

**Lakeland
Water
Utilities**

**Wastewater Materials
Specifications**

September 7, 2023

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Section I

1.0 Definitions

1.1 The following definitions are given for use in these specifications.

Approved—Approved, acceptable, considered necessary, satisfactory or words of similar meaning shall mean approved, acceptable, considered necessary, satisfactory to or by the City unless another meaning is plainly intended.

City—The City of Lakeland Water Utilities Department. When applicable, specific divisions within the Water Utilities Department will be referenced; e.g. Engineering, Wastewater, etc.

Division Representative—The individual designated by the Water Engineering Division to make approval of materials, products, and equipment on the Water Department’s behalf.

Equal—The words “or equal” used in conjunction with materials, products, or equipment designated by manufacturer’s names, trade names or catalog numbers are intended to establish a standard. Other materials, products or equipment meeting or exceeding the established standard may be used provided that their equivalence has been demonstrated to the satisfaction of the Division Representative and that written approval of their use has been obtained.

Manufacturer—An individual, firm or corporation who is furnishing material or equipment to the City.

Materials – “Materials” shall be taken to mean those goods, articles, merchandise, and equipment supplied to the City.

Shop Drawings—All manufacturers’ drawings, plans, diagrams, illustrations, brochures, schedules, and other data that illustrate the details of the materials, products, and equipment to be furnished.

2.0 Submittals

2.1 Four copies of shop drawings shall be submitted to the Division Representative for review on any materials, products, and equipment that are requested by the Manufacturer as a substitute for approved materials. Reference Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments, Section 7.6.3.

3.0 Materials—General

3.1 Materials shall be new, of top quality, manufactured in the United States of America, and shall conform to the appropriate ANSI/ASTM/AWWA standards. *Any later revision shall automatically supersede standards enumerated herein.* Any variance must be approved by the Department Director based upon detailed specifications BEFORE materials are purchased.

3.2 Ductile iron pipe and fittings shall receive an exterior bituminous coating as specified in AWWA C104, C150, or C151 and shall be epoxy lined with a chemically cured, two component epoxy material, having a minimum 24 mils dry thickness as specified in AWWA C550 and/or AWWA C210. Permeability shall be in accordance with ASTM D1653. Alternately, ductile iron pipe and fitting liner may be of fusion-bonded polyethylene, having a nominal thickness of 40 mils, and a minimum thickness of 35 mils. The polyethylene lining shall meet the requirements of ASTM D1238. Cement lined and coal tar epoxy lined ductile iron pipe and fittings are not acceptable for wastewater applications.

3.3 Ductile iron pipe shall be manufactured in accordance with AWWA C151 and AWWA C111. Pipe shall be designed for thickness in accordance with AWWA C150 subject to the following design criteria:

AWWA C150, 150 psi minimum pressure rating.

Depth of cover as shown on the design drawings.

Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments.

- 3.4 Fittings for ductile iron and PVC pressure pipe shall be manufactured of ductile iron, and shall conform to AWWA C153. Fittings shall be designed so as to be compatible with the pipe and to provide at least equal resistance to internal and external loads on the pipe. The joints, bolts, and nuts shall conform to AWWA C111 (mechanical/push joint) and AWWA C115 (flanged joint). All fittings shall be rated for not less than 150 psi working pressure.
- 3.5 Fittings, pipe bells and valves installed for underground service shall be properly restrained in accordance with industry standards, and as specified in the Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments. Metal joint restraints, tie rods, and other approved restraining methods may be employed. All metal joint restraints, tie rods, clamps, bolts, and nuts shall be coated after assembly with a bituminous coating or other acceptable corrosion retarding material. Reference Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments, Section 7.2.9.
- 3.6 PVC pressure pipe shall be manufactured from clean, virgin, unplasticized Polyvinyl resin, cell classification 12454-A or 12454-B as defined in ASTM D1784. PVC gravity sewer pipe shall be manufactured from PVC plastic having a cell classification 12364-B as defined in ASTM 1784.
- 3.7 All pipe shall bear the National Sanitation Foundation seal for potable water pipe, trade name, pipe manufacturer's name, and AWWA standard number.
- 3.8 PVC pipe shall be furnished with factory lubricant, in sufficient quantities for the lengths of pipe provided, and utilized exclusively in the installation of the pipe.
- 3.9 Plug valves shall be of the non-lubricated, eccentric type and shall be designed for a minimum working pressure of 175 psi for valves 12 inches and smaller, 150 psi for valves larger than 12 inches.
- 3.10 Resilient wedge type gate valves shall be designed for a minimum working pressure of 200 psi for valves 12 inches and smaller. Double disc type gate valves shall be designed for a minimum working pressure of 150 psi for valves larger than 12 inches.
- 3.11 Valves shall provide drip tight shut-off at rated pressure. Plug valves, gate valves, and ball valves shall open counter-clockwise.
- 3.12 All interior plug valve and gate valve ferrous surfaces shall receive a protective, nontoxic, fusion-bonded epoxy coating, satin finish, suitable for field over-coating and touch-up without sanding or special surface preparation or application of heat in excess of room temperature. Coating shall meet the requirements of AWWA C550 and/or AWWA C213. Permeability shall be in accordance with ASTM D1653.
- 3.13 Exterior portions of valves shall have two coats of asphalt varnish in accordance with Federal Specification TTC494-A.
- 3.14 Each valve shall have the manufacturer's distinctive marking, pressure rating, and year of manufacture cast on the body.
- 3.15 Ball check valves of "sinking" or "rising" ball design shall not be used when static head on valve is less than 10 feet. Installation of "sinking" or "rising" ball check valves in a vertical orientation or in pump station wet wells is not permissible.

4.0 Ductile Iron Pipe/Fittings (Underground Service)

- 4.1 Thickness class for ductile iron pipe for underground service shall be minimum class 50. Wall thickness requirements where depth of cover exceeds the minimum requirements shall be determined by the design Engineer.
- 4.2 Laying lengths for mechanical joint or push joint ductile iron pipe shall be 18 or 20 feet, as specified, and shall conform to all applicable ANSI/AWWA specifications.
- 4.3 Joints for ductile iron pipe used for underground service shall be mechanical or push-on type design in accordance with AWWA C111. Mechanical or push joint pipe shall be labeled with trade name and the pipe manufacturer's name.

