

EXHIBIT “D” – PRODUCT SPECS & APPROVED MATERIALS LIST

BOYNTON BEACH UTILITIES
124 East Woolbright Road
Boynton Beach, Florida 33435

“SHOP SPECIFICATIONS”

Project Name: _____

Concurrence of Contractor: _____ Signature _____ Date _____

Firm

Concurrence of Engineer of Record: _____ Signature _____ Date _____

Firm

By signature above, the Contractor for the above-named project acknowledges and agrees to comply with this Exhibit “D” Product Specifications, the Department’s Design Handbook, Construction Standards and Specifications (latest edition), and the approved Contract Documents as applicable. The Contractor understands and agrees that any construction or installation work not performed in accordance with these requirements may be rejected by the Department at the Contractor’s sole expense.

PRODUCT AND SPECIFICATION BASIS

The products and specifications listed herein have been determined by the Department to be acceptable and desirable within their respective categories. Shop drawings **are not required** for products listed in this Exhibit. **Any product not listed shall be considered a “substitution” and must be submitted in writing and approved in advance by the Engineer of Record and the City.** All substitutions shall comply with the Department’s Design Handbook, Construction Standards and Specifications (latest edition), and the approved Contract Documents as applicable.

Shop drawings **shall be required** for all non-standard or custom-fabricated items, including but not limited to precast concrete structures, manholes, wet wells, grease traps, other castings, pumps, electrical panels, lift stations, or any product not listed herein.

All materials shall be manufactured in the United States unless otherwise specifically approved in writing by the Department.

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I. MAIN LINE CONSTRUCTION

A. Pipe – All pipes must be properly labeled. 3", 10", and 14" pipe are considered “ODD” pipe sizes and can only be used to tie into existing lines.

1. Potable Water Main

a. Push-on and Mechanical Joint Ductile Iron Pipe (DIP)

For potable water mains and reclaimed water mains shall have a minimum pressure class of 350 and be designed for a minimum working pressure of 150 psi. Pipe shall be manufactured in accordance with AWWA/ANSI C151/A21.51 and AWWA C150, and fittings shall conform to AWWA/ANSI C110/A21.10 and AWWA/ANSI C111/A21.11, latest revisions. The pipe material shall be ductile iron conforming to ASTM A536, latest revision. Interior lining shall be cement-mortar lined and seal coated in accordance with AWWA/ANSI C104/A21.4, latest revision. All buried DIP and fittings shall have an exterior bituminous coating. Joints shall be rubber gasket compression type, either push-on or mechanical joint. Mechanical joint pipe shall be provided with ductile iron glands and Cor-Ten steel tee bolts, or approved equal. All DIP and fittings used for underground potable water systems shall be certified to meet ANSI/NSF 61, latest revision, and shall be color coded, blue, applied either by the manufacturer or in the field, in accordance with Subparagraph 62-555.320(21)(b)3, Florida Administrative Code (F.A.C.).

1. American
2. U.S. Pipe
3. McWane

b. Flanged DIP Class 53

Cement mortar lining ANSI/AWWA C-151/A21.50 for 150 psi, and C-104 flanges must be ductile iron.

1. American
2. U.S. Pipe
3. McWane

c. PVC Pressure Pipe

With push-on joints shall be permitted for potable and reclaimed water mains in sizes ranging from 4 inches to 12 inches in diameter. Pipe sizes greater than 12 inches shall be ductile iron pipe (DIP), unless otherwise approved in writing by the City. Pipe shall meet or exceed ANSI/NSF 61, latest revision, and comply with the latest revision of AWWA C900-16, with C900-16 pipe manufactured as SDR-

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18. At the Department's discretion, approval may be granted based on the location of installation. For underground potable water systems, all pipe and pipe fittings shall be color coded or marked in accordance with Section 62-555, F.A.C., using blue as the predominant color. Underground plastic pipe shall be solid-wall blue pipe, pipe with co-extruded blue external skin, or white or black pipe with blue stripes incorporated into or applied to the pipe wall.

1. JM Eagle
2. Westlake Pipe & Fittings
3. Diamond Plastics Corporation
4. National Pipe & Plastics

d. **High Density Polyethylene Pipe & Fittings (4" and above)**

High Density Polyethylene (HDPE) pipe for Potable & Reclaimed applications shall be PE 4710 material and conform to ductile iron pipe size (DIPS) dimensions with a dimension ratio (DR) of 11 and a pressure rating of 200 psi. Pipe shall meet or exceed the requirements of AWWA C906 and be certified in accordance with ANSI/NSF 61, latest revisions. Piping shall include permanent identification by equally spaced color stripes along the outer surface or by a solid-colored pipe shell, using identifying colors appropriate for potable water service. Pipe and fittings shall be capable of being joined using thermal fusion or mechanical joint methods in accordance with ASTM F2620, ASTM D2657, and ASTM F1290, latest revisions. Use of HDPE pipe shall be limited to installations by directional drilling only and requires prior approval by the City's Water and Wastewater Services (WWS). Only pre-approved manufacturers and fittings approved by the respective pipe manufacturer shall be used.

Size shall be chosen to maintain an internal diameter relatively equal to that of ductile iron pipe as indicated in the table below:

DIP Size	HDPE Size (DR11)
4"	4"
6"	8"
8"	10"
10"	12"
12"	16"
14"	18"
16"	20"

1. JM Eagle
2. Westlake Pipe & Fittings
3. Diamond Plastics Corporation
4. WL Plastics

a. High Range EMS Marker Requirements:

Required at all fittings and valves and every 100 LF of Pipe

Shall be 3M EMS Full Range Marker Type unless otherwise specified or approved

e. Tracer Wire for Non-Metallic Pipe:

Shall be 12 AWG, solid soft-drawn copper, with a minimum 30 mil (0.030 inch) thick high-density polyethylene (HDPE) or PVC insulation, suitable for direct burial, color-coded per APWA standards.

Trace wire shall be installed as a continuous, unbroken single strand of 12 AWG, soft-drawn, solid copper wire with 4/64-inch thick polyvinyl chloride (PVC) insulation. The insulation shall be color-coded in accordance with the American Public Works Association (APWA) standard color code for the corresponding utility type.

Looping or coiling of trace wire is not permitted. The wire shall be installed with minimal slack, maintaining direct alignment with the pipe being marked. All dead ends and stub-outs must be properly grounded.

All trace wire termination points shall be accessible via a trace wire access box. Splicing of locating wire is required before and after all valve boxes and at each branch connection, including tees and crosses. All splices shall be made using waterproof, lockable connectors and shall be wrapped with electrical tape.

Splices at tees shall be made using 3-way connectors, and splices at crosses shall be made using 4-way connectors. Splice locations must be positioned clear of pipe fittings.

All mainline trace wire segments shall be interconnected at intersections, tees, and crosses to ensure continuous signal conductivity throughout the system.

2. Reclaimed Water Main.

b. Push-on and Mechanical Joint Ductile Iron Pipe (DIP)

For potable water mains and reclaimed water mains shall have a minimum pressure class of 350 and be designed for a minimum working pressure of 150 psi. Pipe shall be manufactured in accordance with AWWA/ANSI C151/A21.51 and AWWA C150, and fittings shall conform to AWWA/ANSI C110/A21.10 and AWWA/ANSI C111/A21.11, latest revisions. The pipe material shall be ductile iron conforming to ASTM A536, latest revision. Interior lining shall be cement-mortar lined and seal coated in accordance with AWWA/ANSI C104/A21.4, latest revision. All buried DIP and fittings shall have an exterior bituminous coating. Joints shall be rubber gasket compression type, either push-on or mechanical joint. Mechanical joint pipe shall be provided with ductile iron glands and Cor-Ten steel tee bolts, or approved equal. All DIP and fittings used for underground potable water systems shall be certified to meet ANSI/NSF 61, latest revision, and shall be color coded, blue, applied either by the manufacturer or in the field,

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in accordance with Subparagraph 62-555.320(21)(b)3, Florida Administrative Code (F.A.C.)

1. American
2. U.S. Pipe
3. McWane

c. **Flanged DIP Class 53**

Cement mortar lining ANSI/AWWA C-151/A21.50 for 150 psi, and C-104 flanges must be ductile iron.

1. American
2. U.S. Pipe
3. McWane

d. **PVC Pressure Pipe**

With push-on joints shall be permitted for potable and reclaimed water mains in sizes ranging from 4 inches to 12 inches in diameter. Pipe sizes greater than 12 inches shall be ductile iron pipe (DIP), unless otherwise approved in writing by the City. Pipe shall meet or exceed ANSI/NSF 61, latest revision, and comply with the latest revision of AWWA C900-16, with C900-16 pipe manufactured as SDR-18. At the Department's discretion, approval may be granted based on the location of installation. For underground potable water systems, all pipe and pipe fittings shall be color coded or marked in accordance with Section 62-555, F.A.C., using blue as the predominant color. Underground plastic pipe shall be solid-wall blue pipe, pipe with a co-extruded blue external skin, or white or black pipe with blue stripes incorporated into or applied to the pipe wall.

1. JM Eagle
2. Westlake Pipe & Fittings
3. Diamond Plastics Corporation
4. National Pipe & Plastics

e. **High Density Polyethylene Pipe & Fittings (4" and above)**

High Density Polyethylene (HDPE) pipe for Potable & Reclaimed applications shall be PE 4710 material and conform to ductile iron pipe size (DIPS) dimensions with a dimension ratio (DR) of 11 and a pressure rating of 200 psi. Pipe shall meet or exceed the requirements of AWWA C906 and be certified in accordance with ANSI/NSF 61, latest revisions. Piping shall include permanent identification by equally spaced color stripes along the outer surface or by a solid-colored pipe shell, using identifying colors appropriate for potable water service. Pipe and fittings shall be capable of being joined using thermal fusion or mechanical joint methods in accordance with ASTM F2620, ASTM D2657, and ASTM F1290, latest revisions. Use of HDPE pipe shall be limited to installations

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by directional drilling only and requires prior approval by the City’s Water and Wastewater Services (WWS). Only pre-approved manufacturers and fittings approved by the respective pipe manufacturer shall be used.

