to prevent blowouts due to the internal test pressure.

E. The test pressure shall be no less than 3.5 psi and no more than 9 psi. The specific test pressure shall be determined by the average height of the natural ground water table above the pipe springline. The elevation of the ground water table shall be measured by using a test well, or by digging a test pit, or by other approved methods, or the County Inspector may accept an assumption of the surface of the ground or pavement for the ground water table elevation. The height of the ground water table above the test pipe section shall be the average of the height above the inlet of the pipe and the height above the outlet of the pipe.

F. The test pressure shall be calculated individually for each test section of pipe and shall be as determined by the following formula:

$P = 3.5 + 0.43\ H \quad P \leq 9$
where,

P = test pressure, psi (gage)
H= average height of ground water table above pipe springline, feet

G. Air shall be pumped into the test section of pipe until the pressure inside reaches the test pressure. After the pressure has been stabilized at the test pressure, remove the connection from the pressurized air source and begin the test duration. The test duration shall be as indicated in the following table:

LOW PRESSURE AIR TEST
SPECIFICATION TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP
FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015

L = length of test section, feet.

Source: Uni-Bell Handbook of PVC Pipe.

H. No more air shall be added to the test section during the test duration. The allowable drop in pressure during the test duration shall be 1 psi or less. No gravity sewer main installation shall be accepted if the pressure drop during the test duration is greater than 1 psi.

I. In the event of a failed test result, locate all leaks and make repairs or replacements as required, and retest the sewer main until the leakage is within the allowable limit. All visible leaks in sewer pipes or at connections to manholes shall be repaired regardless of the results of the low-pressure air tests.

J. Any damaged or defective sewer main or service lateral components that are discovered after the low-pressure air testing shall be repaired or replaced with standard materials, and the test shall be repeated until a satisfactory test result is achieved. Any modifications to the new sewer collection system made after a successful test has been performed shall be cause for a new low-pressure air test of the same sewer main to be performed again.

Pipe Diameter (in.)	Minimum Time (min: sec)	Length for Minimum Time (ft.)	Time for Longer Length (sec)	Specification Time for Length (L) Shown (min: sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26.10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106.50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129.16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128.12	153.50	179:29	205:07	230:46

3.09 PIPE RING DEFLECTION TESTING OF GRAVITY SEWERS

A. The Contractor shall perform a pipe ring deflection test on all new gravity sanitary sewer mains. The rigid ball or mandrel used for the ring deflection test shall have a diameter not less than 95 percent of the base inside diameter or average inside diameter of the pipe depending on which is specified in the ASTM C 3034, to which the pipe is manufactured. The test shall be performed without mechanical pulling devices.

B. The allowable ring deflection is 5 percent of the inside pipe diameter. Pipes that have a ring deflection that exceeds this amount shall not be accepted.

3.10 TELEVISION INSPECTION OF GRAVITY SEWERS

A. TV inspection of the entire length of the inside of new gravity sewer mains shall be conducted by the Contractor. The County Inspector shall have been notified and shall be present during the TV inspection.

B. The sewer pipelines shall be thoroughly cleaned of all dirt, debris or obstructions before the TV inspection. Water shall be added to the upstream manhole until it is seen flowing from the most downstream point of the system to be inspected.

C. The TV camera shall be a self-propelled, 360-degree pan-head, color type and shall have dual tape recording capability. The camera shall be equipped with a depth gauge calibrated to 1/4-inch increments to accurately record the depth of the water in the pipeline. A calibration report shall be submitted with each digital video disk (DVD), which shall include a drawing of the depth gauge, indicating the marks on the gauge, and what depth each mark represents.

D. The County Inspector shall be present and will observe the TV monitor along with the camera operator as the camera progresses through the pipe. All pipelines will be inspected with the camera progressing in an upstream direction when possible. The camera operator shall record the manhole numbers and the distance the camera has progressed from the downstream manhole as the inspection proceeds. The operator shall stop the progress of the camera and record the distance at all locations along the pipeline where unusual or defective features are encountered. The operator shall record the distance and depth of the water in the pipe at all locations where the depth is greater than or equal to 3/4 inch. The Contractor shall make records where cracked, dented or deformed pipe is found, or at joints that are not properly installed, or where infiltration is observed, or at any other abnormality or where any other defective feature is encountered.

E. At the end of the inspections, or at the end of the day, one original digital video disk (DVD) of the TV record shall be submitted to the County Inspector along with the written inspection report and depth gauge calibration for evaluation. The County's representative shall be the sole judge of whether any information imparted by the TV test DVD will cause the County to accept or reject the pipe test section.

F. Joint deflection and longitudinal pipe deflection between manholes shall not deviate by more than 1 inch, from the design line, as measured with the television (TV) camera's depth gauge during the TV inspection, provided that such variance does not result in a level or a reverse slope. Joint deflection and longitudinal pipe deflection between manholes that exceeds 1 inch, as measured with the television camera's depth gauge during the TV inspection, shall not be accepted.

3.11 LIFT STATION INSPECTIONS

A. Prior to placing a sanitary sewer pumping station into service, the new facility will be inspected for general compliance with the County's standards and for conformance to the pump performance required by the construction Drawings.

B. The County Inspector shall have been notified and shall be present during the pump startup tests. When calling for inspection, the pumping station Contractor shall have ready the approved Shop Drawings, pump sheet, manufacturer's information and maintenance manuals for the facility and he shall present them to the County at the time of the inspection. The manufacturer's information shall include the model number, serial number, impeller diameter, motor horsepower, voltage, speed and certified performance curve for each pump installed. Provide County's Lift Station Maintenance Section with one copy of the lift station information described above at startup.

C. The total dynamic head for each pump shall be found by direct measurement. The performance of each pump shall be in substantial conformance with the design performance requirement as indicated on the construction Drawings. The Contractor shall perform a "draw down" test and a "dead head" test for each pump.

D. Any materials or installation found not in compliance with the County standards shall be reinstalled or removed and replaced with standard materials. Any pumps found to be not conforming to the performance required by the construction drawings shall be removed and replaced with conforming pumps. Replacement pumps shall be retested until a satisfactory result is achieved. Manatee County Public Works Department and Utility Department representatives shall be the judges of the suitability and acceptability of the pumps.

E. Generator Set Testing:

1. All test instruments used to perform the testing are to have been calibrated within the past 12 months. The calibration shall be performed in accordance with the standards of the National Institute for Standards and Technology.
2. Perform all necessary tests recommended by the manufacturer and all NFPA 110 tests that are in addition to the following:

    a. System Integrity Test: Verify proper installation, connection, and integrity of each of the components of the diesel generator system before and during operation.
    b. Exhaust Emissions Test: After installation at the project site, perform the standard emission test and verify that the diesel engine complies with all applicable local, state and federal requirements for emissions.
    c. Noise Level Test: Measure and calculate the A-weighted (DbA) levels emanating from the product assembly at three meters for at least six equally spaced points around the enclosure while the machine is under load. Include such points as the exhaust discharge, and cooling air intake and discharge. Refer to the test method as defined by ISO 3744.

    d. Load Bank Test: Run a two hour minimum test with all applicable field load. The automatic transfer switch is to be engaged and fully tested for all phases of operation during this test. The load bank may be either resistive or inductive. For purposes of the load test, the NEMA LRKVA/HP Code of the pump motors is H.

    e. Determine the rise by resistance of the generator while under full load. It may be performed in conjunction with the load test. This test is sometimes called a "Heat Run" or "Hot Shutdown Test" (refer to IEEE - 112) and is performed by measuring the ambient temperature and the resistance across any two phases (plus or minus 1 percent accuracy) of the generator immediately prior to starting the machine for the load test and at the conclusion of the load test and temperature stabilization.

The test is performed for a minimum of two hours and at least until the measured temperature stabilizes in the machine while under full load. After the termination of the load test and the temperature stabilization, allow the machine to coast to a stop, quickly remove any residual charge on the windings and immediately measure the resistance again (+/- 1% accuracy) across the exact same leads as when measuring the ambient temperature at the beginning of the test. The rise by resistance is calculated by a formula which correlates a change in electrical resistance to a change in temperature.

3. Compare all measured quantities with required values of testing. Correct all deficiencies identified by tests and repeat test and correction procedure until specified test requirements are met. All problems and shortcomings in the product provided, which are discovered during the testing process, shall be remedied and corrected at the expense of the supplier with no cost to the County.
4. The County shall have the option of whether or not to witness all testing that is performed. Report all test results in writing to the County prior to acceptance of the generator by the County.

F. Fiberglass Wet Wells and Valve Vaults:

1. Wet wells and valve vaults for grinder lift stations that are privately owned and maintained, may be fiberglass. The manufacture, dimensions, material and construction methods shall be available for inspection and approved by the Engineer of Record in advance of construction. As a basis of acceptance, the manufacturer shall provide an independent certification consisting of a copy of the manufacturer's test reports along with a copy of the test results certifying that representative wet well and valve vault samples have been tested, and inspected in accordance with the provisions of this Specification and meet all requirements of same. The Contractor shall provide the County Inspector a copy of the aforementioned independent certification consisting of a copy of the manufacturer's test reports along with a copy of the test results certifying that representative wet well and valve vault samples have been tested, and inspected in accordance with the provisions of this Specification prior to installation of the wet well and valve vault.
2. The quality of all materials, the process of manufacture and the finished wet wells and valve vaults shall be subject to inspection and approval by the Engineer of Record and the County Inspector. Such inspection may be made at the place of manufacture, on site, or both locations. The fiberglass wet wells and valve vaults may be inspected prior to unloading from the delivery truck and marked by the inspector showing acceptance or rejection. Discovery of failure at any time to meet the requirements of these Specifications is cause for rejection.
3. Wet wells and valve vaults rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. All wet wells and valve vaults which are damaged after delivery as determined by the Engineer of Record or County Inspector, shall be rejected. Wet wells and valve vaults already installed, shall be removed and replaced entirely at the Contractor's expense.
4. At the time of inspection, the wet well and valve vault shall be examined for compliance with ASTM D-3753, latest revision; these Specifications; and with the approved manufacturer's drawings. All wet wells and valve vaults shall be inspected for general appearance, dimension, blisters, cracks, roughness, soundness, etc. The surface shall be free of defect.

5. Imperfections may be repaired subject to the approval of the Engineer of Record and County Inspector and after demonstration by the manufacturer that strong and permanent repairs result.
6. There shall be no leaks in the fiberglass wet well and valve vault.

G. Lift stations will not be accepted for County ownership and maintenance until all punch list items are resolved. This includes security fence and driveways, landscaping when required, irrigation, water meter, and a FDEP acceptance letter.

3.12 IN-PLACE GROUTING OF ABANDONED PIPE

A. The County Inspector shall have been notified and shall be present at the time when the grout is pumped into the abandoned pipe. Provide stand pipes or other visual means of inspection as required by the County Inspector to determine if adequate grout material has filled the entire interior volume of the pipe.

3.13 TRACER WIRE

A. Prior to acceptance of pressure pipe by the County, the Contractor shall demonstrate that the locator tracer wire functions properly and is connected to all service meter boxes and fire hydrants. During the tracer wire testing, the Contractor shall also demonstrate that the wire is connected to all services at meter boxes, hydrants, backflow preventers, butterfly valves, wastewater plug valves, tapping valves, air release valves, and blow-off valves. The Contractor shall use one of several commercially available utility locating instruments to energize and trace the locator wire for continuity. Direct signal locate method shall directly apply the current from the transmitter to the tracer wire and the signal shall be detected and followed with a receiver. Submit to the County Inspector for approval of locating instruments and method. Testing of the locator wire shall be done prior to scheduling a final inspection of the pipeline system. The Contractor shall prepare a report indicating continuity. The report shall list each location that the current was applied to the tracer wire and each location that the signal was detected. The Engineer of Record shall review the report and shall submit the report to the County as part of the as-built construction records.

3.14 THE MAXIMUM LENGTH OF PIPE TO BE HYDROSTATICALLY TESTED

A. Granular earth backfill materials shall be tested for percentage of compaction every 500 feet in pipeline trenches and for every fifth excavation for structures.

B. Backfill compaction testing shall be done in accordance with either AASHTO T-180, the Modified Proctor Method, unless otherwise approved by the County.

END OF SECTION

SECTION 02609 INSTALLATION OF PIPELINES

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Furnish and install pipe, fittings, valves, fire hydrants, services, and all other appurtenances and incidentals complete and in-place as required by the construction Drawings.

B. Trees shall not be planted or located within 10 feet of any potable water main, reclaimed water main, sanitary force main or gravity sanitary sewer main that is owned and maintained by Manatee County.

PART 2 PRODUCTS

2.01 MATERIALS

A. Where potable or reclaimed water mains are proposed to be installed under new pavement or new concrete roads, or new parking lots, etc., the main shall be ductile iron with Type "K" copper or Type 316 stainless steel Schedule 40 services. Where water mains are to be installed under existing pavement or existing concrete roads, or existing parking lots, etc., the potable or reclaimed water main shall be installed in a steel casing pipe (for installation using the bore and jack method), or the potable or reclaimed water main shall be high density polyethylene (for installation using the horizontal directional drilling method), or the potable or reclaimed water main shall be ductile iron (for installation using the open trench method). High density polyethylene potable or reclaimed water mains may be used for crossing under existing pavement or existing concrete roads. However, high density polyethylene potable or reclaimed water mains shall not be used for piping that is both running under and along existing pavement or existing concrete roads. All potable or reclaimed services installed under existing pavement or existing concrete roads, or existing parking lots shall be Type "K" copper or Type 316 stainless steel Schedule 40 services.

B. Transmission water mains 16 inches and larger shall be ductile iron or high density polyethylene.

C. Plastic potable water mains shall not be used in soil that is contaminated with low molecular-weight petroleum products, aromatic hydrocarbons, chlorinated hydrocarbons or organic solvents. Ductile iron water mains, with gaskets referenced in these Standards, shall be used in soil that is contaminated with low molecular-weight petroleum products, aromatic hydrocarbons, chlorinated hydrocarbons or organic solvents.

PART 3 EXECUTION

3.01 HANDLING AND STORAGE

A. Prior to installation, all pipe and fittings shall be inspected. Cracked, broken or otherwise defective materials not in conformance with these standards shall not be used and shall be removed from the project site.

B. The pipeline installer shall take care in the handling, storage and installation of the pipe and fittings to prevent injury to the materials or coatings. Use proper implements, tools and facilities for the safe and proper protection of the work. Lower the pipe in a manner to avoid any physical damages. Under not circumstances shall the pipe or fittings be dropped onto the ground or into the trenches.

C. The pipeline installer shall not distribute material on the job site faster that it can be used to good advantage. Unless otherwise approved by the County, he shall not distribute more than one week's supply of material in advance or laying. Any materials not to be installed within two weeks of delivery shall be protected from the sunlight, atmosphere and weather by suitable enclosures or protective wrapping until ready for installation. Stored PVC pipe shall be placed on suitable racks with bottom tiers raised above the ground to avoid damage. Storage of pipe on the job site shall be done in accordance with the pipe manufacturer's written instructions.

3.02 CLEANING

A. The interior of pipe, fittings, valves and other appurtenances shall be thoroughly cleaned of all dirt, debris and obstructions before being lowered into the trenches. All pipelines shall be kept clean during and after installation and shall be protected from dirt or foreign matter entering the pipe at all times. All open pipe ends shall be securely plugged or capped water-tight when construction stops during the day, or during lunch, or overnight or during longer periods of inactivity.

3.03 INSTALLATION

A. Pipe, fittings, valves, and other appurtenances shall be installed in accordance with the manufacturer's written installation instructions. Water mains, valves, and hydrants shall be installed according to the provisions of "Recommended Standards for Water Works - A Report of the Committee of the Great Lakes - Upper Mississippi River Board of State Public Health and Environmental Managers," Health Education Services, as incorporated by reference by Chapter 62-555, F.A.C. Sewer mains shall be installed according to the provisions of "Recommended Standards for Wastewater Facilities - A Report of the Wastewater Committee of the Great Lakes - Upper Mississippi River Board of State Public Health and Environmental Managers," Health Education Services, as incorporated by reference by Chapter 62-604, F.A.C.

B. Lay all pipe true to the lines and grades indicated on the construction Drawings. Gravity sewer pipe shall be laid on grade with bell upgrade and spigot downgrade. Pressure pipe, including water, reclaimed water and force main sewer, shall be laid with no less than three feet of cover, but not more than six feet of cover, unless otherwise approved by the County. The trenches and bedding for the pipe installations shall be prepared according to Section 2, Trenching and Excavation, of these standards. Pipe sections shall be laid in full contact with the prepared pipe bedding, with bell holes dug out, to provide a continuous and uniform bearing and support for the pipe barrel between joints. Blocking under the pipe shall not be permitted (except through casing sleeves).

C. In gravity sewer installations, the pipe alignment shall not deviate by more than 1/2 inch for line and 1/4 inch for grade, as measured at the pipe inverts at the manhole, from the design line and grade established on the construction drawings, provided that such variance does not result in a level or a reverse sloping pipe invert. Line and grade of gravity sewer pipelines shall be measured at the pipe invert and shall be controlled during installation by laser beam method. Other methods of controlling line and grade may be approved by the County if the laser beam method is shown to be unworkable. A "Caution - Laser Light" placard shall be displayed in a conspicuous place while laser beam pipe laying equipment is in use. Joint deflection and longitudinal pipe deflection between manholes shall not deviate by more than 1 inch from the design line, as measured with the television (TV) camera's depth gauge during the TV inspection, provided that such variance does not result in a level or a reverse sloping pipe invert.

D. Joining of pipe sections shall be done in strict accordance with the pipe manufacturer's written instructions. The joining surfaces of the bell and spigot and the rubber seal ring shall be thoroughly cleaned and lubricated immediately prior to joining the pipe per the written instructions. After the joint has been made, the pipe alignment shall be checked. Place sufficient backfill material around and over the pipe to secure the pipe from movement before installing the next joint to assure proper pipe alignment and joint makeup.

E. When cutting or machining pipe in the field is necessary, the pipe installer shall use only the tools and methods recommended by the manufacturer in the written instructions. Care shall be taken to not damage the pipe coating or linings. Damage to linings shall be cause for rejections of the complete section of pipe, or for the rejection of a fitting or valve. Damage to exterior coatings shall be corrected to the original standard material specification.

F. At connections to manholes or other concrete structures, the pipe joint shall be located a minimum of 18 inches outside of the edge of the structure.

G. At stub-outs from new structures to future pipelines, the pipe stub-out length shall be the same as the standard pipe length being laid. Stub-out pipes shall be closed off with standard plug or cap fittings.

