MATERIAL MANUAL
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SECTION 500 - WATER PIPE, FITTINGS AND APPURTENANCES

Updated: September 13, 2012

500.2.00 GENERAL

All materials referenced herein apply for use in systems with minimum design pressures of 150 psi unless otherwise stated. All other pressures will be outlined in specific project specifications.

500.4.00 REFERENCES

The current version of the references at the time of Bid is the version applicable to the related project, unless otherwise noted.

1) American Water Works Association (AWWA)
2) American National Standards Institute (ANSI)
3) City of Portland Standard Construction Specifications (SCS)
4) State of Oregon - Oregon Administrative Rules (OAR)
5) American Society for Testing and Materials (ASTM)
6) National Sanitation Foundation (NSF)
7) American Concrete Institute (ACI)
8) American Association of State Highway Transportation Officials (AASHTO)

500.6.00 CODES AND STANDARDS

City of Portland, Standard Construction Specifications; State of Oregon - Oregon Administrative Rules (OAR); Underwriters Laboratory (UL).

500.8.00 ACCEPTABLE/APPROVED MATERIAL PROCESS

500.8.01 SUBMITTALS

1) Vendor/manufacturer will submit a cover letter outlining product(s) for review plus twelve (12) copies of detailed, technical data to the Portland Water Bureau, 1120 SW 5th Avenue, Room 600, Portland, OR, 97204, Attention: Materials Committee. Single catalog pages do not provide sufficient detail. Do not send the product unless specifically requested.

2) Technical data to include, but no limited to, metal/material composition, NSF certification, pressure rating, component detail, applicable standards (AWWA, ANSI, etc.), manufacturing plant locations, distribution sites, and any other data manufacturer recommends for detailed product evaluation.

3) Submittal data will be routed to Committee members representing the bureau's Construction & Support, Engineering, and Water Resource Management Groups for review and recommendations. This process takes approximately three weeks.

500.8.02 TESTING

1) If requested in writing, vendor/manufacturer will provide testing/certification materials and/or a product sample(s) as directed.

2) Bureau testing will be done in accordance with written procedures. Those procedures may be developed by the Portland Water Bureau or be in accordance with existing standards. Testing may be done by bureau personnel or by independent testing laboratory. This process takes approximately four weeks.

500.8.03 APPROVAL PROCESS

1) A bureau committee will determine whether product/manufacturer is acceptable for use in the Portland Water system. The committee normally meets or discusses material matters on a quarterly basis.

2) The vendor/manufacturer will be notified of the committee determination in writing.

500.10.00 CERTIFICATION

Vendor/Manufacturer shall submit product ANSI/NSF Std. 60, 61, 61G certification as applicable or provide written documentation that product meets an equivalent standard and is suitable for potable water service and is in compliance with Oregon Administrative Rule 333-061-0050-1(e). All products manufactured outside the United States shall indicate plant location(s) by address and national origin of raw material on the certification. The sufficiency and acceptance of documentation provided to meet the above requirement shall be at the sole discretion of the Portland Water Bureau.

501 - DUCTILE IRON PIPE & FITTINGS

Last Update (Materials List Only): March 11, 2025

501.0.00 REFERENCES

All references listed are the latest version at the time of bid or application of the Material Manual, unless otherwise stated herein.

501.2.00 DUCTILE IRON PIPE

501.2.01 GENERAL

Pipe shall be new and free of defects and shall conform to the requirements of the latest revision of AWWA C151 specifications for "Ductile Iron Pipe, Centrifugally Cast, for Water" Ductile iron pipe shall conform to ASTM E8, Grade 60-42-10 Ductile Cast Iron for Tension Test, ASTM E23 for Impact Test. Pipe shall be externally marked, in manufacturers color, indicating gauged pipe. Pipe shall be sound, smooth, and free from scales, lumps, blisters, sandholes, laps, and defects of any nature which would make it unfit for the intended use. Plugging, filling, burning-in, or welding will not be permitted.

501.2.02 TOLERANCES

1) Pipe shall be furnished in nominal 18-foot or 20-foot lengths.

2) Pipe shall be true circles in section with the inner and outer surfaces concentric.

3) Pipe furnished shall be fully gauged along the entire length and shall meet the outside diameter (OD) standard dimensions and tolerances required for spigot ends, along the entire pipe piece length as specified in AWWA C151, Table 1.

501.2.03 STRENGTH REQUIREMENTS

Ductile Iron Water Pipe shall have the following minimum values:

TENSILE STRENGTH	60,000 psi
YIELD STRENGTH	42,000 psi
PERCENT ELONGATION	10%

501.2.04 LINING

1) Furnish pipe with a cement-mortar lining in accordance with ANSI A21.4/AWWA C104-90, or latest revision. The thickness of lining shall be DOUBLE THICKNESS as noted in Section 4-8. The thickness of lining shall not be less than 1/8 inch for 4- through 12-inch pipe; 3/16 inch for 14- through 24-inch pipe; and 1/4 inch for 30-inch pipe. Taper of linings shall be as specified in Section 4.7.3 of AWWA C104.

2) Apply seal coat of asphaltic material to the cement-mortar lining as specified in Section 4-11 of AWWA C-104.

501.2.05 COATING

Furnish pipe with an asphaltic coating not less than one mil thick. Ensure that the coating is continuous, smooth and neither brittle when cold nor sticky when exposed to the sun. Ensure that the coating is adhered to the pipe.

501.2.06 PUSH-ON JOINT

1) Joint shall be of a type which employs a single elongated rubber grooved gasket to create the joint seal.

2) Push-on joint pipe shall be furnished complete with gaskets and joint lubricant. Ensure that the gaskets conform to requirements of AWWA C111.

3) Gaskets shall be type as approved by the manufacturer for use with their pipe. Gaskets shall be approved per project for pressure and potential contaminant requirements.

501.2.07 HYDROSTATIC TEST

Pipe shall be subjected to a hydrostatic test of not less than 500 psi and shall be under full test pressure for at least ten (10) seconds. Tests shall be made prior to application of the cement-mortar lining. All in accordance with AWWA C151, Section 5.2.

501.2.08 APPROVED MANUFACTURERS - All gaskets and fittings shall conform to manufacturer specifications and shall be as approved by the manufacturer for use with their pipe.

1) Pipe shall be as manufactured by:

   American Pipe, Fastite Joint
   McWane Ductile (Pacific States Cast Iron Pipe), Thrust-lok
   McWane Ductile (Pacific States Cast Iron Pipe & Atlantic States), Tyton Joint
   U.S. Pipe and Foundry, Tyton Joint
   U.S. Pipe and Foundry Company, TR Flex

   Special Application (Developer and special construction provision, directional drilling and bridge crossings):
   American Pipe, Flex Ring

2) For bureau's annual supply contract and stocking inventory, pipe and gaskets

   Fastite Joint by American Ductile Iron Pipe Co, ACIPCO
   Tyton Joint by McWane Ductile, (Pacific States Cast Iron Pipe)
   Thrust-lok by McWane Ductile, (Pacific States Cast Iron Pipe)
   Tyton Joint by U. S. Pipe and Foundry Company
   TR Flex by U.S. Pipe and Foundry Company

501.4.00 DUCTILE IRON FITTINGS

501.4.01 GENERAL

All fittings and accessories shall be new and unused. Fittings shall have distinctly cast upon them the manufacturers identification, pressure rating, nominal diameters of openings, and (on all bends) the number of degrees or fractions of the circle.

501.4.02 TESTING

Testing shall be in accordance with AWWA C110.

501.4.03 LINING AND COATING

Fittings shall be coated inside with approved an epoxy or cement mortar with an asphaltic seal coat conforming to AWWA C104, and coated outside with an approved epoxy or a bituminous coating at least 1 mil thick, as noted in AWWA C110.

501.4.04 FLANGED FITTINGS

Flanges shall be drilled in accordance with ASME B16.1 Class 125. Flange faces shall have shallow serrations. Flange bolt holes shall be spot-faced.

SPECIAL REQUIREMENTS

All ductile iron fittings 24-inch and under, where applicable, shall be of compact design conforming to AWWA C110, AWWA C104, and AWWA C153.

501.4.05 NON-COMPACT MECHANICAL JOINT

1) Fittings shall be ductile iron conforming to AWWA C110 and AWWA C104 or latest revision, or as otherwise stated herein.

2) Working water pressure ratings for mechanical joint fittings shall be 350 psi for fittings 24-inch and smaller. Working water pressure for flanged fittings and fittings 30-inch and larger shall be 250 psi.

3) Fittings shall be capable of withstanding, without bursting, three times the rated water working pressure in conformance with Section 4.2.4 of AWWA C110. The ductile iron used in the fittings shall have a minimum tensile strength of 70,000 psi, a minimum yield strength of 50,000 psi, and a minimum elongation of five percent.

501.4.06 COMPACT MECHANICAL JOINT

1) Fittings shall be ductile iron conforming to AWWA C110, C104, and AWWA C153.

2) Ductile iron mechanical joint fittings shall be rated for 350 psi working pressure.

3) Fittings shall be capable of withstanding, without bursting, hydrostatic test pressures of three times the rated working water pressure in conformance with Section 4.2.4 of AWWA C110.

4) Ductile iron used in the fittings shall have a minimum tensile strength of 70,000 psi, a minimum yield strength of 50,000 psi, and a minimum elongation of five percent.

501.4.07 GLANDS

Unless otherwise stated, all glands are to be ductile iron conforming to AWWA C111. Ductile iron glands with reduced flange thickness between the bolt holes (14-inch through 48-inch only) must meet the performance requirements specified in AWWA C111.

501.4.08 APPROVED MANUFACTURERS

Ductile Iron Fittings shall be as manufactured by:

American Cast Iron Pipe Co, ACIPCO
Sigma
Tyler Pipe/Union Foundry (Tyler/Union) (Beijing Chenghong Foundry also accepted unless "Buy America" applies)
Star Pipe Products
U.S. Pipe
Infact Corporation MJ Foster Adaptor sizes 3" through 16" (Special Application Only)

501.6.00 TAPPING SLEEVES

501.6.01 STEEL - FLANGED - TAPPING SLEEVES

1) Sleeves shall be manufactured from materials per AWWA C200 and be finished with fusion bonded epoxy, minimal 12 mils exterior, NSF approved.
2) Sleeve shall be capable of installation on several classes of ductile iron pipe as well as A and C cast iron.

3) Installation shall require no special tools, shims, welding, or caulking.

4) Fabrication shall be in accordance with AWWA C200 and C207.

501.6.02 DUCTILE IRON - MECHANICAL JOINT - TAPPING SLEEVE

1) Sleeves shall be manufactured from materials per AWWA C110, C111, C115, C150, and/or C153 as applicable.

2) Sleeves shall be capable of installation on several classes of ductile iron pipe as well as A and B cast iron.

3) Installation shall require no lead, caulking, melting, shims, or special tools.

4) Sleeves shall be manufactured in accordance with MSS SP111.

501.6.03 OUTLET FLANGES

1) Flanges shall be recessed to mate with standard tapping valves per MSS SP60 up through 12-inch size on size.