Size shall be chosen to maintain an internal diameter relatively equal to that of ductile iron pipe as indicated in the table below:

DIP Size	HDPE Size (DR11)
4"	4"
6"	8"
8"	10"
10"	12"
12"	16"
14"	18"
16"	20"

1. JM Eagle
2. Westlake Pipe & Fittings
3. Diamond Plastics Corporation
4. WL Plastics

f. High Range EMS Marker Requirements:

Required at all fittings and valves and every 100 LF of Pipe

Shall be 3M EMS Full Range Marker Type unless otherwise specified or approved

g. Tracer Wire for Non-Metallic Pipe

Shall be 12 AWG, solid soft-drawn copper, with a minimum 30 mil (0.030 inch) thick high-density polyethylene (HDPE) or PVC insulation, suitable for direct burial, color-coded per APWA standards.

Trace wire shall be installed as a continuous, unbroken single strand of 12 AWG, soft-drawn, solid copper wire with 4/64-inch thick polyvinyl chloride (PVC) insulation. The insulation shall be color-coded in accordance with the American Public Works Association (APWA) standard color code for the corresponding utility type.

Looping or coiling of trace wire is not permitted. The wire shall be installed with minimal slack, maintaining direct alignment with the pipe being marked. All dead ends and stub-outs must be properly grounded.

All trace wire termination points shall be accessible via a trace wire access box. Splicing of locating wire is required before and after all valve boxes and at each branch connection, including tees and crosses. All splices shall be made using

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waterproof, lockable connectors and shall be wrapped with electrical tape. Splices at tees shall be made using 3-way connectors, and splices at crosses shall be made using 4-way connectors. Splice locations must be positioned clear of pipe fittings.

All mainline trace wire segments shall be interconnected at intersections, tees, and crosses to ensure continuous signal conductivity throughout the system.

3. Sanitary Sewer Force Main

NOTE: Polyvinyl Chloride (PVC) and High-Density Polyethylene (HDPE) are the preferred pipe materials for sanitary sewer force main installations due to their corrosion resistance, hydraulic efficiency, and flexibility. The use of Ductile Iron Pipe (DIP) shall be limited to locations where specifically approved by the Utilities Department, and only when justified by site-specific conditions such as depth of cover, external loading, thrust restraint requirements, or other engineering constraints.

DIP may also be the preferred material for force mains 16 inches in diameter and larger, where additional structural strength and pressure capacity are required. Where DIP is permitted, it shall include an interior lining suitable for sanitary sewer service (e.g., Protecto 401, Permax CTF, or equivalent) and appropriate external corrosion protection in accordance with AWWA and project specifications.

a. Push-on and Mechanical Joint Ductile Iron Pipe (DIP)

For sanitary sewer force mains shall be manufactured in accordance with AWWA/ANSI C151/A21.51 and AWWA C150, with fittings conforming to AWWA/ANSI C110/A21.10 and AWWA/ANSI C111/A21.11, latest revisions. Pipe material shall conform to ASTM A536, latest revision, and be designed for a minimum working pressure of 150 psi. Joints shall be rubber gasket compression type, either push-on or mechanical joint, with mechanical joint pipe supplied with ductile iron glands and Cor-Ten steel tee bolts or approved equal. The interior lining of all pipe and fittings shall be Protecto 401 or Permax CTF applied at a minimum dry film thickness of 40 mils, in accordance with the manufacturer's specifications; however, in areas subject to elevated hydrogen sulfide (H₂S) exposure, severe corrosion potential, or other critical service conditions, a high-build ceramic epoxy liner such as Permite 9043, Type 2, applied to a minimum dry film thickness of 80 mils, shall be required. The exterior of all buried pipe and fittings shall be coated with bituminous material for corrosion protection, and all sanitary sewer force main piping shall include a readily visible green identification stripe applied in accordance with Florida Administrative Code (F.A.C.) requirements. Approval of ductile iron pipe for use in sanitary sewer force mains shall be at the sole discretion of the Department and may be based on site-specific conditions, including location, operating environment, and installation criticality.

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1. American
2. U.S. Pipe
3. McWane

b. **Flanged DIP**
Above grade lift station piping and canal crossing pipe shall be Flanged DIP Class 53, Sanitary sewer piping and fittings shall have an interior coating of Protecto 401 or Permax CTF, minimum 40 mils thick. AWWA C-115 and C-104, flanges must be ductile iron. For underground sanitary force main systems, all pipe and pipe fittings will be color coded or in accordance with F.A.C. requirements, using green as the predominant color. For cement epoxy liner, use “Protecto 401” or “Permitte 9043, Type 2” (millage to be according to manufacturer’s specification), and shall meet AWWA C-210 as related to wastewater lines.

1. American
2. U.S. Pipe
3. McWane

c. **PVC Pressure Pipe**
With push-on joints may be permitted for use in sanitary force main systems, subject to approval by the City. Pipe shall also comply with the latest revision of AWWA C900-16 and shall be manufactured to a standard dimension ratio of SDR-18.
Approval of PVC pipe for use in sanitary force main applications is at the sole discretion of the Department and may be based on site-specific conditions, including the location and criticality of the installation.
In accordance with Section 62-555, Florida Administrative Code (F.A.C.), all underground plastic pipe used for sanitary force mains shall be color coded or marked using green as the predominant color. Acceptable color identification includes solid-wall green pipe, pipe with a co-extruded green external skin, or white or black pipe with green stripes that are incorporated into or applied to the pipe wall.

1. JM Eagle
2. Westlake Pipe & Fittings
3. Diamond Plastics Corporation
4. National Pipe & Plastics

d. **High Density Polyethylene Pipe & Fittings (4” and Above)**
High Density Polyethylene (HDPE) pipe for sanitary force main applications shall be manufactured from PE 4710 material and conform to ductile iron pipe size (DIPS) dimensions with a dimension ratio of DR 11 and a pressure rating of 200 psi. All pipe shall meet or exceed the requirements of AWWA C906, latest

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revisions. Pipe shall include permanent identification through equally spaced color stripes along the outer surface or by a solid-colored pipe shell, using identifying colors appropriate for sewer service. Specifically, underground plastic pipe shall be either solid-wall green, have a co-extruded green external skin, or be white or black with green stripes incorporated into or applied to the pipe wall. Pipe lengths and fittings shall be capable of being joined using thermal fusion or mechanical joint methods in accordance with ASTM F2620, ASTM D2657, and ASTM F1290, latest revisions. Use of HDPE pipe shall be limited to directional drilling installations only and requires prior approval by the City’s Water and Wastewater Services (WWS). Only pre-approved manufacturers, and fittings approved by the respective pipe manufacturer, shall be used to ensure full compatibility and performance.

Pipe sizing shall be selected to maintain an internal diameter approximately equal to that of ductile iron pipe, in accordance with the following equivalency table:

DIP Size	HDPE Size (DR11)
4"	4"
6"	8"
8"	10"
10"	12"
12"	16"
14"	18"
16"	20"

1. JM Eagle (Ductile Iron Pipe Size)
2. Performance Pipe (Driscoplex 4000/4100)
3. Charter Plastics
4. WL Plastics

e. High Range EMS Marker Requirements:

Required at all fittings and valves and every 100 LF of Pipe

Shall be 3M EMS Full Range Marker Type unless otherwise specified or approved

f. Tracer Wire for Non-Metallic Pipe:

Shall be 12 AWG, solid soft-drawn copper, with a minimum 30 mil (0.030 inch) thick high-density polyethylene (HDPE) or PVC insulation, suitable for direct burial, color-coded per APWA standards.

Trace wire shall be installed as a continuous, unbroken single strand of 12 AWG, soft-drawn, solid copper wire with 4/64-inch thick polyvinyl chloride (PVC) insulation. The insulation shall be color-coded in accordance with the American

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Public Works Association (APWA) standard color code for the corresponding utility type.

Looping or coiling of trace wire is not permitted. The wire shall be installed with minimal slack, maintaining direct alignment with the pipe being marked. All dead ends and stub-outs must be properly grounded.

All trace wire termination points shall be accessible via a trace wire access box. Splicing of locating wire is required before and after all valve boxes and at each branch connection, including tees and crosses. All splices shall be made using waterproof, lockable connectors and shall be wrapped with electrical tape.

Splices at tees shall be made using 3-way connectors, and splices at crosses shall be made using 4-way connectors. Splice locations must be positioned clear of pipe fittings.

All mainline trace wire segments shall be interconnected at intersections, tees, and crosses to ensure continuous signal conductivity throughout the system.

4. Gravity Sewer Main (Wastewater)

NOTE: Polyvinyl Chloride (PVC) is the preferred pipe material for sanitary sewer gravity main installations due to its corrosion resistance, hydraulic efficiency, and ease of installation. The use of Ductile Iron Pipe (DIP) shall be limited to locations where specifically approved by the Utilities Department, and only when justified by site-specific conditions such as depth of cover, external loading, thrust restraint requirements, or other engineering constraints. DIP may also be the preferred material for sanitary sewer mains 16 inches in diameter and larger, where additional structural strength and pressure capacity are required. Where DIP is permitted, it shall include an interior lining suitable for sanitary sewer service (e.g., Protecto 401, Permax CTF, or equivalent) and appropriate external corrosion protection in accordance with AWWA and project specifications.

a. PVC Gravity Sewer Pipe

Shall conform to ASTM D3034, SDR 26 for depths less than 12 feet. For depths of 12 feet or greater, or where otherwise indicated on the plans, pipe shall conform to AWWA C900, SDR 18. Pipe shall be factory color-coded green, and all underground plastic pipe shall either be solid-wall green, have a co-extruded green external skin, or be white or black with green stripes incorporated into or applied to the pipe wall. Pipe material shall be manufactured from PVC compounds meeting or exceeding ASTM D1784, latest revision, and all pipe shall be new and free from ultraviolet degradation. Joints shall be integral bell and spigot push-on type with rubber gaskets meeting or exceeding the requirements of ASTM D3212, latest revision. Gaskets shall conform to ASTM F477, latest revision. Solvent weld and threaded joints are not permitted. Transitions between SDR 18 and SDR 26 pipe shall not occur between manholes and must be completed at a structure or as otherwise directed and approved by the Engineer.