4.4 Joints for ductile iron fittings used for underground service shall be mechanical joint or push joint type design, as specified.

5.0 Ductile Iron Pipe/Fittings (Aboveground Service)

5.1 Thickness class for ductile iron pipe for aboveground service shall be minimum class 53.

5.2 Lengths for flanged joint ductile iron pipe shall be as specified on the design drawings.

5.3 Joints for ductile iron pipe/fittings used for aboveground service and/or in pumping station wells and valve vaults shall be flanged type design in accordance with AWWA C115, faced and drilled to 125 pound template unless specified otherwise. Flanged joint pipe shall be labeled with trade name and the pipe manufacturer's name. Use of flange adapters is acceptable, and covered in Section 10.0.

6.0 Polyvinyl Chloride (PVC) Pressure Pipe

6.1 **PVC pressure pipe sizes 4 inches through 12 inches for sanitary sewer force mains installed underground shall meet the requirements of AWWA C900, and shall meet or exceed the requirements of DR25. PVC pressure pipe sizes larger than 12 inches shall meet or exceed the requirements of AWWA C905, and shall meet or exceed the requirements of DR18. PVC pressure pipe C900 and C905 shall be of ductile iron O.D.**

6.2 PVC pressure pipe sizes 4 and 6 inches for sanitary sewer force mains installed underground may, upon City authorization, meet the requirements of ASTM D2241, and meet or exceed the requirements of SDR21.

6.3 Maximum laying length for all PVC pressure pipe shall be 20 feet.

6.4 Color of PVC pressure pipe provided shall be as specified, consistent with the following:
Sewer - Green.
Potable Water – Blue / White.
Reclaimed Water – Purple.

6.5 Joints for PVC pressure pipe 4 inches and larger in diameter shall be integral bell and spigot, with a single gasket, compression ring type. The bell shall consist of an integral wall section with a solid cross section elastomeric ring, factory installed, meeting the requirements of ASTM F477.

7.0 Polyvinyl Chloride (PVC) Gravity Pipe/Fittings

7.1 PVC gravity pipe and fittings, sizes 4 inches through 15 inches, for sanitary sewer gravity mains shall meet the requirements of ASTM D3034. PVC gravity pipe and fittings, sizes larger than 15 inches, shall meet the requirements of ASTM F679 T-1. PVC gravity pipe and fittings shall meet or exceed the requirements of SDR35. PVC gravity pipe intended for depth of burial having **10** feet or more of cover shall meet the ASTM D3034 specifications inclusive of having the outside diameter of standard SDR35 pipe, but shall have the wall thickness rating of SDR26.

7.2 Maximum laying lengths for all PVC gravity pipe sizes shall be as follows:

4 inches through 15 inches -- 13 feet.
18 inches – 12.5 feet
Larger than 18 inches – 12 feet

7.3 PVC gravity pipe shall be green in color

7.4 Joints for PVC gravity pipe 4 inches and larger in diameter shall be integral bell and spigot, with a single rubber gasket. The bell shall consist of an integral wall section with a solid cross section elastomeric ring, factory installed, and shall conform to ASTM F477 and meet the requirements of ASTM D3212.

7.5 PVC fittings shall be made of PVC plastic having a cell classification of 12454-B, or 12454-C, or 13343-C as defined in ASTM D1784, joined with a rubber gasket joint.

Approved Suppliers

None Specified (USA)

*Approved Alternatives to Specification –
Multi Fittings Corporation “Trench Tough” SDR35 or SDR26 (Canada) Gasketed Sewer Fittings*

8.0 High Density Polyethylene (HDPE) Pipe

- 8.1 Pipe shall be High Density Polyethylene (HDPE) as per AWWA C906, SDR11 for sizes 4 to 24 inches.
- 8.2 HDPE pipe shall be permanently color coded with stripes along the entire length of the pipe, 120 degrees apart. Fully colored pipe co-extruded from permanently pigmented HDPE is acceptable. Color coding for the following shall apply:
 - a. Sanitary sewer force main service – Green stripes or solid green pipe.
 - b. Reclaimed water service – Purple stripes or solid purple pipe.
- 8.3 Reference Wastewater Division Policies, Standards and Specifications for Subdivisions and Commercial Developments, Section 7.2.5, and Attachment #1 - City of Lakeland Water Utilities Department Developer Directional Bore Standard.

Approved Suppliers

APPROVED MANUFACTURERS:

- Rinker Polypipe (USA)
- JM Pipe (USA)
- Charter Plastics (USA)
- CP Chem Performance Pipe (USA)

9.0 Steel Casing Pipe and Spacers

- 9.1 Steel casing pipe shall conform to the minimum Florida Department of Transportation (FDOT) requirements for roadway crossings or minimum railroad requirements, whichever is more stringent.
- 9.2 Casing pipe shall be steel and shall meet wall thickness requirements as described in the Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments, Section 7.3.2, and Detail WWS-003.
- 9.3 Carrier pipe size for installation in a steel casing pipe shall be sized in accordance with the Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments, Detail WWS-003.
- 9.4 Casing spacers shall be “Cascade System” as manufactured by Cascade Corp.; “The Booster” as manufactured by Pipeline Seal and Insulator, Inc., or approved equal. Placement of spacers on carrier pipe shall be in accordance with manufacturer’s specific instructions.

Approved Suppliers

Cascade Corp. (USA)
Pipeline Seal & Insulator (USA)

- 9.5 The use of banded wood skids with stainless steel bands will not be acceptable.
- 9.6 The City must approve any variations to 9.2 or 9.3 above.

10.0 Pipe Fittings/Bells – Restraints

- 10.1 The following restraints are acceptable for restraining ductile iron and PVC pipe to mechanical joint valves and fittings provided for underground service:

Approved Suppliers

EBAA (USA)

- a. Ductile iron pipe, sizes 4 inches through 12 inches – EBAA Iron Series 1200 mechanical joint retainer gland.
- b. Ductile iron pipe sizes larger than 12 inches – EBAA Iron Series 100 mechanical joint retainer gland.
- c. PVC pipe sizes 4 inches through 12 inches – EBAA Iron Megalug Series 2000PV mechanical joint retainer gland.
- d. PVC pipe sizes larger than 12 inches – EBAA Iron Megalug Series 1100PV mechanical joint retainer gland.