H. Thrust restraint devices shall be either cast-in-place concrete thrust blocks or other approved restrained joint devices. Cast-in-place concrete for thrust blocks shall have a 28-day strength of 3,000 psi. Precast thrust blocks shall not be accepted. At all fire hydrant laterals, the lateral pipe from tee to fire hydrant shoe shall have all joints restrained. The lateral shall also be restrained from side movement by concrete thrust blocks placed at the fire hydrant shoe and at the lateral tee.

I. Place and secure a bag over all fire hydrants not yet placed into service to designate them as such and to serve as a warning that the water is not safe to drink. Bags shall be colored orange and shall have the words "NOT IN SERVICE" printed on them, and shall be N.I.S. bags as manufactured by Assured Flow Sales, or an approved equal.

J. All pressure water, reclaimed water and force main sewer pipelines laid in trenches shall have a continuous, No. 10 gauge solid copper wire attached to the pipe with minimum 30-mils polyethylene insulation rated UF or USE by Underwriter's Laboratories. Insulation shall be of proper color. The plastic wire insulation shall be color coded blue (water), Pantone purple 522 C (reclaimed water) or green (sanitary sewer). The wire shall be laid on top of the pipe and secured in place at every joint and at 5-foot intervals.

K. All pressure mains which are installed by the open-trench method, regardless of piping material, shall also include the installation of a warning tape buried directly over the pipe continuously. Pipe shall have a 3-inch wide warning tape of the proper color placed directly above the pipe 12 inches below finished grade or a 6-inch wide warning tape between 12 inches and 24 inches below finished grade. The tape shall be colored green (sewer), blue (water), or Pantone purple 522C (reclaimed water) on top, and be boldly labeled every eighteen to thirty-two (18-32) inches as follows "CAUTION POTABLE WATER LINE BURIED BELOW", "CAUTION WASTEWATER LINE BURIED BELOW", OR "CAUTION RECLAIMED WATER LINE BURIED BELOW". The tape shall have a tensile strength of no less than 4,000 psi, a dart impact strength of no less than 120 grams per 1.5 mils, be no less than 0.0055-inch thick. The tape shall be designed to last as long as the pipe it is installed over, even in adverse soils.

L. Trenching, backfilling and compaction for the newly laid pipelines shall be accomplished in accordance with Section 2, Trenching and Excavation.

M. In directional bore applications, one No. 10-gauge extra high strength copper clad steel wire shall be pulled and secured to the top of the pipe with duct tape or 10-mil thickness polyethylene pressure sensitive tape at every joint and at 24-inch intervals. The tracer wire shall have minimum 30-mil polyethylene insulation rated UF or USE by Underwriter's Laboratories. The plastic wire insulation shall be color coded blue (water), Pantone purple 522 C (reclaimed water) or green (sanitary sewer).

N. Underground splice connections shall be minimized and shall be rated for direct burial service. Spliced tracer wire connections shall be split bolt connectors or solder as approved by manufacturer. A waterproof or corrosion-proof connector for direct bury applications shall be used. The wire shall terminate at fire hydrants, backflow preventers, and at each meter box. The wire shall also terminate at valve boxes for butterfly valves, wastewater plug valves, tapping valves, air release valves and blow-off valves. The tracer wire shall also terminate at gate valve boxes that are not located within 200 feet of a fire hydrant, backflow preventer, meter box, butterfly valve, air release valve or blow-off valve. Meter boxes shall have 12 inches of wire looped into the boxes. The looped termination shall allow for the connection of an electronic locator transmitter.

O. With the County Inspector present, new reclaimed water mains with diameters greater than or equal to 6 inches shall be pigged and new reclaimed water mains with diameters smaller than 6 inches shall be flushed or pigged to clean all parts of the system and to remove any accumulation of construction debris, rocks, sand, gravel, silt and other foreign material. With County Inspector present, new potable water mains with diameters greater than or equal to 6 inches shall be pigged and new potable water mains with diameters smaller than 6 inches shall be flushed or pigged to preliminarily clean all parts of the system and to remove any accumulation of construction debris, rocks, sand, gravel, silt and other foreign material. If necessary, also make use of mechanical rodding or bucketing equipment. Prior to construction of potable water mains and reclaimed water mains, the Contractor shall submit a flushing/pigging plan to the County Inspector for approval. The

flushing/pigging plan shall identify on the drawings each location where each pig will be placed in the pipe and each location that the pig will be retrieved. The flushing/pigging plan shall describe at minimum the procedures and installations for flushing, any field turbidity measurement equipment provided, pumps used, source and volume of water to be used, flow velocity pumped, effluent screen collector, disposal methods of debris and effluent, and calculations for the length of pipe flushed. A pig recommended by the pipe manufacturer for the type of pipe installed, shall run through pressure potable and reclaimed water main pipes greater than or equal to 6 inches. Pipes smaller than 6 inches shall be flushed. Inspectors must be notified 48 hours in advance of any pigging and flushing operations. Short pipe lengths (i.e. stubs) may be flushed without pigs with prior approval from County. If flushing of pipes smaller than 6 inches fails, or if the potable water main or reclaimed water main has a pipe diameter greater than or equal to 6 inches, or if the water supply is not sufficient to supply the quantity of water required for flushing a new main smaller than 6-inches, the pipe shall be cleaned with pigs recommended by the pipe manufacturer. For flushing, a minimum velocity of at least 3.0 ft/sec, preferably 3.5 ft/sec, shall be obtained in the pipe. This velocity shall be maintained long enough to allow three complete pipe volume changes of water for proper flushing action. Successful flushing shall be determined visually by the County Inspector and may be deemed acceptable when the water is debris free. Refer to the procedures in Sections 02609.06 and 10 of these Standards.

P. Boring logs shall be kept with all horizontal and vertical locations, at intervals not to exceed 25 linear feet, by the horizontal directional drill (HDD) Contractor.

Q. The pulling force and downhole mud pressure shall be monitored with DCI's TensiTrak System, or an approved equal, during the installation of pipelines using the horizontal directional drilling (HDD) method.

R. As a marker for the Surveyor, a PVC pipe marker or 2-inch by 4-inch marker shall be inserted by the Contractor on the top of pipe for potable water mains, reclaimed water mains and sanitary force mains at intervals no greater than 200 feet apart and at locations where there is a substantial grade change. The pipe markers shall indicate the pipe diameter and shall be labeled PWM in blue, RWM in purple, and FM in green, for potable water mains, reclaimed water mains and sanitary force mains, respectively. As a marker for the Surveyor, a PVC pipe marker or 2-inch by 4-inch marker shall be inserted by the Contractor on the top of all pipe fittings (other than sanitary sewer service wyes, potable water saddles and reclaimed water saddles). The markers for fittings shall indicate the type of fitting and shall be labeled PWF in blue, RWF in purple, and FMF in green, for potable water fittings, reclaimed water fittings, and sanitary force main fittings, respectively. The Contractor is responsible for making the aforementioned markers available to the Surveyor. The Contractor shall field locate the mains and fittings when markers are not made available to the Surveyor. A PVC pipe marker or 2-inch by 4-inch marker shall be inserted by the Contractor at the beginning and end of each Horizontal Directional Drill (HDD). The HDD Contractor shall provide a certified report and bore log indicating the horizontal and vertical location every 25 linear feet or less along the pipe.

3.04 PRESSURE TAPS

A. Pressure taps for connection of new water, reclaimed water or sewer systems to existing County pressure mains shall be made by a County crew for tap sizes up to and including 12 inches diameter. For each pressure tap performed by the County, the pipeline installer shall provide excavation to unearth the existing pipe and provide a dry, safe tapping pit, and shall provide and install the tapping sleeve and tapping valve. Prior to the tapping of the pipe, the pipeline installer shall pressure test the sleeve and the valve to the satisfaction of the County Tapping Crew or the County Inspector. After the tap has been made, the pipeline installer shall backfill and compact the excavation, and provide all other materials and labor required to complete the work.

B. Pressure taps shall not be used to make pipeline connections in new work except to make a connection to an existing County main, and then only if it is deemed to be inconvenient or unworkable to make the connection by another method using standard fittings. Where a new phase of the system will be connected to a future phase or future subdivision, standard fittings will be assembled which shall include a line valve and stub-out and cap where the future system will be connected without need for making another pressure tap. All pressure tap installations shall be subject to approval by the County.

C. All pressure taps for tap sizes larger than 12 inches in diameter, and for all tap sizes on concrete mains, shall be made by a Manatee County approved tapping company.

D. When installations are made under pressure, the flow of water through the existing main shall be maintained at all times. The diameter of the tap shall be at least 2 inches smaller than the inside diameter of the through main.

E. The Contractor shall determine the locations of the existing main to be tapped to confirm the fact that the proposed position for the tapping sleeve will be satisfactory and no interference will be encountered such as the occurrence of existing utilities or of a joint or fitting at the location proposed for the connection. No tap will be made closer than 30 inches from a pipe joint or a fitting.

F. Adequate support shall be provided under the sleeve and valve during the tapping operation. Thrust blocks shall be provided behind all tapping sleeves. Proper tamping of supporting earth around and under the valve and sleeves is mandatory. After completing the tap, the valve shall be flushed to ensure that the valve seat is clean.

3.05 FINAL CLEANING

A. All new reclaimed water mains shall be cleaned, in accordance with Section 02609.04.O of these Standards, to clean all parts of the system and to remove any accumulation of construction debris, rocks, sand, gravel, silt and other foreign material.

B. After preliminary cleaning as specified Section 9.04.O of these Standards, and after disinfection, and prior to final acceptance, all new potable water mains shall receive a final flush to clean all parts of the system and to remove all remaining debris/foreign material. For flushing, a minimum velocity of at least 3.0 ft/sec, preferably 3.5 ft/sec, shall be obtained in the pipe. This velocity shall be maintained long enough to allow three complete pipe volume changes of water for proper flushing action. Successful flushing shall be determined visually by the County Inspector and may be deemed acceptable when the water is debris free. The Contractor shall submit a flushing plan for County Inspector's approval where the plan will describe at minimum the procedures and installations for flushing, any field turbidity measurement equipment provided, pumps used, source and volume of water to be used, flow velocity pumped, flushing effluent screen collector, disposal methods of debris and flush effluent, and calculations for the length of pipe flushed. Refer to Section 02610, Cleaning and Disinfecting Potable Water Pipelines, of these Standards.

3.06 PIPELINE ALIGNMENTS

A. Water, sewer, and reclaimed water pipelines to be installed within new roadway rights-of-way shall be situated along typical uniform alignments that minimize the number of interferences or obstructions between the different utilities.

B. Potable water pipelines shall typically be located along the southerly and easterly sides of the roadways midway between the right-of-way and the back-of-curb line. Fire hydrants shall be installed on the same side of the roadways as the potable water mains. Potable water mains shall be on the opposite side of the street from the sidewalks. Sanitary force mains and reclaimed water mains shall be on the opposite side of the street from the potable water mains. Where it is shown that it is not technically feasible or economically sensible for the sanitary force mains or the reclaimed water mains to be on the opposite side of the street from the potable water mains; a minimum horizontal separation of potable water mains to force mains and reclaimed water mains shall be 10 feet and 5 feet, respectively.

C. Force main sewer pipelines shall typically be located along the northerly and westerly sides of the roadways midway between the right-of-way line and the back-of-curb line when no reclaimed water pipeline is present, or no closer than 3 feet to the right-of-way line when this side of the road is shared with a reclaimed water main.

D. Reclaimed water pipelines shall be typically located on the same side of the roads as the force mains, along the centerline side and 5 feet away from the force mains, when force mains are present, so that the reclaimed water main and force main are centered between the back-of-curb line and the right-of-way line, or, when no force main is present, located midway between the back-of-curb and the right-of-way lines, on the northerly and westerly sides of the roadways.

E. Gravity-flow sanitary sewer pipelines shall typically be located under the roadway pavement along the centerline of the right-of-way, and may vary from side to side under curved roadways, but shall be no closer to the potable water main than 10 feet and no closer to the reclaimed water or force mains than 5 feet.

F. Depth of bury for potable water mains, reclaimed water mains and force mains shall typically be no less than 3 feet and no more than 6 feet of cover at final grade. Potable water mains, when crossing other sewer or reclaimed water mains, shall cross over the top of the other mains with a minimum of 18 inches of vertical clearance of the sewer or reclaimed water main. Where approved by the County, potable water, reclaimed water or force mains may be buried less than 3 feet deep to avoid an obstruction or another pipeline, provided the potable water mains or reclaimed water mains are constructed of ductile iron pipe or the potable water mains or reclaimed water mains or force mains are enclosed in ductile iron or steel encasement pipes. Increased thrust restraint shall be provided for decreasing the pipes depth of cover. Written approval from the County is required prior to construction for depth of bury for potable water mains, reclaimed water mains and force mains less than 3 feet or more than 6 feet of cover.

G. A minimum horizontal separation of reclaimed water or force mains to storm sewers is 5 feet. A minimum horizontal separation of potable water mains or gravity sanitary sewer mains to storm sewers is 10 feet.

H. A minimum of 18 inches of vertical clearance shall be provided for potable water mains, reclaimed water mains, gravity sanitary sewer mains, and force mains that cross any potable water, reclaimed water, gravity sanitary sewer mains, force mains, and storm sewers. This vertical clearance may be reduced as follows

1. The vertical clearance may be reduced to 6 inches if the potable water main or the reclaimed water main is ductile iron; or
2. The vertical clearance may be reduced if one of the mains is encased in a watertight casing pipe as follows:
   a. For reclaimed water mains or sanitary force mains that are within a watertight casing pipe, the top of the casing pipe shall be at least 3 inches below the bottom of the potable water main, or
   b. For sanitary force mains that are within a watertight casing pipe, the top of the casing pipe shall be at least 3 inches below the bottom of the reclaimed water main.

I. Maximum obtainable horizontal separation shall be practiced. Setbacks between piping in this section are from outside of pipe to outside of pipe. Where it is shown that it is not technically feasible or economically sensible to comply with the requirements in Sections 9.07 D, E, F & G, acceptable exceptions are as follows:

1. The minimum horizontal setback between potable water mains to both gravity sanitary sewer mains and force mains may be reduced to 5 feet if:
   a. The potable water main is ductile iron, or jointless/fused high density polyethylene, or in a watertight casing pipe; or
   b. The force main is jointless/fused high density polyethylene, or the gravity sanitary sewer main or force main is in a watertight casing pipe.
2. The minimum horizontal setback between potable water mains to stormwater sewer mains may be reduced to 5 feet if:
   a. The potable water main is ductile iron, or jointless/fused high density polyethylene, or in a watertight casing pipe.
3. The minimum horizontal setback between potable water mains to reclaimed water mains may be reduced to 3 feet if:
   a. The potable water main is ductile iron, or jointless/fused high density polyethylene, or in a watertight casing pipe; or

b. The reclaimed water main is ductile iron, or jointless/fused high density polyethylene, or in a watertight casing pipe.

4. The minimum horizontal setback between reclaimed water mains to both gravity sanitary sewer mains and force mains may be reduced to 3 feet if:
   a. The reclaimed water main is ductile iron, or jointless/fused high density polyethylene, or in a watertight casing pipe; or
   b. The force main is jointless/fused high density polyethylene, or the gravity sanitary sewer main or force main is in a watertight casing pipe.
5. The minimum horizontal setback between both reclaimed water mains and sanitary force mains to stormwater mains may be reduced to 3 feet if:
   a. The reclaimed water main is ductile iron, or jointless/ fused high density polyethylene, or in a watertight casing pipe; or
   b. The force main is jointless/fused high density polyethylene, or in a watertight casing pipe.

J. Force mains 4 inches and larger in diameter shall be designed to minimize theadverse effects of air pocket entrapment by either the use of air release valves (ARV's) or by the selection of pumps such that air-scouring fluid velocity is achieved within the pipeline. Where ARV's are used, long upward or downward sloping runs of pipeline should be used - rather than laying-to-cover of 3 feet minimum bury, or rather than dipping up and down under other utility structures - and the vertical alignment should be designed such that the number of ARV's required is limited to the minimum. ARV's shall be placed at high points along the pipeline and where air would otherwise become entrapped. For vertical alignments requiring ARV's, such alignments shall be fully defined and depicted on the construction plans with use of elevation notations at each station or with use of elevations given for all vertical points of intersection and slopes given on the pipeline in between all vertical points of intersection from the lift station valve vault to the termination of the force main. Any proposed significant deviation from the vertical alignment of the approved construction plans must be resubmitted for checking and re-approval by the Manatee County Infrastructure Engineering Division representative before such revised vertical alignments may be constructed. Where an air-scouring design is proposed, and air is to be transported downstream along the pipeline by the sufficiently rapid movement of the fluid, no ARV's are required and no strict definition of the alignment by means of elevation and slope notations are required on the plans. Air-scouring velocity to move air pockets downstream at various downward slopes shall be as determined by Wheeler in Table B-9 of Pumping Station Design, by Robert L. Sanks, 1998, or as determined by an equally credible source or calculation.

3.07 VALVE SPACING

A. In-line potable or reclaimed water valves shall generally be installed at intervals no greater than 1,600 LF on transmission mains where systems serve widely scattered customers and where future development is not expected; and at intervals of no greater than 800 LF on main distribution loops and feeders, and on all primary branches connected to these lines.

B. In residential, commercial and industrial subdivisions, water valves shall be installed, at all sides of tees and crosses, as necessary to minimize the number of persons affected by a break. Valves must be provided at tee connections. One in-line valve should be located, in the run of the tee, at fire hydrant connections. In all instances, effectiveness of placement shall be primary criteria in determining water valve location. Valves placed in curbs will not be accepted. Valves must be provided within the boundary of the public utility easement

when serving privately owned and maintained utilities. All valves require lids and must be marked "water" or "reclaimed water". All potable or reclaimed water valves shall be identified on construction drawings. Clearance of 18 inches or one pipe diameter, whichever is greater, shall be maintained between all fittings (bells, valves, saddles, flanges, etc.).

C. In-line sewer valves shall be installed at intervals of no greater than 1,200 LF on sewer transmission mains. In-line sewer valves shall be installed near each side of a canal crossing and/or major road crossing. Valves must be provided at tee and wye connections. In high-density areas, sewer valves shall be installed as necessary to minimize the number of persons affected by a break and to minimize amount for disposal by pumper trucks. In all instances, effectiveness of placement shall be the primary criteria in determining valve location. Valves must be provided within the boundary of the public utility easement when serving privately owned and maintained utilities. Valves placed in curbs will not be accepted. All valves require lids and must be marked "sewer". All valves shall be identified on construction drawings. Clearance of 18 inches or one pipe diameter, whichever is greater, shall be maintained between all fittings (bells, valves, flanges, etc.).

