

DIVISION 2
SITE WORK - STREETScape

1.0 GENERAL DESCRIPTION

The Engineer shall be notified in writing of the proposed date of the beginning of construction of the site improvements. Any time that work is to stop for a period of time in excess of two (2) working days, the Owner shall be notified in writing of such interruption.

- A. The Contractor shall provide downstream siltation protection during construction. In the event such protection is inadequate, the Contractor shall remove any downstream siltation prior to the time of final inspection.
- B. Certificates of compliance with the specifications furnished by the material supplier shall be submitted on all materials used in the completion of this work.
- C. All private and public property affected by this work shall be restored to a condition equal to or better than existed before commencing construction work, unless specifically exempted by the Plans. Cost to be incidental to other construction and no extra compensation to be allowed.
- D. All topsoil shall be stripped to a depth of six (6) inches or as detailed on plans. Topsoil shall be stockpiled on site as directed by the Owner.
- E. Contractor shall install the retention ponds, swales and/or berms necessary to prevent discharge of stormwater runoff from the site during construction.
- F. **Utility Contacts:**

- | | |
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| 1. City of Mount Dora
1250 North Highland Street
Mount Dora, Florida 32757
(352) 735-7151
Gary Hammond - Public Works & Utilities
Director
Gus Gianikas - Assistant Planning &
Development Director
Charles Revell, Electric Utilities Manager | 2. Embarq
33 North Main Street
Winter Garden, Florida 34787
(407) 889-6617
John Pipkin |
| 3. Comcast Cablevision
8130 CR 44 Leg A
Leesburg, Florida 34788
(352) 315-6625
Danny Ferguson | 4. TECO Peoples Gas
1724 Kurt Street
Eustis, Florida 32726
(352) 483-7237
Martin Kahler |
| 5. Florida Department of Transportation
1405 Thomas Avenue
Leesburg, Florida 34748-3225
(352) 315-3100
Logan Land | |

2.0 SITE ROUGH GRADING/SITE PREPARATION

2.01 GENERAL DESCRIPTION

- A. Work Specified Herein and Elsewhere

1. Work under this Section includes:
 - a. Rough grading for berms, site drainage, and the site.

2.02 PRODUCTS

- A. Unless otherwise indicated, material for fills shall be surplus excavated soil and borrow material meeting the appropriate requirements for backfill as specified in other sections and shall be subject to approval by the E/A.

2.03 EXECUTION

- A. Provide all rough grading and filling to achieve the lines and grades indicated on the Drawings, with an allowance for the thickness of paving, surfacing, or top soil. Material not suitable for the required fills shall be spread uniformly in designated spoil areas and compacted to achieve a smooth and firm surface. All earthwork shall be done in a manner that provides drainage and prevents surface drainage from entering excavations.

2.04 PREPARATION FOR FILLS, BERMS, AND EMBANKMENTS

- A. Upon completion of site preparation work, remove any additional organic material or debris where fill is to be placed. Ground surfaces sloped steeper than 1 vertical to 4 horizontal shall be plowed, stepped or benched, or broken up as directed by the E/A so the fill material will bond with the existing surface. Level surfaces shall be disked, wetted or dried as required, and recompacted. Backfill all holes made by demolition, clearing, grubbing, and other site preparation work.
- B. Lift thickness and compaction requirements are specified.
- C. Compacted material that has been flooded and no longer meets the density specified shall be removed and replaced.

3.0 UTILITY EXCAVATION, TRENCHING, AND BACKFILLING

3.01 GENERAL

The provisions set forth in this section shall be applicable to all underground sewer and water piping installations, regardless of location, unless prior approval is received from the Owner for special design consideration.

3.02 MATERIALS

- A. Sheeting and Bracing
 1. Wood sheeting to be left in place shall be pressure treated.
 2. Steel sheeting to be left in place shall be as specified in ASTM Designation A328.

3.03 WORKMANSHIP

- A. Trench Dimensions

The minimum width of the trench shall be equal to the outside diameter of the pipe at the joint

plus 8 inches for unsheeted trench, or 12 inches for sheeted trench, and the maximum width of trench, measured at the top of the pipe, shall not exceed the outside pipe diameter plus 2 feet, unless otherwise shown on the drawing details, or approved by the Owner. All trenching shall be in accordance with OSHA and the Florida Trench Safety Act.

