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AMERICAN SAMOA POWER AUTHORITY

MATERIALS SPECIFICATIONS

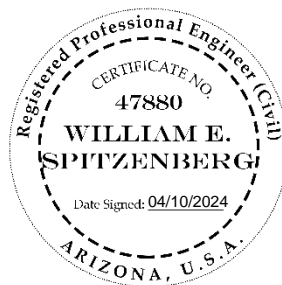
FOR THE

PAGO PAGO HILLSIDE CIP REPLACEMENT PROJECT

DESIGN PHASE

PREPARED BY:

PIOA CONSULTING & ENGINEERING, LLC



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1. SCOPE

The purpose of Material Specifications is to set forth the materials to be used in the construction of facilities which will become the property of ASPA. Any deviation from these standards must be approved by the Engineer.

All Materials in contact with potable water shall conform to the applicable AWWA Standard, and shall be certified by a ANSI accredited organization to be in compliance with NSF/ANSI 61.

2. GENERAL

All Materials shall be new and unused. All materials delivered to the job site shall be adequately housed and protected to ensure the quality of the project.

The Contractor shall furnish, at the request of the Engineer, without additional cost to ASPA, such quantities of construction materials required for test purposes.

ASPA reserves the right to direct or deny use of certain types of materials in specific circumstances.

3. PRE-APPROVED PRODUCTS

Some sections of these specifications list Pre-Approved Products. These products are listed to provide an example of a material or part which ASPA has found to meet the requirements of these specifications. No preference toward a particular brand, series or model is implied by the Pre-Approved Product listing.

4. PIPE

4.1 Brass Pipe

Brass pipe and nipples shall conform to AWWA C800 and these specifications and shall be certified by an ANSI accredited organization to be in compliance with NSF/ANSI 61. Brass parts shall be NO lead content.

Brass pipe shall be suitable for use at pressures not less than 150 psi.

4.1.1 Joints

Joints between brass pipe and adjacent fittings shall be iron pipe threaded. Soldered joints are prohibited.

4.2 Ductile Iron Pipe

Ductile iron pipe shall conform to AWWA C151. The wall thickness of the ductile iron pipe shall be designed in accordance with AWWA C150. The class or nominal thickness, net weight without lining, and casting period shall be clearly marked on each length of pipe. Sticks of ductile iron pipe shall have standard lengths of either 18 feet or 20 feet. Random lengths are not acceptable.

4.2.1 Interior Lining

The interior of ductile iron pipe shall be cement mortar lined and bituminous seal coated in accordance with AWWA C104.

4.2.2 Exterior Coating

The exterior of ductile iron pipe shall have an asphaltic coating conforming to AWWA C151.

4.2.3 Polyethylene Encasement

Polyethylene Encasement for wrapping DI pipe shall conform to AWWA C105. Polyethylene wrap shall be clearly marked ANSI A21.5 / AWWA C105. Polyethylene wrap shall be 10-mil thick and provided from the factory in tube form. Sheets may be allowed at the discretion of the Engineer for encasing appurtenances.

4.2.4 Joints

Joints in DI pipe shall be push-on, mechanical, or flanged rubber gasket joints conforming to AWWA C111. Rubber gaskets and gasket lubricant shall be certified by an ANSI accredited organization to be in compliance with NSF/ANSI 61, and shall not impart taste or odor to water.

Push-on rubber gasket joints shall use the gasket provided by the factory for that particular joint. Swapping gaskets is not allowed.

Mechanical joint glands shall consist of ductile iron conforming to ASTM A536 and shall be protected from corrosion by a quality factory-applied coating. Nuts and bolts for mechanical joints and flanged joints shall either be stainless-steel or protected against corrosion by a field-applied bitumastic coating approved by the Engineer.

4.2.5 Pre-Approved Products

Tyton Joint Pipe as manufactured by U.S. Pipe Mechanical Joint Pipe as manufactured by U.S. Pipe.