3.08 MINIMUM PIPE FLOW DESIGN CRITERIA

A. Gravity Sewer Design:

A minimum design velocity of 2.0 feet per second and a maximum design velocity of 10.0 feet per second shall be used for the design of gravity-flow pipelines. Maximum design flow depths for peak design flow rates shall not exceed 80 percent of the pipe inside diameter. Minimum slopes required to achieve a velocity of at least 2.0 feet per second are provided below:

Sewer Pipe Diameter in Inches, I.D.	Minimum Slope in Feet per 100 Feet, Manning's n = 0.013
8	0.40
10	0.28
12	0.22
14	0.17
15	0.15
16	0.14
18	0.12
21	0.10
24	0.08
27	0.067
30	0.058
36	0.046

B. Sewer Force main Design: Sewer force main velocities shall not be less than 2 feet per second, with one/smallest pump running, at minimum flow and not exceed 6 feet per second at peak-hour flow conditions. Hazen-William's roughness coefficient of a maximum of 120 will be used in the calculations.

C. Gravity Sewer, Sewer Force Main, and Lift Station Design: Construction drawings that are

submitted to Manatee County for approval shall include engineering calculations, which may include electronic hydraulic modeling. Gravity sewer, sewer force main, and lift station design shall be based on peak-hour flow rate. Unless the Engineer of Record provides credible documentation and/or data to support peaking factors used in his or her calculations, peaking factors for peak hour flow rate shall be based on the following equation:

Peak-Hour Flow/Average Daily Flow = $(18 + \sqrt{P})/(4 + \sqrt{P})$
(where $\sqrt{P}$ = square root of the population in thousands)

D. Water Distribution Main Design:

1. Water mains shall be designed with velocities no greater than 5 feet per second at peak-hour flow conditions and no greater than 10 feet per second at maximum-day plus needed fire flow conditions. Hazen-William's roughness coefficient of a maximum of 130 shall be used in the calculations for plastic pipe and lined ductile iron pipe. Delivered flows for pressure water mains shall meet the needed fire flow rate plus a background water demand equivalent to the maximum-day demand with a residual gauge pressure not less than 20 pounds per square inch (psi). A residual gauge pressure not less than 20 psi shall be maintained at the peak-hour water demand. Construction drawings that are submitted to Manatee County for approval shall include engineering calculations, which may include electronic hydraulic modeling. Unless the Engineer of Record provides credible documentation and/or data to support peaking factors used in his or her calculations, peaking factors for peak hour flow rate in potable water main design shall based on the following equation:

   Peak-Hour Flow/Average Daily Flow = $(18 + \sqrt{P})/(4 + \sqrt{P})$
   (where $\sqrt{P}$ = square root of the population in thousands)

2. Also, unless the Engineer of Record provides credible documentation and/or data, Peak-Hour Flow shall be as indicated in the aforementioned calculation or 2.0 x Average Daily Flow, whichever is greater.

3. Unless the Engineer of Record provides credible documentation and/or data, Maximum-Day demand shall be at least 60 percent of the peak hour flow rate or 1.5 x Average Daily Flow, whichever is greater.

END OF SECTION

SECTION 02610 CLEANING AND DISINFECTING POTABLE WATER PIPELINES

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Furnish all labor, materials, equipment and incidentals required to clean and disinfect portable water pipe lines. This work is required to place all types of pipe into service as potable water lines.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CLEANING WATER MAINS

A. With the County Inspector present, all new potable water mains shall be preliminarily cleaned, in accordance with Section 02609.04.O of these Standards, to clean all parts of the system and to remove any accumulation of construction debris, rocks, sand, gravel, silt and other foreign material.

B. Fire hydrants may be used to perform the flushing. A blowoff connection, if one has been installed, may also be used if diameter is determined to be large enough to flush debris. A velocity of at least 3.0 ft/sec, preferably 3.5 ft/sec, should be obtained in the pipe without causing the County's main pressure to fall below 35 psi. This velocity should be maintained long enough to allow three complete changes of water for proper flushing action and follow the requirements in Sections 02609.04.O and 02609.06. The pipeline installer shall take care in the handling, storage and installation of the pipe and fittings to prevent injury to the materials or coatings. Use proper implements, tools and facilities for the safe and proper protection of the work. Lower the pipe in a manner to avoid any physical damages. Under not circumstances shall the pipe or fittings be dropped onto the ground or into the trenches.

3.02 DISINFECTING POTABLE WATER PIPE LINES

A. Prior to being placed in service, all potable water pipe lines shall be chlorinated in accordance with AWWA C651, refer to Standard Detail UW-22. The location of the chlorination and sampling points shall be determined by the Engineer of Record, Health Department, and Manatee County Representatives. Taps for sampling shall be uncovered and backfilled by the pipeline installer as required.

B. The general procedure for chlorination shall be to flush or pig all dirty or discolored water from the lines, then introduce chlorine in approved dosages through a tap at one end while water is being withdrawn at the other end of the line. The chlorine solution shall remain in the pipeline for 24 hours; refer to Standard Detail UW-22.

C. Water for flushing, pigging, filling and disinfecting the new lines must be obtained without contaminating existing pipe lines. Water obtained from existing pipe lines for this purpose shall pass through an approved backflow prevention device, refer to Standard Detail UW-21.

D. After preliminary cleaning as specified Section 9.04.O of these Standards, and subsequently following the chlorination period, all treated water shall be flushed (final flush) from the lines at their extremities and replaced with water from the distribution system, refer Section 9.06.B and to Standard Detail UW-22. Bacteriological sampling and analysis of the replacement water shall then be made by an approved laboratory or the Health Department in full accordance with the AWWA Manual C651. The line shall not be placed in service until the requirements of the State and County Public Health Department are met. Results of the bacteriological tests together with certified record drawings must be submitted to the Health Department (DOH/FDEP) within 60 days of the tests.

E. Water discharged by cleaning, disinfection and flushing operations shall be disposed of in accordance with US EPA, FDEP and SWFWMD regulations.

F. Special disinfection procedures when approved by the County may be used where the method outline above is not practical.

END OF SECTION

SECTION 02611 VALVES AND APPURTENANCES

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install complete and ready for operation all valves and appurtenances as indicated on the construction Drawings and specified herein.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. All of the types of valves and appurtenances shall be products of well established reputable firms who are fully experienced 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 standards as applicable. Valves used in waterworks applications shall comply with Section 8 of NSF Standard 61 for mechanical devices.

B. All of the equipment and materials specified herein are intended to be standard for use in controlling the flow of potable water, reclaimed water, wastewater, etc., depending on the applications.

C. All valves and appurtenances shall be of the size shown on the Drawings and, to the extent possible, all equipment of the same type on the project shall be from a single manufacturer. The year of the valve shall be cast in the body of the valve.

D. All valves and appurtenances shall have the name of the manufacturer and the working pressure for which they are designed cast in raised letters upon some visible part of the body.

E. Special tools, if required for the normal operation or maintenance, shall be supplied with the equipment.

F. All hand actuated buried valves shall have three-piece adjustable valve boxes and 2-inch square AWWA operating nuts. Provide extension stems and alignment rings where needed to bring the operating nut to within 4 feet below the box lid.

G. Water and reclaimed water system isolation valves shall be gate valves for sizes 2-inch through 12-inch and shall be butterfly valves for sizes 16-inch and larger.

H. With the exception of force main tapping valves, isolation valves for sewer force main pipelines shall be plug valves and shall be spaced not more than 1,200 linear feet apart. Gate valves shall be used for tapping force mains.

I. Isolation valves for potable water and reclaimed water shall be in accordance with the Ten State Standards. Valves shall be provided on water mains so that inconvenience and sanitary hazards will be minimized during repairs. Valves should be located at not more than 500 feet intervals in commercial districts and at not more than one block or 800 feet intervals in other districts. Where systems serve widely scattered customers and where future development is not expected, the valve spacing should not to exceed 1,600 linear feet.

J. Valves shall open when turning the operating nut or wheel counterclockwise and shall close when turning clockwise.

K. All bonnet bolts, gland bolts, nuts, and other trim hardware exposed to the outside environment shall be stainless steel. Thrust collar tie-rod bolts shall be stainless steel.

L. Fire hydrant spacing shall be in accordance with the Recommended Standards for Water Facilities (Ten State Standards), Latest Edition, the Manatee County Land Development Code, and State of Florida Fire Prevention Code. Generally, hydrant spacing may range from 350 to 600 feet, depending on the area being served. Hydrants should be provided at each street intersection and at intermediate points between intersections as recommended by the State Fire Marshal or designated local Fire District.

M. All valves shall have:

1. A standard screw type valve box (buried valves).
2. Operator nuts centered in the valve box including a centering device AFC part no. B 59434 or equal (buried valves).
3. Mechanical joint or flanged ends.

N. Valve operator nuts located 4 feet or more below final grade shall be equipped with an approved mechanically connected valve extension. All fittings, bends, crosses, etc., shall have mechanical joint or flanged ends unless previously approved flexible joint restraint system is used.

2.02 DIRECTORY

A. The following valves and appurtenances are specified herein:

Equipment	Paragraph
GATE VALVES	2.03
COMBINATION PRESSURE REDUCING AND PRESSURE SUSTAINING WITH CHECK VALVE OPTION	2.04
BALL VALVES	2.05
BUTTERFLY VALVES	2.06
PLUG VALVES	2.07
VALVE ACTUATORS	2.08
AIR RELEASE VALVES	2.09

VALVE BOXES	2.10
CORPORATION STOPS AND SADDLES	2.11
FLANGE ADAPTERS AND PLAIN END COUPLINGS	2.12
HOSE BIBS	2.13
SWING CHECK VALVES	2.14
HYDRANTS	2.15
RESTRAINED JOINTS	2.16
TAPPING SLEVES AND VALVES	2.17

2.03 GATE VALVES

A. Where indicated on the Drawings or necessary due to locations, size, or inaccessibility, chain wheel operators shall be furnished with the valves. Such operators shall be designed with adequate strength for the valves with which they are supplied and provide for easy operation of the valve. Chains for valve operators shall be galvanized.

B. Gate valves installed underground shall be provided with a box cast in a concrete pad and a box cover. Valve wrenches and extension stems shall be provided by the manufacturer to actuate the valves.

C. Gate valves 2 inches to 14 inches in diameter shall be resilient seated, manufactured to meet or exceed the requirements of AWWA C509 and AWWA C515 and shall be UL listed and FM approved where applicable. Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve.

D. The valves shall have a nonrising stainless steel stem to eliminate lead content. All bolts, nuts and washers shall be stainless steel to eliminate exterior corrosion and maintain fastener strength. Manufacturer shall use Never-Seez or equivalent during assembly of bolt and nut sets to prevent galling of similar metals. Stem seals shall be provided and shall be of the O-ring type, two above and one below the thrust collar. Valves that are located above grade and located in valve vaults shall be OS&Y with flanged joints.

E. The wedge shall be ductile iron fully encapsulated with an EPDM rubber. The Elastomer type shall be permanently indicated on the disc or body of the valve. The resilient sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction.

F. The valve body, bonnet, and bonnet cover shall meet or exceed all the requirements of AWWA C509 or AWWA C515. All ferrous surfaces inside and outside shall have a fusion-bonded epoxy coating per AWWA C550.

G. Gate valves meeting AWWA C509 requirements shall be rated for an operating pressure of 200 psi and shall be tested in accordance with AWWA C509. Valves meeting AWWA C515 requirements shall be rated for an operating pressure of 250 psi and shall be tested in accordance with AWWA C515.

H. The valves are to have 2-inch cast or ductile iron or operating nuts and shall open left or

counter-clockwise.

I. The valves shall be covered by a Manufacturer's 10-year warranty on manufacturer's defects and reasonable labor costs for replacement. Warranty shall become effective from the date of purchase by the end user and delivered within 30 days from the receipt of the purchase order. For publicly owned and maintained utilities, the end user is Manatee County Government.

J. Gate valves shall be assembled and tested in a certified ISO 9001:2000 manufacturing facility within the United States and provide their certification of meeting internationally recognized quality control procedures.

2.04 COMBINATION PRESSURE REDUCING AND PRESSURE SUSTAINING VALVE WITH CHECK VALVE

A. Pressure sustaining and check valve shall be pilot operated diaphragm actuated valve with cast iron body, bronze trim, and 125-pound flanged ends. The valve shall be hydraulically operated, diaphragm type globe valve. The main valve shall have a single removable seat and a resilient disc, of rectangular cross section, surrounded on three and a half sides. No external packing glands are permitted and there shall be no pistons operating the main valve or any controls. The valve shall be equipped with isolation valves to service the pilot system while permitting flow if necessary. Main valve and all pilot controls shall be manufactured in the United States of America. Valve shall be single chamber type, with stainless steel stem.

B. Valve shall automatically reduce pressure for the downstream distribution network and sustain a minimum pressure in the high pressure main regardless of distribution demand, and as an option, shall also close when a pressure reversal occurs for check valve operations. The pilot system shall consist of two direct acting, adjustable, spring loaded diaphragm valves.

C. Valve shall be cast iron or ductile iron with main valve trim of brass and bronze. The pilot control valves shall be cast brass with 303 stainless steel trim. Valve shall be similar in all respects to Cla-Val Company, Model 92-01 or a similar control valve such as Bermad Model 723, GA Industries Model 4700 or an approved equal.

2.05 BALL VALVES

A. Ball valves for water and reclaimed water, in sizes 3/4 inch through 2 inches, shall be brass body, stem and ball per ASTM B 62, alloy 85-5-5-5, full port, full flow, 1/4-turn check, ball curb valves, rated for 300 psi, Mueller 300 (as specified in the table below), Ford B-Series, or approved equal, with compression, pack joint, flare, threaded or flanged ends as required. Ball valves for wastewater, 2 inches through 3 inches, shall be Type 316 stainless steel body, cap, stem and ball per ASTM A351, full port, full flow, 1/4-turn check, ball valves, steam rated for 150 psi, pressure rating 1,000 psi WOG, Pike PSB2 or approved equal, with threaded or flanged ends as required.

CURB STOPS (POTABLE & RECLAIMED WATER)

PIPE MATERIAL	TYPE OF CONNECTION	MODEL
HDPE	Compression x FIP	B-25170
HDPE	Pack Joint x FIP	P-25170
Copper	Compression x FIP	B-25170
Copper	Flare x FIP	B-25166
Stainless Steel	FIP x FIP Thread	B-20200

B. All valves shall be mounted in such a position that valve position indicators are plainly visible. Above grade ball valves shall have a vinyl coated lever handle. Lever handle, handle nut, and lever packing gland shall be Type 304 or Type 316 stainless steel.

C. Potable plastic service pipe material and compression and pack joint connectors shall not be used in soil that is contaminated with low molecular-weight petroleum products, aromatic hydrocarbons, chlorinated hydrocarbons or organic solvents. Appropriate service tubing shall apply.

2.06 BUTTERFLY VALVES

A. Butterfly valves shall conform to AWWA C504, Class 250 B, Mueller Lineseal XP, DeZurik AWWA, Pratt Triton HP-250, or an approved equal. All ferrous surfaces inside and outside shall have a fusion-bonded epoxy coating per AWWA C550.

B. Valve seats shall be an EPDM elastomer. Valve seats 24 inches and larger shall be field adjustable and replaceable without dismounting operator disc or shaft and without removing the valve from the line. Valves 20 inches and smaller shall have bonded or mechanically restrained seats as outlined in AWWA C504.

C. All valves shall be subject to hydrostatic and leakage tests at the point of manufacture. The hydrostatic test for Class 250 valves shall be performed with an internal hydrostatic pressure equal to 500 psi applied to the inside of the valve body of each valve. During the hydrostatic test, there shall be no leakage through the metal, the end joints or the valve shaft seal. The leakage test for the Class 250 valves shall be performed at a differential pressure of 250 psi and against both sides of the valve. No adjustment of the valve disc shall be necessary after pressure test for normal operation of valve. All valves shall be leak-tight in both directions.

D. Butterfly valve actuators shall conform to C504. Gearing for the actuators shall be totally enclosed in a gear case. Actuators shall be capable of seating and unseating the disc against the full design pressure and shall transmit a minimum torque to the valve. Actuators shall be rigidly attached to the valve body.

2.07 PLUG VALVES

A. Plug valves shall be eccentric, non-lubricating type with integral plug and shafts and shall be furnished with end connections and with actuating mechanisms as called for on the construction plans or as otherwise required. Valves shall seal bubble-tight or water drop-tight in both directions when tested according to the Leakage Test method of AWWA C504 with an air pressure or hydrostatic pressure of 150 psi.

B. Plug valves shall also be subjected to the internal, full body Hydrostatic Test of AWWA C504 at a pressure two times the rated pressure or a minimum pressure of 300 psi, whichever is greater. During the test, there shall be no leakage through the metal, or through the end joints or shaft seal, nor shall any part of the valve be deformed.

C. Flanged valve ends shall be faced and drilled according to ANSI B 16.1, Class 125. Mechanical joint valve ends shall conform to AWWA C111. Threaded ends shall conform to the NPT requirements of ANSI B1.20.1.

D. The plug valve body, bonnet and gland shall be cast iron per ASTM A 126, Class B. The integral plug and shafts shall be cast iron ASTM A 126, Class B, or Type 316 stainless steel. The entire plug, except for the shafts, shall be covered with nitrile (Buna N) rubber. The rubber compound shall have been vulcanized to the metal plug and shall have a peel strength of not less than 75 pounds per inch when tested according to ASTM D 429, method B. The valve seat shall be at least 90 percent pure nickel, welded-in overlay into the cast iron body. The top and bottom bearings shall be Type 316 stainless steel.

E. Plug valves shall have a minimum port area of 80 percent of the nominal pipe size area.

F. Valves shall have worm gear type actuators with 2-inch square operating nuts.

G. Plug valves shall be installed side-ways with plug shaft horizontal so that the plug rotates upward when it opens.

H. Plug valves shall be coated inside with Protecto 401 or Amine Cured Novolac ceramic epoxy.

2.08 VALVE ACTUATORS

A. Butterfly valve and plug valve actuators shall conform to the requirements for actuators presented in AWWA C 504 and shall be either manual or motor operated. Actuators shall be capable of seating and unseating the disc against the full design pressure and velocity, as specified for each class, into a dry system downstream, and shall transmit a minimum torque to the valve. Actuators shall be rigidly attached to the valve body.

B. Manual Actuators:

1. Manual actuators shall have permanently lubricated, totally enclosed gearing with handwheel and gear ratio sized on the basis of actual line pressure and velocities. Actuators shall be equipped with handwheel, position indicator, and mechanical stop-limiting locking devices to prevent over travel of the disc in the open and closed positions. They shall turn counter-clockwise to open valves. Manual actuators shall be of the traveling nut, self-locking type or of the worm gear type and shall be designed to hold the valve in any intermediate position between fully open and fully closed without creeping or fluttering. Valves located above grade shall have handwheel and position indicator, and valves located below grade shall be equipped with a 2-inch square AWWA operating nut located at ground level and cast iron extension type valve box.