3.04 UTILITY BEDDING

- A. Class B (Minimum Utility Bedding): The bottom of the trench shall be shaped to provide a firm bedding for the pipe. The pipe shall be firmly bedded in undisturbed soil, or hand shaped so that the pipe will be in continuous contact therewith for its full length.
- B. Class A (Special Utility Bedding): Should special bedding be required due to depth of cover, impact loadings, or other conditions, "Class A" bedding methods shall receive prior approval by the Owner.

3.05 UNSUITABLE MATERIAL BELOW TRENCH GRADE

Soil unsuitable for a proper foundation encountered at or below trench grade, such as muck or other deleterious material, shall be removed for the full width of the trench and to the depth required to reach suitable foundation material, unless special design considerations received prior approval from the Owner. Backfilling below trench grade shall be in compliance with the applicable provisions of this Division.

3.06 EXTRA UTILITY-BEDDING MATERIAL

When rock or other non-cushioning material is encountered at trench grade, excavation shall be extended to 6 inches below the outside of the bottom of the utility, and a cushion of sand or suitable crushed rock shall be provided.

3.07 SHEETING AND BRACING

In order to prevent damage to property, injury to persons, erosion, cave-ins, or excessive trench widths, adequate sheeting and bracing shall be provided in accordance with standard practice and in accordance with all safety, protection of property, and other applicable laws and regulations. All cost for sheeting shall be included in contractor's bid price. No extra compensation shall be made by owner.

3.08 EXCAVATED MATERIAL

Excavated material to be used for backfill shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated material is required, the contractor shall be responsible for obtaining the sites to be used.

3.09 MATERIAL DISPOSAL

Excess, unsuitable, or cleared or grubbed material resulting from the utility installation, shall be removed from the work site and disposed of at locations secured by the contractor. Excess excavated material shall be spread on the disposal site and graded in a manner to drain properly and not disturb existing drainage conditions.

3.10 BORROW

Should there be insufficient satisfactory material from the excavations to meet the requirements for fill material, borrow shall be obtained from pits secured by the contractor.

3.11 DEWATERING

Utilities shall be laid "in the dry" unless otherwise approved. Dewatering systems shall be utilized in accordance with good standard practice and must be efficient enough to lower the water level in advance of the excavation and maintain it continuously to keep the trench bottom and sides firm and dry. All cost for dewatering shall be included in contractor's bid price. No extra compensation shall be made by owner.

3.12 OBSTRUCTIONS

It shall be the contractor's responsibility to acquaint himself with all existing conditions and to locate all structures and utilities along the proposed utility alignment in order to avoid conflicts. Where actual conflicts are unavoidable, work shall be coordinated with the facility owner and performed so as to cause as little interference as possible with the service rendered by the facility disturbed.

3.13 BACKFILL - UNDERGROUND UTILITIES

- A. Backfill material shall be clean earth fill composed of sand, clay and sand, sand and rock, crushed rock, or an approved combination thereof.
- B. Trenches shall be compacted as determined by AASHTO Specification T-180, shall be, for each 12 inch backfill lift, equal to 98 percent of maximum density.

Backfilling of trenches or under and around structures shall be, compacted to 98 percent of maximum density as determined by AASHTO T-180.

One compaction test shall be carried out for each 300 linear feet of pipe and for every 400 square feet of backfill under and around structures and pavement as a minimum and for every 24 inches of vertical backfill around structures.