2) Steel flanges shall comply with AWWA C207, Class D with ASME B16.5, 150 psi drilling.

3) Ductile iron flanges shall comply with AWWA C110, C115, C150 with ASME 16.1, class 125 drilling.

501.6.04 PRESSURE RATING

The installed assembly must be rated by the manufacturer for a minimum working pressure of 175 psi and capable of a minimum test pressure of 125% without leakage or pressure loss.

501.6.05 APPROVED MANUFACTURERS

1) Mechanical joint tapping sleeves shall be as manufactured by

   American Flow Control, ACIPCO Series 2800
   Clow
   Mueller, H615 series
   Tyler Union

2) Steel, flanged tapping sleeves shall be as manufactured by

   Dresser
   Ford FTSC series
   JCM 412 and 432 series
   Romac FTS-420 series
   Smith-Blair 622

501.8.00 RESTRAINT SYSTEMS

501.8.01 FLEXIBLE RETAINER GLANDS

1) Mechanical joint retainer glands shall be cast from ductile iron and shall have bolt circles, bolt holes, and sufficient ID clearance which will permit the glands to be used with standard mechanical joint bells.

2) Glands shall be designed to permit their greatest holding power when installed with 70 foot-pounds to 120 foot-pounds of torque on the twist off nuts.

3) Set screws shall have sufficient shock resistance to perform the tasks for which they are intended. With bolts and set screws tightened per AWWA specifications, no further restraining will be necessary unless working pressure is greater than that recommended by the manufacturer.

4) Wedging mechanism shall be manufactured of ductile iron and heat treated.

5) The assembled joint shall maintain its flexibility after burial and shall maintain its integrity by a controlled and limited expansion of each joint during the wedging action.

6) Glands must meet AWWA C111 and AWWA C153 current specifications unless otherwise specifically noted. Glands should also be rated for working and test pressures with either Underwriters Laboratory, Factory Mutual or both.

501.8.01A SPECIAL REQUIREMENTS

All glands must meet or exceed the following requirements:

Nominal Pipe Size (Inch)	Working * Pressure (lbs.)	Number & Size of Set Screws	Number of Bolts
4	350	4-5/8 x 2	4
6	350	6-5/8 x 2	6
8	250	9-5/8 x 2	6
10	250	12-5/8 x 2	8
12	250	16-5/8 x 2	8
14	250	20-5/8 x 3	10
16	250	24-5/8 x 3	12
18	200	24-5/8 x 3	12
20	200	28-5/8 x 3	14
24	150	32-5/8 x 3	16
30	150	40-5/8 x 3-3/4	20
36	100	48-5/8 x 4-1/3	24
42	100	84-3/4 x 4-5/3	28

*To be tested with a 2:1 safety factor minimum.

501.8.01B APPROVED MANUFACTURERS

EBAA Iron Series 1100 MegaLug
Ford UFR 1400 series Uniflange
Romac ROMAGRIP
Sigma One Lok D-SLDE (Provide certificate of origin with each overseas shipment)
Star Pipe Products Stargrip® Series 3000
Tyler Union/US Pipe MJ Field Lok (sizes 4-inch through 12-inch).

501.8.02 RESTRAINING GASKETS

501.8.02A APPROVED MANUFACTURERS - All gaskets and fittings shall conform to manufacturer specifications and shall be as approved by the manufacturer for use only with their pipe unless otherwise stated. Restraining gaskets may be used through 24" size unless otherwise stated.

American Cast Iron Pipe Co, ACIPCO FastGrip
Gripper Gasket Gripper™ Restraining Gaskets
McWane Surestop 350 Sizes up through 24"
Specification Rubber Products, Inc. Barracuda® Restrained Joint Gaskets
US Pipe Field-Lok 350 Sizes up through 24"

501.8.03 RESTRAINING SLEEVES

501.8.03A APPROVED MANUFACTURERS

EBAA Iron RS 3800 series Megacoupling (sizes 4" through 12")

501.8.04 RESTRAINING FLANGES

501.8.04A APPROVED MANUFACTURERS

EBAA series 2100 Megaflange

501.8.05 RESTRAINING COUPLINGS

501.8.05A APPROVED MANUFACTURERS

501.10.00 COUPLINGS AND CLAMPS

501.10.01 EMERGENCY (LEAK) REPAIR CLAMP (1 1/2 INCH AND UNDER)

501.10.01A CLAMP

1) Band shall be type 304 stainless steel. Lugs shall be ductile iron ASTM A536, have a shop coat enamel finish and be designed to accept shoulder style bolts to prevent slippage.

2) Bolts and nuts shall be carbon steel ASTM A307 electrogalvanized with di-chromate or similar seal. Stainless steel bolts are also acceptable with teflon coated stainless steel nuts. Bolts shall be designed to fit lugs to prevent turning.

501.10.01B GASKET

Full circumferential gaskets shall be rubber made of all new materials compounded to resist oil, acids, alkalies, and water. Gaskets shall be firmly secured to the stainless steel band.

501.10.01C APPROVED MANUFACTURERS

Dresser Style 360
Ford
JCM
Mueller
PowerSeal Model 3121AS
Romac
Smith Blair

501.10.02 FULL CIRCLE CLAMP (2 INCH AND ABOVE)

501.10.02A CLAMP

1) Band shall be type 304 stainless steel. Lugs shall be type 304 stainless steel designed to accept shoulder style bolts to prevent slippage.

2) Bolts and nuts shall be stainless steel with teflon coated stainless steel nuts. Bolts shall be designed to fit lugs to prevent turning.

501.10.02B GASKET

Full circlement, overlapping gasket shall be rubber made of all new materials compounded to resist oil, acids, alkalies, and water. Gaskets shall be firmly secured to the stainless steel band.

501.10.02C APPROVED MANUFACTURERS

Clow
Dresser
Ford
JCM
Mueller
PowerSeal Model 3121AS
Romac
Smith Blair

501.10.03 SERVICE SADDLES

501.10.03A SADDLES

1) Saddle body shall be bronze, cast from certified 85-5-5-5 water works brass, conforming to AWWA C800.

2) Threaded outlet with NPT or CC thread (as specified).

3) Strap(s) shall be silicon bronze with a section rolled flat to provide a wide bearing surface. Welded construction shall not be permitted. Nuts and washers shall be of similar material. Service saddles with tap sizes of 5/8", 3/4", and 1" shall be single strap design. All others shall be double strap design.

501.10.03B GASKET

Gaskets shall be rubber of all new materials compounded to resist oil, acids, alkalies, and water.

501.10.03C APPROVED MANUFACTURERS

A.Y. McDonald 3825, 3826
Ford 101B, 202B
Jones, James Jones Co J979, J975
Mueller BR1B, BR2B
Smith Blair 325 series 103 only

501.10.04 FLEX (BOLTED) COUPLINGS

501.10.04A COUPLINGS

1) Sleeve and end rings/followers shall be ductile iron ASTM A536 or sleeves and end rings/followers shall be steel ASTM A53, ASTM A513, or carbon steel having a minimum yield strength of 30,000 psi.

2) Ductile iron sleeves and end rings shall have a shop coat enamel finish. Steel sleeves and end rings shall have fusion bonded epoxy finish suitable for potable water systems according to NSF regulations.

501.10.04B BOLTS

Bolts shall be high strength, low-alloy steel ASTM A325 with heavy hexagon nuts ASTM A563.

501.10.04C GASKETS

Gaskets shall be rubber of all new materials compounded to resist oil, acids, alkalies, and water.

501.10.04D APPROVED MANUFACTURERS

Dresser
Ford FC1, FC2, and FC3
JCM model 210
Romac
Smith Blair

502 - CONCRETE CYLINDER PIPE AND FITTINGS

Last Update: March 29, 2006

502.2.00 CONCRETE CYLINDER PIPE

502.2.01 GENERAL

1) Concrete cylinder pipe shall conform to AWWA C303. The minimum thickness shall be 3/16 inch (5 mm).

2) Concrete cylinder pipe shall have bonding connection points as recommended by the manufacturer.

3) Concrete cylinder pipe shall have inside diameters as specified in uniform lengths with a range of 24 to 48 feet (7.5 to 15.0 m). Provide shorter lengths as required for closures and changes in alignment and grade.

4) Test the pipe hydrostatically at the manufacturing plant in accordance with AWWA C303.

502.2.02 JOINTS

1) Pipe shall have ends fabricated for bell and spigot (push-on) joints, flanged joints, or welded joints, as specified.

2) If no information is provided about the type of joint to be used, push on joints shall be provided.

3) Joint grout shall be chloride free.

502.2.02A PUSH-ON JOINTS

Pipe ends and joints shall conform to AWWA C303. Push on joint gasket shall conform to AWWA C303.

502.2.02B FLANGED JOINTS

1) Flanges that conform to AWWA C207 flanges shall be designed for the working pressures specified but not less than 150 psi (1034 pKa).

2) Flanges shall be drilled in accordance with ANSI B16.1, Class 125.

3) Gaskets shall conform to AWWA C207.

4) Bolts shall be in accordance with AWWA C207. Bolts and nuts shall be threaded in accordance with ANSI B1.1, Class 2. Bolts and nuts shall be low carbon steel conforming to ASTM A307, Grade B. Bolts shall protrude through the assembled nut at least two threads but not more than 1/2 inch (13 mm).

502.2.02C WELDED JOINTS

Joints shall conform to the requirements of AWWA C206.

502.2.03 LINING AND COATING

1) Pipe shall be supplied with Type II cement mortar lining conforming to AWWA C303.

2) Pipe shall be supplied with Type II cement mortar coating conforming to AWWA C303.

502.4.00 CONCRETE FITTINGS

502.4.01 GENERAL

1) Concrete fittings shall conform to AWWA C303. The minimum thickness shall be 3/16 inch (5 mm).

2) Concrete fittings shall have bonding connection points as recommended by the manufacturer.

3) Test the fittings hydrostatically at the manufacturing plant in accordance with AWWA C303.

502.4.02 JOINTS

1) Fittings shall have ends fabricated for bell and spigot (push-on) joints, flanged joints, or welded joints, as specified.

2) If no information is provided about the type of joint to be used, push on joints shall be provided.

3) Joint grout shall be chloride free.

502.4.02A PUSH-ON JOINTS

Fitting ends and joints shall conform to AWWA C303. Push on joint gasket shall conform to AWWA C303.

502.4.02B FLANGED JOINTS

1) Flanges that conform to AWWA C207 flanges shall be designed for the working pressures specified but not less than 150 psi (1034 pKa).

2) Flanges shall be drilled in accordance with ANSI B16.1, Class 125.

3) Gaskets shall conform to AWWA C207.

4) Bolts shall be in accordance with AWWA C207. Bolts and nuts shall be threaded in accordance with ANSI B1.1, Class 2. Bolts and nuts shall be low carbon steel conforming to ASTM A307, Grade B. Bolts shall protrude through the assembled nut at least two threads but not more than 1/2 inch (13 mm).

502.4.02C WELDED JOINTS

Joints shall conform to the requirements of AWWA C206.