C. Motor Actuators (Modulating):

1. The motor actuated valve controller shall include the motor, actuator unit gearing, limit switch gearing, limit switches, position transmitter which shall transmit a 4 to 20 mA DC signal, control power transformer, electronic controller which will position the valve based on a remote 4 to 20 milliamp signal, torque switches, bored and key-wayed drive sleeve for non-rising stem valves, declutch lever and auxiliary handwheel as a self-contained unit.
2. The motor shall be specifically designed for valve actuator service using 480-volt, 60-Hertz, 3-phase power as shown, on the electrical Drawings. The motor shall be sized to provide an output torque and shall be the totally enclosed, non-ventilated type. The power gearing shall consist of helical gears fabricated from heat treated alloy steel forming the first stage of reduction. The second reduction stage shall be a single stage worm gear. The worm shall be of alloy steel with carburized threads hardened and ground for high efficiency. The worm gear shall be of high tensile strength bronze with hobbed teeth. All power gearing shall be grease lubricated. Ball or roller bearings shall be used throughout. Preference will be given to units having a minimum number of gears and moving parts. Spur gear reduction shall be provided as required.
3. Limit switches and gearing shall be an integral part of the valve control. The limit switch gearing shall be made of bronze and shall be grease lubricated, intermittent type and totally enclosed to prevent dirt and foreign matter from entering the gear train. Limit switches shall be of the adjustable type capable of being adjusted to trip at any point between fully opened valve and fully closed valve.
4. The speed of the actuator shall be the responsibility of the system supplier with regard to hydraulic requirements and response compatibility with other components within the control loop. Each valve controller shall be provided with a minimum of two rotor type gear limit switches, one for opening and one for closing. The rotor type gear limit switch shall have two normally open and two normally closed contacts per rotor. Gear limit switches must be geared to the driving mechanism and in step at all times whether in motor or manual operation. Provision shall be made for two additional rotors as described above, each to have two normally open and two normally closed contacts. Each valve controller shall be equipped with a double torque switch. The torque switch shall be adjustable and will be responsive to load encountered in either direction of travel. It shall operate during the complete cycle without auxiliary relays or devices to protect the valve, should excessive load be met by obstructions in either direction of travel. The torque switch shall be provided with double-pole contacts.
5. A permanently mounted handwheel shall be provided for manual operation. The handwheel shall not rotate during electric operations, but must be responsive to manual operation at all times except when being electrically operated. The motor shall not rotate during hand operation nor shall a fused motor prevent manual operation. When in manual operating position, the unit will remain in this position until motor is energized at which time the valve operator will automatically return to electric operation and shall remain in motor position until handwheel operation is desired. This movement from motor operation to handwheel operation shall be accomplished by a positive declutching lever which will disengage the motor and motor gearing mechanically, but not electrically. Hand operation must be reasonably fast. It shall be impossible to place the unit in manual operation when the motor is running. The gear limit switches and torque switches shall be housed in a single easily accessible compartment integral with the power compartment of the valve control. All wiring shall be accessible through this compartment. Stepping motor drives will not be acceptable.
6. The motor with its control module must be capable of continuously modulating over

its entire range without interruption by heat protection devices. The system, including the operator and control module must be able to function, without override protection of any kind, down to zero dead zone.

7. All units shall have strip heaters in both the motor and limit switch compartments.
8. The actuator shall be equipped with open-stop-close push buttons, an auto-manual selector switch, and indicating lights, all mounted on the actuator or on a separate locally mounted power control station.
9. The electronics for the electric operator shall be protected against temporary submergence.
10. Actuators shall be Limitorque L120 with Modutronic Control System containing a position transmitter with a 4 to 20 mA output signal or equal.

D. Motor Actuators (Open-Close):

1. The electronic motor-driven valve actuator shall include the motor, actuator gearing, limit switch gearing, limit switches, torque switches, fully machined drive sleeve, declutch lever, and auxiliary handwheel as a self-contained unit.
2. The motor shall be specifically designed for valve actuator service and shall be of high torque totally enclosed, nonventilated construction, with motor leads brought into the limit switch compartment without having external piping or conduit box.
   a. The motor shall be of sufficient size to open or close the valve against maximum differential pressure when voltage to motor terminals is 10 percent above or below nominal voltage.
   b. The motor shall be prelubricated and all bearings shall be of the anti-friction type.
3. The power gearing shall consist of helical gears fabricated from heat treated steel and worm gearing. The worm shall be carburized and hardened alloy steel with the threads ground after heat treating. The worm gear shall be of alloy bronze accurately cut with a hobbing machine. All power gearing shall be grease lubricated. Ball or roller bearings shall be used throughout.
4. Limit switches and gearing shall be an integral part of the valve actuator. The switches shall be of the adjustable rotor type capable of being adjusted to trip at any point between fully opened valve and fully closed valve. Each valve controller shall be provided with a minimum of two rotor type gear limit switches, one for opening and one for closing (influent valves require additional contacts to allow stopping at an intermediate position). The rotor type gear limit switch shall have two normally open and two normally closed contacts per rotor. Additional switches shall be provided if shown on the control and/or instrumentation diagrams. Limit switches shall be geared to the driving mechanism and in step at all times whether in motor or manual operation. Each valve actuator shall be equipped with a double torque switch. The torque switch shall be adjustable and will be responsive to load encountered in either direction of travel. It shall operate during the complete cycle without auxiliary relays or devices to protect the valve should excessive load be met by obstructions in either direction of travel. Travel and thrusts shall be independent of wear in valve disc or seat rings.
5. A permanently mounted handwheel shall be provided for manual operation. The handwheel shall not rotate during electric operation except when being electrically operated. The motor shall not rotate during hand operation, nor shall a fused motor prevent manual operation. When in manual operating position, the unit will remain in this position until motor is energized at which time the valve actuator will automatically return to electric operation and shall remain in motor position until handwheel operation is desired. Movement from motor operation to handwheel

operation shall be accomplished by a positive declutching lever which will disengage the motor and motor gearing mechanically, but not electrically. Hand operation must be reasonably fast. It shall be impossible to place the unit in manual operation when the motor is running.

6. Valve actuators shall be equipped with an integral reversing controller and three phase overload relays, Open-Stop-Close push buttons, local-remote-manual selector switch, control circuit transformer, three-phase thermal overload relays and two pilot lights in a NEMA 4X enclosure. In addition to the above, a close coupled air circuit breaker or disconnect switch shall be mounted and wired to the valve input power terminals for the purpose of disconnecting all underground phase conductors.
7. The valve actuator shall be capable of being controlled locally or remotely via a selector switch integral with the actuator. In addition, an auxiliary dry contact shall be provided for remote position feedback.
8. Valve A.C. motors shall be designed for operation on a 480-volt, 3-phase service. Valve control circuit shall operate from a fuse protected 120-volt power supply.
9. Motor operators shall be as manufactured by Limitorque Corporation, Type L120 or approved equal.

2.09 AIR RELEASE VALVES

A. Air release valves shall be automatic float operated, GA Industries 929, or an approved equal, with inlet size and working pressure ratings as required and NPT connections.

B. Valve bodies shall be cast iron per ASTM A126, Class B. The orifice, float and linkage shall be Type 304 stainless steel. The seat shall be (Buna N) nitrile elastomer.

2.10 VALVE BOXES

A. Buried valves shall have adjustable cast iron or HDPE valve boxes. Lids shall be cast iron drop type, and shall have "WATER", "SEWER", or "RECLAIM", as applicable, cast into the top.

B. Cast iron boxes shall be two-piece, or three-piece, as required, screw type, Tyler Pipe, 6850 Series, Box 461-S through 668-S, with extensions, as required to make the desired box length, or an approved equal, such as Russco 461-S through 668-S. Bottom barrel shall be 5-1/4 inches inside diameter, with a flanged bottom with sufficient bearing area to prevent settling.

C. HDPE boxes shall be two-piece, adjustable, 1/4-inch thick minimum heavy wall, high density polyethylene, with cast iron top and galvanized steel adjustable stem, Trench Adapter, as manufactured by American Flow Control, or an approved equal. Bottom barrel shall have flanged bottom to prevent settling. All bolts, screws and pins shall be stainless steel.

D. All valves shall either have operating nuts within 4 feet below the top of the lid or shall have extension stems with centering guides to provide an extended operating nut within 4 feet below the lid. Extension stems shall be fixed to the valve operating nut with a stainless steel fastener.

E. Reclaimed Valve Boxes shall be square 9-inch by 9-inch load bearing marked "Reclaimed Water" and painted purple.

F. All potable water, sewer, and reclaimed water grade-adjustment risers shall be cast iron material just like the valve box.

G. A centering device AFC part no. B 59434 or equal shall be installed in the valve box.

H. Stand pipe shall match color code of the system being installed, (blue for potable, Pantone purple 522 C for reclaimed, and green for sanitary sewer).

2.11 CORPORATION STOPS AND SADDLES

A. Corporation stops for connections to ductile iron and PVC water and reclaimed water mains shall be all red brass, alloy 85-5-5-5, per ASTM B 62, and shall conform to AWWA C800. 1-inch through 2-inch corporation stops shall be ball type, 300 psi working pressure rated, with AWWA MIP threaded inlets and compression, pack joint, flare, or FIP threaded joint outlets, Mueller as shown in the table below, or an approved equal. All joints made to CTS size HDPE tubing shall use stainless steel insert stiffeners.

Corporation Stops

Pipe Material	Type of Connection	Model
HDPE	Compression X AWWA MIP Thread	B-25028 (Saddle)
HDPE	Compression CTS X AWWA MIP Taper Thread	B-25008 (Direct Tap)
HDPE	Pack Joint CTS X AWWA MIP Thread	P-25028 (Saddle)
HDPE	Pack Joint CTS X AWWA MIP Taper Thread	P-25008 (Direct Tap)
Copper	Compression X AWWA MIP Thread	B-25028 (Saddle)
Copper	Pack Joint CTS X AWWA MIP Taper Thread	B-25008 (Direct Tap)
Copper	Pack Joint CTS X AWWA MIP Thread	P-25028 (Saddle)
Copper	Pack Joint CTS X AWWA MIP Taper Thread	P-25008 (Direct Tap)
Copper	Flare X AWWA MIP Thread	B-25025 (Saddle)
Copper	Flare X AWWA MIP Taper Thread	B-25000 (Direct Tap)
Stainless Steel	FIP Thread X AWWA MIP Thread	B-20046 (Saddle)
Stainless Steel	FIP Thread X AWWA MIP Taper Thread	B-20045 (Direct Tap)

B. Potable plastic service pipe material and compression and pack joint connectors shall not be used in soil that is contaminated with low molecular-weight petroleum products, aromatic hydrocarbons, chlorinated hydrocarbons or organic solvents. Appropriate service tubing shall apply.

C. Service connections to water and reclaimed water mains shall be made using red brass saddles, alloy 85-5-5-5 per ASTM B 62. Straps, washers and nuts shall be brass or stainless steel. No ductile iron, cast iron or steel saddles will be allowed. Saddles shall be Smith Blair 325 Bronze saddles with Stainless Steel or brass extra wide strap or equivalent.

D. Connections to sanitary force mains that are less than or equal to 2 inches, shall be made using Romac Style 306 double bolt stainless steel service saddles or equivalent.

E. Connections to HDPE mains shall be as specified in Sections 11.12 C & D or shall be Central Electrofusion Corp Saddles, or equivalent, per AWWA C906 and ASTM F-1055, with stainless steel compression ring and a brass adapter insert (for potable and reclaimed connections) providing direct connection to the brass corporation stop. A stainless steel insert shall be provided for any direct connection to wastewater force mains with stainless steel ball valves associated with air release valves. All saddles shall be properly sized for and compatible with the HDPE pipe. Saddles shall be electrofusion installed per the saddle and electrofusion installation equipment manufacturer's recommendations. All other materials, specifications, and provisions shall remain unchanged.

2.12 FLANGED ADAPTERS AND PLAIN END COUPLINGS

A. Plain end couplings and adapters shall be fusion-bonded epoxy coated carbon steel with Ethylene Propylene Diene Monomer (EPDM) rubber gaskets and stainless steel nuts, bolts and spacers. Acrylonitrile butadiene (NBR) gaskets shall be used for potable water mains that are located in soil that is contaminated with low molecular-weight petroleum products or nonchlorinated organic solvents or non-aromatic organic solvents. Fluorocarbon (FKM) gaskets shall be used for potable water mains that are located in soil that is contaminated with aromatic hydrocarbons or chlorinated hydrocarbons. Fluorocarbon (FKM) gaskets shall be used for potable water mains if the soil is contaminated with aromatic hydrocarbons or chlorinated hydrocarbons, and is also contaminated with low molecular-weight petroleum products or organic solvents. Couplings shall be of a two-bolt design where each end gasket is compressed and sealed by tightening a single bolt, equal to Dresser Style 262 Hymax, or another approved equal. Flanged adapters shall have a plain end single-bolt compression seal same as the Hymax, with an ANSI 125 Class flange on the opposite end, and shall be Dresser Style 272 or an approved equal. Type 316 stainless steel backup rings shall be used for force mains that are located in corrosive environments including wet wells and valve vaults.

2.13 HOSE BIBS

A. Hose bibs shall be 3/4-inch or 1-inch brass, polished chromium plated brass, with vacuum breaker as noted on the Drawings.

2.14 SWING CHECK VALVES

A. Check valves shall be swing type, weighted lever, conforming to AWWA C508. Valves shall be iron-body, bronze-mounted, single disk, 175 psi working pressure for 2 inches through 12 inches, 150 psi for 14 inches through 30 inches, with ANSI B16.1 Class 125 flanged ends, as manufactured by Mueller, No. A-2600-6-01 (sewer), Mueller, No. A-2602-6-01 (water), or AVK series 41, or an approved equal.

B. When there is no flow through the line, the disc shall hang lightly against its seat in practically a vertical position. When open, the disc shall swing clear of the waterway.

C. Check valves shall have bronze seat and body rings, extended bronze or stainless steel hinge pins and stainless steel nuts and bolts on bolted covers.

D. Valves shall be so constructed that disc and body seat may easily be removed and replaced without removing the valve from the line. Valves shall be fitted with an extended hinge arm with outside lever and weight.

2.15 HYDRANTS

A. Hydrants shall be dry barrel, nostalgic style, and shall be AVK Model 2780, or approved equal, and shall conform to AWWA C502 and be UL/FM certified, and shall in addition meet the specific requirements and exceptions which follow:

1. Hydrants shall be according to manufacturer's standard pattern or nostalgic style and of standard size, and shall have one 5-inch Storz connection or equivalent with two 2-1/2-inch hose nozzles.
2. Hydrant inlet connections shall have mechanical joints for 6-inch pipe.
3. Hydrant valve opening shall have an area at least equal to that area of a 5-1/4-inch minimum diameter circle and be obstructed only by the valve rod. Each hydrant shall be able to deliver 1,000 gpm minimum through its 5-inch Storz nozzle with a loss of not more than 2.5 psi in the hydrant.
4. The upper and lower stem rod shall be stainless steel and shall have stainless steel break coupling, pins and clips; or cast or ductile iron breakaway coupling with fusion bonded epoxy coated at the factory with stainless steel pins and clips.
5. Hydrants shall be hydrostatically tested as specified in AWWA C502 and shall be rated at 250 psi minimum.
6. The operating nut shall be 1-1/2-inch pentagon shaped with a protective weather cover, and open counter clockwise.
7. All nozzle threads shall be American National Standard.
8. Each nozzle cap shall be provided with a Buna N rubber washer.
9. All hydrants shall be traffic break away type and allow for 360-degree rotation to position the Storz connection/nozzle in the desired direction after installation.
10. Hydrants must be capable of being extended without removing any operating parts.
11. Weepholes shall be excluded from fire hydrants.
12. Hydrant main valve closure shall be of the compression type opening against the pressure and closing with the pressure. The main valve shall be faced or covered with EPDM elastomer, which shall seat on a bronze ring.

13. Hydrant bonnets, weather cover, nozzle section, caps and shoe shall be cast iron or ductile iron, and shall be fusion-bonded epoxy coated at the factory, per AWWA C550, inside and outside. Hydrant extensions shall have stainless steel stems with stainless steel breakaway couplings and pins; or fusion bonded epoxy coated cast or ductile iron breakaway coupling with stainless steel pins, and stainless steel nut and bolt sets. Aboveground parts shall also have a top coat of UV resistant polyester or exterior enamel paint; color Safety Yellow for fire hydrants that are connected to the potable water system. Aboveground parts shall also have a top coat of UV resistant polyester or exterior enamel paint; color Pantone Purple 522C for fire hydrants that are connected to the reclaimed water system.
14. Exterior nuts, bolts and washers shall be stainless steel. Bronze nuts may be used below grade.
15. All internal operating parts shall be removable without requiring excavation.
16. Hydrants shall be located on same side of roads as water main unless approved by Manatee County.
17. All hydrant sections shall have a yellow electrostatic applied, fusion bonded epoxy coating internally and externally, or approved equal by Manatee County. The coating shall meet or exceed the requirements of AWWA C-550. Coating will be applied only at the original manufacturing facility. The standpipe shall be Bitumen coated internally and externally or fusion-bonded epoxy internally and externally with a bury line present below the break flange to indicate proper installation depth. Bury line will be clearly stenciled on the standpipe section. All hydrants shall be delivered painted externally with Sherman-Williams Acrolon™ 218 HS, an Aliphatic Acrylic Polyurethane, or a manufacturer's equivalent. The color shall be Safety Yellow (Color #330) for fire hydrants that are connected to the potable water system. The color shall be Pantone Purple 522C for fire hydrants that are connected to the reclaimed water system. All hydrants shall be covered by a Manufacturer's 10-year warranty on manufacturer's defects and reasonable labor costs for replacement. Warranty shall become effective from the date of purchase by the end user and delivered within 30 days from the receipt of the purchase order.

2.16 RESTRAINED JOINTS

A. Pipe joints shall be restrained by poured-in-place concrete thrust blocks, thrust collars or by other mechanical methods, including stainless steel tie rods, Stargrip and Allgrip, as manufactured by Star Pipe Products or Megaflange and 2000 PV, as manufactured by EBAA Iron Sales. Flanged joints may be used aboveground.

B. Restrained joints may also be Lok-Ring, as manufactured by American Cast Iron Pipe Company, or an approved equal.

C. Restrained joint designs which require wedges and/or shims to be driven into the joints in order to disassemble the pipe shall not be allowed.