- C. If, in the opinion of the Owner, densities are questionable, density tests for determination of the above specified compaction shall be made by a testing laboratory approved by the Owner at the expense of the contractor. Test locations will be determined by the Owner.
- D. If any test results are unsatisfactory, the contractor shall re-excavate and re-compact the backfill at his expense until the desired compaction is obtained.
- E. Protective concrete slabs shall be installed over the top of trenches, where required, to protect the installed pipe against excessive loads across roadways and river/swamp areas.
- F. Existing sidewalks and driveways removed, disturbed, or destroyed by construction, shall be replaced or repaired by the contractor at his expense.
- G. All water and sewer lines must have a metallic tracing tape placed above them, with the appropriate designation of pipe use labeled thereon.
- H. All non-metallic water mains and sewer force mains must have a continuous type TWH insulated PVC copper conductor #14 solid single strand wire taped to the top of the pipe every ten (10) foot and pulled up into all valve boxes and all meter boxes. All wires shall be spliced and taped back 12 inches from connection point to insure electrical continuity for the entire length of constructed pressure main.

3.14 ROADWAY AND PAVEMENT RESTORATION

- A. Pavement or roadway surfaces cut or damaged shall be replaced by the contractor in equal or better condition than the original, including stabilization, base course, surface course, curb and

gutter, or other appurtenances. The contractor shall obtain the necessary permits and all applicable authorizations from the proper agencies prior to any roadway work. Additionally, the contractor shall provide advance notice to the appropriate authority, as required, prior to construction operations.

- B. Restoration shall be in accordance with requirements set forth by the Owner. The materials of construction and method of installation, along with the proposed restoration design for items not referred to or specified herein, shall receive prior approval from the Owner.
- C. Where existing pavement is removed, the surfacing shall be mechanical saw cut prior to trench excavation, leaving a uniform and straight edge, with minimum disturbance to the remaining adjacent surfacing. The width of cut for this phase of existing pavement removal shall be minimal.
- D. Immediately following the specified backfilling and compaction, a temporary sand seal coat surface shall be applied to the cut areas. This temporary surfacing shall provide a smooth traffic surface with the existing roadway and shall be maintained until final restoration.
- E. Density tests shall be provided for trenches in pavement across roadways as specified in Section 3.13.

3.15 PROTECTION AND RESTORATION OF PROPERTY

During the course of construction, the contractor shall take special care and provide adequate protection in order to minimize damage to vegetation, surfaced areas, and structures within the construction right-of-way, easement or site, and take full responsibility for repair thereof.

3.16 DISPOSAL OF EXCAVATED MATERIAL

- A. Excess excavated material not suitable or required for backfilling or site grading and all material containing slag, cinders, foundry sand, debris and rubble shall be placed in designated spoil areas and graded to drain. If no spoil areas are provided on the site the excess material shall be removed from the site by the Contractor and legally disposed at no additional cost to the Owner.

4.0 COMPACTION CONTROL AND TESTING

4.01 DESCRIPTION

- A. Work Specified Herein and Elsewhere
 - 1. Work under this Section includes:
 - a. Placement, compaction control, and field density testing requirements for all earthwork, including pavement subgrade.

4.02 TESTING

- A. Tests will be performed by an approval independent soils laboratory at the Contractor's expense to insure adequate density is being obtained. The E/A (see Division 1, No 9.b., page 14) will designate where and when samples shall be taken. The Contractor will pay all costs to make tests. The laboratory shall submit test reports directly to the E/A and the Contractor. Contractor shall be responsible for coordinating all testing.

4.03 EXECUTION

Fill Placement

- A. Compacted material that has been flooded and no longer meets the density specified shall be removed, replaced and recompacted.
- B. If the in-place surface had dried, sprinkle with water before placing the next lift. The surface of smooth lifts shall be scarified before the next lift is placed.
- C. Where fill is required on both sides of structures, fill and compact simultaneously on opposite sides in even layers. Other filling sequences shall be as specifically indicated on the Drawings.
- D. Fill shall be spread in uniform horizontal lifts. The material shall be thoroughly mixed to insure a uniform moisture content slightly wetter than optimum but not greater than 5 percent above optimum water content as determined by the Modified Proctor Test, ASTM D1557.
- E. Where cohesive structural fill is used, the moisture content when compacted shall be within 3 percent of the optimum moisture content. If the fill does not have a natural water content which falls within the acceptable range, the Contractor shall mix, dry, or moisten as necessary.
- F. Place and compact each lift over an entire area prior to placing successive lifts, unless otherwise approved by the E/A.
- G. All materials shall be placed in loose lift thickness indicated hereafter.