10.2 The following adapters are acceptable for mating ductile iron and PVC pipe to flanged valves and fittings provided for aboveground service and/or in pumping station wells and valve vaults:

- a. Ductile iron pipe, sizes 4 inches through 12 inches – EBAA Iron Megaflange flange adapter Series 2100, or Uni-Flange Series 200 flange adapter.
Approved Suppliers

EBAA (USA)
Uni-Flange (USA)

- b. Ductile iron pipe, sizes larger than 12 inches – Uni-Flange Series 400 flange adapter.
Approved Suppliers

Uni-Flange (USA)

- c. PVC pipe, sizes 4 inches through 12 inches – EBAA Iron Series 3500 flange adapter, or Uni-Flange Series 900-C flange adapter.
Approved Suppliers

EBAA (USA)
Uni-Flange (USA)

10.3 The following restraints are acceptable for restraining ductile iron and PVC pipe bells as indicated on the design drawings:

- a. Ductile iron pipe, mechanical joint, sizes 4 inches through 12 inches – EBAA Iron Series 1200 mechanical joint retainer gland.
Approved Suppliers

EBAA (USA)

- b. Ductile iron pipe, mechanical joint, sizes larger than 12 inches – EBAA Iron Series 100 mechanical joint retainer gland.
Approved Suppliers

EBAA (USA)

- c. Ductile iron pipe, push-on, sizes 4 inches and larger – EBAA Iron Series 800 bell retainer
Approved Suppliers

EBAA (USA)

- d. PVC pipe bells, sizes 4 inches and larger – Uni- Flange Series 1350-C bell retainer.
Approved Suppliers

Uni-Flange (USA)

11.0 Plug Valves – Forcemains (Underground Service)

- 11.1 Plug valves shall be of round port design, applicable to buried forcemains and forcemain manifold vaults, to better enable efficient pigging of the forcemain.
- 11.2 All plug valves shall be from the same manufacturer. Plug valves shall be as manufactured by Henry Pratt Company, 401 South Highland Av., Aurora, Illinois 60506-5563, Figure 550 or Figure 551 as specified or approved equal.

Approved Suppliers

Henry Pratt Co. (USA)

- 11.3 The plug valve body shall be cast iron with a welded-in overlay of 90 percent nickel alloy content on all surfaces contacting the plug face. Sprayed, plated, nickel welded rings or seats screwed into the body are not acceptable. Plug coating shall be Buna-N.
- 11.4 Plug valves shall be furnished with replaceable permanently lubricated sleeve type stainless steel bearings in the upper and lower journals.
- 11.5 Plug valve shaft seals shall be multiple U-cap or V type, replaceable without removing the valve bonnet. “O” rings that are retained in a bronze or delrin cartridge in direct contact with the plug stem are not acceptable.
- 11.6 Manual gear operators shall be totally enclosed worm and gear type, permanently lubricated. Gear segment shall be of ductile iron, supported on bronze bearings.
- 11.7 Plug valves 6 inches and smaller for buried service shall be provided with a 2 inch AWWA nut having an arrow cast in the meter indicating direction of opening. Plug valves larger than 6 inches for buried service shall be provided with a gear operator and 2 inch AWWA nut having an arrow cast in the meter indicating direction of opening.
- 11.8 Plug valves shall be mechanical or flanged joint as specified, and open counter-clockwise.

12.0 Plug Valves – Pump Stations (Aboveground Service)

- 12.1 In addition to Section 11.0, the following specified plug valve shall be acceptable for use in pump station applications.
- 12.2 All plug valves shall be from the same manufacturer. Plug valves shall be as manufactured by DeZurik, or approved equal.

Approved Suppliers

DeZuric (USA)

- 12.3 The plug valve body shall be cast iron with a welded-in overlay of nickel alloy content on all surfaces contacting the plug face. Plug shall be a resilient plug faced with neoprene and shall have hard nickel-iron inserts.
- 12.4 Plug valves shall be furnished with replaceable permanently lubricated sleeve type stainless steel bearings in the upper and lower journals.
- 12.5 Plug valve packing shall be nitrile-butadiene.
- 12.6 Manual gear operators shall be totally enclosed worm and gear type, permanently lubricated. Gear segment shall be of ductile iron, supported on bronze bearings.
- 12.7 Plug valves 6 inches and smaller for aboveground service shall be provided with a 2 inch AWWA nut having an arrow cast in the meter indicating direction of opening. Plug valves

larger than 6 inches for aboveground service shall be provided with a gear operator and hand wheel, with a cast arrow indicating direction of opening.

12.8 Plug valves shall be flanged joint as specified, and open counter-clockwise.

13.0 Gate Valves

13.1 All gate valves shall be from the same manufacturer. Gate valves shall be as manufactured by Mueller, Kennedy, or approved equal.

Approved Suppliers

Mueller (USA)
Kennedy (USA)

13.2 Gate valves 2 inches and smaller shall conform to Federal Specifications WW-V-54, Type II, solid wedge disc, rising stem, secured joints and of bronze construction. Valves shall have malleable iron handwheels.

13.3 Valve sizes 4 inches through 12 inches shall be Mueller catalog number A-2370-6 or Kennedy Figure 561X, or approved equal, of the resilient wedge type with iron body, bronze mounted, non-rising stem with operating wheel or 2 inch AWWA nut, in accordance with AWWA C509 requirements. The operating wheel or nut shall have an arrow cast thereon indicating the direction of opening. Valves shall have a clear waterway opening of full nominal diameter of the valve.

13.4 Valve sizes larger than 12 inches shall be Mueller catalog number A-2380-23 or Kennedy Figure 561X, or approved equal, of the double-disc type having an iron body, bronze mounted, with parallel seats and O. S. & Y. or non-rising stem as specified, with operating wheel or 2 inch AWWA nut, in accordance with AWWA C500 requirements. The operating wheel or nut shall have an arrow cast thereon indicating the direction of opening. Valves shall be provided with bypass valves. Valves shall have a clear waterway opening of full nominal diameter of the valve.

13.5 Gate valves 4 inches and larger shall have flanged joints as specified, and utilized exclusively in pigging ports, wet taps and emergency pump-out by-pass applications.

14.0 Ball Valves

14.1 Stainless steel ball valves shall be as manufactured by Jamesbury, Figure 21-3600TT-3, or approved equal. Valves shall be of two piece construction, with 316 stainless steel body and ball and 300 series stainless steel body bolts. Seat shall be TFE. Actuating handles shall be 300 series stainless steel. Size shall be as specified on the design drawings.