D. Valves may be restrained by a restrained vault or thrust collars when restrained joints are not feasible.

2.17 TAPPING SLEVES AND VALVES

A. Tapping valves shall meet the requirements of AWWA C509/C515 with ductile iron body and shall be rated for a pressure of 250 psi. The valves shall be flanged with alignment ring by mechanical joint with a non-rising stainless steel stem to eliminate lead content. All bolts, nuts and washers shall be stainless steel to eliminate exterior corrosion and maintain fastener strength. Manufacturer shall use Never-Seez or equivalent during assembly of bolt and nut sets to prevent galling of similar metals. Stem seals shall be provided and shall be of the O-ring type, two above and one below the valve's thrust collar. Valve shall be designed for vertical burial and shall open counterclockwise. Operating nut shall be AWWA standard 2-inch square for 2 inches and up. Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve to accommodate full size shell cutter. Gaskets shall cover the entire area of the flange surface and be 1/8-inch minimal thickness of red rubber. The wedge shall be ductile iron fully encapsulated with EPDM rubber. All bolts, nuts and washers between the sleeve and valve shall be stainless steel.

B. Tapping sleeves and saddles shall seal to the pipe by the use of a confined "O" ring gasket, and shall be able to withstand a pressure test of 180 psi for water lines or 150 psi for sewer force mains for one hour with no leakage in accordance with AWWA C110. A stainless steel 3/4-inch NPT test plug shall be provided for pressure testing. All bolts joining the two halves shall be stainless steel and shall be included with the sleeve or saddle. Sleeves and saddles shall be protected from corrosion by being fusion applied epoxy coated, or be made of 18-8 Type 304 stainless steel. Saddle straps shall be 18-8 Type 304 stainless steel.

2.18 TRACER WIRE BOXES

A. Tracer wire test station boxes shall be provided at plug valves, butterfly valves, blowoff valves, gate valves, fire hydrants and backflow preventers as shown in these standards. Tracer wire test station boxes shall be 2-1/2-inch diameter, 15-inch length, ABS plastic with a cast iron lid, part no. P200NFG2T as manufactured by Bingham/Taylor, or equal approved by Manatee County.

PART 3 EXECUTION

3.01 INSTALLATION

A. All valves, hydrants, and other appurtenances shall be installed at the location indicated on the construction Drawings, in accordance with the Ten State Standards, Latest Edition, true to the required alignment on firm foundations, rigidly affixed and firmly supported, as required, and at right angles to the horizontal. In the event of any damages occurring to the installed materials, they shall be either repaired to the complete satisfaction of the County or they shall be removed from the project site and replaced with new standard equipment.

END OF SECTION

SECTION 02614 RECORD DRAWINGS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. When construction is complete, Record Drawings, indicating the locations and elevations of the improvements that have been built, shall be provided to Manatee County Public Works Department. The Record Drawings shall be a special revision of the Construction Drawings, and shall depict design information crossed out (or screen shaded) and replaced by accurate record information.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 RECORD INFORMATION

A. Water distribution utility systems, reclaimed water (or irrigation) utility systems, and sanitary sewer collection utility systems shall be located and the locations shall be depicted and noted on the Record Drawings by station and offset from an established baseline, and by elevation relative to established benchmarks.

1. Elements of the utility systems that shall be located and noted by station and offset:
   a. Valves (center of cover).
   b. All fittings (other than sanitary sewer service wyes and water or reclaimed water saddles).
   c. Water services (center of meter or meter box).
   d. Reclaimed water (or irrigation) services (center of meter or meter box).
   e. Other miscellaneous utility structures with features at or above the surface of the ground.
2. Elements of the utility systems that shall be located and noted by station, offset and elevation:
   a. Center of sanitary sewer manhole covers (top of rim for elevations).
   b. Center of lift stations (top of slab for elevations).
   c. Center of valve vaults (top of slab for elevation).
   d. Top of pipe on potable water mains, reclaimed water mains and sanitary force mains at intervals no greater than 200 feet apart and at locations where there is a substantial grade change.
   e. Center of sanitary sewer service clean-out cover (invert of 45° wye that is located directly below the clean-out cover for elevation).
   f. Center of fire hydrants, (center of 5-inch Storz connection nozzle for elevation).
3. At locations where a top-of-pipe elevation is required for pipeline, a top-of-ground or top-of-pavement elevation shall also be measured and noted on the Drawings.
4. Elements of the utility systems that shall be located and noted by elevation only - sanitary sewer manhole inverts of individual sewer pipes where they enter and exit the manhole.

B. On Record Drawings, at locations where the horizontal positions of constructed pipelines or other utility structures deviate by more than 5 feet (as scaled on the Drawing) from the horizontal positions that were shown on the Construction Drawings, the actual positions of the pipelines or structures shall be measured and they shall be depicted in their actual positions on the Record Drawings and their original design positions shall be crossed-hatched out or screen shaded.

C. Record information shall include a thorough description of the pipes that have been installed, including type of pipe material, size, class, diameter ratio, and other basic information. The recalculated slopes of gravity sewer mains, based on the record survey of manhole inverts and lengths of pipes, shall be indicated on the Record Drawings.

D. For new valves, the manufacture type (as in gate, plug or butterfly), size (pipe nominal diameter) and make (manufacturer) of each valve shall be noted on the Record Drawings.

E. Lift station control and equipment elevations that were shown on the original construction drawing lift station detail sheet shall be measured and the record survey elevations shall be shown on the record drawing revision of the detail sheet. Record pump information, including pump make, model, year of manufacture, serial number, impeller diameter, voltage, horse power and speed, shall be shown on the record drawing revision of the lift station detail sheet.

F. Horizontal Directional Drilling (HDD) locations and elevations shall be shown on the Record Drawing. The Surveyor shall locate the beginning, ending and the surface location of the log readings, and shall be so noted on the Record Drawings. The HDD Contractor shall provide a certified report and bore log indicating the horizontal and vertical location every 25 linear feet or less along the pipe. The information provided by the HDD Contractor shall be depicted on the Record Drawing and identified as having been provided by the HDD Contractor.

3.02 REQUIREMENTS AS TO FORM

A. Every set of Record Drawings shall have a cover sheet with a vicinity map, which shows where the project is located, and a key map, which shows where each sheet in the record drawing set is located inside the project boundaries.

B. Each sheet of the Record Drawings shall have the title "RECORD DRAWING" printed on it in large, bold lettering, near the title block. Each sheet shall also have the words "COUNTY MAINTAINED - WATER," "- SEWER" or "-WATER AND SEWER," or "PRIVATELY MAINTAINED - WATER," "- SEWER," or "- WATER AND SEWER" in large, bold lettering, near the title block, depending on which entity will be responsible for maintaining the utilities. If the project includes a new reclaimed water system, each sheet shall also have the words "COUNTY MAINTAINED - RECLAIMED WATER," or "PRIVATELY MAINTAINED - RECLAIMED WATER," in large, bold lettering, near the title block, depending on which entity will be responsible for maintaining the utilities.

C. Record drawing information submitted in tabular form shall not be accepted. Record information notes shall be positioned individually on the Drawings near the depictions of structures to which each note corresponds.

D. Record information notes shall be bold, italics, boxed or clouded to identify them as record information.

E. Record Drawings shall have a revision note such as "Record Drawing" in the revision block and a date corresponding to the date the Record Drawing was issued.

F. Record information shall be presented in a clear and comprehensible form.

G. The drawing scales used in the Record Drawings shall be the same as were used in the Construction Drawings, and the sheet number of each Record Drawing sheet shall be the same as the sheet numbers that were used on the Construction Drawings from which the Record Drawings originate.

H. All sheets that were used to depict locations and elevations of utility structures in the Construction Drawings shall be included in the record drawing set.

I. Record Drawings shall accurately depict all existing improvements lying within the immediate vicinity of the constructed utilities. Existing improvements shall include, but not be limited to: sidewalks, walls, fences, road surfaces, buildings, and other utilities. Immediate vicinity includes areas within utility easements, includes areas within rights of way, and also includes areas within 15 feet of potable water mains, reclaimed water mains, sanitary force mains, and gravity sewer mains. Immediate vicinity also includes areas within 10 feet of potable water meters, reclaimed water meters, backflow preventers, and fire hydrants. Private irrigation mains that are not located within the rights of way shall also be located on the Record Drawings. Rights of way, easements, and property corners shall be shown and shall be of sufficient detail as to determine if the constructed utilities are within the easements or rights of way. A reference to the recording document (O.R. Book or Plat Book and Page) shall be included with any depiction of a right-of-way or easement. O.R. Book or Plat Book and Page are not required to be shown on the Record drawings of a project for proposed rights of way, or proposed easements that will identified on the proposed final plat for the said project.

J. Each roadway depicted on the Drawings shall have the correct roadway name noted on it. Provisional roadway names, such as "Street A", shall not be allowed on the Record Drawings. Each new lot of a new subdivision shall have its street address number noted on the Record Drawings.

K. Horizontal locations required for valves, fittings, services, and other utility structures shall be to the center of each installation. Top of ground or pavement elevations required along pipelines shall be reported to the nearest 0.1 feet. Top of pipe elevations shall be to the nearest 0.1 feet. Elevations of manhole rims and manhole pipe inverts shall be reported to the nearest 0.01 feet. Horizontal locations of all features shall be reported to the nearest 0.1 feet.

L. Computer drawing files submitted shall be AutoCAD® 2004 or later release date versions. All reference files required to recreate the signed and sealed Record Drawings shall be included in the submitted digital files. Computer drawing files format shall be DWG only and shall be Windows NT or Windows 2000 or Windows XP compatible.

3.03 MONUMENTATION

A. Record information shall be referenced by station and offset to a monumented baseline. The monumentation for the baseline shall be shown or described on the record drawing (i.e. iron rod & cap, nail & disk or other durable and identifiable monument). For each baseline, there shall be at least two monuments described and referenced. State Plane Coordinates for the monuments shall be shown in NAD 83 (99 adjustment) in feet. Developments not within existing or proposed subdivisions and not within 1.5 miles from existing Manatee County Primary Control Points or platted State Plane Coordinates may be exempted from the requirement for monuments to be based on State Plane Coordinates.

B. The alignment of the baseline shall be along the centerline or edge of one of the following: an existing paved road, recorded right-of-way, recorded easement, face of an existing building, existing sidewalk or other existing, identifiable reference line. Offsets from the baseline shall not exceed 150 feet. All elevations shown on Record Drawings shall be referenced to a minimum of two described bench marks. A minimum of two on-site bench marks shall be described including datum. All bench marks shall be based upon NGVD29 and NAVD88. However, all Record Drawings shall be in NGVD29.

C. All locations and elevations shall be field located by or under the direct supervision of a Florida Licensed Surveyor and Mapper.

3.04 CERTIFICATIONS

A. Record Drawings shall be certified by a Florida Licensed Surveyor and Mapper. The certification shall state that the Record Locations and Elevations depicted on the Record Drawing are true and correct and were collected in the field by the Surveyor and Mapper or by a representative under the direct supervision of the Surveyor and Mapper.

B. Record Drawings shall be certified by the Engineer-of-Record. The certification must state that the improvements have been constructed in substantial conformance with the approved plans.

C. All visible record features, including sewer inverts, must be measured and located by the Surveyor or by personnel under his or her direct supervision. The certifying Surveyor shall be fully responsible for the accuracy of the record locations and elevations shown on the Record Drawings. However, the Surveyor may include statements on the Record Drawings indicating the following:

1. With the exception of the beginning, ending and the surface locations of the Horizontal Directional Drilling (HDD) log readings, the Horizontal Directional Drilling (HDD) locations and elevations provided by the HDD Contractor have not been field verified.
2. Station and offset of pipe fittings are based on PVC pipe markers or 2-inch by 4-inch markers inserted by the Contractor on the top of pipe fittings.
3. Station, offset, and elevation of potable water mains, reclaimed water mains, and sanitary force mains are based on PVC pipe markers or 2-inch by 4-inch markers inserted by the Contractor on the top of pipe. (See Sections 02614.02F and 02609.04R of these Standards.)

3.05 SUBMITTALS

A. Record Drawing submittal materials shall be attached to a transmittal letter, which shall list the following information:

1. Submittal date.
2. Project Title.
3. Planning Department Final Site Plan number (if applicable).
4. Title and sheet number of each Record Drawing sheet submitted.

B. The following materials shall be submitted for review and approval:

1. Transmittal letter.
2. Two signed, dated, and sealed sets of the Record Drawings.
3. Final plats and/or easements when applicable.
4. Final breakdown of construction quantities and final costs when applicable.
5. Performance bond, defect security bond, warranties and associated cost estimates when applicable.
6. A copy of the bacteriological test results.
7. A copy of all of the infrastructure inspection reports, and
8. Up to four copies each of the water and wastewater Completion of Construction forms, fully signed, sealed and dated by the Owner and Engineer, of which one of each will be retained for the County's records.

C. Once the Record Drawings has been reviewed and all corrections have been made, notification will be given to the Engineer to make the final submittal, which shall consist of the following materials:

1. Transmittal letter.
2. One set original Mylar Record Drawings.
3. Three copies of the Record Drawings plan set, each signed, dated, and sealed by the Engineer of Record.
4. One 3-1/2-inch floppy or CD ROM copy of the Record Drawings plan set.

END OF SECTION

SECTION 02619 HORIZONTAL DIRECTIONAL DRILLING

PART 1 GENERAL

1.01 SCOPE

The Contractor shall furnish all labor, materials, equipment and incidentals required to install all pipe, fittings and appurtenances as shown on the Drawings and specified in the Contract Documents by Horizontal Directional Drilling (HDD).

1.02 GENERAL

A. All existing structures, water and sewer lines, storm drains, utilities, driveways, sidewalks, signs, mail boxes, fences, trees, landscaping, and any other improvement or facility in the construction area that the Contractor disturbs for his own construction purposes shall be replaced to original condition at no additional cost to the County.

B. For "Navigable Waters of the U.S." reference 33 of the Code of Federal Regulations, Part 329.

C. For "Waters of the U.S." reference 33 of the Code of Federal Regulations, Part 323.

D. For "Waters of the State" reference Section 62-301 of the Florida Administrative Code.

1.03 TESTING

A. In place soil compaction tests shall be performed by a qualified testing laboratory.

B. Compaction tests shall be taken at every excavation, except in the road crossings or road shoulders; tests are to be taken according to current FDOT Standards.

C. All pipe shall be tested in accordance with the appropriate material specifications.

D. Reference Standards: American Society for Testing and Materials (ASTM), D1557, Moisture-Density Relations of Soils Using 10-lb. Rammer and 18-in. Drop.

E. The density of soil in place shall be a minimum of 95 percent in accordance with ASTM test 1557-70T, Method A or C.

1.04 QUALIFICATIONS

A. Pipe Manufacture: All pipe and fittings shall be furnished by a single manufacturer who is fully experienced, reputable and qualified in the manufacture of the items to be furnished.

B. Drilling Supervisor: The Contractor shall provide a competent boring specialist who shall remain on the project site during the entirety of the directional boring operation. This includes, but is not limited to, drilling fluid preparation, seaming, boring and pulling. The boring specialist shall have a minimum of five years experience in supervising directional bores of similar nature, diameter, materials and lengths.

C. Pipe Fusion: All boring and fusing equipment shall be certified for operation. The Contractor responsible for thermal butt fusing pipe and fittings shall have manufacturer certification for performing such work or a minimum of five years experience performing this type of work. If no certification is available, written documentation of the required work experience shall be submitted for approval.

D. Drilling Fluid Specialist: The personnel responsible for supervising the supply, mixing, monitoring fluid quality, pumping and re-circulation system proposed for the drilling fluid shall have a written certification issued by the Drilling Fluid manufacturer for performing such work or a minimum of five years experience performing this type of work. If no certification is available, written documentation of the required work experience for the proposed personnel shall be submitted for review and approval.

1.05 SUBMITTALS

A. Detailed description including specifications and catalog cuts for:

1. Shop drawings and catalog data for all HDD equipment.
2. The pipe manufacturer's maximum degree of radial bending allowed for the pipe when full and when empty and pullback force recommended setting.
3. Steering and tracking devices including specific tracer wire.
4. Drilling fluids; the drilling fluid submittal shall include the ratio of mixture to water, including any additives, based on the Contractor's field observations prior to construction, knowledge and experience with drilling in similar conditions, and any soil data provided in the Contract Documents, which shall be verified by the fluid specialist.
5. Shop drawings for the breakaway swivel, including the method of setting the swivels' break point and set point to be used.
6. Pipe assembly procedure, details of support devices, and staging area layout including methods to avoid interference with local streets, driveways, and sidewalks.
7. Details of pipe fusion procedures and copies of the fusion technician qualification certification or documentation.
8. Drilling fluid technician qualification certification or documentation

B. If the Contractor proposes any changes to the pull-back distance or profile shown on the drawings, he may be required to submit a complete design for the proposed pipe including an analysis for pull-back forces, external loads including full hydrostatic pressure if empty, external forces due to borehole collapse, ovalization during pull-back, thermal stress while exposed to Sun-light, shortening after release of pull-back force, and tensile stress during pull-back.

C. Bore Plan: For all contiguous piping installations over 300 feet in length or any installations for piping larger than 4" in diameter, the Contractor shall submit a Bore Plan that includes the following:

1. Contact information and experience for the drilling fluid specialist.
2. The number of passes the bore will include to get the product pipe installed.
3. The pilot bore and all reaming bore sizes including the final pullback with the product pipe.
4. Drilling rod length in feet.
5. The pilot bore, pre-ream bores (if any) and pullback production rate in minutes per (drilling) rod to maintain adequate mud flow.

6. Details of the entry and exit pit locations along with entry and exit angles for the bore, drawn to scale, depicting the position of all required equipment, access points, existing facilities to remain in place, existing traffic lanes to be maintained in operation, office trailers and storage sites.
8. The method of fusing or joining pipe of adjacent bores to ensure that the joint is on grade with the installed pipe.

D. Furnish a Bore Path Report to the Engineer within seven days of the completion of each bore path. Data collected by the County Representative does not relieve the Contractor from the responsibility of recording his own data. Include the following in the report:

1. Location of project, project name and number
2. Name of person collecting data, including title, position and company name
3. Investigation site location (Contract plans station number or reference to a permanent structure within the project right-of-way)
4. Driller's Log & identification of the detection method used
5. Elevations and offset dimensions of installed pipe as referenced to the drawings
6. Data log of pullback force during product pipe installation
7. All failed bores. Include length of pipe left in place and explanation of failed installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Incidental materials that may or may not be used to install the product depending on field requirements are not paid for separately and will be included in the cost of the installed product.

B. Drilling Fluids shall use a mixture of bentonite clay or other approved stabilizing agent mixed with potable water with a pH of 8.5 to 10.0 to create the drilling fluid for lubrication and soil stabilization. Vary the fluid viscosity to best fit the soil conditions encountered. Contractor shall have appropriate additives for drilling fluid available for different soil conditions that may be encountered. Do not use any other chemicals or polymer surfactants in the drilling fluid without written consent from the Engineer. Certify to the Engineer in writing that any chemicals to be added are environmentally safe and not harmful or corrosive to the product pipe.