4.04 COMPACTION

- A. General
 - 1. Unless otherwise indicated, the type of equipment and number of passes required to obtain the specified degree of compaction shall be determined at the site, subject to the approval of the E/A.
 - 2. Provide mechanical compaction for cohesive material and vibratory compaction for granular materials, unless otherwise approved by the E/A.
- B. Noncohesive soils shall be compacted with vibrating roller or equivalent; cohesive soils shall be compacted with sheeps-foot roller, pneumatic tamping, or approved equivalent, unless otherwise indicated.
- C. Topsoil
 - 1. Topsoil shall be compacted with a "cultipacker", roller, or approved equivalent equipment weighing 100 to 600 pounds per lineal foot of roller width. Landscape areas are to be prepared per Landscape Plans and Specifications.

4.05 TESTING

- A. The Contractor shall provide samples for and pay for the following field density tests to insure required densities are being obtained.
 - 1. One test for each 400 square feet or fraction thereof per lift of general backfilling.
 - 2. One test for each 400 square or fraction thereof per lift of structural fill under slabs, foundations, and pavements.

3. One test per lift for each other type of fill, if so directed by the E/A.
- B. Tests shall be in accordance with ASTM D1557 or other tests suitable for the materials being tested.
- C. The Contractor will pay for all field density tests. Subsequent tests and associated costs necessitated as a result of the initial tests failing to meet specified requirements will be at the expense of the Contractor.

5.0 PIPE, FITTINGS, VALVES, AND APPURTENANCES

5.01 GENERAL

- A. This section includes the material and installation standards for pipe, fittings, valves, and appurtenances, as applicable to sewerage and water installations.
- B. Required specialty items not included under this Section shall be high quality and consistent with approved standards of the industry for the applicable service installation.
- C. All material to be furnished by the contractor.

5.02 PIPE, FITTINGS, VALVES, AND APPURTENANCES

- A. General

All pipe and fittings shall be clearly marked with the name or trademark of the manufacturer. All underground pipe and fittings shall be suitable for 200 p.s.i. working pressure and shall meet all applicable AWWA specifications. **All pipe installations shall have indicator tape run with the pipe to indicate the purpose of piping (water, sewer, force main) and all non-metallic pipe shall have copper tracing wire for location purposes.**

- B. Ductile Iron Pipe and Fittings

1. Ductile iron pipe shall be in accordance with AWWA C151. Pipe shall be laid in accordance with AWWA C600. Ductile iron pipe for mains with diameters 12" and smaller shall be Pressure Class 350 and for mains with diameters greater than 12" shall be Pressure Class 250.
2. Ductile iron fittings shall conform to ANSI/AWWA C110/A21.10 and ANSI/AWWA C153/A21.53. All underground fittings shall be restrained mechanical joint, unless otherwise specified.
3. Joints
 - a. "Push-On" and mechanical type joints shall be in accordance with ANSI/AWWA C111/A21.11.
 - b. Restrained joint assemblies with mechanical joint pipe shall be "GripRing", "Megalug" or approved equal.
 - c. Flanged connections shall be in accordance with ANSI/AWWA C115/A21.15, 125 lb. standard.
 - d. No leaded joints or connection of any kind will be permitted.

- e. PVC fittings for pressure mains are prohibited above 2 inches in diameter, unless otherwise specifically approved by the City.
4. Coatings and Linings
- a. Ductile iron pipe and fittings for all wastewater or process water mains shall receive an interior epoxy lining of for both pipe and fittings in accordance with AWWA C210. The lining shall be 16 mil dry film thickness minimum.
 - b. Ductile iron pipe and fittings for water service shall be cement mortar lined in accordance with ANSI/AWWA C104/A21.4.
 - c. Ductile iron pipe and fittings for water and sewer shall receive an exterior asphaltic coating approximately 1 mil thick. The coating shall be applied to the exterior of all pipe and fittings unless otherwise specified. Coatings shall be applied in accordance with AWWA C-110-fittings, AWWA C115-flanged pipe, and AWWA C151-ductile iron pipe.
 - d. Ductile iron pipe for wastewater shall be painted with a green stripe visible from above to indicate that it is being utilized for wastewater.