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1. JM Eagle
2. Westlake Pipe & Fittings
3. Diamond Plastics Corporation
4. National Pipe & Plastics

b. **Ductile iron pipe (DIP)**

For gravity sanitary sewer systems shall be used only where specifically approved by the City of Boynton Beach based on site-specific conditions or engineering justification, and shall conform to AWWA C151 with a minimum pressure class of 350. Pipe material shall meet ASTM A536 requirements, and joints shall be rubber gasket compression type, either push-on or mechanical joint, with mechanical joint pipe supplied with ductile iron glands and Cor-Ten steel tee bolts or approved equal. The interior lining of all pipe and fittings shall be Protecto 401 or Permax CTF applied to a minimum dry film thickness of 40 mils in accordance with the manufacturer's specifications; however, in areas subject to elevated hydrogen sulfide (H₂S), severe corrosion potential, or other critical service conditions, a high-build ceramic epoxy liner such as Permite 9043, Type 2, applied to a minimum dry film thickness of 80 mils, shall be required. All lining systems shall comply with AWWA C210 for wastewater service, and proper quality control measures, including holiday (spark) testing and adhesion verification, shall be performed to confirm coating integrity. The exterior of all buried DIP and fittings shall be coated with a bituminous material for corrosion protection, and all sanitary sewer pipe shall be clearly identifiable with a readily visible green longitudinal stripe applied by the manufacturer or in the field in accordance with Florida Administrative Code (F.A.C.) requirements, using green as the predominant color to designate sewer service. Approval for the use of DIP in gravity sewer applications remains at the sole discretion of the City and may be conditioned on site-specific factors, including soil aggressivity, groundwater conditions, and installation criticality.

1. American
2. U.S. Pipe
3. McWane

c. **Manhole Cover**

- a. NEENAH Foundry (previously U.S. Foundry) Model #230 with City of Boynton Beach logo or approved Equal

5. **Marking Tape for Buried Utility Lines**

Detectable underground warning tape shall be Mylar-style, consisting of a 6-inch-wide, foil-backed tape designed to provide easy detection and identification during excavation. The tape shall have 2-inch high, bold, black lettering repeated at intervals not exceeding 3 feet along the entire tape length. It shall be installed 12

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to 18 inches above the top of the buried utility pipe to provide adequate warning prior to contact with the pipe during digging or trenching activities.

The tape shall be color-coded in accordance with APWA standards and printed with the following warning messages:

- **Water Mains** – Blue background with the wording:
“CAUTION – POTABLE WATER MAIN BURIED BELOW”
- **Force Mains** – Brown background with the wording:
“CAUTION – FORCE MAIN BURIED BELOW”
- **Reclaimed Water Mains** – Purple background with the wording:
“CAUTION – RECLAIMED MAIN BURIED BELOW”

The tape shall be durable, resistant to acids, alkalis, and other soil chemicals, and maintain legibility and detectability throughout the service life of the utility.

Acceptable manufacturers and products are:

1. Magnatec by Thor Enterprises
2. T. Christy Enterprises
3. Approved Equal

B. Valves, Fittings, and Accessories

1. Resilient Wedge Gate Valves (3" to 12")

- a. Resilient wedge gate valves shall be designed for a minimum working pressure of 250 psi and conform to the requirements of AWWA C509 or AWWA C515, latest revision. Valves shall meet or exceed the applicable standards of AWWA C550 for interior and exterior coatings and be certified to ANSI/NSF 61, latest revision, for potable and reclaimed water use. Valves shall be of the resilient seat type, with a non-rising stem, and shall open left (counterclockwise). No leakage shall be permitted under any conditions. The valve wedge shall be of cast or ductile iron, fully encapsulated with a chloramine-resistant synthetic elastomer.
 1. American Flow Control – 2500 Series
 2. Kennedy – Ken-Seal 2370 (Super Seal)
 3. Mueller – A-2360 or A-2361
 4. Clow – 2639 or Clow F-6100 Series

2. Butterfly Valves (>12")

- a. Butterfly valves 12 inches in diameter and larger shall conform to the requirements of AWWA C504, Class 150B, latest revision, and be certified to ANSI/NSF 61, latest revision, for use in potable and reclaimed water systems. The valve body and disc shall be constructed of cast or ductile iron meeting or exceeding ASTM A126 or ASTM A536, latest revisions. The disc shall be rigidly attached to the shaft to eliminate any relative motion, and the shaft shall be offset

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from the disc and body seats to prevent intersection, minimizing wear and enhancing sealing performance. Valves shall be furnished to open counterclockwise (left). All buried service butterfly valves shall be equipped with a 2-inch square operating nut. For valves 24 inches and smaller, operators shall be traveling nut or worm gear type; valves larger than 24 inches shall be equipped with worm gear operators. Valve operators shall be one size larger than the minimum required by the valve manufacturer to ensure reliable operation under field conditions.

1. Mueller (Lineseal III)
2. Pratt (Models: #2MII, #2FII, Triton XR-70)
3. Val-Matic

3. Side Drive, Horizontal Bevel Reduction Gear Gate Valves

- a. Where specified side drive, horizontal bevel gear-operated gate valves shall conform to AWWA C500, latest revision, and be certified to ANSI/NSF 61 for use in potable or reclaimed water systems. Valves shall be iron body, bronze mounted, double-disc, non-rising stem, parallel seat type, with a clear waterway equal to the full nominal diameter of the valve. The valves shall open counterclockwise (left) and be suitable for buried service with a 2-inch square operating nut. Valve bodies, stuffing boxes, and operating nuts shall be constructed of cast or ductile iron meeting or exceeding ASTM A126 or ASTM A536, latest revisions. Valve seats and stems shall be constructed of bronze conforming to ASTM B62, with Type 304 stainless steel acceptable for stems on valves 42 inches and larger. All nuts and bolts shall be Type 304 stainless steel, minimum. Valves shall include a minimum of two bearing points in the wedging mechanism to ensure proper alignment and long-term performance. Valves 16 inches and larger shall be furnished with bronze rollers, bronze tracks, and scrapers, and be equipped with horizontal bevel gear operators and bypass valves to equalize pressure. Valves shall have a minimum working pressure of 150 psi and be hydrostatically tested to 300 psi. All interior and exterior ferrous surfaces, excluding stainless steel components, shall be coated with a two-part thermosetting epoxy or fusion bonded epoxy, suitable for potable and reclaimed water service. Flange faces shall not be epoxy coated.

1. Mueller
2. Kennedy Valve
3. Clow Valve
4. American Flow Control

4. Outside Screw and Yoke (OS&Y) Valves – Flanged (Above-Ground Fire line Use)

- a. OS&Y gate valves shall be used for above-ground fire line applications only and shall conform to the latest revision of AWWA C509. Valves shall be of the resilient

wedge type, with a rising stem and outside screw and yoke design for clear visual indication of valve position. The wedge shall be fully encapsulated in EPDM rubber, which shall be clearly and permanently stamped “EPDM” on the wedge surface for verification. Valves shall have flanged ends meeting ANSI B16.1 or B16.42 Class 125/150 standards. The valve shall be equipped with a bronze follower packing gland, along with bronze follower studs and nuts. Use of cast iron or cadmium-plated steel components for these assemblies is not permitted. All internal and external ferrous surfaces, excluding stainless steel, shall be coated with a fusion-bonded epoxy or two-part thermosetting epoxy in accordance with AWWA C550, suitable for fire protection and potable water service. Valves shall open left (counterclockwise) and be UL-listed and FM-approved for fire protection service.

1. Mueller
2. Kennedy Valve
3. Clow Valve
4. American Flow Control

5. Plug Valves

- a. **Below Grade** (Buried Service, Mechanical Joint, Side Actuated) Plug valves for below-grade service shall be of the eccentric, resilient-seated type with a minimum 80% port opening, and shall be bi-directional and bubble-tight in both directions of flow. Valves shall conform to AWWA C517, latest revision, and be certified to ANSI/NSF 61 for potable, reclaimed, and wastewater applications. Valve bodies shall be constructed of cast or ductile iron, conforming to ASTM A126 or ASTM A536, latest revision. The body seat shall be welded nickel alloy or Type 316 stainless steel. Seating surfaces shall be stainless steel plate, locked into the body cavity and replaceable through the bonnet. Port area shall be at least 100% of the full pipe area. All bearing areas shall be isolated from the flow stream and constructed of permanently lubricated stainless steel (Type 316 minimum), bronze, or Teflon. Valves shall be equipped with a packing bonnet where the shaft exits the valve, and self-adjusting packing that is replaceable without removing the bonnet. Shaft hardware (nuts, bolts, washers, springs) shall be Type 316 stainless steel, minimum. Valves shall be rated for a minimum working pressure of 175 psi for sizes up to 12 inches, and 150 psi for 14 inches and above. Valves shall be side-actuated using a 2-inch square operating nut, suitable for direct buried service. Mechanical joint ends shall be provided in accordance with AWWA C111/A21.11, and all interior and exterior ferrous surfaces (except stainless steel) shall be coated with fusion bonded epoxy or a two-part thermosetting epoxy, suitable for potable and wastewater use. Flange faces shall not be coated