C. For drilling operations that will be below waters of the State of Florida, only bentonite free drilling fluids shall be used. Acceptable products are BioMax, manufactured by M-I Swaco, Inc., P.O. Box 2216, Laurel, Mississippi 39440, Phone: (800) 731-7331 or Bio-Bore, manufactured by Baroid Drilling Fluids, Inc., P.O. Box 1675, Houston, Texas 77251, Phone: (731) 987-5900 or approved equal.

D. Identify the source of water for mixing the drilling fluid. Approvals and permits are required for obtaining water from such sources as streams, rivers, ponds or fire hydrants. Any water source used other than potable water may require a pH test.

E. The tracer wire to be used for all directional drills shall be a solid, 10 gauge, high strength, copper clad steel wire with a polyethylene jacket of appropriate color manufactured by Copperhead Industries or Manatee County approved equal.

F. Breakaway connectors shall be supplied by DCD Design & Manufacturing, Condux International, Inc. or approved equal.

PART 3 EXECUTION

3.01 SITE CONDITIONS

A. Carry out excavation for entry, exit, recovery pits, slurry sump pits, or any other excavation as specified in the Contract documents. Sump pits are required to contain drilling fluids if vacuum devices are not operated throughout the drilling operation, unless approved by the Engineer.

B. Within 48 hours of completing installation of the boring product, clean the work site of all excess slurry or spoils. Take responsibility for the removal and final disposition of excess slurry or spoils. Ensure that the work site is restored to pre-construction conditions or as identified on the plans.

C. Exposure of product pipe to sunlight shall be limited to 14 consecutive days unless approved by the Engineer.

C. The pipe shall be supported at intervals along its length with rollers or Teflon pads to minimize frictional forces when being pulled, and to hold the pipe above the ground. Surface cuts or scratches greater than or equal to the maximum defect depth in 3.08 E are not acceptable.

3.02 DAMAGE RESTORATION & REMEDIATION

A. The Contractor shall take responsibility for restoration for any damage caused by heaving, settlement, separation of pavement, escaping drilling fluid (frac-out), or the directional drilling operation, at no cost to the County.

B. When required by the Engineer, provide detailed plans which show how damage to any roadway facility will be remedied. These details will become part of the Record Drawings Package. Remediation Plans must follow the same guidelines for development and presentation of the Record Drawings. When remediation plans are required, they must be approved by the Engineer before any work proceeds.

C. For HDD operations that will be below waters of the State of Florida, the contractor shall be responsible for any damage caused by the drilling operation, including, but not limited to, fracturing of the channel bottom. Any State or Federal required environmental cleanup due to the release of drilling fluids into State waters shall be at the Contractor's expense. The Contractor may at his own expense increase the depth of his drilling operations upon the approval from the Engineer.

3.03 QUALIFICATIONS FOR REJECTION OF DIRECTIONAL BORE

A. The Engineer may reject any portion of the work that is deemed to be non-responsive to the Contract requirements or not in conformance with approved plans and submittals, and for other factors including the following:

1. Failed Bore: When there is any indication that the installed product has sustained damage, stop all work, notify the County and investigate damage. The County may require a pressure and / or mandrel test at no additional cost to the County and shall have a County representative present during the test. Perform all testing within 24 hours unless otherwise approved by the Engineer. Furnish a copy of the test results and all bore logs to the Engineer for review and approval. The Engineer is allowed up

to 5 working days to approve or determine if the product installation is not in compliance with the specifications.

2. Obstructions: If an obstruction is encountered during boring which prevents completion of the installation in accordance with the design location and specification, the pipe may be taken out of service and left in place at the discretion of the Engineer.
3. Pull-back Failure: If the installed breakaway device should fail during pull back.
4. Loss of Drilling Fluids: If the drilling fluid is "lost" during the pull back of the product and can not be regained within the required timeframe of the manufacturer or if more than a reasonable amount of fluid is used to fill an unknown void and flow can not be regained. No pipe shall be pulled without visible flow of drilling fluid.
5. Test Failure: If the pipe shall fail a hydraulic pressure test as specified by the County.
6. Damaged Pipe: If at any time when the product is pulled back and any exposed areas have a greater than allowable "gouging" or visible marring of the pipe per the table in 3.08 E.
7. Alignment Tolerance Exceeded: If the vertical and horizontal limits are not within tolerances.
8. Defective Material: Any other defect in material or workmanship which would affect the quality, performance, or installation life of the installed pipeline.

B. Remediation: All rejected bores shall be at the Contractors expense to correct and provide a satisfactory installed product. The Contractor shall submit to the Engineer a revised installation plan and procedure for approval before resuming work. The Engineer may require non-compliant installations to be filled with excavatable flowable fill or to be completely removed at no additional cost to the County.

3.04 PRODUCT LOCATING AND TRACKING

A. The County recognizes walkover, wire line, and wire line with surface grid verification, or any other system as approved by the Engineer, as the accepted methods of tracking directional bores. Use a locating and tracking system capable of ensuring that the proposed installation is installed as intended. The locating and tracking system must provide information on:

1. Clock and pitch information
2. Depth
3. Transmitter temperature
4. Battery status
5. Position (x,y)
6. Azimuth, where direct overhead readings (walkover) are not possible (i.e. sub aqueous)

B. Ensure proper calibration of all equipment before commencing directional drilling operation.

C. Prepare the Driller's Log. Take and record alignment readings or plot points such that elevations on top of and offset dimensions from the center of the product to a permanent fixed feature are provided. Such permanent fixed feature must have prior approval of the Engineer. Provide elevations and dimensions at all bore alignment corrections (vertical and horizontal) with a minimum distance between points of 10 feet. Provide a sufficient number of elevations and offset distances to accurately plot the vertical and horizontal alignment of the installed product.

D. Installation Location Tolerances: The location of the initial bored hole shall be deemed acceptable by the Engineer if the deviations of the bore from the design alignment or approved adjustments do not exceed the following tolerances:

1. Profile:
   a. 2.0 feet within a length of 100 feet
   b. No reverse curvature within 200 feet
   c. Total deviation not to exceed 5 feet
2. Alignment:
   a. 3.0 feet within a length of 200 feet
   b. No reverse curvature
   c. Total deviation not to exceed 7.0 feet

3.05 PRODUCT BORE HOLE DIAMETER

Minimize potential damage from soil displacement/settlement by limiting the ratio of the bore hole to the product size. The size of the back reamer bit or pilot bit, if no back reaming is required, will be limited relative to the product diameter to be installed as follows:

Maximum Pilot or Back-Reamer Bit Diameter When Rotated 360 Degrees	
Nominal Inside Pipe Diameter Inches	Bit Diameter Inches
2	4
3	6
4	8
6	10
8	12
10	16
12 and greater	Maximum Product OD plus 6

3.06 EQUIPMENT REQUIREMENTS

A. The HDD equipment selected by the Contractor shall be capable of drilling, steering, tracking, reaming and installing the pipeline through all the subsurface conditions that may be present at the site.

B. Match equipment to the size of pipe being installed. Obtain the Engineer's approval for installations differing from the above chart. Ensure that the drill rod can meet the bend radius required for the proposed installation.

C. All HDD equipment shall have a data logger to record pull back force during all pipe installations.

D. All HDD equipment that has the capability to exceed the maximum recommended pulling force shall have a breakaway swivel properly attached to the product pipe that will release if the pullback force exceeds the pipe manufacturers recommended pulling force.

3.07 THRUST / PULLBACK REQUIREMENTS

The Contractor shall provide as part of the required working drawings submittal complete data regarding the operational and maximum thrust or pulling forces to be used for the initial drill

head and back-reamer installations, and the final pull-back of the pipe. Gages or other measurement tools shall be used to monitor the forces being used.

3.08 INSTALLATION PROCESS

A. Ensure adequate removal of soil cuttings and stability of the bore hole by monitoring the drilling fluids such as the pumping rate, pressures, viscosity and density during the pilot bore, back reaming and pipe installation. Relief holes can be used as necessary to relieve excess pressure down hole. Obtain the Engineer's approval of the location and all conditions necessary to construct relief holes to ensure the proper disposition of drilling fluids is maintained and unnecessary inconvenience is minimized to other facility users.

B. The Contractor shall determine the pull-back rate in order to allow the removal of soil cuttings without building excess down-hole pressure and to avoid local heaving, or spills. Contain excess drilling fluids at entry and exit points until they are recycled and separated from excavated materials, or removed from the site or vacuumed during drilling operations. Ensure that entry and exit pits and storage tanks are of sufficient size to contain the expected return of drilling fluids and soil cuttings. The bored hole shall always be maintained full of drilling fluids for support of surfaces, and the fluid re-circulation equipment shall operate continuously until the pipe installation is completed and accepted by the Engineer.

C. Ensure that all drilling fluids are disposed of or recycled in a manner acceptable to the appropriate local, state, or federal regulatory agencies. When drilling in suspected contaminated ground, test the drilling fluid for contamination and appropriately dispose of it. Remove any excess material upon completion of the bore. If in the drilling process it becomes evident that the soil is contaminated, contact the Engineer immediately. Do not continue drilling without the Engineer's approval.

D. The timing of all boring processes is critical. Install a product into a bore hole within the same day that the pre-bore is completed to ensure necessary support exists. Once pullback operations have commenced, the operation shall continue without interruption until the pipe is completely pulled into the borehole.

D. E. All prepared pipe that is being used for installation shall be adequately supported off the ground along the entire length to avoid damaging of the material during pullback due to ground surface conditions. Surface cuts or scratches greater than or equal to the maximum defect depth are not acceptable.

Pipe Size In.	Max. Defect Depth In.
4	1/16
6	1/11
8	5/32
10	3/16
12	1/4
> 12	Per Pipe Manufacturer's Recommendations

F. The drilling fluid specialist shall remain on the project site during the entirety of the directional boring operation to ensure proper mixture and production of drilling fluids needed for the bore.

G. Upon successful completion of the pilot hole, the borehole shall be reamed to a minimum of 25 percent greater than the outside diameter of the pipe being installed.

H. For bores with more than two radii of curvature (entrance and exit), the borehole should be reamed up to 50 percent larger than the outside diameter of the carrier pipe. Prereaming may be necessary dependent on size of material to be pulled.

I. Additional passes for prereaming may be required for larger pipe. Incremental increases shall be used as needed until appropriate bore hole size has been achieved.

J. Prereaming must be accomplished with no product attached to the reamer head on all bore pipe 6" and larger. The bore product maybe pulled back on final pass of prereaming upon prior approval from the Engineer.

K. After reaming the borehole to the required diameter, the pipe shall be pulled through the hole. In front of the pipe shall be a breakaway swivel and barrel reamer to compact the borehole walls.

L. The Contractor shall not attempt to ream at a rate greater than the drilling equipment and drilling fluid system are designed to safely handle.

M. Install all piping such that their location can be readily determined by electronic designation after installation. For non-conductive installations, externally attach two (2) tracer wires; see Section 2.01 - Materials, Part I. above, to the product pipe. Connect any break in the conductor line before construction with an electrical clamp, or solder, and coat the connection with a rubber or plastic insulator to maintain the integrity of the connection from corrosion. Clamp connections must be made of brass or copper and of the butt end type with wires secured by compression. Soldered connections must be made by tight spiral winding of each wire around the other with a finished length minimum of 3 inches overlap. Tracking conductors must extend 2 feet beyond bore termini. Test conductors for continuity. Each conductor that passes must be identified as such by removing the last 6 inches of the sheath. No deductions are allowed for failed tracking conductors. Upon completion of the directional bore, the Contractor shall demonstrate to the County that the wire is continuous and unbroken through the entire run of the pipe by providing full signal conductivity (including splices) when energizing for the entire run in the presence of the County Representative. If the wire is broken, the Contractor shall repair or replace it at no additional cost to the County.

END OF SECTION

SECTION 02999 MISCELLANEOUS WORK AND CLEANUP

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes items and operations which are not specified in detail as separate items, but may be sufficiently described as to the kind and extent of work involved. The Contractor shall furnish all labor, materials, equipment and incidentals necessary to complete all work under this Section.

B. The work of this Section may include, but is not limited to the following:

1. Restoration of roads, sidewalks, driveways, curbing and gutters, fences, guardrails, lawns, shrubbery and any other existing items damaged or destroyed.
2. Crossing utilities.
3. Relocation of existing water, reclaim water, or sewer lines less than four inches diameter, water and sanitary sewer services, low pressure gas lines, telephone lines, electric lines, cable TV lines as shown on the Contract Drawings.
4. Restoring easements (servitudes) and rights-of-way.
5. Clean up.
6. Incidental work (project photographs, testing, shop drawings, traffic control, record drawings, etc.).
7. Excavation and Embankment - As defined in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (1991 Edition or latest revision).
8. Stormwater and erosion control devices.

1.02 SUBMITTAL OF LUMP SUM BREAKDOWN

Contractor shall submit to the Owner/Engineer, a breakdown of the lump sum bid for Miscellaneous Work and Cleanup Item in the Proposal within 10 days after date of Notice to Proceed.

1.03 WORK SPECIFIED UNDER OTHER SECTIONS

All work shall be completed in a workmanlike manner by competent workmen in full compliance with all applicable sections of the Contract Documents.

PART 2 PRODUCTS

2.01 MATERIALS

Materials required for this Section shall equal or exceed materials that are to be restored. The Contractor may remove and replace or reuse existing materials with the exception of paving.

PART 3 EXECUTION

3.01 RESTORING OF SIDEWALKS, ROADS, CURBING, FENCES AND GUARDRAILS

A. The Contractor shall protect existing sidewalks & curbing. If necessary, sidewalks & curbing shall be removed from joint to joint and replaced after backfilling. Curbing damaged during

construction because of the Contractor's negligence or convenience, shall be replaced with sidewalks & curbing of equal quality and dimension at no cost to the Owner.

B. At the locations necessary for the Contractor to remove, store and replace existing fences and guardrails during construction, the sections removed shall be only at the direction of the Engineer. If any section of fence is damaged due to the Contractor's negligence, it shall be replaced at no cost to the Owner with fencing equal to or better than that damaged and the work shall be satisfactory to the Engineer.

C. Guardrails in the vicinity of the work shall be protected from damage by the Contractor. Damaged guardrails shall be replaced in a condition equal to those existing

D. Road crossings shall be restored in accordance with the Contract Documents and current FDOT Standards. Compensation for road restoration shall be included under the Road Restoration Bid Item if specified or under Miscellaneous Cleanup if it is not specified.

3.02 CROSSING UTILITIES

This item shall include any extra work required in crossing culverts, water courses, drains, water mains and other utilities, including all sheeting and bracing, extra excavation and backfill, or any other work required or implied for the proposed crossing, whether or not shown on the Drawings.

3.03 RELOCATIONS OF EXISTING GAS LINES, TELEPHONE LINES, ELECTRIC LINES AND CABLE TV LINES

The Contractor shall notify the proper utility involved when relocation of these utility lines is required. The Contractor shall coordinate all relocation work by the utility so that construction shall not be hindered.

3.04 RESTORING THE EASEMENTS AND RIGHTS-OF-WAY

The Contractor shall be responsible for all damage to private property due to his operations. He shall protect from injury all walls, fences, cultivated shrubbery, pavement, underground facilities, including water, sewer and reclaimed water lines and services, or other utilities which may be encountered along the easement. If removal and replacement is required, it shall be done in a workmanlike manner, at his expense, so that the replacement are equivalent to that which existed prior to construction.

3.05 STORMWATER AND EROSION CONTROL DEVICES

The Contractor shall be responsible for, provide, and install all stormwater and erosion control devices necessary to insure satisfactory compliance with the Florida Department of Environmental Protection Stormwater, Erosion, and Sedimentation Control Inspector's Manual.

END OF SECTION

DIVISION 3 CONCRETE

SECTION 03200 CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Reinforcing steel bars and welded steel wire fabric for cast-in-place concrete, complete with tie wire.

B. Support chairs, bolsters, bar supports and spacers, for reinforcing.

1.02 QUALITY ASSURANCE

Perform concrete reinforcing work in accordance with ACI 318 unless specified otherwise in this Section.

1.03 REFERENCES

A. ACI 318 - Building Code Requirements for Reinforced Concrete.

B. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

C. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

D. CRSI 63 - Recommended practice for placing reinforcing bars.

E. CRSI 65 - Recommended practice for placing bar supports, specifications and nomenclature.

F. ACI 315 - American Concrete Institute - Manual of Standard Practice.

1.04 SHOP DRAWINGS

A. Submit shop drawings in accordance with Contract Documents.

B. Indicate bar sizes, spacings, locations and quantities of reinforcing steel and wire fabric, bending and cutting schedules and supporting and spacing devices.

C. Manufacturer's Literature: Manufacturer's specifications and installation instructions for splice devices.

PART 2 PRODUCTS

2.01 REINFORCING

A. Reinforcing steel: Grade 60, Minimum Yield Strength 60,000 psi, deformed billet steel bars, ASTM A615; plain finish.

B. Welded steel wire fabric: Deformed wire, ASTM A497; smooth wire ASTM A185 in flat sheets; plain finish.

2.02 ACCESSORY MATERIALS

A. Tie wire: Minimum 16 gauge annealed type, or patented system accepted by Engineer.

B. Chairs, bolsters, bar supports, spacers: Sized and shaped for strength and support of reinforcing during construction conditions.

C. Special chairs, bolsters, bar supports, spacers (where adjacent to architectural concrete surfaces): Stainless steel type sized and shaped as required.

2.03 FABRICATION

A. Fabricate concrete reinforcing in accordance with ACI 315.

B. Locate reinforcing splices, not indicated on Drawings, at points of minimum stress. Location of splices shall be reviewed by Engineer.

C. Where indicated, weld reinforcing bars in accordance with AWS D12.1.

PART 3 EXECUTION

3.01 PLACEMENT

A. Reinforcing shall be supported and secured against displacement. Do not deviate from true alignment.

B. Before placing concrete, ensure reinforcing is clean, free of loose scale, dirt, or other foreign coatings which would reduce bond to concrete.

3.02 QUALITY ASSURANCE

A. Acceptable Manufacturers: Regularly engaged in manufacture of steel bar and welded wire fabric reinforcing.

B. Installer Qualifications: Three years experience in installation of steel bar and welded wire fabric reinforcing.

C. Allowable Tolerances:

1. Fabrication:
   a. Sheared length: +l in.
   b. Depth of truss bars: +0, -1/2 in.
   c. Stirrups, ties and spirals: $\pm$1/4 in.
   d. All other bends: $\pm$1 in.
2. Placement:
   a. Concrete cover to form surfaces: $\pm$1/4 in.
   b. Minimum spacing between bars: 1 in.
   c. Top bars in slabs and beams:
      (1) Members 8 in. deep or less: $\pm$1/4 in.
      (2) Members more than 8 in.: $\pm$1/2 in.
   d. Crosswise of members: Spaced evenly within 2 in. of stated separation.

e. Lengthwise of members: Plus or minus 2 in.