Approved Suppliers

Jamesbury (USA)

14.2 PVC ball valves shall be as manufactured by Wallace and Tiernan, Inc., or approved equal Valves shall be of PVC Type 1 with union, socket, threaded or flanged ends as required. Valves shall be full port, full flow, and all plastic construction. Size shall be as specified on the design drawings.

Approved Suppliers

Wallace & Tiernan, Inc. (USA)

15.0 Swing Check Valves – Lever and Weight

15.1 All swing check valves shall be from the same manufacturer. Swing check valves shall be as manufactured by Mueller, Kennedy or approved equal.

Approved Suppliers

Mueller (USA)
Kennedy (USA)

- 15.2 Swing check valves with lever and weight as manufactured by Mueller shall be catalog number A-2600-6-01. Swing check valves as manufactured by Kennedy shall be Figure 106LW.
- 15.3 Swing check valve body shall be cast iron per AWWA C508 having integral (not Wafer) flanged ends. The seat shall be solid bronze with an “O” ring seal and be locked in place with stainless steel lock screws field replaceable without the use of special tools. All internals shall be replaceable in the field without removing the main valve from the pipeline.
- 15.4 The disc shall be cast iron, with a resilient synthetic rubber facing, connected to a ductile iron disc arm. The disc arm assembly shall be suspended from a stainless steel shaft that passes through a seal retainer on both sides of the valve body.
- 15.5 The check valve shall prevent backflow of the media on normal pump shut-off or power failure, at zero velocity and be watertight.
- 15.6 Materials shall be certified to the following ASTM specifications:

Body, Cover, Disc	Cast iron	ASTM A126, C1B
Disc Arm	Ductile iron	ASTM A536
Disc Seat	Metal	To Suit
Disc Facing	Rubber	ASTM D2000
Seat	Bronze	ASTM B584
	or Stainless Steel	ASTM A276

16.0 Ball Check Valves

- 16.1 All ball check valves shall be from the same manufacturer. Ball check valves shall be as manufactured by the ITT Flygt Corporation.

Approved Suppliers

ITT Flygt (USA)

- 16.2 For valve sizes 4 inches through 14 inches, Type 5087 ball check valve shall be provided. For valve sizes 16 inches through 20 inches, Type 2016 shall be provided.
- 16.3 Ball check valves shall be flanged joint and may be used in valve vaults at lift stations where static head pressure on valve exceeds 10 feet.
- 16.4 Ball check valves shall be installed horizontally, and provided with a “sinking” hollow metal ball having an exterior coating of vulcanized nitrile rubber. Ball shall roll clear of the waterway in pump-on conditions providing full flow equal to the nominal size.
- 16.5 The ball check valve shall prevent backflow of the media on normal pump shut-off or power failure, at zero velocity and be watertight.

17.0 Check Valves – Rubber Duckbill

- 17.1 Rubber duckbill check valves shall be Tide-Flex Series TF-2, as manufactured by Red Valve Co., or approved equal.

Approved Suppliers

Red Valve Co. (USA)

- 17.2 Valves are to be all rubber and of the flow operated check type with a slip-on end connection, designed to slip over the specified outside diameter of the pipe and attached by means of vendor supplied clamps. Inlet port areas are to be 100 percent of the mating pipe port size.
- 17.3 The port area shall contour down to a duckbill that shall allow passage of flow in one direction while preventing reverse flow.

17.4 Company name, plant location, valve size, and serial number shall be bonded to the check valve.

18.0 Air Release Valves (Sewage)

18.1 Air release valves shall be as manufactured by **H-Tec**.

Approved Suppliers

Porter Products

18.2 When sewage air release valves are specified, **H-Tec Model 986** shall be provided, having a 2 inch N.P.T. inlet with a 0.5 inch N.P.T. outlet, inlet and blow off valves, quick disconnect couplings and a minimum 5 foot hose for flushing.

18.3 When sewage air and vacuum valves are specified, **H-Tec Model 986** shall be provided, having a 2 inch N.P.T. inlet with a 1 inch N.P.T. outlet, inlet and blow off valves, quick disconnect couplings and a minimum 5 foot hose for flushing.

18.4 All sewage air or air/vacuum valves shall be made from stainless steel.

19.0 Valve Vaults/Boxes – Forcemains

19.1 Reference the Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments, Detail WWS-008, for valve vaults used with sewage air release/vacuum valves.

19.2 Reference the Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments, Detail WWS-010, for valve vaults used when manifolding forcemains.

19.3 Unless specified otherwise, valve boxes for buried valves having a 2 inch AWWA operating nut and located on forcemain runs where there are non-traffic conditions or outside of road rights-of-ways shall consist of a section of 6” diameter C900 PVC pipe extending from finish grade to the valve bonnet with a cover labeled “SEWER”, as manufactured by Davis Water and Waste Industries, Inc., Davis Meter and Supply Div., or approved equal.

Approved Suppliers

Davis Water & Waste Industries, Inc. (USA)

19.4 Unless specified otherwise, valve boxes for buried valves having a 2 inch AWWA operating nut and located on forcemain runs where there are traffic conditions or within road rights-of-ways shall be cast iron, adjustable type, CLOW F-2454 or approved equal, with cover labeled “SEWER”. Extension pieces, if specified, shall be manufacturer’s standard type.

Approved Suppliers

CLOW (USA)

20.0 Manholes

20.1 Manholes for sanitary sewers shall be precast, cast-in-place concrete or **Armorock Polymer concrete**. Reference the Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments, Section 7.5, and Details WWS-004 and WWS-005. **New manholes that have a forcemain connection shall be an Armorock polymer concrete.**

21.0 Manhole Frame and Cover

21.1 Frame and cover for manholes shall be Catalog No. USF 420-G-ORS as manufactured by U.S. Foundry and Manufacturing Corp., or approved equal, and imprinted with “LAKELAND”, “SANITARY SEWER”, and “CONFINED SPACE”. Watertight fittings shall be supplied where the City deems necessary.