502.4.03 LINING AND COATING

1) Fittings shall be supplied with Type II cement mortar lining conforming to AWWA C303.

2) Fittings shall be supplied with Type II cement mortar coating conforming to AWWA C303.

503 - STEEL PIPE AND FITTINGS

Updated: March 29, 2006

503.2.00 STEEL PIPE

503.2.01 GENERAL

1) Steel pipe shall conform to AWWA C200.

2) Thickness of the steel pipe shall not be less than 1/4 inch (6.5 mm).

3) Pipe shall have inside diameters as specified in uniform lengths with ranges of 20 to 40 feet (6.1 to 12.2 mm). Provide shorter lengths for closures and changes in alignment and grade.

4) Test pipe hydrostatically at the manufacturing plant in accordance with AWWA C200.

503.2.02 JOINTS

Pipe shall have ends fabricated for bell and spigot (push-on) joints, flanged joints, or welded joints, as specified.

503.2.02A PUSH-ON JOINTS

Pipe ends and joints shall conform to AWWA C200. Push -on joints are not acceptable on pipe larger than 48 inches (1200 mm) in diameter.

503.2.02B FLANGED JOINTS

1) Flanges that conform to AWWA C207 flanges shall be designed for the working pressures specified but not less than 150 psi (1034 pKa).

2) Flanges shall be drilled in accordance with ANSI B16.1, Class 125.

3) Gaskets shall conform to AWWA C207.

4) Bolts shall be in accordance with AWWA C207. Bolts and nuts shall be threaded in accordance with ANSI B1.1, Class 2. Bolts and nuts shall be low carbon steel conforming to ASTM A307, Grade B. Bolts shall protrude through the assembled nut at least two threads but not more than 1/2 inch (13 mm).

503.2.02C WELDED JOINTS

Joints shall conform to the requirements of AWWA C206.

503.2.03 LINING AND COATING

1) Pipe shall be supplied with a Type II cement mortar lining, shop-applied, conforming to AWWA C205.

2) Pipe shall be supplied with an exterior protective coating in accordance with AWWA C203 (hot applied, cold tar enamel coating) or AWWA C214 (cold

applied, tape coating). The hot applied, coal tar enamel coating (AWWA C203) shall consist of Type B primer, coal tar enamel, and glass-fiber outerwrap.

503.4.00 STEEL FITTINGS

503.4.01 GENERAL

1) Steel fittings shall conform to AWWA C208.

2) Thickness of the steel fitting shall not be less than 1/4 inch (6.5 mm).

3) Fittings shall inside diameters as specified in uniform lengths with ranges of 20 to 40 feet (6.1 to 12.2 mm). Provide shorter lengths for closures and changes in alignment and grade.

503.4.02 JOINTS

Fittings shall have ends fabricated for bell and spigot (push-on) joints, flanged joints, or welded joints, as specified.

503.4.02A PUSH-ON JOINTS

Fitting ends and joints shall conform to AWWA C208. Push -on joints are not acceptable on pipe larger than 48 inches (1200 mm) in diameter.

503.4.02B FLANGED JOINTS

1) Flanges that conform to AWWA C207 flanges shall be designed for the working pressures specified but not less than 150 psi (1034 pKa).

2) Flanges shall be drilled in accordance with ANSI B16.1, Class 125.

3) Gaskets shall conform to AWWA C207.

4) Bolts shall be in accordance with AWWA C207. Bolts and nuts shall be threaded in accordance with ANSI B1.1, Class 2. Bolts and nuts shall be low carbon steel conforming to ASTM A307, Grade B. Bolts shall protrude through the assembled nut at least two threads but not more than 1/2 inch (13 mm).

503.4.02C WELDED JOINTS

Joints shall conform to the requirements of AWWA C206.

503.4.03 LINING AND COATING

1) Fittings shall be supplied with a Type II cement mortar lining, shop-applied, conforming to AWWA C205.

2) Fittings shall be supplied with an exterior protective coating in accordance with AWWA C203 (hot applied, cold tar enamel coating) or AWWA C214 (cold applied, tape coating). The hot applied, coal tar enamel coating (AWWA C203) shall consist of Type B primer, coal tar enamel, and glass-fiber outerwrap.

503.6.00 FABRICATED STEEL DRIP TEE FITTINGS

503.6.01 GENERAL

1) Drip tee fittings and accessories shall be new and unused. Flanges and fittings shall have distinctly cast upon them the manufacturer's identification. All fittings shall be shipped less accessories unless specifically stated otherwise.

2) Drip tees are a special fabrication for the Portland Water bureau for use in service installations and regulator installations.

503.6.02 FABRICATION

Drip tees are to be fabricated of steel pipe; forged steel, threaded branch connection; and ring-type steel slip-on flanges. The pipe shall conform to AWWA C200-86 or latest revision for 6-inch pipe and larger. The 4-inch pipe shall conform to schedule 80, ASA B36.10 for pipe material. The branch connection shall be a Threadolet as manufactured by Bonny Forge Co., P.O. Box 359, Allentown, PA 18105 in the size listed below for 2-inch outlet. The flanges for the assembly shall meet AWWA C207-86 or latest revision, Class D, 175 psi rating.

503.6.03 COATING

Fabricated assembly shall be coated with a fusion bonded epoxy coating in conformance with AWWA C213-91 or latest revision.

503.6.04 SPECIAL REQUIREMENTS

Fabricated assembly will use the following components and be of overall length as shown. The branch connection (Threadolet) shall be oriented so that the fitting can be at the top or rolled 90 degrees for side outlet use, and centered between the flanges.

Table

Fabricated Assembly	Branch Outlet	Ring-type Slip-on Flanges	Overall Assembly Length
4x4x2	4-3-1/2x2	2-Class D	9-inch
6x6x2	6x2	2-Class D	9-inch
8x8x2	10-8x2	2-Class D	11-inch
12x12x2	18-12x2	2-Class D	11-inch

503.6.05 APPROVED MANUFACTURERS

Approved steel fabricators

504 - COPPER AND BRASS PIPE AND FITTINGS

Updated: April 17, 2020 (Material List Change Only)

504.2.00 COPPER PIPE

504.2.01 GENERAL

1) Copper tubing shall be in accordance with ASTM B88.

2) Tubing shall be type K, seamless, and annealed.

3) Sizes 1 inch and below shall be soft drawn design. Sizes larger than 1 inch shall be hard drawn design.

504.2.02 WALL THICKNESS

1) 3/4 inch and 1 inch tubing shall have a wall thickness of .065 inch.

2) 2 inch shall have a wall thickness of .083 inch.

504.4.00 BRASS PIPE

504.4.01 GENERAL

1) Brass Pipe in accordance with ASTM B43, entitled "Seamless Red Brass Pipe, Standard Sizes".

2) Brass pipe furnished shall conform to the standard dimensions, weights, and tolerances as shown in Table 1 of ASTM B43 for "regular" weight pipe.

504.4.02 CERTIFICATION

Testing and certification of results shall be prepared by the manufacturer in accordance with the ASTM Specification for each of the categories being bid. In addition, mill test reports for the brass pipe in accordance with ASTM B43 shall be provided.

504.4.03 COMPOSITION

1) Material composition shall be copper alloy UNS No. C23000. The pipe shall be furnished in accordance with the quantities listed in Schedule A, be of "regular" weight and be furnished in 12 foot lengths unless otherwise noted. The chemical requirements shall be as follows:

Element	Composition
Copper	84.0-86.0%
Lead	0.05% maximum
Iron	0.05% maximum
Zinc	remainder

2) Pipe shall be furnished in the annealed condition to Standard No. "O 61" in accordance with ASTM B601, such that the pipe shows complete recrystallization to enable the pipe to meet the tests required of ASTM B43.

504.6.00 BRASS SERVICE FITTINGS

504.6.01 GENERAL

1) Brass goods furnished under this specification shall be new and unused. And shall have an alloy composition of copper, tin, lead and zinc in accordance with ASTM B62 "Composition Bronze or Cast Metal Castings". The material shall meet ANSI/NSF 61, Drinking Water Components – Health Effects and NSF 61 G requirements and comply with the Safe Drinking Water Act, as amended, and the U.S. Enviornmental Protection Agency (E.P.A.).

2) Unless otherwise noted, all fittings shall have a minimum working water pressure of 150 psi and shall conform to AWWA Standard C800, "Underground Service Line Valves and Fittings".

3) Detailed design of the valves and fittings shall be in accordance with Standard C800. Inspection and testing shall be in accordance with Section 6 of Standard C800 except as noted below for special shop testing. The chemical requirements shall be as noted in ASTM B60.

4) In accordance with ASTM B62, all castings shall not have injurious blowholes, porosity, shrinkage defects, cracks, or other injurious defects. Castings shall not be plugged, welded, burned in, or impregnated. All threads shall mesh snugly, be clean cut, and be of uniform pitch. All valves shall be carefully cored and machined to insure evenly balanced walls. The keys shall be properly machined and ground and shall be covered with a non-corrosive non-toxic grease.

5) Mechanical services shall have a 100 percent machine finish with no gaps or low spots due to insufficient parent material.

6) All fittings shall either be stamped or embossed with the manufacturer's name.

504.6.02 VALVES, VALVE SEAT AND GASKET

1) All corporation stops, curb stops and meter valves shall be of the ball-valve design with full port opening and have a flow passage area equivalent to the fitting outlet flow area. Curb Stops and meter valves shall be provided with padlock wings.

2) Balls for the corporation and curb valves shall be fabricated from the same material as the body.

3) A Teflon or Nitrile seat or another material proven not to deteriorate when exposed to chemicals such as chloramines shall support the ball.

4) Each compression nut shall be fitted with a gasket and shall contain a groove in its inner surface to locate a stainless steel gripper band. The gasket shall contain a built-in metal conductor spring at one-end to provide electrical continuity between the copper tubing and the coupling.

504.6.03 TESTING

In addition to the testing noted in AWWA C800, the following shop testing is required.

1) Fittings shall show no air bubbles when subjected to the following production line submerged testing:

   A. Angle Meter Valves: Valves shall be air tested at 150 psi (unless otherwise noted) while submerged in water for a minimum of five (5) seconds. Valves shall be tested in the open and closed positions.

   B. Corporation Stops and Angle Meter Stops: Stops shall be air tested at 150 psi (unless otherwise noted) while submerged in water for a minimum of eight (8) seconds. Stops shall be tested in both the opened and closed positions.

   C. Straight and Angle Meter Couplings: All fittings shall be air tested at 150 psi (unless otherwise noted) while submerged in water for a minimum of five (5) seconds.

504.6.04 APPROVED MANUFACTURERS

AY McDonald
Cambridge Brass
Ford
James Jones
Mueller

504.8.00 BRASS/BRONZE FITTINGS

504.8.01 COMPOSITION

All brass and bronze goods shall have an alloy composition as indicated for each of the categories as follows:

A) Brass (Bronze) fittings in accordance with ASTM B62, entitled "Composition Bronze or Ounce Metal Castings"

B) Brass pipe nipples in accordance with ASTM B687, entitled "Brass, Copper, and Chromium-Plated Pipe Nipples".