4.3 PVC-O Pipe for Main Line

Pipe shall be manufactured from rigid polyvinyl chloride (PVC) compound meeting the requirements of ASTM D1784 cell class 12454. Gaskets shall meet ASTM F477 for high-head applications

Pipe shall be manufactured with cast-iron-pipe outside diameters (CIOD) in all sizes. Pipe walls shall meet minimum thickness requirements for AWWA C909 and CSA B137.3.1.

Pipe shall be joined by means of integral-bell elastomeric-gasket joints conforming to ASTM D3139. Spigot ends shall be chamfered by the manufacturer. Pipe ends shall be capped at the production facility prior to storage and shipping.

Each length of pipe shall be clearly marked with the applicable AWWA Standard, Pressure class, and dimension ratio. Sticks of PVC pipe shall have standard lengths of 20 feet. Random lengths are not acceptable.

Pipe which appears discolored or oxidized, or has gouges deeper than 10% of the wall thickness shall be rejected.

4.3.1 Joints

Joints in pipe shall be push-on rubber gasket joints conforming to AWWA C900 or C905 as applicable. Rubber gaskets and gasket lubricant shall be certified by an ANSI accredited organization to be in compliance with NSF/ANSI 61, and shall not impart taste or odor to water.

Push-on rubber gasket joints shall use the gasket provided by the factory for that particular type of joint. Swapping gaskets is not allowed.

4.3.2 Pre Approved Products

PVC-O pipe as manufactured by IPEX Inc. - BIONAX® PVC-O

5. PVC PIPE: SCHEDULE 80 FOR SERVICE LINE

This specification outlines minimum manufacturing requirements for Polyvinyl Chloride (PVC) Schedule 80 iron pipe size (IPS) pressure pipe. This pipe is intended for use in applications where the fluid conveyed does not exceed 140°F. This pipe meets and or exceeds the industry standards and requirements as set forth by the American Society for Testing and Materials (ASTM) and the National Sanitation Foundation (NSF International).

Corrosion resistant pressure pipe, IPS sizes 1/8" through 24", for use at temperatures up to and including 140°F. Pressure rating (210 psi to 1230 psi) varies with schedule, pipe size, and temperature. Generally resistant to most acids, bases, salts, aliphatic solutions, oxidants, and halogens.

Pipe exhibits excellent physical properties and flammability characteristics (independently tested flame and smoke characteristics-ULC).

This pipe will be used for Potable Water Systems application and must meet all Local and Federal regulations pertaining to potable water applications.

The material used in the manufacture of the pipe shall be domestically produced rigid polyvinyl chloride (PVC) compound, Type I Grade I, with a Cell Classification of 12454 as defined in ASTM D1784, trade name designation H707 PVC. This compound shall be gray in color as specified, and shall be approved by NSF International for use with potable water (NSF Std 61).

PVC Schedule 80 pipe shall be manufactured in strict accordance with the requirements of ASTM D1785 for physical dimensions and tolerances. Each production run of pipe manufactured in compliance to this standard, shall also meet or exceed the test requirements for materials, workmanship, burst pressure, flattening, and extrusion quality defined in ASTM D1785. All belled-end pipes shall have tapered sockets to create an interference-type fit, which meet or exceed the dimensional requirements and the minimum socket length for pressure-type sockets as defined in ASTM D2672. All PVC Schedule 80 pipes must also meet the requirements of NSF Standard 14 and CSA Standard B137.3 rigid PVC pipe for pressure applications, and shall bear the mark of these Listing agencies. This pipe shall have a flame spread

rating of 0-25 when tested for surface burning characteristics in accordance with CAN/ULC-S102-2-M88 or equivalent.

Product marking shall meet the requirements of ASTM D1785 and shall include: the manufacturer's name (or the manufacturer's trademark when privately labeled); the nominal pipe size; the material designation code; the pipe schedule and pressure rating in psi for water @ 73°F; the ASTM designation D1785; the independent laboratory's seal of approval for potable water usage; and the date of manufacturing.