POLYVINYL CHLORIDE (PVC)

- A. Pipe shall be manufactured from clean virgin Type I, Grade I rigid, unplasticized polyvinyl chloride resin (class 12454-A or Class 12454-B) conforming to ASTM D1784. The PVC compound shall have an established hydrostatic design basis (HDB) of 4000 psi as directed in ASTM D2837. The pipe shall bear the National Sanitation Foundation (NSF) seal for potable water pipe. Pipe with diameters less than 4" shall be Class 200 a minimum Standard Dimension Ratio (SDR) of 21 and shall be in accordance with ASTM D-2241.

Pipe with diameters of 4" to 12" for water mains shall have a minimum dimension ratio (DR) of 18, Class 150, and shall be manufactured in accordance with AWWA Specifications C-900 latest revision. Pipe with diameters of 14" to 24" for water mains shall have a minimum dimension ratio (DR) of 25 and shall be manufactured in accordance with AWWA Specification C-905 latest revision. Ductile iron pipe may be used as an alternate where PVC pipe is specified.

PVC PIPE COLORS - Per City Standards

- B. Connections and fittings for pipe 1 ½" and smaller shall be solvent welded sleeve type joint. Connections and fittings for pipe 2" and 2 ½" in diameter shall be rubber compression ring type. Pipe shall be extruded with integral thickened wall bells without increase in DR. Rubber ring gaskets shall consist of synthetic compounds meeting the requirements of ASTM Designation D1869, and suitable for the designated service. Fittings for Pressure mains 3" and larger (water lines or sewage force mains) shall be ductile iron with restrained mechanical joint rubber compression ring type joints.

5.03 HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND TUBING

Pipe and tubing shall comply with AWWA C906, AWWA C800 and AWWA C901, and be certified for potable water service by the National Sanitation Foundation.

- A. Materials
- 1. Pipe and Fittings:

The pipe supplied under this specification shall be high performance, high molecular weight, high density polyethylene pipe, PE 3408. The pipe shall conform to ASTM D 1248 (Type III C, Class C Category 6\5, P.O. 3408). Minimum cell classification values shall be 345434C as referenced in ASTM D 3350 - latest edition. The fittings supplied in this specification shall be molded or manufactured from a polyethylene compound having a cell classification equal to or exceeding the compound used in the pipe. Fitting connections shall be made with flange adaptors utilizing 316 stainless steel back up rings and 316 stainless steel hardware.

2. Tubing and Fittings:

The tubing supplied under this specification shall be high performance, high molecular weight, high density polyethylene tubing, PE 3408. The pipe shall conform to ASTM D 1248 (Type III, Grade P34, Class A, Category 5). Minimum cell classification values shall be 345434E as referenced in ASTM D 3350 - latest edition. **The tubing shall be blue** as manufactured by Endot Industries or an engineer approved equal. The fittings shall be brass, equipped with compression type connections with stainless steel inserts.

3. Quality Control:

a. The pipe and tubing shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. The pipe shall be homogenous throughout and free of visible cracks, holes, foreign inclusions, or other deleterious defects, and shall be identical in color, density melt index, and other physical properties.

The engineer may request certification that the pipe produced is represented by the quality assurance data. Additionally, test results from manufacturer's testing which shows the pipe does not meet appropriate ASTM standards or manufacturer's representation, can be cause for rejection. These tests may include density and flow rate measurements from samples taken at selected locations within the pipe wall and thermal stability determinations according to ASTM, D 3350, 10.1.9.

b. The owner or the specifying engineer may request certified lab data from the manufacturer to verify the physical properties of the materials supplied under this specification or at his own expense may take random samples for testing by an independent laboratory.

c. Polyethylene pipe, tubing and fittings may be rejected for failure to meet any of the requirements of these specifications.

4. Material Dimensions:

a. Pipe for sizes 3" and larger supplied under this specification shall have a nominal IPS (iron pipe size) O.D. and shall be rated for a minimum working pressure of 160 psi with a minimum Standard Dimension Ratio (SDR) of 11 for force water main pipe. Tubing for sizes 2" and smaller supplied under this specification, unless otherwise specified, shall have a CTS (copper tubing size) O.D. and shall be rated for a minimum working pressure of 200 psi with a minimum Standard Dimension Ratio (SDR) of 9 for tubing.

b. The piping shall be equipped with a green stripe indicating its use for wastewater.