C) Material composition shall be copper alloy, complying with NSF 61 and NSF 61G requirements.

504.8.03 MECHANICAL REQUIREMENTS

Unless otherwise noted, all fittings shall have a minimum working water pressure of 150 psi and shall conform to AWWA C800, "Underground Service Line Valves and Fittings".

504.8.04 WORKMANSHIP

1) Workmanship, finish and appearance of the castings shall not have injurious blowholes, porosity, shrinkage defects, cracks, or other injurious defects. Castings shall not be plugged, welded, burned in, or impregnated. Machined surfaces shall have 100 percent machine finish with no gaps or low spots due to insufficient parent material.

2) Threading for fittings shall be as detailed on the schedule and in accordance with Section 5.1 "Threads and Threaded Connections" of AWWA C800, unless otherwise specified. Where appropriate, threads shall conform to ASME Standard B 1.1. Pressure rating, where applicable, shall be high pressure per AWWA C800.

504.8.05 BRASS/BRONZE PIPE NIPPLES

1) Pipe nipples shall meet the composition and mechanical properties for pipe. The pipe nipple threads shall conform to AWWA C800 and ASME B1.1.

2) Standard length and size of nipples shall conform to ASTM B687 for standard and close nipples.

3) All other provisions of ASTM B687 "Brass, Copper and Chromium-Plated Pipe Nipples" shall apply to the materials furnished.

504.8.06 CERTIFICATES AND MILL TEST REPORTS

Testing and certification of results shall be prepared by the manufacturer in accordance with the ASTM Specification for each of the categories being bid. In addition, mill test reports for the brass pipe in accordance with ASTM B43 shall be provided.

504.10.00 METER SETTERS/RESETTERS

504.10.01 GENERAL

1) Meter Resetters will be made of materials as per AWWA C800 specifications and assembled with lead-free solder.

2) Resetters will be made of Type “L” copper tubing and brass complying with NSF 61 and NSF 61G.

3) Resetters will have saddle nuts for easy resetting of meters. The length between the saddle nuts will be the same as the brass bar that is threaded and the length of the meter desired.

4) Resetter will have a brass bar to support the front and back side of said resetter and at the same length of existing meter, with the same threads as on the existing meter size, connected between the old existing meter couplings (meter threads).

5) The inlet side will have a length of copper tubing bent to the size ordered and soldered (lead-free) into the brass bar from the top of the brass bar of 90 deg bend. At the top of the copper tubing, solder (lead-free) an IPT brass bushing with an angle curb stop with a saddle nut shall be attached.

6) The outlet side will have a length of copper tubing bent to the size ordered and soldered (lead-free) into the brass bar from the top of the brass bar for a 90 deg bend. At the top of the copper tubing, it will be formed to a flat surface of ¼” with a saddle nut for ease in service installation of meter.

7) 2” meter setters will be specially designed and must conform to approved drawings on file.

504.10.02 APPROVED MANUFACTURERS

Meter Setters:
Ford
Mueller: 2” standard size, 1.5” only allowed on an exception basis with PWB approval per setter.

- 105B2427-28N
- 105B2423-107N
- 107B2423-107N
- 095B2423-107N
- 695B2423-107N

Meter Resetters:
A.Y. McDonald
Ford
Mueller

505a - VALVES

Updated: December 18, 2019

505.0.00 SCOPE

The following includes valves and related devices.

505.2.00 GATE VALVES - RESILIENT SEATED

505.2.01 GENERAL

All 4-inch through 12-inch valves shall meet AWWA C509. Valves are for cold water service of minimum 200 psi working water pressure. The above standard applies to resilient seated gate valves with non-rising stems (NRS) and outside screw and yoke (OS&Y) rising stems.

505.2.02 TESTING AND INSPECTION

Testing, inspection and rejection shall be in accordance with AWWA C509.

1) Valves shall open left (counter-clockwise) and shall have an arrow showing the direction of opening.

2) Valves shall be designed with attention to the maintenance of an unobstructed waterway when the valve is open.

3) Bodies, valves, stems, stem sealing, valve seats, glands, and bolting shall be in accordance with all provisions of Section 4 of the above Specification. No voids (blows), filling (bondo) or altering of casting will be accepted.

4) Gate valves shall be shipped less accessories. Tapping valves shall include accessories.

5) Wedge shall be cast gray or ductile iron, with guide bars or channels for controlled movement, and may have an integral bronze stem nut. The wedge shall be ruggedly constructed for resistance to deflection. The wedge and wedge guide bars or channels shall be fully encapsulated by a resilient rubber material bonded to the metal. The wedge stem hole, if not also encapsulated, shall be epoxy coated. Peel strength shall comply with AWWA C509 Method B.

505.2.03 ADDITIONAL REQUIREMENTS FOR TAPPING VALVES

Inlet end of valve shall have an inlet flange class 125 (ASME B16.1) for attaching to a sleeve or cross. A machined projection on this valve flange shall mate with a machined recess in the tapping sleeve outlet flange to assure correct alignment. Seat opening of the tapping valves shall be larger than the nominal size to permit full diameter cuts to be made. The valves shall be designed to be used with a Mueller drilling machine, Model No CC-25.

505.2.04 APPROVED MANUFACTURER

American AVK Series 25 Bronze Stem,
American AVK Series 25 Stainless Steel Stem: Special Application Only
American Flow Control, ACIPCO Series 2500
Clow Resilient Wedge
Kennedy Valve C509 (size 2 to 12)
M&H Valve 4067
Mueller A2362

505.2.05 NRS VALVE TESTING CHECK LIST

REVIEW OF NRS VALVES

Manufacturer: _____

Model: _____ Class of Valve: _____

Size of Valve: _____

Bolt hole drilled properly?	Yes	No	N/A
Casting smooth without high seams or flash?	Yes	No	N/A
All parts of valve unbroken?	Yes	No	N/A
Is stem brass?	Yes	No	N/A
Is waterway large enough?	Yes	No	N/A
Is hub or hand wheel of proper size?	Yes	No	N/A
Is hub or hand wheel marked for direction of operation?	Yes	No	N/A
Do valves open left?	Yes	No	N/A
Are all joints acceptable?	Yes	No	N/A

Number of turns: _____

Type of coating Inside: _____

Outside: _____

Test pressure _____300_____ PSI

Time: _____ Hours

% of leakage _____

Condition of coating? _____ Describe briefly:

Is gasket material acceptable?	Yes	No	N/A
Type of stem seal? (Please circle)		O-Ring	Packing
If O-ring seals are used, are they replaceable with valve in service?		Yes	No

How many O-Rings? (List number) _____

Is wedge fully encapsulated in rubber?	Yes	No

If not, describe method of sealing:

Valve is: ACCEPTABLE REJECTED

Comments:

505.4.00 BUTTERFLY VALVES

505.4.01 GENERAL

Butterfly valves shall be of the tight closing, rubber-seat type. Valves shall meet the full requirements of AWWA C504 for Class 150B. Valves shall be bubble tight at rated pressures with flow in either direction, and shall be satisfactory for applications involving valve operation after long periods of inactivity. Valve discs shall rotate 90 degrees from the full open position to the tight shut position.

505.4.02 CONSTRUCTION

1) Valve bodies and flanges shall be constructed of cast iron ASTM A126 Class B and shall have either integrally cast mechanical joint ends or shall be flanged. All valves shall be supplied less accessories.

2) Valve shaft shall be constructed of wrought stainless steel or Monel.

3) Valve seats shall be of a natural or synthetic rubber compound, mounted on the valve disc or in the valve body. Seats mounted in the body shall be bonded or vulcanized to the body by a process proved by test method A or B of ASTM D429. Seats mounted on the disc shall be clamped thereon, and seating surface shall be stainless steel or Monel.

4) Valve operators shall be designed for buried service operation with manual operators. Operators shall be sized for AWWA C504, Table 4, Class 150B torques. Operators shall be designed for operation with flows at 16 ft/secs, maximum at 150psi pressure. Manual operators shall be of the traveling nut, self-locking type and shall be designed to hold the valve in any intermediate position between full open and fully closed without creeping or fluttering. Operators shall be equipped with a 2-inch square operating nut. Valves shall close with a clockwise rotation of the nut.

505.4.03 NUMBER OF TURNS

Minimum number of turns from fully open to fully closed shall be as follows:

4 inches to 8 inches	16 turns
10 inches to 12 inches	28 turns
14 inches to 18 inches	30 turns
20 inches to 24 inches	44 turns
30 inches	60 turns
36 inches	72 turns
48 inches	96 turns
54 inches and larger	200 turns

505.4.04 APPROVED MANUFACTURERS

DeZurick
M&H/Kennedy Model 4500 (3” to 24”)
M&H/Kennedy Model 1450 (30” to 48”)
Mueller Model Lineseal III
Pratt Groundhog
Pratt Triton

505.4.05 BUTTERFLY VALVE TESTING CHECK LIST

REVIEW OF BUTTERFLY VALVE FOR CONFORMANCE WITH AWWA C504

Manufacturer: _____

Model: _____

Size Of Valve: _____ Class Of Valve: _____

Type Of Body: Long Flanged Short Flange Wafer Mech. Joint

Laying Lengths Conform To Table 3:

Body Material: Cast Iron Ductile Iron Alloy Cast Iron
Other: _____

Two Hubs Cast In Valve Body: Yes No

Minimum Body Shell Thickness Meets Table 3 Requirements: Yes No

Shaft Is: One Piece Unit Length of 1 1/2 x Shaft

Diameter into Disc: Yes No

Shaft Material: Stainless St Monel Carbon Steel w/SS Journals
Other: _____

Shaft Diameters Meet Minimum Requirements Of Table 4: Yes No

Type of Shaft Seal: Split V Type Packing O Ring Other:_____

If O Ring, Is It Contained In A Removable Corrosion Resistant Recess: Yes No

Shaft Seals Replaceable W/O Removing Valve Shaft: Yes No

Disc Material: Cast Iron Cast Steel Bronze(A,D,E) Alloy Cast Iron
Fabricated Steel Stainless Steel Ductile Iron
Other: _____

Disc Is: Cast Fabricated with no External Ribs Transverse to Flow

Disc Thickness Is Less Than 2 1/4 x Table 4 Shaft Diameter: Yes No

Valve Has Sleeve Type Bearings: Yes No

Bearings Contained In The Hubs on Body: Yes No

Bearing Of Corrosion Resistant Material: Yes No

For Valves Greater Than 20", Thrust
Bearings Are Provided To Resist Axial Loads: Yes No

Operator Equipped With An Adjustable
Mechanical Stop-Limiting Device: Yes No

Max. Operating Torque Meets Table 1 Requirements: Yes No
In 30 in and Larger Valves, Seats Are Replaceable In Place: Yes No

Valve Seat Is A Rubber Based Compound: Yes No

Valve Seat Is Secured To The: Disc Body

Rubber Seat Is Secured To The Body Or Disc By Being:

Clamped Bonded Mechanically Secured Vulcanized

Mating Seat Surface Is: Stainless Steel Monel Other: _____

Number of turns meet technical specifications Yes No

Comments:

ACCEPTED REJECTED

Explanation:

Reviewed By: _____ Date: _____

(The Detector Double Check, Bypass Meters and Check Valves are not covered in this document due to State jurisdiction and maintenance of a separate specification. Refer to the State of Oregon website for requirements.)