- 21.2 Frame and cover for air release valve vaults shall be Catalog No. **USF 1125-G-ORS** as manufactured by U.S. Foundry and Manufacturing Corp., or as in 21.1, or approved equal, and imprinted with **“Lakeland”, “Sanitary ARV”, and “Confined Space”**.
- 21.3 Frame and cover for monitoring manholes shall be Catalog No. USF 420-G0ORS as manufactured by U.S. Foundry and Manufacturing Corp., or approved equal, and imprinted with **“MONITORING”, “SANITARY SEWER”, and “CONFINED SPACE”**.
- 21.4 Reference the Wastewater Division Policies, Standards and Specifications for Subdivisions and Commercial Developments, Section 7.5, and Standard Details WWS-005A, WWS-009 and WWS-009A.

22.0 Service Saddles

- 22.1 Service saddles shall be as manufactured by JCM, or approved equal.

Approved Suppliers

JCM (USA)

- 22.2 Service saddles for ductile iron and PVC cast iron pipe sizes through 12 inches shall be Model 406, having a heavy duty double strap ductile iron body fusion coated with a heavy resilient plastic coating with two corrosion resistant Type 304 stainless steel straps, and a 2 inch N.P.T. tap unless specified otherwise on the design drawings.
- 21.2 Service saddles for ductile iron and PVC cast iron pipe sizes larger than 12 inches shall be Model 418, having a steel full sleeve body with a 2 inch N.P.T. tap unless specified otherwise on the design drawings.

- 22.4 Materials shall be certified to the following specifications:

Body (404)	Ductile iron	ASTM A536
Body (418)	Steel sleeve	ASTM 285
Straps	Stainless steel	18-8 Type 304
Bolts, Nuts, Washers	Stainless steel	18-8 Type 304
Gasket	Rubber	Buna-N
Finish	Shop coat primer	Corrosion resistant

23.0 Hangers and Supports

- 23.1 Pipe hangers and supports shall be provided to rigidly support pipes, maintain the necessary pitch, prevent vibration, and to allow expansion and contraction of the pipe type(s) and location(s) in accordance with individual project specifications and drawings.
- 23.2 Overhead hangers for pipe 8 inches and smaller shall be of the adjustable split ring type, Fig. 107R, as manufactured by Grinnel Co., Fig. 205 as manufactured by Fee & Mason Mfg. Co., or approved equal. For pipe sizes larger than 8 inches, single pipe rolls and sockets shall be provided, Fig. 171 or 181 as manufactured by Grinnel Co., Fee & Mason Mfg. Co., or approved equal.

Approved Suppliers

Grinnel Co. (USA)
Fee & Mason Mfg. Co. (USA)

- 23.3 Threaded hanger rods suspended from beam clamps or galvanized inserts in concrete shall be Fig. 253 or CT-140 as manufactured by Grinnel Co., Fig. 267 as manufactured by Fee & Mason Mfg. Co., or approved equal.

Approved Suppliers

Fee & Mason Mfg. Co. (USA)

- 23.4 Pipe saddle supports shall be adjustable type with pipe and floor flanges, Fig. 264 as manufactured by Grinnel Co., F-1608 as manufactured by Clow Corp., or approved equal.

Approved Suppliers

Grinnel Co. (USA)
CLOW Corp.)USA)

- 23.5 Wall and column supports shall be welded steel brackets with anchor chairs and additional wall bearing plates where required for wall brackets, Fig. 194, 195, 197 and 199 as manufactured by Grinnel Co., Fig. 150, 151, 153 and 155 as manufactured by Fee & Mason Mfg. Co., or approved equal.

Approved Suppliers

Grinnel Co. (USA)
Fee & Mason Mfg. Co. (USA)

- 23.6 Concrete piers where specified shall be located as shown on the design drawings, constructed to accurately conform to the bottom one-third to one-half of the pipe.

- 23.7 Plastic, FRP, and miscellaneous hangers shall be as shown on the design drawings or as approved by the design Engineer.

24.0 Dresser/Flexible Couplings

- 24.1 Dresser couplings shall be as manufactured by JCM, or approved equal.

Approved Suppliers

JCM (USA)

- 24.2 Dresser couplings for ductile iron pipe sizes of the same nominal diameter with the same outside diameter dimension through 16 inches shall be Model 210, having ductile iron flanges and sleeve, meeting the requirements of ASTM A536, with rubber gaskets and corrosion resistant high strength, low alloy bolts and nuts.

- 24.3 Dresser couplings for ductile iron pipe sizes of the same nominal diameter with different outside diameter dimension through 16 inches shall be Model 212 Transition Coupling, having ductile iron flanges and sleeve, meeting the requirements of ASTM A536, with rubber gaskets and corrosion resistant high strength, low alloy bolts and nuts.

- 24.4 Flexible couplings for gravity sewer pipe with the same or different nominal inside or outside diameters and of the same or different pipe type shall be **MAXADAPTOR** or approved equal, suitable for the intended application. No types of repair clamps or repair couplings shall be used in new construction installations.

Approved Suppliers

Porter Associates, Inc.
Hayes Pipe Supply, Inc
Ferguson Enterprises

25.0 Quick-Disconnects

- 25.1 By-pass connection used in pump station valve vault or in pigging port vault shall be brass quick-disconnect cam and groove “Andrews” type, part ‘D’ female coupler by female N.P.T. (size as specified) with part ‘DP’ dust plug, as manufactured by Dixon Valve and Coupling, OPW, or approved equal.

Approved Suppliers

Dixon Valve & Coupling (USA)
OPW (USA)

26.0 Vent Caps

26.1 Vent caps shall be coated cast iron, Series 26700 as manufactured by Josam Co., or approved equal, with vandal proof hooded vent cap, counterflashing collar, protective hood and recessed securing screws.

27.0 Access Hatches and Frames

27.1 Access hatches and frames for pump station wet well and valve vault tops shall be as manufactured by Halliday Products, Inc., or approved equal.

27.2 Access hatch assemblies shall be the size and orientation shown on the design drawings.

27.3 Access hatch assemblies shall have a 0.25 inch thick, one-piece, mill finish, extruded aluminum frame, incorporating a continuous concrete anchor.

27.4 Door panel(s) shall be 0.25 inch aluminum diamond plate, reinforced to withstand minimum live loading of 300 pounds per square foot. Door panel(s) shall open to 90 degrees and automatically lock with a stainless steel hold open arm with automatic release handle. Door panel(s) shall close flush with the frame.