5. Construction Practices:

a. Trench Construction:

The trench and trench bottom shall be constructed in accordance with ASTM Standard D 2321-Section 7.

b. Embedment Material:

Embedment materials shall be Class I, Class II, or Class III materials as defined by ASTM D 2321-Section 6. The use of Class IV and Class V materials for embedment is not recommended and shall be done only with the approval of the engineer.

c. Bedding:

Bedding of the pipe shall be performed in accordance with ASTM Standard 2321-Section 8. Compaction rates shall be as specified in ASTM D 2321. Deviations from the specified compaction must have the approval of the engineer.

d. Haunching and Initial Backfill:

Haunching and initial backfill should be as specified in ASTM D 2321-Section 9 using Class I, Class II, or Class III materials. Materials used and compaction rates shall be as specified by the engineer. In cases where a compaction rate of 85% Standard Proctor Density is not attainable, the engineer may wish to increase the SDR of the pipe to provide adequate stiffness.

e. Special Conditions:

ASTM D 2321-Section 11.2, minimum cover for load applications, section 11.3, use of compaction equipment and section 11.4, removal of trench protection should apply unless directed otherwise by the engineer.

f. After polyethylene piping is installed and backfilled, the contractor shall apply an initial hydrostatic pressure to the pressure listed in the piping schedule shown on the drawings. The initial test pressure shall be allowed to stand without make-up pressure for a period of time as required by the pipe manufacturer and approved by the engineer to allow for diameter expansion or pipe stretching to stabilize. After the required equilibrium period the test section shall be returned to the original test pressure.

g. Pressure Piping Systems:

The initial pressure test can be conducted before the line is backfilled. However, it is advisable to cover the pipe at intervals or particularly at curves to hold the pipe in place during pressure test. Flanged connections may be left exposed for visual leak inspection. **The main shall be tested after the final installation is completed.**

Test pressure should not exceed 1.5 times the rated operating pressure of the pipe or the lowest rated component in the system.

The initial pressure test shall be applied and allowed to stand without make up pressure for a sufficient time to allow for diametric expansion or pipe stretching to stabilize. This usually occurs within 2 to 3 hours. After this equilibrium period, the test section can be returned to the 1.5 times operating pressure, the pump turned off, and a final test pressure held for 2 hours.

Allowable amounts of make up water for expansion during pressure test is shown in Chart 6, taken from PPI technical report TR 31/9-79. There shall be no visual leaks or pressure drops greater than 5 p.s.i. during the final test period.

Under no circumstances shall the total time under test exceed 3 hours at 1 ½ times the pressure rating. If the test is not completed

5.04 COPPER PIPE AND TUBING

Pipe or tubing shall meet AWWA C-800. Fittings shall be brass, with approved compression connections.

5.05 SPECIAL ITEMS

A. Tapping Saddles shall be of two (2) types:

1. Stainless steel full circle sleeve as manufactured by Ro-Mac type SST, assuring a full circumferential seal, or approved equal.
2. Mechanical Joint type with outlet, flange ANSI B16.1, 125 lb. standard. Mueller #615 or #715, assuring a full circumferential seal, or approved equal.

B. Service Saddles

Shall be as manufactured by Smith & Blair Inc., Ford, or Rockwell. Units for cast or ductile iron, PVC cement pipe shall be double strap. Sealing gasket shall be BUNA-N rubber and straps shall be corrosion resistant stainless steel or equivalent alloy steel.

5.06 GATE VALVES

The valve type, size, rating, flow direction arrow if applicable, and manufacturer shall be clearly marked on each unit. Valves shall open left (counterclockwise) with an arrow cast in the metal of operation handwheels and nuts indicating the direction of opening.