505.10.00 AIR RELEASE VALVE

505.10.01 APPROVED MANUFACTURES

Vent-O Mat model 050-RBX-2511

505.11.00 SILENT CHECK VALVE

505.11.01 CONSTRUCTION

1) Valve shall be flanged both ends. Flanges may be either 125 or 250 drilling based on system requirements.

2) Valve shall have cast iron body.

505.11.02 APPROVED MANUFACTURERS

DeZurik/APCO Willamette

505.12.00 PRESSURE REDUCING VALVE

505.12.01 SIZE 2 1/2 INCH AND UNDER

1) Valve shall have female iron pipe threaded (FIPT) ends.

2) Valve shall be direct acting or pilot operating depending on system requirements.

3) Valve shall have adjustable outlet pressure ranging from 15 to 75 psi.

4) Valve shall have cast iron body.

505.12.02 SIZE 3 INCH AND ABOVE

1) Valve shall be flanged both ends. Flange may be either 125 or 250 drilling based on system requirements.

2) Valve will be globe style.

3) Valve shall have cast iron body.

4) Valve shall have adjustable outlet pressures ranging from 15 to 100 psi.

505.12.03 APPROVED MANUFACTURES

2 1/2 inch and under:
Cla-Val (pilot operating)
Watts (direct acting)

3 inch and above:
Cla-Val model 90G-01

505.14.00 PRESSURE RELIEF VALVE

505.14.01 SIZE 1/2 TO 2 1/2 INCH

1) Valve shall be female IPT both ends.

2) Inlet ranges from ½" to 2". Outlet ranges from ¾" to 2 ½"

3) Orifice sizes shall be .121 sq.inch to 1.399 s.q inch

4) Temperature range to be –20 deg F to 800 deg F

5) Valve shall be soft seat design and shall have bronze body..

6) Average pressure range shall be 15 to 500 psig.

7) Valve shall meet ASME Section VIII, designed for high capacity, low pressure applications on assorted media.

505.14.02 APPROVED MANUFACTURERS

Dresser Consolidated Type 1982

505.15.00 AIR RELEASE/BLOWOFF FOR LARGE VALVES

505.15.01 Approved Manufacturer

Kupferle Foundry TF-500 (Not approved for use at the end of water mains.)

505b - METERS

Updated: November 1, 2012

Scope: The following includes small and large meters.

505.6.00 SMALL DOMESTIC METERS

505.6.01 GENERAL

1) Meters shall be positive displacement disc type, which displaces a fixed quantity of water for each nutation. Multi-jet and piston type meters are not acceptable.

2) Water meters shall conform to performance standards of AWWA C700, Standard for Cold-Water Meters – Displacement Type, Bronze Main Case, except as otherwise noted.

3) Suitable engineering plastic shall be as defined in AWWA C700.

4) All parts shall be chloramine resistant.

505.6.02 CONSTRUCTION

1) Water meter component materials that contact potable water shall conform to requirements of ANSI/NSF Standard 61G: Drinking Water System Components – Health Effects.

2) Meters shall have a separate measuring chamber in which the disc operates. The main case for all meters shall be made of materials that meet ANSI/NSF 61G standards. Coatings, treatments and plastic are not acceptable substitutes for no-lead/ultra low-lead content bronze material.

3) Casing shall be new and shall not be repaired, plugged, brazed or burned in, or have laminations.

4) Inlet and outlet connections on 5/8" x 3/4", 3/4" and 1" versions shall have a flat gasket surface of 1/4" width.

5) Only meters that produce a sound level reading between 0 db. and 21 db measured at a distance of 3 inches from the side of the meter at all flow rates are acceptable.

6) Meter manufacturer shall provide within forty eight (48) hours of notification a factory representative to the Portland Water Bureau, 1900 N. Interstate Ave, Portland, OR, to address factory warranty or contract issues.

505.6.03 INFORMATION CAST ON METERS

Meters shall have the size and model designation cast in raised letters on the body of the meters. The direction of flow though the meter shall be properly indicated and visible from the top of the meter. The serial number of each meter shall be stamped into the meter case and into the meter lid. The Bureau will designate serial numbers to be placed on meters at the time the order is placed.

505.6.04 FROST PROTECTION

Meters shall be designed to operate during freezing conditions and provide frost protection. Cast iron/polymer bottom caps of frost-proof meters are to break or yield under normal freezing conditions before damage occurs to any other part of the meters. The portion of the bottom cap that comes into contact with the potable water shall be made of suitable engineering plastic.

505.6.05 MEASURING CHAMBERS

1) Measuring chambers, thrust rollers, thrust roller bearing plates, and discs, shall be constructed of a suitable engineering plastic. Chambers shall be nutating disc type and secured in position in the main casings. Nutating disc shall be either flat or conical type. An operating pressure of 150 PSI shall not affect the sensitivity of the meter. Measuring chambers on all meters shall be equipped with a thrust roller to compensate for wear and maintain calibration of the meter.

505.6.06 REGISTERS

1) Meters shall be adaptable to absolute encoder type registers.

2) Either hermetically or permanently sealed non-fogging register is required. Mechanism shall be totally enclosed and shall be driven by a magnetic coupling.

3) Registers shall be straight reading,

4) Center sweep hand shall be clear plastic with red or black tip and provided with 100 equally graduated divisions near the outside rim of the dial face. One complete revolution shall represent one cubic foot of water.

5) Registers must be straight readers, odometer-type, marked in cubic feet, with low flow leak indicator, center sweep hand and 360-degree test circle with 100 increments, and shall be mounted to allow reading from the outlet side of the meter through a glass or plastic lens. Odometers shall have black numbers on white background for 100 or greater cubic feet, and white numbers on black background for 10 cubic feet and 1 cubic foot.

6) Meters furnished shall indicate on the registers not less than 98.5 percent nor more than 101.5 percent of the water actually passed through the meter while it is being tested at any rate of flow within the limits specified in the Operating Characteristics table from the latest edition of AWWA Manual M6

7) Register box shall be secured to the main case by a tamper proof screw or pin.

8) Lids shall be flat type, hinged, covering only the top of the register case.

505.6.07 REGISTER ACCURACY

Meters furnished shall indicate on the registers not less than 98.5 percent nor more than 101.5 percent of the water actually passed through the meter while it is being tested at any rate of flow within the limits specified in the Operating Characteristics table from the latest edition of AWWA Manual M6

505.6.08 GUARANTEE

1) Meters shall operate at a working pressure of 150 PSI without leaking or damage to any parts.

2) All meters shall be manufacturer guaranteed against defects in materials, workmanship and construction for a period of five (5) years from date of installation or for a period of six (6) years from date of delivery, whichever event occurs first.

3) Sealed register units shall have a guarantee of twenty (20) years against defects in workmanship, materials or fogging.

4) Any part or parts not meeting requirements of 505.6.08 1) – 3) above and within the time periods established, such part or parts shall be replaced free of charge to the City of Portland, Bureau of Water Works, prepaid freight to 1900 N. Interstate Avenue, Portland, Oregon, within sixty (60) calendar days from time the manufacturer receives notice thereof. Manufacturer may repair or replace such meters or parts locally at the manufacturer's option.

505.6.09 APPROVED MANUFACTURERS

Badger Recordall 25, 35, 55, 70
Hersey 400 IIS
Neptune T-10

505.8.00 LARGE METERS

505.8.00A GENERAL

1) Meters shall be new and unused and of latest design and manufacture.

2) The manufacturer shall submit an accuracy test summary for all meters when shipped to the Portland Water Bureau (PWB).

3) Water meter component materials that contact potable water shall conform to the requirements of National Sanitation Foundation Standard 61G - Drinking Water System Components - Health Effects (NSF 61G). An affidavit of compliance shall be furnished by the manufacturer.

4) Meters shall have outer cases with case flanges and with separate removable measuring chambers. The casing shall not be repaired in any manner. The inlet and outlet shall have a common axis. Connection flanges shall be parallel. Main casings shall be a copper alloy with not less than 85 percent copper. Meters shall have a test outlet. Main casings must be bolted together with either standard nuts and bolts or bolted into a tapped lower case with a gasket between the upper and lower sections. Bolts shall be stainless steel.

5) The size, model and direction of flow shall be cast in raised letters or numbers on the outer case of all meters and be visible from the top side of the meter. The serial number shall be stamped into the lid of the register and the body of the meter. PWB will designate serial numbers to be stamped on meters at the time the order is placed.

6) Meters shall be guaranteed to operate under a working pressure of 150 psi without leaking or damage to any parts.

7) The 1-1/2-inch and 2-inch positive displacement disc or turbine meters shall be guaranteed against defects in materials, workmanship and construction for a period of five years from date of installation or for a period of six years from date of delivery, whichever event shall first occur.

8) Should any part or parts require replacement for the reasons stated above and within the time set, such part or parts shall be replaced free of charge to the City of Portland, Portland Water Bureau, prepaid freight to and from 1900 N Interstate Avenue, Portland, Oregon, within sixty (60) days from the time the bidder receives written notice sent by email or certified mail. Such meters or parts will be repaired locally or replaced at the manufacturer’s option.

9) Suitable engineering plastic shall be as defined in AWWA C700

10) All parts shall be chloramine resistant.

505.8.00B REGISTER ACCURACY

Meters furnished shall indicate on the registers not less than 98.5 percent nor more than 101.5 percent of the water actually passed through the meter while it is being tested at any rate of flow within the limits specified in the Operating Characteristics table from the latest edition of AWWA Manual M6.

505.8.00C REGISTERS

1) All registers shall be of the absolute encoder type. Pulses are not allowed.

2) Either hermetically or permanently sealed non-fogging register is required. Mechanism shall be totally enclosed and shall be driven by a magnetic coupling.

3) When interrogated, encoder registers shall send readings from the register odometer to the receptacle.

4) Encoder registers shall have a lens made of a scratch resistant glass.

5) Registers must be straight readers, odometer-type, marked in cubic feet, with low flow leak indicator, center sweep hand and 360-degree test circle with 100 increments, and shall be mounted to allow reading from the outlet side of the meter through a glass or plastic lens. Odometers shall have black numbers on white background for 100 or greater cubic feet, and white numbers on black background for 10 cubic feet and 1 cubic foot.

6) Register box shall be secured to the main case by tamper proof pin or screw.

7) The minimum and maximum indication of the register shall conform to AWWA C700.

8) Encoder registers shall be wired at the factory to a touch reader that can be read with a Neptune Pocket Pro Reader and programmed to read the serial number cast on that meter.

9) Encoder registers shall be field programmable

10) Sealed register units shall have a guarantee of ten (10) years against defects in workmanship, materials or fogging.