27.5 Lifting handle, hinges, and all fastening hardware shall be stainless steel. Assembly shall be complete with a non-corrosive pad-lockable hasp.

28.0 Interior Liner (New Pre-Cast Concrete Structures)

28.1 Interior liner shall be “Dura Plate 100” PVC liner as manufactured by A-Loc, Inc.; “AGRU Sure Grip” PP-R (Polypropylene Random Copolymer) liner as manufactured by Alois Gruber GmbH, or approved equal, as specified on the design drawings.

28.2 Interior surfaces of pre-cast wet wells, influent structures, and structures receiving forcemain discharge shall be protected from physical and chemical deterioration. The liner shall cover all interior wall and top surfaces and shall be formed into the concrete surface during the pre-casting process and held in place by imbedded ribs.

28.3 The liner shall be installed in accordance with the specific instructions of the manufacturer.

28.4 Reference Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments, Section 7.5.3.

28.5 Reference Section 34 for pipe ingress/egress through pre-cast structures.

29.0 Interior Liner (Retrofit For Existing Concrete Structures)

29.1 Interior surfaces of existing concrete structures receiving forcemain discharge shall be protected from physical and chemical deterioration by one of the following methods:

- a. IET System 3 Coating
- b. **SPRAYROQ**
- c. **RAVEN**

29.2 IET System 3, **SPRAYROQ and RAVEN** coating shall be a 100% solids two-component isophthalic polyester resin. Structure preparation and product application shall be in accordance with specifications of Integrated Environmental Technologies. Application shall be performed by a qualified applicator approved by the Manufacturer or manufacturer’s designated representative.

29.3 Reference Wastewater Division Policies, Standards and Specifications for Subdivisions and Commercial Developments, Section 7.5.3.

30.0 Paint

30.1 “Paint” as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate, or finish coats.

30.2 Paint shall be as manufactured by one of the following except where specified paint type is not widely available, and shall be their highest grade of paint: Glidden, Sherwin-Williams, Koppers, or approved equal.
Approved Suppliers

Glidden (USA)
Sherwin-Williams (USA)
Koppers (USA)

30.3 Surfaces to be painted shall be prepared, primed, and painted in accordance with individual project specifications and drawings, using the following types of paint by Glidden/Koppers as a basis for the paint schedule:

- a. Vent Caps, Fuel Tanks, Fuel Lines -- Safety Orange, Glidden Alkyd Industrial Enamel 4500 Series.
- b. Generator Sets – Cat Yellow, Ringhaver Equipment Co. No. Y1R11-C106A.
- c. Potable Water Piping (Above Grade) -- Safety Blue, Glidden Alkyd Industrial Enamel 4500 Series.
- d. Concrete, Ductile Iron Pipe/Fittings, Valves, Manhole Covers/Frames (Exposed to Wastewater and Corrosive Atmospheres) – Carbaline Co., Carboline Bicumastic No. 300-Black, or Porter’s Tarsel Maxi-build II #7080, BLP Mobile Paints Mo-Tar C-200 epoxy, Rusto-leum 9578 SP-1 or SP06 coal tar epoxy, or ConSeal CS 55.
- e. Concrete, Masonry (Exterior) – White, Glidden Alkyd Industrial Enamel 4500 Series.
- f. Ferrous Metal (Non-submerged Exterior) – Koppers Pug Primer.
- g. Non-Ferrous Metal (Non-submerged Exterior) – Glidden Glid-Guard Metal Conditioning Primer 5290 Series.

30.4 Reference Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments, Section 7.5.3.

31.0 Tracer Wire

31.1 Reference City of Lakeland *Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments, Section 7.2.6.*

32.0 Detection Tape

32.1 Detection tape provided for early warning of buried forcemain pipe shall be plastic and foil laminate, 3 inches wide, green in color, with lettered message “CAUTION, BURIED FORCEMAIN” repeating every 20-36 inches and buried 2-feet above pipe.

32.2 Reference Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments, Section 7.2.6.

33.0 Joint Sealant

33.1 Section joints of pre-cast structures shall be sealed with “Ever-Grip 990” as manufactured by Gulf States Asphalt Co., “Ram-Nek” as manufactured by Henry Company, Sealants Division. “D-Lok” as manufactured by Atlantic Concrete Products, or approved equal.

Approved Suppliers

Gulf States Asphalt Co. (USA)
Henry Company – Sealants Division (USA)
Atlantic Concrete Products (USA)

“Rub’r-Nek” external concrete joint wrap, as manufactured by Henry Company, Sealants Division, shall be used in combination with joint sealant for each pre-cast joint section.

Approved Suppliers

Henry Company – Sealants Division (USA)

- 33.2 Flexible sealant shall be a pre-formed, ready to use, flexible gasket providing a watertight joint for each pre-cast joint section. Joint sealant composition shall be a blend of refined hydrocarbon resins, plasticizing compounds, non-asbestos fibers, and inert mineral fillers, without solvents and emitting no offensive odor. “Ram-Nek” product shall be supplied as a flat extruded tape between two pieces of silicone-coated release paper.
- 33.3 Joint sealant shall comply with Federal Specification SS-S210-A, AASHTO M-198-B, and ASTM C990.
- 33.4 Reference Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments, Section 7.5.6, and Detail WWS-015.

34.0 Pipe-to-Manhole Adapters

- 34.1 Pipe-to-manhole (flexible resilient boot) pipe adapters shall be as follows: Formed or Cut Holes – “PSX” Positive Seal” by Press Seal-Gasket Corp. Cast-in Adapter – “Econoseal” by Press Seal-Gasket Corp., “Z-Lok” or “A-Lok” by A-Lok Products, Inc., or approved equal.

Approved Suppliers

Press Seal-Gasket Corp. (USA)

A-Lok Products, Inc (USA)

- 34.2 The adapter for formed or cut holes shall consist of a polyisoprene or natural rubber gasket, an 11 gage 304 stainless steel non-magnetic internal expansion sleeve, and one or more 304 stainless steel external compression take-up clamps.
- 34.3 The cast-in adapter shall be constructed solely of polyisoprene or natural rubber, and shall be cast into the concrete structure using casting mandrels as specified by the adapter manufacturer.
- 34.4 Pipe-to manhole adapters for existing structures shall be a PVC sleeve having a Quick-Grit exterior coating, suitable for grouting into existing structures and meeting the requirements of ASTM D3034.
- 34.5 The connector for pipe ingress/egress through the pre-cast structure shall be “A-Lok” as manufactured by A-Loc, Inc.;

Approved Suppliers

Alois Gruber GmbH (USA)

- 34.6 Reference Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments, Section 7.5.6, and Detail WWS-005B.