3. Maximum bar movement to avoid interference with other reinforcing steel, conduits, or embedded items: 1 bar diameter.

3.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and length.

B. Handle and store materials to prevent contamination.

3.05 INSTALLATION

A. Placement:

1. Bar Supports: CRSI 65.
2. Reinforcing Bars: CRSI 63.

B. Steel Adjustment:

1. Move within allowable tolerances to avoid interference with other reinforcing steel, conduits, or embedded items.
2. Do not move bars beyond allowable tolerances without concurrence of Engineer.
3. Do not heat, bend, or cut bars without concurrence of Engineer.

C. Splices:

1. Lap splices: Tie securely with wire to prevent displacement of splices during placement of concrete.
2. Splice devices: Install in accordance with manufacturer's written instructions.
3. Do not splice bars without concurrency of Engineer, except at locations shown on Drawings.

D. Wire Fabric:

1. Install in longest practicable length.
2. Lap adjoining pieces one full mesh minimum, and lay splices with 16 gauge wire.
3. Do not make end laps midway between supporting beams, or directly over beams of continuous structures.
4. Offset end laps in adjacent widths to prevent continuous laps.

E. Cleaning: Remove dirt, grease, oil, loose mill scale, excessive rust, and foreign matter that will reduce bond with concrete.

F. Protection During Concreting: Keep reinforcing steel in proper position during concrete placement.

END OF SECTION

SECTION 03300 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 WORK INCLUDED

Poured-in-place concrete slabs, thrust blocks, pile caps and pipe support cradles.

1.02 QUALITY ASSURANCE

Perform cast-in-place concrete work in accordance with ACI 318, unless specified otherwise in this Section.

1.03 TESTING LABORATORY SERVICES

A. Inspection and testing will be performed by the testing laboratory currently under contract to Manatee County in accordance with the Contract Documents.

B. Provide free access to work and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of work.

D. Tests of cement and aggregates may be performed to ensure conformance with requirements stated herein.

E. Three concrete test cylinders will be taken for every 100 cu. yds. or part thereof of each class of concrete placed each day. Smaller pours shall have cylinders taken as directed by the Engineer.

F. One slump test will be taken for each set of test cylinders taken.

1.04 REFERENCES

A. ASTM C33 - Concrete Aggregates

B. ASTM C150 - Portland Cement

C. ACI 318 - Building Code Requirements for Reinforced Concrete

D. ASTM C260 - Air Entraining Admixtures for Concrete

E. ASTM C94 - Ready-Mixed Concrete

F. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete

G. ACI 305 - Recommended Practice for Hot Weather Concreting

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

A. Cement: Moderate-Type II, High early strength-Type III, Portland type, ASTM C150.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water: Clean and free from injurious amounts of oil, alkali, organic matter, or other deleterious material.

2.02 ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Chemical: ASTM C494 Type A - water reducing admixture.

2.03 ACCEPTABLE MANUFACTURERS

Acceptable Products:

1. Pozzolith
2. WRDA

2.04 ACCESSORIES

Non-shrink grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2400 psi in 2 days and 7000 psi in 28 days.

2.05 CONCRETE MIXES

A. Mix concrete in accordance with ASTM C94.

B. Provide concrete of following strength:

1. Required concrete strengths as determined by 28 day cylinders shall be as shown on the Drawings, but shall not be less than 3000 psi.
2. Select proportions for normal weight concrete in accordance with ACI 301 3.8 Method 1, Method 2, or Method 3. Add air entraining agent to concrete to entrain air as indicated in ACI 301 Table 3.4.1.
3. All mixes shall be in accordance with FDOT Specifications.

C. Use set-retarding admixtures during hot weather only when accepted by Engineer.

D. Add air entraining agent to concrete mix for concrete work exposed to exterior.

2.06 FORMS

A. Forms shall be used for all concrete masonry, including footings. Form shall be so constructed and placed that the resulting concrete will be of the shape, lines, dimensions, appearance and to the elevations indicated on the Drawings.

B. Forms shall be made of wood, metal, or other approved material. Wood forms shall be constructed of sound lumber or plywood of suitable dimensions, free from knotholes and loose knots; where used for expose surfaces, boards shall be dressed and matched. Plywood shall

be sanded smooth and fitted with tight joints between panels. Metal forms shall be of an approved type for the class of work involved and of the thickness and design required for rigid construction.

C. Edges of all form panels in contact with concrete shall be flush within 1/32-inch and forms for plane surfaces shall be such that the concrete will be plane within 1/16-inch in four feet. Forms shall be tight to prevent the passage of mortar and water and grout.

D. Forms for walls shall have removable panels at the bottom for cleaning, inspection and scrubbing-in of bonding paste. Forms for walls of considerable height shall be arranged with tremies and hoppers for placing concrete in a manner that will prevent segregation and accumulation of hardened concrete on the forms or reinforcement above the fresh concrete.

E. Molding or bevels shall be placed to produce a 3/4-inch chamfer on all exposed projecting corners, unless otherwise shown on the Drawings. Similar chamfer strips shall be provided at horizontal and vertical extremities of all wall placements to produce "clean" separation between successive placements as called for on the Plans.

F. Forms shall be sufficiently rigid to withstand vibration, to prevent displacement or sagging between supports and constructed so the concrete will not be damaged by their removal. The Contractor shall be entirely responsible for their adequacy.

G. Forms, including new pre-oiled forms, shall be oiled before reinforcement is placed, with an approved nonstaining oil or liquid form coating having a non-paraffin base.

H. Before form material is re-used, all surfaces in contact with concrete shall be thoroughly cleaned, all damaged places repaired, all projecting nails withdrawn, all protrusions smoothed and in the case of wood forms pre-oiled.

I. Form ties encased in concrete shall be designed so that after removal of the projecting part, no metal shall be within 1-inch of the face of the concrete. That part of the tie to be removed shall be at least 1/2-inch diameter or be provided with a wood or metal cone at least 1/2-inch in diameter and 1-inch long. Form ties in concrete exposed to view shall be the cone-washer type equal to the Richmond "Tyscru". Throughbolts or common wire shall not be used for form ties.

PART 3 EXECUTION

3.01 PLACING CONCRETE

A. Place concrete in accordance with ACI 304.

B. Notify Engineer minimum 24 hours prior to commencement of concreting operations.

C. Verify anchors, seats, plates and other items to be cast into concrete are placed, held securely and will not cause hardship in placing concrete. Rectify same and proceed with work.

D. Maintain records of poured concrete items. Record date, location of pour, quantity, air temperature and test samples taken.

E. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.

F. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Apply bonding agent in accordance with manufacturer's recommendations.

G. Pour concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.

H. In locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and pack solidly with non-shrink grout.

I. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.

J. Conform to ACI 305 when concreting during hot weather.

3.02 SCREEDING

Screed surfaces level, maintaining flatness within a maximum deviation of 1/8" in 10 feet.

3.03 PATCHING

Allow Engineer to inspect concrete surfaces immediately upon removal of forms. Patch imperfections as directed. All patching procedures shall be submitted to and approved by the Engineer prior to use.

3.04 DEFECTIVE CONCRETE

A. Modify or replace concrete not conforming to required lines, details and elevations.

B. Repair or replace concrete not properly placed resulting in excessive honeycomb and other defects. Do not patch, fill, touch-up, repair, or replace exposed architectural concrete except upon express direction of Engineer for each individual area.

3.05 CONCRETE FINISHING

Provide concrete surfaces to be left exposed, columns, beams and joists with smooth rubbed finish.

3.06 CURING AND PROTECTION

Beginning immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury. Maintain concrete with minimal moisture loss at relatively constant temperature for a period of 7 days or until concrete strengths reaches 75% of the 28 day design strength.

Protection against moisture loss may be obtained with spray on curing compounds or plastic sheets. Protection against heat or cold may be obtained with insulated curing blankets or forms.

3.07 CONCRETE DRIVEWAY RESTORATION

Concrete driveways shall be restored with 6 inches of 3,000 psi concrete with W2.5 X

W2.5, 6X6 wire mesh. Place ½ inch expansion joint between back of curb and new concrete. Area beneath restoration shall be mechanically tamped prior to placing concrete.

3.08 CONCRETE SIDEWALK RESTORATION

Concrete sidewalks across driveways shall be restored with 6 inches of 3,000 psi concrete with W2.5 X W2.5, 6X6 wire mesh. Place ½ inch expansion joint between back of curb and new concrete. Area beneath restoration shall be mechanically tamped prior to placing concrete.

Concrete sidewalks outside of driveways shall be restored with 4 inches of 3,000 psi concrete per FDOT Design Standards, Sections 522 & 310

END OF SECTION

SECTION 03350 CONCRETE FINISHES

PART 1 GENERAL

1.01 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required to finish cast-in-place concrete surfaces as specified herein.

1.02 SUBMITTALS

Submit to the Engineer as provided in the Contract Documents, the proposed chemical hardener manufacturer's surface preparation and application procedures.

1.03 SCHEDULE OF FINISHES

A. Concrete for the Project shall be finished in the various specified manners either to remain as natural concrete or to receive an additional applied finish or material under another Section.

B. The base concrete for the following conditions shall be finished as noted and as further specified herein:

1. Exterior, exposed concrete slabs and stairs - broomed finish.
2. Interior, exposed concrete slabs - steel trowel finish.
3. Concrete on which process liquids flow or in contact with sludge - steel trowel finish.
4. Concrete where not exposed in the finished work and not scheduled to receive an additional applied finish or material - off-form finish.
5. Provide concrete surfaces to be left exposed such as walls, columns, beams and joists with smooth rubbed finish.

1.04 RESPONSIBILITY FOR CHANGING FINISHES

A. The surface finishes specified for concrete to receive additional applied finishes or materials are the finishes required for the proper application of the actual products specified under other Sections. Where different products are approved for use, it shall be the Contractor's responsibility to determine if changes in finishes are required and to provide the proper finishes to receive these products.

B. Changes in finishes made to accommodate product different from those specified shall be performed at no additional cost to the Owner. Submit the proposed new finishes and their construction methods to the Engineer for approval.

PART 2 PRODUCTS

2.01 MATERIALS

A. Portland cement and component materials required for finishing the concrete surfaces shall be as specified in the Contract Documents.

B. Hardener shall be Lapidolith as manufactured by Sonneborn Building Products or approved equal. Hardener shall be used on all floors, stair treads and platforms.

PART 3 EXECUTION

3.01 FORMED SURFACES

A. Forms shall not be stripped before the concrete has attained a strength of at least 50 percent of the ultimate design strength. This is equivalent to approximately five "100 day-degrees" of moist curing.

B. Care shall be exercised to prevent damaging edges or obliterating the lines of chamfers, rustications, or corners when removing the forms or doing any work adjacent thereto.

C. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to the satisfaction of the Engineer.

D. Off-form finish. Fins and other projections shall be removed as approved. Tie cone holes and other minor defects shall be filled with non-shrink grout specified under the Contract Documents.

3.02 FLOORS AND SLABS

A. Floors and slabs shall be screeded to the established grades and shall be level with a tolerance of 1/8-inch when checked with a 10 foot straight edge, except where drains occur, in which case floors shall be pitched to drains as indicated. Failure to meet either of above shall be cause for removal, grinding, or other correction as approved by the Engineer.

B. Following screeding as specified above, power steel trowel as follows:

1. Immediately after final screeding, a dry cement/sand shake in the proportion of 2-sacks of portland cement to 350-pounds of coarse natural concrete sand shall be sprinkled evenly over the surface at the rate of approximately 500 pounds per 1,000 square feet of floor. Neat, dry cement shall not be sprinkled on the surface. This shake shall be thoroughly floated into the surface with an approved disc type power compacting machine weighing at least 200 pounds if a 20-inch disc is used or 300 pounds if a 24-inch disc is used (such as a "Kelly Float" as manufactured by the Weisner-Rapp Corporation of Buffalo, New York). A mechanical blade-type float or trowel is not acceptable for this work.

   NOTE: This operation (application of the cement/sand shake) may be eliminated at the discretion of the Engineer if the base slab concrete exhibits adequate fattiness and homogeneity.

2. In lieu of power steel troweling, small areas as defined by the Engineer shall be compacted by hand steel troweling with the dry cement/sand shake as ordered.

3. The floor or slab shall be compacted to a smooth surface and the floating operation continued until sufficient mortar is brought to the surface to fill all voids. The surfaces shall be tested with a straight edge to detect high and low spots which shall be eliminated.

4. Compaction shall be continued only until thorough densification is achieved and a small amount of mortar is brought to the surface. Excessive floating shall be avoided.

C. After Paragraph 3.02 A and B procedures are accomplished, floors and slabs for particular conditions shall be completed as scheduled in one of the following finishes:

1. Wood float finish. Hand wood float, maintaining the surface tolerance to provide a grained, nonslip finish as approved.
2. Broomed finish. Hand wood float maintaining the surface tolerance and then broom with a stiff bristle broom in the direction of drainage to provide a nonslip finish as approved.
3. Steel trowel finish. Hand steel trowel to a perfectly smooth, hard even finish free from high or low spots or other defects as approved.

D. Floors, stair treads and platforms shall be given a floor hardener. Application shall be according to manufacturer's instructions.

3.03 APPROVAL OF FINISHES

A. All concrete surfaces will be inspected during the finishing process by the Engineer.

B. Surfaces which, in the opinion of the Engineer, are unsatisfactory shall be refinished or reworked until approved by the Engineer.

END OF SECTION

SECTION 03410 PRECAST CONCRETE STRUCTURES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all materials, labor and equipment and construct valve vaults, meter vaults, concrete pipe and accessory items, consisting of precast sections as shown on the Drawings and as specified herein.

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

C. These Specifications are intended to give a general description of what is required, but do not purport to cover all of the structural design details which will vary in accordance with the requirements of the plans. It is, however, intended to cover the furnishing, shop testing, delivery and complete installation of all precast structures whether specifically mentioned in these Specifications or not.

D. The supplier of the precast items shall coordinate his work with that of the Contractor to insure that the units will be delivered and installed in the excavation provided by the Contractor, in accordance with the Contractor's construction schedule.

E. The Contractor will ensure coordination of the precast structures fabrication with the supplier to achieve the proper structural top slab openings, spacings and related dimensions for the selected equipment frames and covers. The top slabs, frames, covers, and subsurface structures outside of roadways shall be capable of live load of 300 pounds per square foot unless noted othewise.

F. All interior surfaces of valve vaults and meter vaults shall be painted with two coats of coal tar epoxy paint dry film thickness of 8 mils each coat, as approved by the Engineer.

1.02 SUBMITTALS

A. Submit to the Engineer in accordance with the Contract Documents, shop drawings showing details of construction, reinforcing, and joints.

B. Shop Drawings

1. Content
   a. Dimensions and finishes.
   b. Estimated camber.
   c. Reinforcing and connection details.
   d. Lifting and erection inserts.
   e. Other items cast into members.
2. Show location of unit by same identification mark placed on member.
3. Include design calculations.

C. Manufacturer's Literature: Manufacturer's recommended installation instructions.

D. Manufacturer's certificates of material conformance with Specifications.

E. Test Reports: Reports of tests on concrete. A minimum of three compression test cylinders will be required for each pour.

1.03 INSPECTION

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

B. At the time of inspection, the sections will be carefully examined for compliance with the applicable ASTM designation and these Specifications and with the approved manufacturer's drawings.

1. All sections shall be inspected for general appearance, dimension, "scratch-strength", blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.
2. All sections shall meet the manufacturing tolerance requirements of ASTM C-478 or the following casting tolerances, whichever are more severe:

   Wall Thickness ± 3/8"
   Inside Diameter ± 3/8"
   Outside Diameter ± 1/2"
   Height or Length ± 3/8"

C. Imperfections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi at the end of 7 days and 5,000 psi at the end of 28 days, when tested in 3-inch by 6-inch cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs subject to the approval of the Engineer.

PART 2 PRODUCTS

2.01 PRECAST CONCRETE SECTIONS

A. Joints between precast concrete sections shall be set by plastic shims and filled with non-metallic non-shrink grout as specified in the Contract Documents and shown on the Drawings.

B. The top slab sections shall be fitted with water tight hatches as specified in the Construction Drawings. The frames and covers will be sized for the openings shown on the Contract Drawings.

C. The various precast sections shall have the inside dimensions and minimum thickness of concrete as indicated on the Drawings. All precast and cast-in-place concrete members shall conform to the Building Code Requirements for Reinforced Concrete ACI 318 and applicable ASTM Standards.

D. Fillets shall be provided and installed in the wet wells as shown on the Drawings. They shall be constructed using concrete fill and shall conform to the Contract Documents.

E. Precast structures shall be constructed to the dimensions as shown on the Drawings and as specified in these Specifications. Flow channels, inverts, and benches in manholes shall be precast, not constructed after installation. Provide a true curve of the largest radius possible for changes in direction of sewer and entering branch or branches.

F. Type II cement shall be used, typically at a compressive strength of 4,000 psi, except as otherwise approved.

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

H. Sections shall be cured by an approved method and shall not be shipped until at least seven (7) days after having been fabricated.

I. Each precast section manufactured in accordance with the Drawings shall be clearly marked to indicate the intended installation location. The Contractor shall be responsible for the installation of the correct precast sections in their designated locations.

J. Wet wells, and manholes receiving flow from lift stations shall be precast with a cast in place PVC protective liner.

1. The prefabricated wetwell or manhole liner shall be a non-load bearing component installed and adequately anchored inside a new precast concrete wetwell or manhole riser during the concrete casting process at the concrete precaster's manufacturing facility. The liner must be fully supported during the casting process.
2. The liners shall be resistant to the chemical environment normally found in the gravity wastewater transmission systems to which they will be exposed.
3. The liner shall have a warranty against defect in material and workmanship for a period of three years.
4. After assembly and installation, in the field, all internal seams are to be sealed by bonding or welding per the manufacturer's standard method and details.
5. Any repairs or other modifications to the liner, such as patching or sealing PVC sleeves used for pipe penetrations of the structure, shall sealed by bonding or welding per the PVC liner manufacturer's standard methods and details.

PART 3 EXECUTION

3.01 INSTALLATION

A. The Contractor shall be responsible for handling ground water to provide firm, dry subgrade for the structure, shall prevent water rising on new poured-in-place concrete or grouted joint sections within 24 hours after placing and shall guard against flotation or other damage resulting from ground water or flooding.

B. A minimum of an 8-inch shell base compacted layer of washed shell or crushed stone shall be placed as a foundation for the wet well base slabs and valve and/or meter vault pits.

B. Backfill materials around the wet well and above the pipe bedding shall be select material as

specified in the Contract Documents.

D. Precast bases, conforming to all requirements of ASTM C478 and above listed requirements for precast sections, may be used.

E. The structure shall not be set into the excavation until the installation procedure and excavation have been approved by the Engineer.