A. Valves for Underground Service

Valves from 2" thru 12" for underground service, unless otherwise stated on the plans, shall be iron body gate valves, non-rising stem type and shall be equipped with a 2" square cast iron operating nut with corrosion protection coating inside and out. Resilient seated valve which meets all C-509 requirements of AWWA (water). Mueller A2370-20, American Darling CRS-80 or Clow. All dead end lines will have valves at end the size of main line pipe with blow off attached. End line valves shall be adequately restrained to the pipeline such that they may be excavated and the line extended without shutting off line pressure.

B. Valves for Above-Ground Service for Water Systems shall be iron body, bronze mounted resilient seat gate valves where indicated, conforming to AWWA C-509, with the exception that valves shall be outside screw and yoke (OS & Y) rising stem type. Valves shall have cast iron hand wheels or chain operators with galvanized steel chains, as required.

C. Valves Smaller than 2 Inches

Valves smaller than 2 inches shall be bronze body gate valve conforming to Federal specifications 150 psi minimum working pressure with threaded joints equal to American 3 FG or Red and White 280 and Kitz Gate valve.

5.07 GAUGES

Gauges - All gauges shall be liquid filled to reduce wear due to vibration. Accuracy shall be within 1%. Gauge diameter shall be 4-1/2" diameter minimum. Housing shall be impact resistant stainless steel and internals shall be stainless steel. Range shall be at least 30% higher than the highest pressure attainable in the system. System pressures for each application shall be verified during shop drawing review.

5.08 VALVE BOXES

Units shall be adjustable, cast iron, minimum interior diameter of 5", with covers cast with the applicable inscription in legible lettering on the top; "WATER", "SEWER" OR "REUSE". Boxes shall be suitable for the applicable surface loading and valve size. Valve boxes not in the pavement shall have around their tops concrete pads, which will be flush with the top of the curb, with minimum dimensions of 24" x 24" x 6" and rebar as per details. Concrete pads shall be equipped with brass disks indicating type of fluid, type of valve, size of valve and number of turns to open.

5.09 INSTALLATION

- A. Piping, fittings, valves and appurtenances shall be installed in accordance with these Standards and manufacturer's recommendations.
- B. Piping shall be installed along straight line and grade between fittings, manholes, or other defined points, unless definite lines of alignment, deflection or grade change have been established. Modification to approved alignment or grade during construction shall receive prior approval from the Owner and all resulting design considerations shall be resolved by the contractor.
- C. Materials shall be cleaned and maintained clean, with all coatings protected from damage. The interior of the pipe shall be free of dirt and debris, and when work is not in progress, all open ends shall be plugged.
- D. Pipe, valves, fittings, or other items shall be inspected prior to installation, and any items showing a fracture or other defect shall be rejected. However, cast or ductile iron pipe showing an end crack, with no fracture indicated beyond that visible, may be salvaged by cutting off the damaged section 12" past the fracture, providing the remaining pipe is sound.
- E. Underground piping shall not be driven to grade by striking it with an unyielding object. When the pipe has been properly bedded, enough compacted backfill shall be placed to hold the pipe in correct alignment. If necessary, precaution should be taken to prevent flotation.
- F. Jointing shall be by an approved method and shall not require undue force to accomplish full satisfactory seating and assembly. Connections at structures shall be cut accurately and worked into place without forcing and shall align with the connecting point.
- G. Underground pressure piping systems shall be thoroughly braced with joint restraints at fittings, valves and plugs. Fittings shall not be encased in concrete or thrust blocked. When tie-rods and/or clamps are used, they shall receive two heavy coats of bituminous paint to minimize corrosion.
- H. Disinfecting of all potable water pipes shall be accomplished by the contractor following approved pressure testing. Unless alternate procedures are set forth under the applicable service Standard, said disinfecting procedures shall be in accordance with AWWA Standard C 651.
- I. Ductile Iron Pipe installation shall be performed in accordance with the applicable provisions of AWWA Standard C 600.

- J. Polyvinyl Chloride (PVC) pipe-lubrication and/or solvent for pipe and fitting joints shall be non-toxic (NSF approved for potable water). Following making, solvent type joints shall not be disturbed for 5 minutes and shall not have internal pressure applied for 24 hours, or as recommended by the pipe manufacturer.