35.0 Pressure Transmitter (Forcemain Manifolds)

- 35.1 Forcemains to be manifolded shall be provided with a pressure transmitter installed on the forcemain “tee” or “cross” prior to forcemain exiting the pump station valve vault.
- 35.2 Pressure transmitter shall be a WIKA Model 891.13-500, pre-calibrated to generate a 4 - 20 mA signal over a range from zero to a top pressure equal to two times the related operating pressure of the pump (or the rated shut-down pressure of the pump, whichever is larger).

Approved Suppliers

WIKA (USA)

- 35.3 Reference Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments, Detail WWS-015.

36.0 Chain Link Fences and Gates

- 36.1 Where specified on the design drawings, an aluminum coated steel chain link fence, nominally 6 feet high, complete with gate(s), shall be furnished and installed.
- 36.2 Fabric shall be aluminum coated steel chain link 72 inches high, No. 9 gage wire woven in a 2 inch mesh. Top and bottom selvages shall be barbed. The fabric shall conform to the requirements of ASTM A491. The aluminum coating shall be a minimum of 0.40 ounces per square foot of wire surface. The weight of coating shall be determined by the strip test as defined in ASTM A428.
- 36.3 Posts and other appurtenances used in the construction of this fence shall be hot dipped galvanized with a minimum of 1.8 ounces per square foot of surface. Pipe section shall conform to the requirements of ASTM A123.
- 36.4 Minimum sizes of posts, gate frames, and rails shall be as follows:

Dimension in Inches

<u>Designation</u>	<u>Nominal Diameter</u>	<u>Outside Diameter</u>	<u>Thickness</u>	<u>Lbs. Per Foot Plain Ends</u>
a. End, Corner & Pull Posts:	2 ½	2.875	0.203	5.79
b. Gate Posts:	2 ½	2.875	0.203	5.79
c. Intermediate Posts:	2	2.375	0.154	3.65
e. Gate Frames:	1 ½	1.900	0.145	2.72
f. Braces:	1 ¼	1.660	0.140	2.27
g. Top Rails:	1 ¼	1.660	0.140	2.27

- 36.5 As an option, posts, braces, rails, and gate frames may be steel pipe manufactured from steel conforming to ASTM A568, cold-rolled and coated with a minimum of 0.9 ounces of zinc per square foot, a minimum of 15 micrograms of zinc chromate per square inch and a minimum of 3 mils cross link polyurethane acrylic exterior coating may be furnished in lieu of round posts of Section 36.3 and 36.4. Steel pipe shall be of the same external dimension as round posts for the respective uses with minimum wall thickness as follows:

<u>Outside Dimension, Inches</u>	<u>Wall Thickness, Inches</u>
1.66	0.111
1.90	0.120
2.375	0.130
2.875	0.160

- 36.6 Gates shall be complete with latches, stops, keepers, and hinges. Gate frames shall be constructed of round tubular members continuously welded at all corners or assembled with fittings. Welds shall be painted with aluminum or zinc based paint. Gate filler shall be of same fabric as specified for the fence and shall be attached securely to the gate frame at intervals not exceeding 14 inches. Hinges shall be of adequate strength for the gate and with large bearing surfaces for clamping in position. The hinges shall not twist or turn under the action of the gate. The gate(s) shall be easily operable by one person. Latches, stops, and keepers for all gates, with provision for padlocking, shall be provided.
- 36.7 The top rail shall be provided with couplings approximately every 20 feet. Couplings are to be the outside sleeve type, at least 6 inches long.
- 36.8 Miscellaneous hardware shall be of steel, malleable iron or ductile iron of standard design and conform to the requirements of the Chain Link Fence Manufacturer’s Institute. All parts shall be galvanized except ties and clips, which shall be a minimum of No. 9 gage aluminum.
- 36.9 Reference Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments, Section 7.6.2.5. The City reserves the right to require standoffs and barbed wire or other types of security ribbon where security may be an issue.

37.0 Submersible Pumps

- 37.1 Submersible pumps shall be provided in accordance with individual project specifications and design drawings. The City will accept designated pump models by pre-approved manufacturers. **For public lift stations, certain pumps such as the 2 pole motors, Hydromatic S4P/S4PX and S4N/S4NX are not accepted.**
- 37.2 The pump manufacturer shall supply compatible mounting appurtenances for supporting the pump and for routine removal and replacement of the pump in the wet well. These shall include:
- a. Pump discharge elbow with stainless steel anchor bolts for each pump, sized as shown on the design drawings to accommodate the specified pump.
 - b. All rail systems must be compatible with Flygt rail systems.
 - c. Dual guide rails for each pump.
 - d. Upper guide-rail support brackets and intermediate support brackets as necessary to prevent excessive deflection of the guide-rails.
 - e. Lifting cables with suitable hardware for raising and lowering the pump on the guide-rail system.
 - f. Cable holder bracket
 - g. **Stainless steel pump lifting bale minimum 8 inch from top of motor to bale**
- 37.3 Reference Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments, Section 7.6.2.7

Approved Suppliers

ITT Flygt Corp. (USA)
Aurora/Hydromatic Pumps (USA)
Davis EMU/Wilo

38.0 Permanent Diesel Bypass Pumps

- 38.1 **Permanent diesel pumps shall be provided in accordance with individual project specifications and design drawings. The City will accept designated pump models as manufactured by the following pre-approved manufacturers: Xylem, Thompson, or Mersino.**
- 38.2 **The system will meet all current City requirements, including but not limited to SCADA, concrete padding, double walled fuel tank, and aluminum sound attenuated weatherproof enclosure. Please ask for the most current comprehensive list.**

39.0 Flowmeters

- 39.1 **Flowmeters shall be provided in accordance with individual project specifications and design drawings. The City will accept Yokogawa or McCrometer brands.**