505.8.01 POSITIVE DISPLACEMENT METERS

505.8.01A GENERAL

1) Meters shall be positive displacement disc type, which displaces a fixed quantity of water for each nutation. Multi-jet and piston type meters are not acceptable.

2) Unless otherwise noted herein, Group I meters shall conform to AWWA C700. Meters, 1-1/2-inch and 2-inch, shall have flanged ends in accordance with Subsection 4.2.2 of AWWA C700. Flanges shall be full 5/8-inch thickness throughout or reinforced from bolt hole to wall of meter throat to prevent warpage of the flange under stress.

505.8.01B MEASURING CHAMBERS

Measuring chambers, thrust rollers, thrust roller bearing plates, and discs, shall be constructed of a suitable engineering plastic. Chambers shall be nutating disc type and secured in position in the main casings. Nutating disc shall be either flat or conical type. An operating pressure of 150 PSI shall not affect the sensitivity of the meter. Measuring chambers on all meters shall be equipped with a thrust roller to compensate for wear and maintain calibration of the meter.

505.8.01C STRAINER SCREENS

Both the 1-1/2-inch and the 2-inch meters shall be provided with plastic or stainless strainer screens installed in the meters and comply with Section 4.3.6 of AWWA C700. The self-straining type is not acceptable.

505.8.01D APPROVED MANUFACTURERS

Neptune T-10, 1.5-inch and 2-inch with Auto Read register & TP

505.8.02 COMPOUND METERS

505.8.02A GENERAL

1) Compound meters shall conform to AWWA C702 "Cold Water Meters - Compound Type," unless as otherwise noted herein.

2) Meters shall meet the requirements for accuracy as set forth in AWWA C702 and will be tested and inspected at the Portland Water Bureau Meter Shop, 1900 N. Interstate Avenue, Portland, Oregon, 97201

3) Unibody construction is required if any manufacturer makes a unibody in a particular size.

505.8.02B MATERIALS

1) Material requirements for the various meter components shall conform to AWWA C702 and NSF 61G Standards

2) Automatic valves shall be in accordance with Section 4.3.12 of AWWA C702. Valve shall either have a removable rubber seat or removable rubber disc that is chloramine resistant.

505.8.02C STRAINERS

Meters shall be provided with rigid, easily removed plastic or stainless strainers and comply with Section 4.3.14 of AWWA C702.

505.8.02D APPROVED MANUFACTURERS

Neptune TruFlo 2”, 3”, 4”, 6” with Auto read register & TP
Sensus Omni C2

505.8.04 TURBINE METERS

505.8.04A GENERAL

Turbine meters shall conform to the latest revision of AWWA C701, "Cold Water Meters - Turbine Type, for Customer Service." Companies shall have a minimum of five years experience in the manufacturing of turbine water meters.

505.8.04B MAIN CASES

Size, model and direction of flow shall be cast, in raised characters, on both sides of the main cases.

505.8.04C OPERATING CHARACTERISTICS

(minimum accuracy)

Meter size	Normal-low Range (98.5% - 101.5%)
4"	10 to 1200 GPM
6"	30 to 2000 GPM
8"	35 to 3500 GPM
10"	55 to 5500 GPM
16”	250-10,000 GPM

505.8.04D PERFORMANCE

Meters shall have performance capabilities of continuous operation up to the rated maximum flows as outlined above without affecting long-term meter accuracy or causing undue wear. Meters shall also have a 25 percent flow capacity in excess of the maximum flows listed for intermittent flow demands.

505.8.04E REGISTER

Registers must adapt to high speed pick up or 4 to 20 mil-amp output for SCADA.

505.8.04F STRAINERS

Turbine meters shall include a strainer. Strainers shall have a cover plate to allow for inspection and removal of debris from the screen without disturbing the pipeline. Strainer screens shall be stainless steel.

505.8.04G GUARANTEE AND MAINTENANCE PROGRAM

Meter manufacturer shall submit, in writing, a price schedule of its factory maintenance program for factory testing, repair, and measuring chamber exchange program. Meters shall be guaranteed against defects in material and workmanship for a period of one year from date of installation.

505.8.04H APPROVED MANUFACTURERS

Sensus W series with integral strainer with ICE register & TP
Sensus W series with separate strainer with ICE register & TP
Sensus Omni T2
Neptune HPT

505.8.05 COMBINATION FIRE-DOMESTIC METER

505.8.05A GENERAL

1) The 1-inch, 1.5-inch, and 2-inch disc type positive displacement bypass meters shall be guaranteed against defects in materials, workmanship, and construction for a period of five years from date of installation or for a period of six years from date of delivery, whichever event shall first occur. For meters larger than 2-inch, the above guarantee shall be for a period of one year from date of installation.

2) All meters shall be a combination of (1) a mainline meter of the turbine type (class II), both UL listed and FM approved; (2) a UL-listed and FM-approved fire-service strainer; (3) a bypass meter of the appropriate size and type for measuring low flow rates; and (4) an automatic valve shall direct the flow from the bypass meter to the mainline meter as flow rates increase and back to the bypass meter as flow rates decrease.

505.8.05B MATERIALS

1) Cold water meter-fire service type meters shall conform to the latest revision of AWWA C703, and NSF 61G Standards unless as otherwise noted herein.

2) Automatic valves shall be in accordance with the latest revision of Section 4.3.11 of AWWA C703. The automatic valve shall be of the spring-loaded, knuckle joint type. All internal linkage parts shall be stainless steel. A vulcanized rubber disc on a stainless steel clapper plate shall seal against a bronze seat. The spring shall be ANSI Type 18-8 stainless steel.

3) The meter body, strainer, and valve body shall be fabricated steel with a coating of fusion-bonded epoxy both internally and externally. The meter body shall be welded to the valve body effecting a uni-body construction with the valve. The strainer outlet and meter inlet shall be connected by a Style 77 Victaulic grooved coupling or other UL Listed and FM Approved coupling or the equivalent. The meter assembly shall have a rated working pressure of 175 psi.

4) Flanges shall be Class 125; flat faced, and shall conform to ANSI 16.1 for drilling and thickness.

5) Each meter shall be equipped with a Touch Pad.

6) Meter cover bolts shall be made of ANSI Type 316 stainless steel. All other bolts shall be made of stainless steel.

505.8.05C REGISTERS

1) Registration accuracy on any meter shall register not less than 98.5 percent and not more than 101.5 percent of the water that actually passes through the meter at normal flow and test range limits as listed in Table 1 of the latest revision of AWWA C703, except in the registration of flow rates within the changeover from bypass meter to main meter.

2) Registers must be straight readers, odometer-type, marked in cubic feet, with low flow leak indicator, center sweep hand and 360-degree test circle with 100 increments, and shall be mounted to allow reading from the outlet side of the meter through a glass or plastic lens. Odometers shall have black numbers on white background for 100 or greater cubic feet, and white numbers on black background for 10 cubic foot and 1 cubic foot.

3) All registers shall be of encoder type.

4) Either hermetically or permanently sealed non-fogging register is required. Mechanism shall be totally enclosed and shall be driven by a magnetic coupling.

5) Encoder registers shall send readings from the register dials to the receptacle, touch pad, radio, or other device as specified. Readings will be from the contact switches or equivalent on the rotating dials. No registers based on pulse technology will be accepted. All registers shall be equipped with touch pads (TP), one TP per register.

6) Encoder registers will have a lens made of a scratch resistant plastic or scratch resistant glass.

7) As an option, registers may be capable of high-speed pick up or 4-20 mil-amp output for SCADA and dual reading type.

505.8.05D MAXIMUM OPERATING PRESSURE

Meter shall operate without leakage, damage, or malfunction under a maximum operating pressure of 175 psi.

505.8.05E STRAINERS

1) Meters shall have an attached or integrated strainer as part of the meter package.

2) Strainers shall have a cover plate for inspection and removal of debris from the screen without disturbing the pipeline.

3) Turbine meters used as mainline devices must include strainers immediately upstream of the meter.

4) Fire Service strainers shall have effective straining areas of at least four times the open area of the nominal meter size and shall not cause any changes in water velocity that adversely effect meter accuracy or that accelerate meter wear.

5) Fire Service strainer shall be UL listed and FM approved.

6) The maximum pressure loss across the strainer shall be 4 PSI at the safe maximum rated capacity in Table 1 in accordance with the latest revision of AWWA C703.

7) Strainers supplied under this standard shall operate without leakage at working pressure of 175 psi or less.

505.8.05F SIZE

1) The size of the meters shall be determined by the nominal size (in inches) of the opening in the inlet and outlet flanges.

2) Overall lengths of the meters shall be as follows:

Meter Size	Laying Length	
4”	33”	(and not to exceed the
6”	45”	maximum lay length
8”	53”	of the current meter)
10”	68”	

505.8.05G CAPACITY

The capacity of the meters in terms of normal operating range, maximum rate for continuous use, maximum loss of head, and extended low flow capability is as follows:

Size	Normal Operating Range (GPM)	Max Rate for Continuous use (GPM)	Max Loss of Head @ Max Head (PSI)	Extended Low Flow (GPM)
4	.75 - 1200	1200	9	0.375
6	1.5 - 2500	2500	10.5	0.75
8	1.5 - 4000	4000	10.5	1
10	2.0 - 6500	6500	9	1

505.8.05H METER SERIAL NUMBER

The meter serial number shall be on the meter cover, encoder registers, and on the bypass meter.

505.8.05I UNITIZED MEASURING ELEMENT (UME)

The UME shall be a complete assembly that includes the cover, registers, and a turbine-measuring element that is calibrated to the standards in the latest revision of AWWA C703, Section 4. It shall be easily field removable from the meter body without the requirement of unbolting flanges.

505.8.05J INTERMEDIATE GEAR TRAIN

The intermediate gear train shall be directly coupled to the turbine rotor and magnetically coupled to the register through the meter cover. The gear train shall be housed within the turbine-measuring chamber. All moving parts of the gear train shall be made of a self-lubricating polymer or ANSI Type 316 stainless steel for operation in water.

505.8.05K BYPASS METERS (side arm meter)

1) Bypass meters shall be of the positive displacement disc type which displace a fixed quantity of water for each nutation and shall conform, except for size, to the latest revision of AWWA C700, except that bypass meters may have plastic measuring chambers.

2) The bypass meter may be piped on the left or right side of the assembly.

3) The bypass meter shall include a self-actuated valve that directs flow through the disc meter at low flow rates, and through the turbine meter at high flow rates. At high flow rates, the self-actuated throttle valve shall restrict the flow through the disc meter to minimize wear.

4) The bypass meter shall conform to the latest revision of AWWA C-700 standards in the following sizes:

Mainline Size	Meter Size
4” Mainline	1” Bypass Meter
6” Mainline	1 ½” Bypass Meter
8” & 10” Mainline	2” Bypass Meter

5) Meters, 1.5-inch and 2-inch, shall have flanged ends in accordance with Subsection 4.2.2 of the latest revision of AWWA C700. Flanges shall be full 5/8-inch thickness throughout or reinforced from bolt hole to wall of meter throat to prevent warpage of the flange under stress. The meters shall be the split case type, which is bolted together with either standard nut and bolt or bolted into a tapped lower case, with a gasket between the upper and lower case section.