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1. Ga Industries (Eco-Centric)
2. Dezurik (PEF Series)
3. Milliken Valve (Series 600/601)
4. Val-Matic (Series 5600F & 5700F)

b. **Above Grade** (Flanged, Top Actuated 4"-8", Handwheel 10"+) Plug valves for above-grade service shall be eccentric, resilient-seated, with a minimum 80% port opening, and shall be designed for bi-directional flow and bubble-tight shutoff. Valves shall conform to AWWA C517, latest revision, and be certified to ANSI/NSF 61 for potable, reclaimed, or wastewater service. Valve bodies shall be cast or ductile iron conforming to ASTM A126 or ASTM A536, with welded nickel alloy or Type 316 stainless steel body seats. Stainless steel plate seating surfaces shall be locked into the body cavity and replaceable via the bonnet. Bearings shall be permanently lubricated Type 316 stainless steel, bronze, or Teflon, and isolated from the flow stream. Valves shall have packing bonnets at all shaft penetrations, with self-adjusting, bonnet-removable packing systems. All exposed fasteners and shaft hardware shall be Type 316 stainless steel, minimum. The port area shall not be less than 100% of the full pipe diameter. Pressure rating shall be 175 psi minimum for valves up to 12 inches, and 150 psi minimum for valves 14 inches and larger. Valves 4" through 8" shall be top actuated using a 2-inch square operating nut. Valves 10 inches and larger shall be equipped with handwheel-operated worm gear actuators, which shall be one size larger than the manufacturer's minimum recommended size. All valves shall have flanged ends in accordance with ANSI B16.1 Class 125 or B16.42 Class 150, as specified. All interior and exterior ferrous surfaces, excluding stainless steel, shall be coated with fusion bonded epoxy or a two-part thermosetting epoxy, suitable for potable and wastewater service. Flange faces shall not be coated.

1. Ga Industries (Eco-Centric)
2. Dezurik (PEF Series)
3. Milliken Valve (Series 600/601)
4. Val-Matic (Series 5600F & 5700F)

6. Tapping Sleeve and Valve (Potable Water, Reclaimed Water and Force Main Only).

a. **Ductile iron Tapping Sleeve (Mechanical Joint) Allowed for 4" and larger size taps. May be used on Ductile Iron Pipe only. Not Permitted for use on Sanitary Sewer Force Mains.**

Ductile iron tapping sleeves shall conform to the latest revision of AWWA C223 and be certified to ANSI/NSF 61 for use in potable water systems. Sleeves shall be designed for permanent pressure tapping applications and shall include an integral, recessed flange outlet for mounting a tapping valve. Recess dimensions shall comply with MSS-SP-60, latest revision, and the flange shall be flat-faced, drilled in accordance with ANSI B16.1 Class 125. The sleeve body shall be

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constructed of ductile iron meeting or exceeding ASTM A536, with a full mechanical joint configuration. The joint shall include side and end gaskets that are fully confined to ensure uniform compression and long-term sealing performance under pressure. A test plug shall be provided on the outlet throat to allow pressure testing before valve installation. All mechanical joint accessories, including glands, gaskets, bolts, and nuts, shall be included. Bolts and nuts shall be zinc-coated high-strength low-alloy steel, or Type 304 stainless steel where corrosion resistance is required. All interior and exterior ferrous surfaces shall be coated with a fusion bonded epoxy coating or a two-part thermosetting epoxy, in accordance with AWWA C550, suitable for contact with potable water. Flange faces shall not be coated. Ductile iron tapping sleeves shall be compatible with ductile iron or cast iron pipe and shall be installed in accordance with the manufacturer's instructions.

1. American Flow Control (2800 Series)
2. Mueller (H-615 Series)

b. **Stainless steel Tapping Sleeve (For use on DIP,CIP AC, PVC)**

Stainless steel tapping sleeves shall conform to the latest revision of AWWA C223 and be certified to ANSI/NSF 61 for use in potable water systems. Sleeves shall be designed for permanent pressure tapping applications and shall include an integral, recessed flange outlet for mounting a tapping valve. Recess dimensions shall comply with MSS-SP-60, latest revision, and the flange shall be flat-faced and drilled in accordance with ANSI B16.1 Class 125 or B16.5 Class 150, as specified. The sleeve body shall be constructed of Type 304 stainless steel, minimum, and shall provide full circumferential contact with the host pipe. A test plug shall be provided on the outlet throat to allow pressure testing prior to valve installation. The sleeve shall include a gasket system that is fully bonded or mechanically retained within the sleeve, providing integral restraint and preventing blowout under pressure. Gasket materials shall be suitable for potable water contact and capable of maintaining a reliable seal on ductile iron, cast iron, PVC, or steel pipe. All bolting hardware, including nuts and bolts, shall be Type 304 or 316 stainless steel, and all sleeves shall be passivated after fabrication to remove heat-affected zones and fabrication residues. The sleeve shall be factory-tested and clearly marked with manufacturer name, model, size range, and pressure rating. Stainless steel tapping sleeves shall be installed in accordance with the manufacturer's instructions and are intended for use where corrosion resistance, versatility, and long-term sealing integrity are required.

1. Ford (FAST/Fast-SS)
2. JCM 432/439 (AC mains – 439 only)
3. Power Seal (3490-AS/3490-ASST)

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4. Romac Series (“SST”)
5. Muller (H-616)

c. **Tapping Valve (Resilient wedge – mechanical joint outlet only).**

Tapping valves shall conform to the latest revisions of AWWA C509 or AWWA C515, and be certified to ANSI/NSF 61 for use with potable and reclaimed water systems. Valves shall also meet the coating requirements of AWWA C550, with all interior and exterior ferrous surfaces, exclusive of stainless steel, coated with a fusion bonded epoxy or two-part thermosetting epoxy. Flange faces shall not be epoxy coated. Valves shall be of the resilient seat type, non-rising stem, and shall open left (counterclockwise). The valve body, stuffing box, and operating nut shall be constructed of cast or ductile iron conforming to ASTM A126 or ASTM A536, latest revision. The resilient wedge shall be constructed of cast or ductile iron, fully encapsulated in a chloramine-resistant synthetic elastomer. The valve stem shall be bronze (ASTM B62) or Type 304 stainless steel, and all hex head nuts and bolts shall be Type 304 stainless steel, minimum. Valve discs shall be contoured to ensure uniform seating. Both ends of the tapping valve shall be mechanical joint, conforming to ANSI/AWWA C111/A21.11, latest revision. The valve outlet flange shall be flat-faced and match MSS-SP-60 dimensions for compatibility with standard tapping sleeves. A 2-inch square operating nut shall be provided for buried service. Zero leakage shall be permitted through the valve in the closed position. Valves shall have a minimum working pressure rating of 250 psi, and be suitable for horizontal installation in line with a tapping sleeve.

1. Mueller Co. (A-2360, T-2360, A-2361)
2. American Flow Control (2500 Series)
3. American AVK (Avk Series 65 or 76)
4. Clow Valve (2639)
5. Kennedy Valve (KS or KTV)

7. Insertion Valves

- a. Insertion valves shall meet or exceed ANSI/NSF 61 and ANSI/NSF 372 requirements, and applicable components shall conform to AWWA C509, C515, or demonstrate equivalent performance to AWWA standards through independent third-party testing. The valve shall be suitable for installation on operating water mains under pressure up to 150 psi without service interruption and shall have a minimum working pressure rating of 250 psi. The valve shall be compatible with the host pipe material and allow standard open/close operation with the appropriate number of turns. The stem shall be manufactured in accordance with AWWA design requirements and shall include a 2-inch square operating nut. Valve body components, including sleeve, bonnet, and neck, shall be manufactured from ductile iron with fusion-bonded epoxy coating or from Type 304 stainless steel. The wedge or sealing element shall consist of a ductile iron

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wedge fully encapsulated with a chloramine-resistant elastomer or a composite cartridge with an integrally molded resilient seal meeting the performance requirements of AWWA resilient wedge gate valves. All interior and exterior ferrous surfaces, exclusive of stainless steel, shall be coated with a two-part thermosetting or fusion bonded epoxy suitable for potable and reclaimed water applications. Stainless steel components shall not require epoxy coating, and flange faces shall not be epoxy coated. Valve height shall be generally comparable to standard resilient wedge gate valves. The gasket system shall prevent leakage at the insertion point, and all hardware shall be stainless steel, Type 304 minimum.

1. Advanced Valve Technologies – EZ Valve
2. TEAM Industrial Services - InsertValve
3. Mueller - Perma Seal Insertion Valve
4. Hydra-Stop Insta-Valve 250 (if approved by Engineer)

8. Check Valves (Wastewater/ Lift station – Outside level and weight only AWWA C-508, Neoprene Seat)

a. Check valves shall conform to the latest revision of AWWA C508 and shall be suitable for use in reclaimed water and wastewater systems. Valves shall be of the flapper type, equipped with an external lever and weight, and designed for sewage and fluid flow under pressure. The valve shall provide reliable backflow prevention with smooth operation and minimal head loss. The seating surface shall be bronze to metal, ensuring a corrosion-resistant and tight seal. All internal working parts, including the flapper assembly, hinge pin, fasteners, and seat ring, shall be constructed of Type 304 stainless steel, minimum, to prevent corrosion and wear in harsh environments. The valve shall be equipped with O-ring packing, providing a self-sealing and maintainable seal around the shaft penetration. Valves shall have flanged ends, drilled to match ANSI Class 125/150 bolt patterns. Side plugs are not permitted, and access for inspection or maintenance shall be provided from the top or front of the valve body as applicable. All ferrous surfaces, exclusive of stainless steel, including all interior wetted surfaces of valves 4 inches and larger, and the entire exterior of valves installed in submerged or buried service, shall be coated with a two-part thermosetting epoxy coating or fusion bonded epoxy coating meeting AWWA C550. Coating materials shall be certified for use in reclaimed water and wastewater applications. Flange faces shall not be coated.