F. The base may be cast-in-place concrete placed on a thoroughly compacted crushed rock subbase. The tops of the cast-in-place bases shall be shaped to mate with the precast barrel section and shall be adjusted in grade so that the top slab section is at the approximately correct elevation.

G. Precast concrete structure sections shall be set so as to be vertical and with sections in true alignment with a 1/4-inch maximum tolerance to be allowed. The outside and inside joint shall be filled with a non-shrink grout and finished flush with the adjoining surfaces. Allow joints to set for 24 hours before backfilling. Backfilling shall be done in a careful manner, bringing the fill up evenly on all sides. The Contractor shall install the precast sections in a manner that will result in a watertight joint. Leaking joints are not acceptable.

H. Holes in the concrete sections required for handling or other purposes shall be plugged with a non-shrink grout or by grout in combination with concrete plugs.

I. Where holes must be cut in the precast sections to accommodate pipes, cutting shall be done prior to setting them in place to prevent any subsequent jarring which may loosen the mortar joints.

J. Frames and hatches specified and furnished shall be cast in the cover slab prior to setting. Normal installation shall include 6" to 12" of concrete grade rings between the top of the cone section and the cover plate ring slab.

ASTM A48-74, or most recent revision, Specification for Gray Iron Castings, Class 30 or Grade 60-45-10 Ductile Iron meeting the requirements of ASTM A536-72, or most recent revision, Specification for Ductile Iron Castings. Cast in a true symmetrical pattern of tough, dense and even grained iron, free from warping, scales, lumps, blisters, sandholes, or any defects of any kind. Provide indented pattern lids with lettering as shown on the Drawings. Machine or grind frames and lids at touching surfaces to provide firm seats and prevent rocking. Remove and replace any set not matching perfectly. All frames and covers shall be designed to withstand an HS20-44 wheel loading as defined by AASHTO specifications.

K. Manhole inserts: Watertight manhole inserts shall be required for all sanitary sewer manholes installed. Inserts shall be as manufactured by FRW Industries, Conroe, Texas, or approved equal. Inserts shall be complete with a self-cleaning relief valve. Relief valves shall operate on a pressure differential of 1/2 psi. Neoprene gaskets shall be installed under the insert lip to insure a leakproof seal.

L. Penetrations and connections into precast or existing structures shall be accomplished by rotary core boring.

M. Cast in place liners shall be repaired, fitted around penetrations, sealed at joints, etc. in accordance with the manufacturer's recommendations for that liner. As a general rule, repairs, sleeves and patches shall be welded in place, glues and sealants shall nt be used unless

approved by the manufacturer.

3.04 TESTING

A. After constructed to its finished height and before being backfilled, each manhole shall be tested for water tightness.

1. Plug pipe lines and perform vacuum test. Observing all recommended safety measures induce a backpressure of 5.0 p.s.i. equivalent to 10" Hg (mercury). The manhole assembly is considered satisfactory if the vacuum loss is less than 1" Hg for the length of time listed in the following table:

Time of Test in Seconds			
Depth Feet	Manhole Diameter in Feet		
	4	5	6
4	10	13	16
8	20	26	32
12	30	39	48
16	40	52	64
20	50	65	80
24	60	78	96
T	5	6.5	8

Note: Add "T" seconds for each additional 2'- of depth.

B. Failure to pass this test requires the Contractor to correct the problems and retest. The Contractor will replace leaking gaskets and/or concrete sections and retest the completed manhole. No manhole will be accepted without successfully passing this test.

END OF SECTION

DIVISION 5 METALS

SECTION 05500 MISCELLANEOUS METAL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, equipment and incidentals required and install covers, grates, frames and other miscellaneous metals as shown on the Drawings and specified herein. The miscellaneous metal items include but are not limited to the following:

1. All metal frames, ladders, stairs, stair rails, floor opening frames including gratings and supports.
2. Prefabricated access hatches and frames.
3. Anchors and anchor bolts except those specified to be furnished with all equipment.
4. Railings, posts and supports both interior and exterior.
5. Cast iron frames, covers, grates, drain leaders and drains.
6. Bridge crane track supports.
7. Stair nosings, steel plates, overhead steel door frames, angle frames, plates and channels.
8. Exterior H.V.A.C. hoods.
9. Pump guide rail system.

1.02 COORDINATION

A. The work in this Section shall be completely coordinated with the work of other Sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before fabrication and installation of items herein specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other Sections.

1.03 SHOP DRAWINGS AND SAMPLES

A. Detail drawings, as provided for in the Contract Documents, showing sizes of members, method of assembly, anchorage, and connection to other members shall be submitted to the Engineer for approval before fabrication.

B. Samples shall be submitted at the request of the Engineer for concurrent review with Shop Drawings.

1.04 FIELD MEASUREMENTS

A. Field measurements shall be taken at the site to verify or supplement indicated dimensions and to insure proper fitting of all items.

1.05 REFERENCED SPECIFICATIONS

A. Unless otherwise specified, materials shall conform to the following:

Structural Steel	ASTM A36
Welded & Seamless Steel Pipe	ASTM A53
Gray Iron Castings	ASTM A48, Class 30
Galvanizing, general	ASTM A123
Galvanizing, hardware	ASTM A153
Galvanizing, assemblies	ASTM A386
Aluminum (Extruded Shapes)	6061-T6 (Alum. alloy)
Aluminum (Extruded Pipe)	6061-T6 (Alum. alloy)
Aluminum Bar Structural	6061-T6 (Alum. alloy)
Bolts and Nuts	ASTM, A307
Stainless Steel Bolts, Fasteners	AISI, Type 316
Stainless Steel Plate and Sheet, Wire	AISI, Type 316
Welding Rods for Steel	AWS Spec. for Arc Welding

PART 2 PRODUCTS

2.01 ANCHORS, BOLTS AND FASTENING DEVICES

A. Anchors, bolts, etc., shall be furnished as necessary for installation of the work of this Section.

B. Compound masonry anchors shall be of the type shown or required and shall be equal to Star Slug in compounded masonry anchors manufactured by Star Expansion Industries, equal by Phillips Drill Co., Rawlplug, or equal. Anchors shall be minimum "two unit" type.

C. The bolts used to attach the various members to the anchors shall be the sizes shown or required. Stainless steel shall be attached to concrete or masonry by means of stainless steel machine bolts and iron or steel shall be attached with steel machine bolts unless otherwise specifically noted.

D. For structural purposes, unless otherwise noted, expansion bolts shall be Wej-it "Ankr-Tite", Phillips Drill Co. "Wedge Anchors", or Hilti "Kwik-Bolt". When length of bolt is not called for on the Drawings, the length of bolt provided shall be sufficient to place the wedge portion of the bolt a minimum of 1-inch behind the reinforcing steel within the concrete. Material shall be as noted on the Drawings. If not listed, all materials shall be stainless steel.

2.02 ALUMINUM ITEMS

A. Aluminum gratings shall be of serrated I-Bar Aluminum Alloy 6061-T6, fabricated to the depths and thicknesses shown on the Drawings and shall be Reliance Steel Products Company, I-Lok Type 7/8 R4 Aluminum Grating; IKG Industries, "Galok" Aluminum I-Bar Grating Type S194-I, or equal. All openings 2 inches and greater in diameter shall be banded with a bar of the same depth and thickness as the main bearing bars of the grating, or furnished with continuous cross bridges. Each cut bar shall be welded to the band if banding is utilized. The ends of all grating sections shall be likewise banded. Clamps and bolts used for attaching grating to supporting members shall be

stainless steel. All grating shall be clamped unless noted otherwise. Clamps shall be as recommended by the manufacturer.

B. Stair treads shall be as specified above for grating and shall have abrasive nonslip nosing.

C. Aluminum nosing at concrete stairs shall be an extrusion of 4-inch minimum width with abrasive filled and shall be Wooster Products, Inc., Alumogrit Treads, Type 116; equal by Barry Pattern and Foundry Co.; Andco; or equal. Embedded anchors shall be furnished with a minimum of three anchors per tread.

D. Aluminum ladders shall be fabricated to the dimensions and details and installed as shown on the Drawings. Treads to be of cast aluminum by Dixie Metals, Inc. of Fort Lauderdale, Florida or equal.

E. Aluminum Handrails, Mechanically Fastened Type:

1. All aluminum mechanically fastened type pipe handrails and guardrails shall be clear anodized aluminum finish and installed as specified herein and indicated on the Drawings. Handrails shall be made of nominal 1-1/2 inches inside diameter pipe (Schedule 40) fabricated or seamless 6063-T6 alloy. The supplier of the handrail system shall supply all necessary fittings, rackets, transition, corner and connector pieces, toeboards, protective gaskets, etc., for a complete job at the locations, indicated on the Drawings. All mounting hardware including bolts, studs, nuts, etc., shall be stainless steel Type 316. Bends shall be smooth and accurate to the details shown. Railings shall be the "Rigid Rail System" as manufactured by Reynolds Aluminum of Reynolds Metal Company as Reynolds II pipe railing system or the "Connectorail System" as manufactured by Julius Blum & Co., Inc., Carlstadt, New Jersey. The handrail systems shall comply with all OSHA and D Section 1208.2 of the Standard Building Code.

2. Spacing of posts where posts are required shall be as noted on shop drawings, but in all cases, shall be uniform and shall not exceed the requirements of OSHA and Section 1208.2 of the Standard Building Code. Shorter spacing may be used where required to maintain the maximum spacing. The fabricator of the aluminum handrail and guardrail system shall be responsible for the design and preparation of shop drawings and design calculations (signed and sealed by Florida Registered Engineer) to meet OSHA requirements and Section 1208.2 of Standard Building Code.

3. All railings shall be erected in line and plumb. Field splicing and expansion compensation shall be accomplished using internal splice sleeves. Make provisions for removable railing sections as detailed and where shown on the Drawings.

4. Where handrail or guardrail posts are set in concrete as per the manufacturer's requirements the posts shall be set into aluminum sheeves cast in the concrete and firmly cemented with 1651 epoxy resin by E-Bond Epoxies, Oakland Park, Florida, Moulded Reinforced Plastics, Inc., Fort Lauderdale, Florida or equal. Collars shall be placed on the posts and fastened in place, as shown and as detailed on approved shop drawings.

5. Where handrail is supported from structural members, it shall be done by the use of approved sockets, flanges, brackets, or other approved means which will provide neat and substantial support for the pipe railing.

6. All railing shall be properly protected by paper, or by an approved coating or by both against scratching, splashes or mortar, paint, or other defacements during transportation and erection and until adjacent work by other trades has been completed.

F. Toeboards: Contractor shall furnish and install aluminum toeboards conforming to latest OSHA requirements on all railings and other locations where indicated on the Drawings.

1. Toeboards shall consist of an extruded 6063-T6 aluminum shape bolted by means of a pipe clamp to the railing posts without requiring any drilling or welding of the toeboard to the railing posts as manufactured by Reynolds Aluminum, Julies Blum & Company, Thompson Fabricating Company or equal. Toeboards shall have pitched top and tear drop bottom to prevent accumulation of dirt, or other material.
2. All fastening hardware shall be Type 316 stainless steel.

G. Kickplates, if required, shall be fabricated and installed as shown on the Drawings.

H. Aluminum safety gate shall be fabricated of extruded aluminum.

I. Prefabricated checkerplate aluminum floor hatches shall be Type "JD", or "KD" as manufactured by Bilco Co., Babcock-Davis Associates, Inc.; Type "AM" Inland-Ryerson Construction Products Co., Milcor Division; or equal, sized as shown. Hatches with either dimension over 3 feet-6 inches shall be double leaf type. Hatches shall be designed for a live load of 300 pounds per square foot. Hatches shall be watertight.

J. Ship ladders shall be of all aluminum construction as detailed. Treads shall have abrasive nosing as manufactured by Reliance Steel Products Co., IKG Industries, or equal.

K. Checkplate aluminum cover plates shall be fabricated to the details shown and installed at the locations shown.

L. Structural aluminum angle and channel door frames shall be provided as shown on the Drawings and shall be anodized. Frames shall be fabricated with not less than three anchors on each jamb.

M. Miscellaneous aluminum shapes and plates shall be fabricated as shown. Angle frames for hatches, beams, grates, etc., shall be furnished complete with welded strap anchors attached. Furnish all miscellaneous aluminum shown, but not otherwise detailed. Structural shapes and extruded items shall conform to the detail dimensions on the Plans within the tolerances published by the American Aluminum Association.

2.03 STEEL ITEMS

A. Sleeves shall be steel or cast iron pipe in walls and floors with end joints as shown on the Drawings. All pipe sleeves shall have center anchor around circumference as shown.

B. Miscellaneous steel pipe for sleeves and lifting attachments and other uses as required shall be Schedule 40 pipe fabricated according to the details as shown on the Drawings.

C. Miscellaneous steel shall be fabricated and installed in accordance with the Drawings and shall include: beams, angles, support brackets, closure angles in roof at edge of T-beams; base plates to support ends of T-beams; door frames; splice plates, anchor bolts; lintels and any other miscellaneous steel called for on the Drawings and not otherwise specified.

2.04 CAST IRON ITEMS

A. Outside pipe clean-out frames and covers shall be heavy duty, R-6013-R-6099 series as manufactured by Neenah Foundry Co., or equal. All outside pipe clean-outs shall be 6-inch diameter.

B. Frames and covers for valve vaults and manholes shall be of a good quality, strong, tough even grained cast iron except as otherwise specified below. Castings shall be as manufactured by the U. S. Foundry, Neenah Foundry, Mechanics Iron Foundry, or equal. Covers to have letters "WATER", "SEWER" or "DRAIN", as applicable, embossed on top.

PART 3 EXECUTION

3.01 FABRICATION

A. All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability.

B. Connections and accessories shall be of sufficient strength to safely withstand stresses and strains to which they will be subjected. Steel accessories and connection to steel or cast iron shall be steel, unless otherwise specified. Threaded connections shall be made so that the threads are concealed by fitting.

C. Welded joints shall be rigid and continuously welded or spot welded as specified or shown. The face of welds shall be dressed flush and smooth. Exposed joints shall be close fitting and jointed where least conspicuous.

D. Welding of parts shall be in accordance with the Standard Code of Arc and Gas Welding in Building Construction of the AWS and shall only be done where shown, specified, or permitted by the Engineer. All welding shall be done only by welders certified as to their ability to perform welding in accordance with the requirements of the AWS Code. Component parts of built-up members to be welded shall be adequately supported and clamped or held by other adequate means to hold the parts in proper relation for welding.

E. Welding of aluminum work shall be on the unexposed side as much as possible in

order to prevent pitting or discoloration.

F. All aluminum finish exposed surfaces, except as specified below, shall have manufacturer's standard mill finish. Aluminum handrails shall be given an anodic oxide treatment in accordance with the Aluminum Association Specification AA-C22-A41. A coating of methacrylate lacquer shall be applied to all aluminum shipment from the factory.

G. Castings shall be of good quality, strong, tough, even-grained, smooth, free from scale, lumps, blisters, sand holes, and defects of any kind which render them unfit for the service for which they are intended. Castings shall be thoroughly cleaned and will be subjected to a hammer inspection in the field by the Engineer. All finished surfaces shown on the Drawings and/or specified shall be machined to a true plane surface and shall be true and seat at all points without rocking. Allowances shall be made in the patterns so that the thickness specified or shown shall not be reduced in obtaining finished surfaces. Castings will not be acceptable if the actual weight is less than 95 percent of the theoretical weight computed from the dimensions shown. The Contractor shall provide facilities for weighing castings in the presence of the Engineer showing true weights, certified by the supplier.

H. All steel finish work shall be thoroughly cleaned, in accordance with the Contract Documents, of all loose mill scale, rust, and foreign matter before shipment and shall be given one shop coat of primer compatible with finish coats specified in Painting Section after fabrication but before shipping. Paint shall be applied to dry surfaces and shall be thoroughly and evenly spread and well worked into joints and other open spaces. Abrasions in the field shall be touched up with primer immediately after erection. Final painting is specified in the Contract Documents.

I. Galvanizing, where required, shall be the hot-dip zinc process after fabrication. Following all manufacturing operations, all items to be galvanized shall be thoroughly cleaned, pickled, fluxed, and completely immersed in a bath of molten zinc. The resulting coating shall be adherent and shall be the normal coating to be obtained by immersing the items in a bath of molten zinc and allowing them to remain in the bath until their temperature becomes the same as the bath. Coating shall be not less than 2 oz. per sq. ft. of surface.

3.01 INSTALLATION

A. Install all furnished items imbedded in concrete or other masonry. Items to be attached to concrete or masonry after such work is completed shall be installed in accordance with the details shown. Fastening to wood plugs in masonry will not be permitted. All dimensions shall be verified at the site before fabrication is started.

B. All steel surfaces to come in contact with exposed concrete or masonry shall receive a protective coating of an approved heavy bitumastic troweling mastic applied in accordance with the manufacturer's instructions prior to installation.

C. Where aluminum is embedded in concrete, apply a heavy coat of approved bitumastic troweling mastic in accordance with the manufacturer's instructions prior to installation.

D. Where aluminum contacts masonry or concrete, provide a 1/32-inch neophrene gasket between the aluminum and the concrete or masonry.

E. Where aluminum contacts a dissimilar metal, apply a heavy brush coat of zinc-chromate primer and provide a 1/32-inch neoprene gasket between the aluminum and the dissimilar metal.

C. Where aluminum contacts wood, apply two coats of aluminum metal and masonry paint to the wood.

END OF SECTION

SECTION 05550 AIR RELEASE ENCLOSURE

PART 1 GENERAL

1.01 SCOPE OF WORK

The Contractor shall furnish all labor, materials, equipment and incidentals required to install the above ground air release enclosure as listed in the specifications and as shown on the Drawings.

1.02 RELATED WORK

The contractor shall be responsible for any related work necessary for the proper installation of enclosure. This shall include, but is not limited to, any required bypass pumping, any required earthwork and any required concrete work.

1.03 SUBMITTALS

A. Submit to the Engineer shop drawings and schedules of all enclosure systems and appurtenances required. Submit design data and specification data sheets listing all parameters used in the enclosure system design.

B. Submit to the Engineer the name of the enclosure supplier and a list of materials to be furnished.

1.04 REFERENCE STANDARDS

A. American Water Works Association (AWWA).

B. American Society for Testing and Materials (ASTM).

C. Where reference is made to the above standard, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

The enclosure manufacturer shall be a company specializing in the manufacture of such enclosures with at least five(5) years of successful field experience and being lab certified as meeting A.S.S.E 1060 requirements.

1.06 DELIVERY, STORAGE AND HANDLING

A. Care shall be taken in shipping, handling and placing to avoid damaging. Any material damaged in shipment shall be replaced as directed by the Engineer.

B. Any material showing deterioration, or which has been exposed to any other adverse storage condition that may have caused damage, even though no such damage can be seen, shall be marked as rejected and removed at once from the work.