6) Registration accuracy on a meter with strainer shall register not less than 98.5 percent and not more than 101.5 percent of the water that actually passes through the meter at normal flow and test range limits as listed in the Operating Characteristics table of AWWA C703, except in the registration of flow rates within the changeover from bypass meter to main meter.

7) Meters shall have an outer case, with a separate measuring chamber in which the disc operates. The outer case for all meters shall conform to NSF 61G Standards. Casings shall not be repaired, plugged, brazed, or burned in.

8) Measuring chambers may be constructed of a suitable synthetic polymer or bronze and conform to NSF 61G Standards, and shall not be cast as part of the outer casings. Chambers shall be of the nutating disc type and shall be machined carefully and secured in position in the outer casings. Meters shall operate without leakage or damage to any part at a working pressure of 175 psi. Measuring chambers on all flat disc meters shall be equipped with a thrust roller to compensate for wear and maintain calibration of the meter.

9) Both the 1.5-inch and the 2-inch meters shall be provided with plastic or stainless strainer screens installed in the meters in accordance with Section 4.8 of the latest revision of AWWA C700.

10) Disc plates, whether flat or conical, shall be either metal reinforced or equipped with thrust rollers.

505.8.05L APPROVED MANUFACTURERS

Neptune HP (High Performance) Protectus III Fire Service Meter

505c - Boxes, Frames & Covers

Updated (Materials Only): March 11, 2025

Scope: The following is a continuation of section 505 that covers meter boxes, valve boxes, frames and covers.

505.16.00 CAST IRON VALVE BOXES AND CAST IRON METER BOXES

505.16.01 GENERAL

1) Manufacture valve boxes, extensions, and covers and meter box frames and covers, all of cast iron, except for the wrought iron handles, and in accordance with Portland Water Bureau, City of Portland, Oregon, as shown.

2) Ensure that all castings conform to ASTM A48 Standard Specification for Gray Iron Castings, Class 30 B. Provide test bars and machine test them, both in accordance with ASTM A48 and at Manufacturer's expense.

505.16.02 QUALITY OF CASTINGS

Ensure that all work is true to the dimensions and shapes shown on the Standard Plans with no additional indentations, raised areas, or other deviations. Do not produce castings by the open mold method. Provide castings that are free of porosity, shrink cavities, cold shuts or cracks, spalled areas, burrs, or other imperfections. Repair of defects by welding, or by the use of "smooth-on" or similar material will not be permitted.

505.16.03 FIT OF COVERS

1) Ensure that the covers and their seats are finished with the exact dimensions and shapes shown so that the fit is neither too loose nor too tight.

2) Produce castings free of warp and other imperfections to ensure that a flat, even contact between covers and boxes or frames is made when assembled and that no rocking occurs under actual loading conditions.

505.16.04 CHARACTERS AND FIGURES ON CASTINGS

1) Cast the initials of the Manufacturer, the year of the cast, and the heat number distinctly upon each individual casting. Make these characters 1/2-inch in height and 1/8-inch in relief. Locate this information, so that it can be seen after installation, on the inside faces of the boxes, box frames, and extensions and on the underside of the covers.

2) Cast two rose-shaped characters, the character "W", and the characters, "PORTLAND, OR. WATER" distinctly on the tops of the covers as shown in Standard Drawings P-910, P-930, and P-935. Make these rose-shaped characters as large as space will permit without crowding and make the other characters to the dimensions shown. Use a 1/4-inch line width for the "W" and an 1/8-inch line width for "PORTLAND, OR. WATER." Vary the line width and the relief size of the rose-shaped figures from 1/8-inch to 1/4-inch as required to achieve the most realistic-looking figures and make the other characters 1/8-inch in relief. Submit a detailed plan of this entire layout to the Portland Water Bureau for approval before beginning any work on the castings.

505.16.05 FINISH OF CASTINGS

1) Remove all visible rust and foreign material from castings by dry sandblasting using sand, grit, or shot in conformance to SSPC-SP5. Immediately after sandblasting, inspect all elements of

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each casting carefully and reject and discard any castings not conforming to these specifications.

2) Immediately following inspection, before any new rust occurs, paint all castings except the tops and edges of item number two with two coats of black coal-tar varnish, Waterworks Supplies Company, PLICO No. 70, or approved equal in order to prevent them from rusting during shipment, storage, and handling.

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505.18.00 METER BOXES, COVERS AND LIDS

505.18.01 GENERAL

Boxes, lids and covers shall be new and free of defects. Concrete units and composite units are to be manufactured in as follows.

505.18.02 CONCRETE BOX AND COVERS

1) Aggregates shall conform on Oregon Standard Specifications for Highway Construction, Section 703. The cement shall meet ASTM Standard C150, Type I-II low alkali. The aggregates shall be sized, graded, proportioned and thoroughly mixed with proportions of cement and water to produce a homogeneous concrete having a compressive strength of 4000 psi at 28 days of age.

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2) Each box and cover shall be reinforced to withstand H-20 loading as defined by Oregon State Highway Department standards.

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3) The forms shall be made of non-porous material with smooth surfaces and accurate and strong enough to maintain the structure's dimensions within one-half of the allowable tolerance given in Section 8 of ASTM C858. They shall be free of paint or other protective coating that may cling to the surface of the concrete. Releasing agents applied to aid in breaking the bond shall not be injurious to the concrete.

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4) Concrete boxes shall have a molded flat top surface, rounded corners and edges and shall be finished while in the molds. The covers shall have a molded surface that passes the four-way skid test per current City of Portland standards. Capping will not be used for either the box or the cover.

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505.18.03 POLYMER BOX AND COVERS

1) Boxes and covers shall be made of reinforced plastic mortar (RPM), which is to include polyester resins and glass fibers, modified polyethylene or high-density polyethylene (HDPE).

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2) Each box and cover shall be individually reinforced to withstand H20 loading as defined by Oregon State Highway Department standards or 20,800 load rating when tested in accordance with Western Underground Committee (WUC) Guide 3.6. H20 rating must be achieved with no external support (e.g. concrete).

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3) Boxes shall be of one-piece molded construction and have a molded flat top surface, rounded corners and edges. The exterior shall retard ultra-violet degradation. The box shall be so designed as to retard settling and keep the box stable in loose soil, aggregate, or any other backfill material.

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4) The covers shall have a molded surface that passes the four-way skid test per current City of Portland standards. The exterior shall retard UV degradation.

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5) Covers shall have a hinged reader lid centrally located in the cover. A #5 lid, as specified below, may be used in lieu of a hinged reader lid. Lid may use a magnet molded within the lid for increased metal detection in lieu of hinged or #5 lid..

6) Test procedures for resistance to chemical solutions shall be in accordance with ASTM D543. Test procedures for sunlight shall be in accordance with ASTM D1501. Test procedures for water absorption shall be in accordance with ASTM D570.

7) The box dimensions shall be approximately 22" x 15 ¼" external dimensions and internal dimensions of 21 ¼ x 12 ½ or other as preapproved alternatives if listed in the approved material list after review by the Portland Water Bureau. The box shall be designed in such a way as to be securely stackable.

505.18.04 LID

1) Lids are to be manufactured from cast iron, ductile iron, or tens-o-loy. The cast iron is to conform to requirements of ASTM A48 Class 30.

2) Lids shall have rounded corners. The top surface shall pass the four-way skid test per current City of Portland standards. The overall surface shall be treated to inhibit rust. The lid shall have 1/2-inch wide and 1-inch long slot to allow easy removal using Portland Water Bureau standard hook tool. The lid shall be manufactured to include the identification of Lid Number (5) and to state "City Water Meter."

3) Polymer lids may be used when reviewed and preapproved as part of a complete box unit and listed in the approved material list by the Portland Water Bureau.

505.18.05 WEIGHT

Boxes, covers and lids are to be manufactured not to exceed the weight as follows:

Box – 38 pounds
Cover – 20 pounds
Lid – 6 pounds

505.18.06 APPROVED MANUFACTURERS

DFW Plastics, Inc.
DFW Models including Box, Lid, and AMI Lid

- DFW38C
- DFW486
- DFW1640
- DFW1730
- DFWBP4

505.20.00 24-INCH BY 36-INCH FRAME AND COVER & LARGER ACCESS DOORS

1) Frame and cover shall be water-tight and be constructed aluminum. Doors shall have a load-tested H20 rating and have a non-skid surface. The coefficient of friction for all vault doors shall be in compliance with City of Portland Standard Construction Specifications Section 00225.18.

2) Each door shall have one each ninety-degree 'hold open' locking arm, one heavy-duty pneumatic spring, slam lock, and two each heavy-duty brass hinges with stainless steel pins.

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3) 24" x 36" Frame and cover shall conform to Standard Drawing P-965. All other doors shall have similar properties.

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505.20.01 WEIGHT

Frames and covers are to be manufactured not to exceed the weight as follows, or hydraulic lift arms shall be provided:

Frame and Cover – 115 pounds

505.20.02 APPROVED MANUFACTURERS

Products acceptable in all sizes. Model number provided as guide for acceptable type.
Bilco
Syracuse EC-3-HD-PORT
Oldcastle Precast (Utility Vault)
VersaHatch of VersaSteel VSH-H20DP-A-24-36-S-GS-S

506 - FIRE HYDRANTS

Updated: July 12, 2017

506.01 GENERAL

a) Fire hydrants shall be new and unused, 150 psi (1034 kPa) working pressure, 300 psi (2064 kPa) test pressure, and shall conform to AWWA C502 "Standard for Dry Barrel Fire Hydrants," unless these specifications state otherwise. Certificates of compliance to AWWA C502 and NSF 61, current versions at time of shipping, are required.

b) Hydrants shall use parts, tools and equipment and be maintainable in consistent manner with hydrants already found in the PWB system. Hydrants shall be reviewed for compatibility with existing parts and training.

c) Internal parts to be removed without removing nozzle section.

506.02 NOZZLES

a) Hose and Pumper Outlet Nozzles - Two 2-1/2-inch (64 mm) hose outlet nozzles and one 4-1/2-inch (115 mm) pumper outlet nozzle. Hydrant caps shall have inside gaskets.

b) Outlet Nozzle Threads - Conform with NFPA 194 for National Standard Fire Hose Coupling Screw Threads.

506.03 OPERATING VALVE

a) Size of Hydrant - Minimum 5-inch diameter main operating valve opening.

b) Furnish two or more bronze bushed drain valves.

c) Drain valve shall close within six turns, at start of opening hydrant.

d) Direction of Operation - Open by turning to the left or counter clockwise direction.

e) Main valve seat ring and seat ring bushings shall be bronze. Removal of main valve assembly including seat ring shall be by a tool that engages the stem either at the breakaway stem coupling or the upper stem section.

506.04 CONNECTION

Inlet Connection - 6-inch mechanical joint, accessories not required.