1. Mueller 2602-6-01
2. Kennedy Style 106 LW
3. M&H 159-02
4. Clow 5380
5. APCO 250 LW
6. AFC Series 52-SC

9. Check Valves for Potable Water

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- a. Check valves for potable water applications shall meet or exceed ANSI/NSF 61 and AWWA C508, latest revisions. Valves shall be of the flexible, rubber-coated disc type, with rubber-to-metal seating. Body construction shall be of cast iron per ASTM A126 or ductile iron per ASTM A536, latest revisions. The rubber materials used shall be chloramine resistant. Valves shall incorporate a resilient hinge design; valves utilizing a shaft and mechanical hinge are not acceptable. All bolts and nuts shall be stainless steel, Type 304 minimum. Valves shall be designed for a minimum working pressure of 250 psi. Side plugs are not permitted. Except where otherwise specified, all interior and exterior ferrous surfaces, excluding stainless steel, shall be coated with a two-part thermosetting epoxy or fusion bonded epoxy coating suitable for potable and reclaimed water service.
 1. Mueller (Flexible Disk)
 2. DanFoss Flo-Flex 745
 3. Clow 360AS
 4. Val-Matic (VM-500A)
 5. Kennedy Ken-Flex Check Valve

10. Control Check Valves

- a. Valves shall have a body and cap(s) constructed of gray iron castings conforming to ASTM A126, Class B. Internal bronze components shall meet the requirements of ASTM B584, and internal stainless steel components shall conform to ASTM A743, Grade CF-8 or CF-8M. Control piping shall be constructed of rigid red brass, with a minimum internal diameter of 0.5 inches. All flanged assemblies shall comply with applicable ANSI standards, including wall thickness of the body and caps, as well as flange thickness and drilling, unless otherwise superseded by more stringent project specifications. These valves shall be suitable for service in potable or non-potable water systems, depending on application

1. Ross Valve MFG Co

11. Air Release Valves (Stainless Steel Fittings)

- a. Potable Water Main

Air/vacuum release valves shall conform to the latest revision of AWWA C512 and be certified to ANSI/NSF 61 for use in potable and reclaimed water systems. Valves shall be designed to automatically release small accumulations of air from pressurized pipelines during operation, preventing air pocket formation that can reduce system efficiency and cause surges. They shall also allow for the rapid ingress of air during pipeline draining or negative pressure events, and the rapid egress of large volumes of air during pipeline filling. The valve body, cover, and baffle shall be constructed of cast iron or ductile iron meeting or exceeding ASTM

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A126 or ASTM A536, latest revision. All internal float and trim components shall be made of Type 304 stainless steel, minimum, for corrosion resistance and long-term durability. The valve shall have a minimum air/vacuum orifice size suitable for the intended application, with a minimum working pressure of 150 psi. Both the inlet and outlet shall be threaded. Flanged valves are not acceptable under this specification. All interior ferrous surfaces, exclusive of stainless steel, shall be coated with a two-part thermosetting epoxy coating or fusion bonded epoxy coating in accordance with AWWA C550. Flange faces, if present, shall not be epoxy coated. All exterior surfaces shall be coated with a corrosion-resistant primer. The epoxy coating shall be suitable for continuous exposure to potable and reclaimed water, and valves shall be designed for buried or above-ground installation in water distribution systems.

1. ARI D-040 Combination ARV 2" Inlet
2. GA Industries – GA Figure 945
3. APCO (DeZurik) – AVC-140C/150C
4. Val Matic – 201/206C

b. Force Main 2" Inlet

Air/vacuum release valves for wastewater force mains shall conform to the latest revision of AWWA C512 and shall be suitable for use in raw or treated wastewater containing air, gas, or vapor. The valve shall be of the type designed to automatically release air under pressure during normal pipeline operation, and to admit and exhaust large volumes of air/gases during filling, draining, or surge conditions. The body and cover shall be constructed of cast iron, ductile iron (per ASTM A126 or A536), or Type 304 stainless steel. The internal trim, float, and seat components shall be constructed of Type 304 stainless steel at a minimum. The orifice button shall be made of a durable synthetic rubber compound appropriate for exposure to wastewater. The valve outlet shall be threaded, and the minimum working pressure shall be 150 psi. All interior ferrous surfaces, excluding stainless steel, shall be coated with a two-part thermosetting epoxy or fusion bonded epoxy coating. Flange faces shall remain uncoated. All exterior surfaces shall receive a corrosion-resistant primer coating. The coating system shall be suitable for long-term exposure to wastewater conditions, including hydrogen sulfide (H₂S) environments. Sizing of the inlet, outlet, and venting orifice shall be determined by the Engineer of Record based on system-specific air handling and transient flow requirements.

1. ARI D-025 SS
2. Val-Matic Model #VM-800 Series
3. Ga Industries 942SS

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4. APCO (DeZurik) High Performance Combination Air Valve (ASU)

c. Reclaimed Water 2" Inlet

1. ARI D-021

12. Flanged Fittings

- a. Flanged fittings shall be constructed of ductile iron conforming to ASTM A536 and meet or exceed AWWA C153 or AWWA C110, latest revisions. All flanged joints shall comply with AWWA/ANSI C111/A21.11, with bolt circles and bolt holes meeting ANSI B16.1, Class 125. Fittings shall have a minimum pressure rating of 250 psi and be NSF/ANSI 61 certified. All bolts shall be Type 304 stainless steel, and gaskets shall be full face neoprene. Interior lining shall be cement mortar with seal coat per AWWA C104 for potable water, and Protecto 401 (minimum 40 mils) for sanitary sewer force main applications

1. US Pipe

2. Tyler Union (Domestic Made Products Only)

3. ACIPCO (America Cast Iron Pipe Company)

4. Star Pipe Products (Domestic Made Products Only)

13. Mechanical Joint (MJ) Fittings

- a. Flanged fittings shall be constructed of ductile iron conforming to ASTM A536 and meet or exceed AWWA C153 or AWWA C110, latest revisions. All flanged joints shall comply with AWWA/ANSI C111/A21.11, with bolt circles and bolt holes meeting ANSI B16.1, Class 125. Fittings shall have a minimum pressure rating of 250 psi and be NSF/ANSI 61 certified. All bolts shall be Type 304 stainless steel, and gaskets shall be full face neoprene. Interior lining shall be cement mortar with seal coat per AWWA C104 for potable water, and Protecto 401 (minimum 40 mils) for sanitary sewer force main applications

1. US Pipe

2. Tyler Union (Domestic Made Products Only)

3. ACIPCO (America Cast Iron Pipe Company)

4. Star Pipe Products (Domestic Made Products Only)

5. Romac Alpha Restrained Fittings

14. Flange Adapters

- a. Flange adapters shall be constructed of ductile iron meeting or exceeding ASTM A536 and certified to ANSI/NSF 61, latest revision. Flange bolt circles shall conform to AWWA/ANSI C110/A21.10, latest revision. Adapters shall incorporate gripping wedges designed to provide secure restraint, with torque-limiting actuating screws to ensure proper and consistent wedge engagement. The

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adapter shall accommodate up to 5 degrees of deflection and allow a minimum 0.6-inch axial gap between the pipe end and mating flange without compromising the seal. Minimum pressure ratings shall be 200 psi for ductile iron pipe (up to 20") and 150 psi for PVC C900 DR18 pipe (up to 20")

1. Ford - Uniflange
2. EBBA iron – Mega-Flange – Series 2100
3. Romac

15. Follower Glands (accessory Package)

- a. ANSI/AWWA C-111/ A21.11; ANSI/AWWA C-110/A21.10
 1. US Pipe
 2. Tyler Union (Domestic Made Products Only)
 3. ACIPCO (America Cast Iron Pipe Company)

16. Transition Couplings

- a. ANSI/NSF 61 and AWWA C219, latest revisions, with a minimum working pressure of 150 psi. The sleeve body shall be constructed of fusion bonded epoxy-coated ductile iron conforming to ASTM A536, epoxy-coated carbon steel, or Type 304 stainless steel. Flanges, where applicable, shall be ductile iron coated with fusion bonded epoxy and also meet ASTM A536. All hardware, including bolts and nuts, shall be stainless steel, Type 304 minimum, to ensure corrosion resistance and long-term performance.
 1. Hymax (2000-2100 Series)
 2. Romac Macro HP Extended Range
 3. Romac Alpha

17. Flexible Transition Couplings

- a. Flexible couplings used for sanitary sewer and force main applications shall be constructed with all clamp bands and shear rings made of stainless steel, Type 304 minimum, to ensure corrosion resistance and durability. Couplings shall be capable of joining pipes of the same or different outside diameters and materials without the use of bushings, fillers, or spacers, which are not permitted. The coupling must provide a positive, watertight seal to prevent both infiltration and exfiltration under buried conditions. All flexible couplings shall meet or exceed the applicable requirements of ASTM C1173 and ASTM D5926, and shall be selected based on the exact pipe materials and dimensions being connected. Only products from manufacturers approved by the Utilities Department shall be permitted, and product submittals must include detailed manufacturer data, material certifications, dimensional compatibility information, and applicable test results.

1. Fernco

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2. Approved Equal

18. Fire Hydrants

a. Fire hydrants shall meet or exceed the requirements of AWWA C502 and ANSI/NSF 61 (latest revisions), and shall be rated for a minimum working pressure of 250 psi and a test pressure of at least 500 psi. Hydrants shall include a grease or oil reservoir lubrication system that automatically lubricates all stem threads and bearing surfaces during operation, sealed from both the waterway and external contaminants. Lubricants must be non-toxic and safe for potable water systems. Hydrants shall be traffic breakaway type, with a safety stem coupling and breakable flange that permits 360-degree rotation of the nozzle section—cut-down bolts are not permitted. The main valve opening shall be a minimum of 5-1/4 inches. Each hydrant shall include two 2-1/2" hose nozzles and one 4-1/2" pumper nozzle, all conforming to NFPA 1963 standards and designed to be field-replaceable with noncorrosive locking devices. An anti-friction bearing shall be provided to reduce operating torque. The shoe's ferrous waterway shall be epoxy-coated, and the main valve material must be resistant to chloramines. Hydrants shall be painted red with rustoleum fire hydrant paint or with reflective paint in compliance with NFPA 291 or as required by the local fire authority. All hydrants shall be furnished with a 6-inch mechanical joint (MJ) inlet.