6.0 PIPING SYSTEMS

This section sets forth the general requirements for installation of water and wastewater systems.

6.1 JOINT RESTRAINING

Pressure piping fittings and other items requiring restraint, shall be braced with joint restraining assemblies. Said restraining devices shall be designed for the maximum pressure condition (testing).

6.2 PIPE DEPTH AND PROTECTION

The standard minimum cover for water distribution systems shall be 3 feet from the top of the finish grade or as shown in the drawings. However, should this design not be feasible, protective concrete slabs shall be provided over the pipe within the limits of the lesser cover. Where waterways, canals, ditches or other cuts are crossed, ductile iron pipe shall be installed across and to 10 feet each side of the bottom. Additionally, approved utility crossing signs shall be placed on the pipe alignment at each side of the canal, etc. Additional depth may be required as noted on plans.

6.3 TESTING

- A. The contractor shall perform hydrostatic testing of all water distribution and wastewater pressure systems, as set forth in the following and shall conduct said tests in the presence of representatives from the Owner and/or other authorized agencies, with 24 hours advance notice provided, in writing.
- B. Piping and appurtenances to be tested shall be within sections between valves, not exceeding 2,000 feet unless alternate methods have received prior approval from the Owner. Testing shall not proceed until concrete thrust blocks are in place and cured, or other restraining devices installed. All piping shall be thoroughly cleaned and flushed prior to testing to clear the lines of all foreign matter. While the piping is being filled with water, care shall be exercised to permit the escape of air from extremities of the test section, with additional release cocks provided if required.
- C. Hydrostatic testing shall be performed at 150 pounds per square inch pressure for water and 100 pounds per square inch for force mains, unless otherwise approved by the Owner, for a period of not less than two (2) hours. Testing shall be in accordance with the applicable provisions as set forth in Section 13, AWWA Standard C600. The allowable rate of leakage shall be less than the number of gallons per hour determined by the following formula:

$$L = \frac{ND P^{1/2}}{7400}$$

$$L = 0.00165 ND$$

L = allowable leakage in gallons per hour

N = number of joints in the section tested

D = nominal diameter of the pipe in inches

- D. The testing procedure shall include the continued application of the specified pressure to the test system, for the two hour period, by way of a pipe taking supply from a container suitable for measuring water loss. The amount of loss shall be determined by measuring the volume

displaced from said container.

- E. Should the test fail, necessary repairs shall be accomplished by the contractor and the test repeated until within the established limits. The contractor shall furnish the necessary labor, water, pumps, gauges and all other items required to conduct the required water distribution system testing and perform necessary repairs.
- F. Pipe sections to be pressure tested shall be subjected to a hydrostatic pressure of 150 psi for a duration of 2 hours by means of a pump.

6.4 DISINFECTING

Following the pressure testing: the contractor shall disinfect all sections of the water distribution system, and receive approval thereof from the appropriate agencies, prior to placing in service. Advance notice shall be provided to the Owner before disinfecting procedures start. The disinfection shall be accomplished with the applicable provisions of AWWA Standard C651, "Standard Procedures for Disinfecting Water Mains" and all appropriate agency approvals. Computation of the amounts of chlorine to be used for disinfection should be approved by the Owner or its engineer consultant.

- A. Care shall be taken to provide disinfection to the total system and extremities shall be carefully flushed prior to chlorination.

After disinfection and final flushing have been accomplished, samples of water for bacteriological analysis shall be collected and submitted to and as directed by the Florida Department of Environmental Regulations or other appropriate approval agency. Should these samples or subsequent samples prove to be unsatisfactory, then the piping shall be disinfected until a sufficient number of satisfactory samples are obtained.

- B. The contractor shall furnish all equipment and materials and perform the work necessary for the disinfecting procedures, including additional disinfection as required.

7.0 GRASSING AND SODDING MATERIALS

7.1 The FDOT (Florida Department of Transportation) Standard Specifications for Road and Bridge Construction latest revisions Section 981 for Grassing and Sodding Materials will apply to all seeding and sodding work within this project.

- A. All areas disturbed by construction shall be sodded to match existing grassing.

END OF DOCUMENT