506.05 STANDPIPE

a) Cast as one piece, screwed flanges, or mechanical joint retaining ring, flanged extensions may be used for different bury lengths. Flanges shall be cast integral on extension barrel, or screwed flanges.

b) Standpipe Extension Kits - Shall be 6 inch, 12 inch, or 18 inch of breakaway design.

506.06 TOP OF BONNET CASTING

Cast on top of bonnet an arrow and the word "OPEN" in relief indicating the direction of turning to open the hydrant.

506.07 PAINT

a) Barrel painted orange to the bury line, OSHA Standard Safety Color or equal from the Federal Standard 595.

b) Nozzle caps painted black, Federal Standard 595, #17038 or equal.

c) Pumper caps painted red, OSHA Standard Safety Color or equal from the Federal Standard 595.

d) Bonnet top painted Orange, OSHA Standard Safety Color or equal from the Federal Standard 595.

e) All paints shall be lead free.

506.08 BREAKAWAY SECTION

Furnish traffic model hydrants with breakaway bolts, flanges or lugs. Design shall also include a breakaway stem coupling. Stainless steel couplings required. Aluminum or grey iron couplings are not acceptable. Fire hydrant head section shall have either 4, 6, or 8 bolts at the connection of the standpipe.

506.09 NOZZLE CAPS

a) Operating and Nozzle Cap Nuts - Pentagon shape, 1-1/4-inches from point to opposite flat at base of nut and 1-3/16-inches (30 mm) from point to opposite flat at top of nut with a tolerance of 1/64-inch for each dimension from flat to opposite point.

b) Nozzle Cap Chains or Cable are not to be included.

506.10 SEALS

O-ring stem and valve seals throughout. Stuffing-box shall not be substituted for the o-ring and seal system.

506.11 SHIPPING

Hydrants shall be palletized in such a way that there is no contact made between hydrants or other objects.

506.12 THRUST COLLAR

Operating nut thrust collar and threaded stem drive shall be one piece bronze. Oil filter plug shall be furnished in bonnet to lubricate thrust collar and stem drive. Furnish a positive stop to prevent over travel of the stem.

506.13 APPROVED MANUFACTURERS

Kennedy Guardian K-81A Portland Hydrant 1546340615132POR
McWane Clow Medallion 2545
Mueller Centurion A-423

506.14 HYDRANT ACCEPTANCE

Water Bureau personnel will inspect and determine if hydrants provided meet the above requirements. Any deficiency may be considered adequate for rejection. Hydrants must also meet requirements of the PWB Asset Management.

SECTION 507 - FIELD TESTING AND DISINFECTION

Updated: July 30, 2012

507.2.00 SAMPLING STATIONS

507.2.01 CONSTRUCTION

1) Unit to have aluminum housing with locking hinged door and padlock provision
2) Unit to have ¼ inch brass valve on vent pipe
3) Unit to be supported with ¾ inch brass standpipe with ¾ inch IPT thread at the base.
4) Unit to have ¼" brass drain tube attached to standpipe.
5) See Portland Water Bureau Standard Drawing P-825.

507.2.02 APPROVED MANUFACTURERS

Kupferle Foundry Eclipse model 88

SECTION 508 - CORROSION

Updated: February 16, 2011

****See City of Portland Standard Construction Specifications Section 01180.****

SECTION 509 - VAULTS

Latest updated: March 29, 2006

509.2.00 VAULTS

509.2.01 GENERAL

1) Concrete vault sections shall meet the City of Portland's Standard Construction Specifications (SCS), and the Bureau of Water Works' standard vault drawings. Standard Construction Specifications are available at the Permit Application Center, 1120 SW 5th Avenue, Portland, Oregon 97204. The Bureau of Water Works' standard vault plans are available from the Bureau of Water Works' Storeroom, 1900 N. Interstate, Portland, OR 97227.

2) Vault sections and appurtenances shall be provided with a two (2) year warranty. This warranty shall include water tightness and repair of material defects and defective workmanship. Warranty repairs shall be made with the vault in place, or if the correction cannot be made with the vault in place, the Bureau of Water Works may require the supplier provide replacement part(s) and reimburse labor costs for installation by the Bureau of Water Works.

509.2.02 CONCRETE VAULT SECTIONS

1) Concrete vault sections shall be designed per ACI 318-89 (building code), AASHTO 92 and ASTM C913/857, with H-20 loading and 30% impact factor over a 8" wide x 20" long area. A copy of the pertinent calculations including core drilling assumptions shall be provided to the Bureau of Water Works upon execution of agreement. Design loading assumptions should be as follows:

Soil Cover (5' Maximum)	100 pcf
Fluid Pressure above water table	30 pcf
Fluid Pressure below water table	75 pcf

2) Concrete shall have a minimum 28-day compressive strength of 4500 psi. Vaults may be delivered to site prior to reaching design strength providing there is sufficient strength for handling, installation and backfill, and the supporting documentation of the 28-day break is subsequently provided to the Bureau of Water Works.

3) Details and placement of reinforcing bar shall be in accordance with ASTM A-615 Grade 60. Welded wire fabric shall meet ASTM A-82 and A-185.

4) Concrete components should meet the following standards:

Type II/III Cement	ASTM C-150
3/4" Rock (washed)	ASTM C-33
Sand	ASTM C-33
Plasticizer	ASTM C-494
Water Reducer	ASTM C-49
Air Entrainment	ASTM C-26
Reinforcing Mesh	ASTM A-185
Reinforcing Bar	ASTM A-615 GR 60

5) Concrete sections shall have all outside surfaces coated with two (2) applications of Crystal Seal at 200 sq ft/gal.

6) Walls shall be solid with a minimum thickness of 4 inches nd shall have no knockouts or lightening pans.

7) The dimensions of the top slab opening shall be consistent with the dimensions of the manhole or access door provided.

8) Vault floors shall slope to a sump located within the floor.

9) Removable lifting eyes should be provided for each individual section. Lifting eyes can be pull irons, Burke's or lifting inserts and shall meet the applicable standards in the Uniform Building Code.

10) In order to provide a watertight seal, pipe penetrations shall be made in conformance with the requirements for installation of Linkseal between the pipe and vault wall. These requirements include smoothness, roundness and size of the penetration.

11) Vault sections shall be provided with butyl rubber joint sealant material to be used between sections, including hatch riser rings. This joint sealant shall be Conseal CS-101 as manufactured by Concrete Sealants, Inc. or equal. Sealant shall be installed by the supplier at the time of delivery or observed by a representative of the supplier at the time of delivery. Supplier shall be responsible for water tightness upon final assembly of the vault sections.

12) Vault sections shall have dimensions consistent with the specific Utility Vault and Pipe, Inc. sizes referenced in the bid items.

13) Vault tops shall allow for up to four, 12-inch diameter core drillings in locations determined by the Bureau of Water Works without affecting design strength. Minimum spacing between edges of drillings and/or hatch opening would be 12 inches.

14) Base vault sections shall be provided with a shallow sump in the base section with a steel grate. Vault floor shall slope a minimum of 1/2-inch from wall to sump. Sump shall be a minimum of 2 inches deep and located directly below the access door or manhole. Sumps in 687, 810 and 814 vaults shall be the trench type and located on one end of the vault. The sump in the 575 shall be 12 inches in diameter and located in the center of the vault. No sump grate is required in the 575 vault. In the floor of the sump, a 4-inch galvanized drain pipe should be provided that extends a minimum of 6 inches below the bottom of the vault. A ball trap shall be provided within the drain pipe. Ball trap shall be "Flood-Guard" as manufactured by General Specialties or equal. Ball trap shall prohibit inflow of water into the vault and shall be replaceable from inside the vault.

509.4.00 APPURTENANCES

509.4.01 GENERAL

1) Concrete vault appurtenances shall meet the City of Portland's Standard Construction Specifications (SCS), and the Bureau of Water Works' standard vault drawings. Standard Construction Specifications are available at the Permit Application Center, 1120 SW 5th Avenue, Portland, Oregon 97204. The Bureau of Water Works' standard vault plans are available from the Bureau of Water Works' Storeroom, 1900 N. Interstate, Portland, OR 97227.

2) Vault appurtenances shall be provided with a two (2) year warranty. This warranty shall include water tightness and repair of material defects and defective workmanship.

3) Warranty repairs shall be made with the vault in place, or if the correction cannot be made with the vault in place, the Bureau of Water Works may require the supplier provide replacement part(s) and reimburse labor costs for installation by the Bureau of Water Works.

509.4.02 MANHOLES

1) Where manholes are requested as openings, provide a 30-inch manhole per SCS Standard Plan 5-602.

2) Manhole shall be provided within a 2", 4", 6" or 12" concrete riser ring as specified. Riser rings shall have a load-tested H20 rating.

3) Joint sealant shall provide a watertight seal between the manhole casting and the riser ring, and the riser ring to the top slab.

509.4.03 ACCESS DOORS

1) Where access doors are requested as openings, provide spring-assisted diamond plate access doors with locking latch and angle iron frames cast in one 6-inch concrete riser ring.

2) Doors shall be water-tight and be constructed of steel, hot dipped galvanized after fabrication, or aluminum. Doors shall have a load-tested H20 rating. The coefficient of utilization for all vault doors shall be in compliance with City Code.

2) Doors shall be a single opening lid, Utility Vault 332-P or equal or double opening lid, Utility Vault 2-332-P, Utility Vault 3030P or equal as specified within the bid item.

3) Non-removable, penta head bolts shall secure doors. Single doors shall utilize one bolt. Double doors will utilize two bolts and mounted on the corners of the overlapping door. The bolts will measure 27/32” from any flat edge to the opposite point

4) Each door shall have two ninety degree arms ‘hold open’ arms.

5) Joint sealant shall be provided for joining the access door riser ring to any additional riser rings and the lowest riser ring to the top slab. These seals shall be water-tight.

6) Access doors shall be constructed of steel, or aluminum, approved non-slip surface having a static coefficient of friction in accordance with City of Portland Standard Construction Specifications Section 308.2.07

509.4.04 LADDER

1) Center/Base vault sections shall include chamber ladder and extension. Chamber ladder shall conform to Bureau of Water Works' standard vault plans. Extension shall be Utility Vault model 1672 or approved equal.

2) Bracket fabrication and welding details are included in Standard Plan 5-501. Use structural steel with a minimum yield strength of 36,000 psi (ASTM A-36). After fabrication, hot dip galvanize ladder and all mounting hardware in accordance with ASTM

A-123.

3) Length of ladder and mounting details shall be per the Bureau of Water Works' standard vault plans. Ladder length is dependent on size of vault supplied and number of riser sections requested.

4) Clearance between vault floor and bottom of ladder should be a maximum of 12 inches to allow room for sump grate removal.

5) Vault walls shall be drilled and 1/2 inch stainless steel flush shell installed for mounting of ladder. Vendor shall include four each 1/2 - 13 stainless steel bolts.

509.4.05 GRATES

Grate shall be hot dipped galvanized after fabrication in accordance with ASTM A-123.

509.4.06 APPROVED MANUFACTURER

Utility Vault Co and PIPE, INC.