1. American Darling B-84-B
2. Clow Medallion
3. Mueller Super Centurion

19. Tie Rods

a. Tie back bolts, nuts, washers and all thread rods shall meet ASTM A-242 requirements (3/4" galvanized dipped, Cor-Ten steel or equivalent) and be painted in accordance with the Department's specifications. Tie back bolts shall be Star Model SST 753 of Cor-Ten steel or approved equivalent. All tie rods shall be a minimum 3/4" diameter; the use of rebar with welded thread is prohibited. Two (2) tie rods (with eye bolts) are required per joint for pipe sizes 4" through 10". A minimum of four (4) tie rods (with eye bolts) are required per joint for pipe sizes 12" and larger.

20. Self Restraining Gaskets for Push on DIP

1. U.S. Pipe – Field Lok
2. American Pipe – Fast Grip
3. McWane – Sure Stop 350
4. RieberLOK – C900 PVC

21. Restrained Joint Push on Ductile Iron Pipe (straight runs of pipe only)

1. U.S. Pipe – TR Flex

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2. American – Flex Ring

22. Restrained Mechanical Joint Fittings

- a. Restrained mechanical joint (MJ) fittings shall be compatible with joints meeting AWWA C111 (latest revision) and shall be suitable for pipe diameters 4 inches and larger. Restraint devices shall consist of multiple gripping wedges incorporated into the follower gland and be designed for use on both ductile iron and PVC pipe. All components, including the follower gland, gripping wedges, and actuating mechanisms, shall be made of ductile iron meeting or exceeding ASTM A536 (latest revision). The assembly shall meet or exceed ASTM F1674 (latest revision) for PVC applications and be rated for a minimum working pressure of 250 psi for ductile iron pipe and to the full working pressure of the applicable PVC pipe. Restraints shall include a built-in mechanism to ensure proper tightening without overstressing the pipe. Systems that do not rely on field torque measurements or calibrated tools are required; torque-off bolts are an acceptable example of such mechanisms.
 1. EBAA iron - Megalug
 2. Star Pipe – Stargrip 3000 (sizes through 24') Domestic Only
 3. Star Pipe – Stargrip 4000 (PVC) Domestic Only

23. Gripping Ring Joint Restraint for DIP and PVC Pipe

- a. Mechanical joint restraints shall be compatible with joints conforming to AWWA C111, latest revision, and suitable for use on pipe diameters ranging from 4" to 12". Restraints shall meet or exceed ASTM F1674 for use on PVC pipe. The gland body and gripping ring shall be constructed of ductile iron in accordance with ASTM A536, latest revision. Restraint devices shall consist of a gripping ring secured by a ductile iron follower gland. T-bolts and nuts shall conform to AWWA C111, latest revision. The restraint system shall provide a minimum working pressure of 250 psi for ductile iron pipe and shall be rated to the full working pressure of PVC pipe. Pipe deflection shall not exceed 50% of the manufacturer's maximum specified allowance
 1. Romac Grip Ring
 2. Approved Equal

24. Permanent Sampling Station

1. Kupferele Eclipse #88 WC with Plastic Cover
2. Approved Equal

25. Casing Spacers

- a. Shall be constructed with a minimum 14-gauge stainless steel (Type 304 or better) band, an integrated riser of minimum 10-gauge stainless steel, and hardware of stainless steel (Type 304 minimum). The riser shall be structurally

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sized to fully support the carrier pipe and shall include polymer runners mechanically bolted to the riser. The liner material shall be PVC with a minimum thickness of 0.09 inches, securely bonded to the band to prevent slippage. Band width shall be no less than 8 inches. Runners shall have a coefficient of friction that meets or exceeds the requirements of ASTM D1894, latest revision. The spacer assembly shall ensure proper pipe alignment, prevent metal-to-metal contact, and allow for unrestricted pipe movement during installation.

1. Psi (S8g-2, S12g-2)
2. Cascade Waterworks Mfg. (Ccs)
3. Advanced Products & Systems, Inc. (Ssi8, Ssi12)

26. Pressure Pipe Repair Clamps

- a. Pressure pipe repair clamps shall meet or exceed the requirements of ANSI/NSF 61 and AWWA/ANSI C230, latest revisions. The clamp band (body), fasteners, and lugs shall be manufactured from Type 304 stainless steel. As an alternative, lugs may be fabricated from ductile iron meeting or exceeding ASTM A536, latest revision, and coated with a fusion bonded epoxy suitable for potable water service. The gasket shall be a full-coverage virgin SBR compound conforming to ASTM D2000, latest revision, ensuring a watertight seal and long-term durability. The clamp shall be suitable for use in pressurized piping systems and shall provide a leak-tight repair without requiring pipe shutdown.
 1. Ford Meter Box
 2. Romac Industries
 3. Smith-Blair
 4. Hymax-Ezmax

27. Bell Joint Restraint for Ductile Iron and PVC Pipe

- a. Joint restraint systems shall be compatible with joints meeting the requirements of AWWA C111, latest revision. The restraint device shall consist of split restraint rings with serrations on the inside diameter designed to securely grip the pipe. Restraining rings shall be manufactured from ductile iron conforming to ASTM A536, latest revision. Restraining rods shall be stainless steel, Type 304 minimum. The system shall be capable of withstanding a working pressure of not less than 250 psi for ductile iron pipe and 150 psi for PVC pipe. The restraint shall be suitable for use with mechanical joint, push-on, or bell-and-spigot joints as required by the application.

1. Ductile Iron
 - a. EBAA iron (1700 Megalug Harness)
 - b. EBBA iron (series 1600 – TD 4"-12)

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- c. Tyler Union (TUF Grip) Series 1000
- 2. PVC Pipe
 - a. Ford (Uni Flange Series 1390)
 - b. EBAA Iron (Series 1600 PV, Series 1500 PV)
 - c. EBAA Iron (Series 3100S & 3100P)
 - d. Tyler Union (Tufgrip) Series 2000

II. Service Line Construction

A. Pipe

1. Potable and Reclaimed Water Service Line.

- a. Polyethylene service tubing shall meet or exceed the latest revision of ANSI/NSF 61 and AWWA C901 standards. Tubing shall be manufactured from high-density polyethylene (HDPE) material with a standard dimension ratio (SDR) of 9 and pressure class rating of 200 psi. Tubing shall comply with ASTM D3350, including UV protection layers sufficient to withstand a minimum of five (5) years of direct sunlight exposure. The exterior surface of the tubing shall be smooth and free from bumps, cracks, or other manufacturing irregularities. Tubing shall be clearly and permanently marked at intervals not exceeding five (5) feet with the following information: manufacturer's name, brand or trademark, nominal size, HDPE designation code, SDR, pressure class, AWWA C901 compliance, and testing agency mark or seal. All fittings shall be compression-type with a totally confined grip seal and threaded coupling nut. A Type 304 stainless steel tube stiffener insert shall be required for all service connections to ensure proper mechanical strength and joint integrity.

- 1. Drisco Pipe 5100
 - 2. Endot Endopoly
 - 3. ADS – Polyethylene Tubing

- b. Type “K” copper tubing (soft roll) 1”, 1½” & 2”. Copper service tubing shall meet or exceed the latest revisions of ANSI/NSF 61, AWWA C800 (Section A.2), and ASTM B88. Tubing shall be seamless Type K copper, suitable for underground service line installations, and free of defects such as indentations, kinks, or flattening that may impair performance or durability. All threaded fittings intended for underground copper tubing

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connections shall be of the compression type and shall incorporate a fully confined grip seal with a compression coupling nut to ensure a leak-free, secure joint. Materials and fittings shall be suitable for direct burial and provide long-term corrosion resistance and mechanical integrity under pressurized service conditions.

2. Sanitary Sewer Service Lateral

1. PVC – SDR26 (Conforming to ASTM D3034, SDR26)
2. SDR 18 AWWA C-900 PVC pipe shall be required for services connecting to deep sanitary sewer mains (>12' Depth)

B. Service Line Fittings & Accessories

1. Potable and Reclaimed Water Service

- a. Polyethylene tubing – “Pack-Joint” fittings, or equal with stainless steel inserts.
- b. Type “K” copper tubing (must be color coded based on water type (blue for potable and purple for reclaimed))
- c. Cast brass solder joint fittings, or equal for above ground backflow prevention device installation.
- d. Both lead free solder and flux shall be used on all solder joints.