40.0 Pump Power Panel

- 40.1 **The Electrical panel shall be manufactured by approved suppliers as listed the City's Liftstation Detail and shall be the standard pump station unit conforming to City standards and designed for direct addition and integration into the City's existing telemetry/control system. The electrical panel shall serve as the primary power distribution center at the pump station. It shall differ from a traditional "control panel" in that the pump control logic functions shall be provided by a microprocessor based logic controller housed in the same panel. The panel shall include the main power circuit breaker, VFDs, the level sensing radar, and other miscellaneous features such as load circuit breakers, service light, service receptacle, running lights, switches, interposing relays and terminal strips to interface between the various externally located electrical control and mounting features of the station as shown on the design drawings and as required for a complete working system.**
- 40.2 **RTU interface standard features: All standard manufacturer's features available with the pumps shall be supplied and incorporated into the electrical panel, if they are electrical or control features. Should these features be alarm or control monitoring points (i.e., seal failure alarms, etc.) their status shall be terminated at the RTU terminal strip in addition to indicators on the power panel. All contacts brought to the RTU terminal strip shall be dry-form 'C' fail safe contacts. Voltage levels**

shall be isolated via interposing relays of the type specified. The control enclosure shall be sized large enough to house all components.

- 40.3 The electrical panel shall contain a radio/modem, UPS power supply, Schneider PLC microprocessor, and all necessary appurtenances for handling all input/output signals, along with all motor control and protection devices as shown on the design drawings, in the individual project specifications, as specified herein and as necessary for complete conformance to and utilization of the City systems.
- 40.4 The radio tower shall be the standard 20 foot Rohn tower of galvanized steel tubing. The antenna shall be a yagi or omni unit as determined by the radio propagation study. The unit shall include 20 feet of antenna cable. Panels over 40Hp or 100,000 gpd flow rate will utilize the Cities fiber network for communications, as required, to the Wastewater SCADA network. Developer will be responsible for this connection.
- 40.5 All components will be in accordance with the approved drawings from the Cities approved vendor.

All components and conductors shall be sized according to the maximum full load amperes specified. Conductors shall be stranded copper AWG 14 minimum.

VFDs and panel components shall be sized to the specific motor supplied for the pumping application, 10, 20, or 40 Hp for the standard panel and above 40 for the larger panels. If alternate pumps/motors of a different size are proposed, all affected electrical components must be properly re-sized and included in the description of the proposed alternate equipment.

- 40.6 All component parts of the electrical panel shall be permanently marked and identified as they are indicated on the control drawings with engraved nameplates affixed with plated machine screws. All power and signal conductors shall be permanently number marked with wire markers at each end.
- 40.7 Wet well level indicator shall be provided, consisting of a radar transmitter designed to produce a 4-20 mA analog signal proportional to the level in the wet well, to operate in a range from zero to 15 feet and cable (length as required by the design drawings).

Approved Suppliers

VEGA Americas, Inc.
Classic Controls (Local Vendor)
Vega C21

- 40.8 Upon completion of the panel a complete set of “AS-BUILT” drawings and Bill of Materials shall be supplied. The drawings shall include a power and control schematic and a terminal block diagram showing each remote connection to the panel. An adhesive mylar copy of the schematic drawings and terminal diagram must be permanently affixed to the inside of the panel door.

- 40.9 In addition to “As-Built” drawings and bill of materials, upon completion of a public pump station the following items shall be furnished by the Contractor/Engineer/Developer:

- 3 Parts manuals
- 3 Pump O&M Manuals
- 3 Electrical schematic drawings
- 5 Sets of fuses and bulbs
- 3 Component list to include manufacturer, model and serial number

41.0 Warranties

- 41.1 Excluding pumps, equipment warranties shall be in accordance with the manufacturer’s standard warranty, unless otherwise specified in the individual project specifications, commencing at the time of final acceptance of the equipment by the City.
- 41.2 The pump manufacturer shall warrant the pump(s) to be supplied to the City for a period of five (5) years under normal use. The warranty shall include 100% coverage for the parts and labor for the first year and then 50% coverage for the second to the fifth year. This warranty shall not be in pre-printed form

Section II

1.0 Reference Standards

1.1 The following is a listing of standards referenced throughout this materials specification.

- ASTM A123 – Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
- ASTM A126 – Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
- ASTM A276 – Stainless Steel Bars and Shapes.
- ASTM A428 – Weight (Mass) of Coatings on Aluminum-Coated Iron or Steel Articles.
- ASTM A491 – Aluminum-Coated Steel Chain Link Fence Fabric
- ASTM A536 – Ductile Iron Castings.
- ASTM A568 – Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
- ASTM D1248 – Polyethylene Plastics Molding and Extrusion Materials.
- ASTM D1653 – Water Vapor Transmission of Organic Coating Films.
- ASTM D1784 – Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds.
- ASTM D2000 – Rubber Products in Automotive Applications.
- ASTM D2241 -- Polyvinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series).
- ASTM D3034 – Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
- ASTM D3212 – Joints for Drain and Sewer Plastic Pipes using Flexible Elastomeric Seals.
- ASTM D3753 – Glass Reinforced Polyester Manholes.
- ASTM F477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- ASTM F679 – Polyvinyl Chloride (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
- ASTM F1216 – Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
- AWWA C111 – Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
- AWWA C115 – Flanged Ductile-Iron and Gray-Iron Pipe with Threaded Flanges.
- AWWA C150 – Thickness Design of Ductile-Iron Pipe.
- AWWA C151 – Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water and Other Liquids.
- AWWA C153 -- Ductile-Iron Compact Fittings, 3 inches through 16 inches, for Water and Other Liquids.
- AWWA C213 – Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.
- AWWA C500 – Gate Valves, for Water and Sewerage Systems.
- AWWA C508 – Swing-Check Valves for Waterworks Service, 2 In. through 24 In. NPS.
- AWWA C509 – Resilient-Seated Gate Valves, for Water and Sewerage Systems.
- AWWA C550 – Protective Interior Coatings for Valves and Hydrants.
- AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. through 12 In., for Water.
- AWWA C905 – Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 In. through 36 In.
- Uni-B-13 – Joint Restraint Devices for use with Polyvinyl Chloride (PVC) Pipe.
- Wastewater Policies, Standards and Specifications for Subdivisions and Commercial Developments
- Water Utilities Directional Bore Standard**
- Water Utilities Jack & Bore Standard**

2.0 Abbreviations

- AASHO – American Association of State Highway Officials
- ANSI – American National Standards Institute
- ASTM – American Society for Testing and Materials
- AWWA – American Water Works Association