2. Service Saddles

- a. Service Saddles Service saddles shall meet or exceed ANSI/NSF 61 and AWWA C800, latest revisions. Saddles shall be of a double-strap design or a single stainless steel shell band, depending on the application. Saddle bodies shall be constructed of ductile iron meeting ASTM A536 (latest revision) or Type 304 stainless steel. Straps, bales, nuts, and washers shall be stainless steel (Type 304 minimum). The saddle shall conform to the pipe curvature upon tightening, and sealing shall be achieved using an O-ring gasket confined in a retaining groove (for double strap designs). Stainless steel shell band saddles shall include an EPDM rubber insulating boot. All saddles shall include a service outlet with either NPT or AWWA threads, and ductile iron bodies shall have a factory-applied epoxy coating.
 1. Mueller
 2. Ford 202
 3. Romac Style 202
 4. JCM 406

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5. Smith Blair Series 317
6. AY McDOnald 4825A/3825

3. Corporation Stops

- a. Shall meet or exceed ANSI/NSF 61 and AWWA C800, latest revisions. The body shall be constructed of brass alloy in accordance with ASTM B62, latest revision, and designed as a full-port ball valve type. The inlet shall be male threaded to properly engage with the service saddle, and the outlet shall be a compression-type fitting compatible with polyethylene or copper water service lines, as specified by the design. All seals and rubber gasket materials shall be chloramine-resistant to ensure long-term performance in potable water systems.
 1. Ford Type FB1000
 2. Mueller Model B-25008
 3. AY McDonald MFG 4701B-22

4. Curb Stops

- a. Curb Stops shall meet or exceed the requirements of ANSI/NSF 61 and AWWA C800, latest revisions. The body shall be constructed of brass conforming to ASTM B62, latest revision, and the valve shall be of the full-port ball type. The ball and seat shall be coated with a chloramine-resistant material, or be nickel and chrome-plated brass with chloramine-resistant seats, ensuring durability in potable water applications. The valve shall include a tee-head with a locking wing and provide a watertight seal in both directions. The stem shall be sealed with dual O-rings made of chloramine-resistant material, and the valve shall open and close with a 90-degree turn using a standard slotted wrench. Curb stops shall be rated for a minimum working pressure of 300 psi and provided with a pack-joint compression fitting on the inlet side
 1. Ford – straight ball meter valves B41-444, B41-777
 2. Mueller 300 Ball Curb Valve P25122
 3. AY McDonald 71601

5. Yokes (potable and reclaimed water) (tailpiece – yoke x IP).

- a. Meter yokes shall meet or exceed ANSI/NSF 61, latest revision, and be designed to accommodate meter lay lengths in accordance with AWWA C800, latest revision. The yoke body shall be manufactured from cast iron conforming to ASTM A48 or ASTM A126, latest revision, and constructed to provide a rigid, secure mounting platform for service meter installation. Yokes shall provide a leak-tight connection to compatible meter valves and fittings, ensuring proper alignment and support of the meter assembly. All connection components shall be corrosion-resistant and compatible with the intended service line materials.
 1. Ford – Iron Yoke Bars, Y500 Series
 2. AY M Mueller – Iron Meter Yokes, H-5020

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6. Ball Valves (FIP X FIP with key adapter, 1/4 turn stop)

- a. Meter valves shall meet or exceed ANSI/NSF 61 and AWWA C800, latest revisions. The valve body shall be made of brass conforming to ASTM B62, latest revision. Meter valves shall be of the full port ball valve type, with the ball and seat material either coated with a chloramine-resistant material or constructed of nickel- and chrome-plated brass with a chloramine-resistant seat. Valves shall be watertight against flow in either direction and shall feature a tee-head with a locking wing for secure operation. Seals around the stem shall consist of two chloramine-resistant O-rings. Valves shall operate with a 90-degree turn using a standard slotted wrench and shall have a minimum working pressure of 300 psi. The inlet connection shall be a pack-joint compression fitting. For 1½" and 2" meters, the outlet side of the meter valve shall have a flanged connection. Meter valves larger than 2" will be evaluated and approved on a case-by-case basis based on specific installation requirements.
 1. Ford Ball Valves - B43-444W, B43-344W, BF43-777W
 2. Mueller Straight Valve (300) – P24335, P24350
 3. A.Y. McDonald 6101MW, 76101MW, 6100MW-22, 76100MW-22

7. Couplings and Adapters for Water Service

- a. Couplings and adapters used in water service connections shall meet or exceed the requirements of ANSI/NSF 61 and AWWA C800, latest revisions. These fittings shall be designed for a minimum working pressure of 150 psi. All materials in contact with potable water shall be certified for such use, and the couplings shall be free of defects or irregularities that could impair sealing performance. Fittings shall provide a secure, leak-free connection between service lines and appurtenances, compatible with copper, polyethylene, or other approved water service piping material
 1. Mueller
 2. Ford Meter Box
 3. A.Y. McDonald (4761-22, 4753-22, 4754-22, 4758-22, 4620)

8. Dual Check Valves for Water Services

- a. Dual check valves for water service connections shall meet or exceed the requirements of ANSI/NSF 61 and ANSI/ASSE 1024, latest revisions. All wetted surfaces in contact with potable water shall be constructed of lead-free materials containing less than 0.25% lead by weight. Each valve shall incorporate two independently operating spring-loaded check valves, with springs constructed of Type 304 stainless steel or better. The valves shall be designed for a minimum working pressure of 150 psi and shall have a low head loss not exceeding 5 psi at 12 gpm for 3/4-inch valves and 6 psi at 20 gpm for 1-inch valves. Inlet and outlet configurations shall be as required for the specific installation. Dual check valves under this specification are approved only for residential water services

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where reclaimed water is available and shall be installed immediately downstream of the water meter.

1. Watts – Series LF7RMueller
2. Wilkins (Zurn) – Model 700XL

8. Sanitary Sewer Service Fittings

- a. PVC Fittings for sanitary sewer service laterals shall be SDR-26 and meet or exceed the latest revisions of ASTM D3034, ASTM D3212, and ASTM F477. Fittings shall be of monolithic construction and designed with spigot push-on joints utilizing rubber gaskets, with no solvent weld or threaded joints permitted. All gasketed joints shall conform to ASTM D3212, while gaskets shall comply with ASTM F477, ensuring a watertight seal. These fittings are approved for use only in installations with a maximum burial depth of 12 feet. SDR 18 AWWA C-900 PVC pipe shall be required for services connecting to deep sanitary sewer mains
 1. Harco
 2. Westlake Pipe & Fittings
 3. Multi-fittings
 4. Tigre ADS_USA

III. Backflow Prevention Devices

A. Reduced Pressure Zone (RPZ) Backflow Preventers

Reduced Pressure Zone (RPZ) backflow preventers shall meet or exceed the requirements of ASSE 1013, AWWA C511, and NSF/ANSI 61 and 372, latest revisions. The assemblies shall be USC FCCC&HR approved and designed for a minimum working pressure of 175 psi. All materials in contact with potable water shall be lead-free and certified for such use. The device shall incorporate two independently operating check valves and a hydraulically operated differential pressure relief valve, along with shut-off valves and test cocks for field testing. For sizes 3/4 inch through 2 inches, the shut-off valves shall be full-port ball valves with blowout-proof stems and lead-free construction. Assemblies shall be designed for in-line serviceability without removal from the pipeline and shall provide reliable protection against backpressure and back siphonage. Acceptable manufacturers and models are:

1. Wilkins (Zurn) – 375, 975XL2
2. Watts – 009, 909
3. Febco – 825Y
4. Apollo (Conbraco) – 4A Series, 40-200 Series
5. Ames – 4000SS

B. Double Detector Check Valve (DDCV) with Bypass Valve

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Double Detector Check Valve (DDCV) assemblies with bypass valve shall meet or exceed the requirements of ASSE 1048, AWWA C510, and NSF/ANSI 61 and 372, latest revisions, and shall be approved by the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research (USC/FCCCHR). The assembly shall consist of two internally loaded, independently operating check valves in series, a bypass line equipped with a check valve and a water meter, and shut-off valves on both the inlet and outlet. The bypass assembly shall include a 5/8-inch Sensus water meter (to be purchased from the Department) capable of accurately measuring low flows, and the meter shall be configured to read in U.S. gallons. For sizes 3/4 inch through 2 inches, shut-off valves shall be full-port ball valves; for larger sizes, resilient wedge gate valves or approved OS&Y valves shall be provided. The complete assembly shall be lead-free, constructed of corrosion-resistant materials, and designed for a minimum working pressure of 175 psi. Assemblies shall be designed for in-line serviceability without removal from the pipeline and shall provide reliable protection against backpressure and backsiphonage while monitoring unauthorized water use through the bypass meter.

1. Wilkins (Zurn) – Models 350DA, 350ADA
2. Watts – Models 007DCDA, 909DCDA
3. Febco – Model 850DCDA
4. Apollo (Conbraco) – Models 4ADDCAA, 4A-200DCDA
5. Ames – Model 2000SSDCDA

IV. Meters

A. Water Meters (3", 4", 6", 8") Large Water Meters

Large water meters for high-capacity and compound service shall meet or exceed the requirements of AWWA C701 (Class II) for turbine-type meters and AWWA C702 for compound meters, as well as NSF/ANSI 61 and NSF/ANSI 372, latest revisions. The meters shall utilize advanced floating ball technology (FBT) or equivalent to ensure accurate measurement across a wide range of flow conditions with minimal wear to internal components. The meter body shall be constructed of ductile iron with an NSF-approved fusion-bonded epoxy coating for corrosion protection, and all wetted surfaces shall be lead-free, containing less than 0.25% lead by weight. The turbine-type meter shall be designed to provide superior accuracy at high continuous flow rates, while the compound-type meter shall offer an extended dynamic flow range, maintaining accuracy at both very low and very high flows without the use of multiple measuring elements or changeover valves. Both meter types shall feature a removable measuring chamber for in-line serviceability and an AWWA-compliant V-shaped strainer. The electronic register shall be hermetically sealed, include an LCD display, and be fully compatible with AMI/AMR communication systems. All meters shall be rated for a minimum working pressure of 150 psi and maintain a maximum head loss of 7 psi at rated flow. Operating temperature shall range from 33°F to 120°F, and the meters shall be factory-calibrated and tested to meet all applicable accuracy requirements.

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1. Sensus – OMNI™ Turbo (T²) (sizes 1.5" and larger)
2. Sensus – OMNI™ Compound (C²) (sizes 1.5" and larger)

B. Compound Fire Meters

Compound fire line water meters shall meet or exceed the requirements of AWWA C703, latest revision, and ANSI/NSF 61, latest revision. All meters shall be UL listed or FM approved for fire service applications. Flanges shall conform to ANSI B16.1 Class 125. The main case shall be constructed of bronze, cast iron, or ductile iron, and where applicable, the bypass meter casing shall be constructed of bronze. The meter shall be designed to accurately measure flows across an extremely wide dynamic range, including both domestic (low flow) and fire service (high flow) usage. The transition between the low-flow element and main-line element shall be controlled by an internal, automatic device; however, for meters designed without an external bypass (e.g., Sensus Omni F2), this requirement shall not apply. Both the high-capacity and bypass meter registers shall incorporate a magnetic drive, be permanently sealed, tamper-resistant, and use a standard gear ratio to allow interchangeability. The meter shall be rated for a minimum operating pressure of 150 psi and shall be factory-calibrated to meet the accuracy requirements of AWWA C703.

1. Sensus – OMNI F2

V. Lift Station Remote Telemetry Unit (RTU)

- A. Motorola ACE 3600 or latest version. Integration by STAR CONTROLS or Approved Installer, Control Panel by CC Controls or Approved Alternate vendor

VI. Lift Station Generator Requirements

A. Lift Station Generator

Standby generators for lift stations shall be diesel-powered (or as otherwise specified) and shall meet the latest U.S. Environmental Protection Agency (EPA) emissions requirements for stationary emergency engines. Generators shall be designed to provide automatic standby power to lift station equipment during utility power outages, with sufficient capacity to operate all pumps, controls, lighting, and ancillary equipment under full load conditions. Units shall include an automatic transfer switch (ATS), weatherproof and sound-attenuated enclosure, block heater, battery charger, starting batteries, and all accessories required for a complete and operable system. The generator shall be capable of manual and automatic operation, include electronic engine controls with monitoring and diagnostic features, and be rated for continuous duty at the specified voltage and phase. All components shall be factory-tested, comply with applicable NFPA, NEC, UL, and ANSI standards, and be supported by a manufacturer's warranty. Installation shall conform to all local, state, and federal codes.

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1. Baldor
2. Kohler
3. Approved Equal Meeting latest EPA requirements

VII. Appurtenances (Water, Reclaimed, and/or Wastewater Facilities)

A. Potable Water Meter Boxes

1. Water Meter Boxes & Lids for 5/8", 3/4" and 1" meters, single Service

1. Meter Box: Sigma RMB 111812 NSW
2. Meter Box Lid: Oldcastle FL12P- WATER, AMR - 2.0"x4.125"x.375"

2. Water Meter Boxes & Lids For 1 1/2" & 2" Meters

1. Meter Box & Lid: DFW PLASTICS: DFWB40WBC-14-1T 63D
2. Approved Equal

B. Manhole Cover Riser Rings

1. Manhole cover riser rings shall be non-expanding type and used only in existing structures to provide a secure and stable adjustment of manhole frame elevations. Riser rings shall have a maximum height of 4 inches and be manufactured to ensure proper fit and alignment with the existing manhole frame without compromising structural integrity or load-bearing capacity. Materials shall consist of cast iron or an equivalent durable material suitable for traffic-bearing applications, conforming to applicable ASTM and AASHTO standards for roadway structures.

1. NEENAH Foundry (Previously U.S. Foundry)
2. Approved Equal

C. Coatings & Liners and for Underground Concrete Structures & Manholes

1. Coatings for Meter Vaults, Valve Vaults, Special Structures

All underground concrete structures, including meter vaults, valve vaults, and special structures, shall receive a two-coat protective coating system to prevent moisture penetration, chemical attack, and deterioration from soil contaminants. The first coat shall be applied in gray or red to allow for inspection and ensure complete coverage, followed by a second coat in black to provide the final protective barrier. The coating shall be a coal tar epoxy or bituminous mastic specifically formulated for below-grade or partially submerged concrete applications, providing excellent adhesion, chemical resistance, and long-term durability in buried environments. Surface preparation shall be performed in strict accordance with the manufacturer's recommendations to achieve proper adhesion and coating performance. 1st coat shall be gray or red, 2nd coat shall be black in color.

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1. Carboline (Koppers) bitumastic 300m
2. Targuard (Coal Tar Epoxy)
3. Approved Equal

2. Exterior Coating for Manholes & Wet Wells

Exterior coatings for manholes, wet wells, and other underground concrete structures such as meter vaults, valve vaults, and special structures shall consist of a two-coat protective system designed to prevent moisture penetration, groundwater intrusion, chemical attack, and deterioration from soil contaminants and corrosive environmental conditions. The first coat shall be applied in gray or red to allow for inspection and verification of complete coverage, and the second coat shall be applied in black to provide the final protective barrier and ensure UV resistance where exposed. The coating system shall be a coal tar epoxy or bituminous mastic specifically formulated for below-grade or partially submerged concrete applications, providing excellent adhesion, chemical resistance, water impermeability, and long-term durability in buried environments. Surface preparation shall be performed in strict accordance with the manufacturer's recommendations to achieve proper adhesion and performance.

1. Carboline (Koppers) bitumastic 300m
2. Targuard (Coal Tar Epoxy)
3. Approved Equal

2. Interior Lining for Manholes & Wet Wells

Interior linings for manholes and wet wells shall be designed and applied to provide long-term, verifiable protection against biogenic sulfuric acid (H_2S) corrosion, chemical attack, infiltration, and structural deterioration in wastewater environments. All interior lining systems shall be applied in two or more coats to achieve the manufacturer's recommended total wet film thickness (WFT) or dry film thickness (DFT) necessary to meet the specified performance requirements. Lining materials shall consist of either cementitious or high-alumina-based mortars with proven resistance to severe sewer gases, or polymer-modified/cementitious hybrid systems formulated specifically for continuous wastewater service. Acceptable products shall demonstrate documented field performance in wastewater structures and provide the following minimum characteristics: (1) strong adhesion to concrete substrates with bond strengths meeting or exceeding ASTM C1583 pull-off adhesion tests; (2) resistance to hydrogen sulfide and sulfuric acid environments typical of municipal sewerage systems; (3) compatibility with continuous immersion, cyclic wet/dry exposure, and elevated humidity conditions; and (4) the ability to restore structural integrity of deteriorated concrete surfaces when applied to a minimum thickness as recommended by the manufacturer. Surface preparation shall include complete cleaning of the substrate, removal of loose and deteriorated concrete, high-pressure water blasting or abrasive blasting to achieve a

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sound profile, and repair of voids or cracks prior to lining installation. All applications shall be performed strictly in accordance with the coating manufacturer's written instructions, including environmental conditions, curing times, and quality control testing requirements.

1. Sewper coat (Calcium aluminate mortar lining)
2. Strong Seal (High-performance cementitious lining system)
3. Thor-Roc (Epoxy-modified cementitious coating)
4. Refratta HAC 100 (High-alumina cement-based coating)
5. Approved Equal

VIII. Stormwater System

A. PIPE (Conduits) -

All stormwater conveyance materials shall comply with the latest FDOT Standard Specifications for Road and Bridge Construction, FDOT Design Manual (FDM), and the Palm Beach County Land Development Design Manual, unless otherwise approved by the City Engineer or Assistant Director of Utilities, Engineering. Pipe class and type shall be selected based on hydraulic, structural, and environmental conditions. Pipe materials shall conform to the following

1. Reinforced Concrete Pipe (RCP)

Shall comply with ASTM C76, ASTM C443 for jointing, and FDOT Section 449. Pipe class (III, IV, V) shall be as indicated on the design plans and based on fill height and loading per FDOT Structures Manual. All joints shall be rubber gasketed and watertight. Minimum cover and bedding shall conform to FDOT Index 280 and Palm Beach County details.

2. Ductile Iron Pipe (DIP)

Shall conform to ANSI/AWWA C151/A21.51, C110/A21.10, and C111/A21.11. Pipe and fittings shall be pressure-class rated and cement mortar lined per AWWA C104. Exterior surfaces shall be bituminous-coated. DIP may be used in utility conflict areas, road crossings, or special applications as approved by the City.

3. Polyvinyl Chloride Pipe (PVC)

Shall conform to AWWA C900 (DR18 or DR25 for 4"-12") and ASTM D3034 (SDR 26 for gravity systems). Bell-and-spigot joints shall meet ASTM D3212 and utilize gaskets conforming to ASTM F477. All installations must follow FDOT Section 948 and ASTM D2321 trenching and backfill standards.

4. Corrugated Polyethylene Pipe (CPEP)

Shall comply with AASHTO M294 (Type S dual-wall or Type D), FDOT Design Standards Index 280, and FDOT Section 948. Minimum 12" diameter. HDPE shall be limited to non-

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traffic bearing areas unless approved. Installation must meet FDOT trench conditions and bedding requirements.

B. Exfiltration Trench

Exfiltration trench systems shall consist of perforated RCP, HDPE, or PVC pipe as shown on the design plans, surrounded by clean, washed rock per FDOT Index 287, or latest edition and fully wrapped in geotextile fabric meeting FDOT Section 985 (Type D-4 or better). Exfiltration systems shall be designed to meet Palm Beach County stormwater treatment requirements and shall include an impermeable barrier where separation from the water table is necessary.

C. Concrete Flumes, Inlet Aprons, Erosion Control Slope Protection

All non-structural concrete such as flumes, ditch blocks, and inlet aprons shall have a minimum compressive strength of 2,500 psi at 28 days and conform to FDOT Section 347. Structural concrete shall be Class II (3,000 psi) or Class IV (4,000 psi) as specified on the plans and meet FDOT Section 346. Reinforcing steel shall comply with ASTM A615 and be epoxy-coated when required by FDOT or Palm Beach County standards.

D. Ground Cover

Sodding and erosion control shall conform to FDOT Section 570 and Palm Beach County erosion control guidelines.

Irrigated Areas: Floratam St. Augustine sod

Non-irrigated Areas: Argentine Bahia sod

All disturbed areas shall be stabilized to prevent erosion and sediment transport. Erosion and sedimentation control measures must comply with the NPDES Construction General Permit, FDOT Index 102, and Palm Beach County's Best Management Practices Manual.

E. Pollution Control Devices

Stormwater structures discharging to canals, lakes, or water bodies shall be fitted with hydrodynamic separators and/or snouts for debris and oil separation. The minimum requirement shall be a BMP Inc. SNOUT® 12F or 18F with a bio-skirt or approved equal. Devices must be designed to meet FDEP and Palm Beach County performance criteria for TSS and nutrient removal.