5.1 Pre-Approved Products

PVC SCH 80 Pipe as manufactured by Charlotte Pipe

6. FITTINGS

6.1 PVC Fittings

Injection molded PVC Schedule 80 fittings shall conform to ASTM D 2467. PVC Schedule 80 threaded fittings shall conform to ASTM D 2464.

6.1.1 Pre-Approved Products

PVC SCH 80 fittings as manufactured by Charlotte Pipe

6.2 Bolted Sleeve Couplings (Flex Couplings)

Bolted sleeve couplings (flex couplings) shall conform to AWWA C219 and these specifications. Flex couplings shall consist of a carbon steel or stainless-steel sleeve conforming to the material requirements of AWWA C200 or C220, respectively. The sealing mechanism at each end of the sleeve shall consist of a rubber gasket certified by an ANSI accredited organization to be in compliance with NSF/ANSI 61 and compressed by a stainless or carbon steel compression ring. The Compression ring shall be tensioned by a single nut and bolt which acts perpendicular to the pipe centerline. Sleeves larger than 12 inches may use two nuts and bolts to provide tension. All fasteners and washers shall consist of stainless-steel.

Flex couplings shall provide for a minimum of 8 degrees of pipe deflection. Flex couplings shall have a working pressure of not less than 200 psi.

6.2.1 Interior/Exterior Coating

All non-stainless-steel components of flex couplings shall be protected from corrosion by a fusion-bonded epoxy coating conforming to AWWA C213, or another quality factory-applied coating approved by the Engineer.

6.2.2 Pre-Approved Products

Hymax Couplings as manufactured by Total Piping Solutions, Inc.

6.3 Brass Fittings

Brass fittings shall conform to AWWA C800 and these specifications. Brass fittings shall consist of brass alloy having NO lead content.

Brass fittings shall be suitable for use at pressures not less than 150 psi.

6.3.1 Joints

Joints between brass fittings and copper pipe shall be made with iron pipe thread to CTS grip joint adapters. Joints between brass fittings and brass pipe shall be iron pipe threaded. Soldered joints or flare fittings are prohibited.

6.3.2 Pre-Approved Products

No-lead brass fittings as manufactured by The Ford Meter Box Company, marked "NL"

6.4 Ductile Iron Fitting

Ductile iron fittings shall conform to AWWA C110 or C153, in material, body thickness and radii of curvature with the exception of laying lengths.

6.4.1 Interior Lining

Ductile iron fittings shall be lined with a bituminous seal-coated cement mortar lining conforming to AWWA C104.

6.4.2 Exterior Coating

Ductile iron fittings shall be coated with an asphaltic coating conforming to AWWA C110, or with fusion bonded epoxy conforming to AWWA C116.

6.4.3 Joints

Joints in DI fittings shall be push-on, mechanical or flanged rubber gasket joints conforming to AWWA C111. Rubber gaskets and gasket lubricant shall be certified by an ANSI accredited organization to be in compliance with NSF/ANSI 61 and shall not impart taste or odor to water.

Push-on rubber gasket joints shall use the gasket provided by the factory for that particular joint. Swapping gaskets is not allowed.

DI fitting joints shall include joint restraints conforming to the applicable sections of these specifications.

6.4.4 Pre-Approved Products

AWWA C110 Flanged Fittings as Manufacture by US Pipes

AWWA C153 (Compact) Mechanical Joint Fittings as Manufacture by US Pipes

7. JOINT RESTRAINTS

7.1 Joint Restraints for DI Push-On Joints

Joint restraints for DI pipe push-on joints shall consist of bell restraint harnesses and/or rubber gaskets with embedded locking elements. Joint restraints shall be capable of restraining the thrust force created at two times the rated working pressure of the pipe or fitting to which they are attached.

Bell restraint harnesses for DI push-on joints shall consist of two split-ring harnesses manufactured from ductile iron conforming to ASTM A536. One split-ring harness shall bear upon the back of the pipe bell. The other split-ring harness shall grip the spigot end of the adjacent pipe with individual bolt-tightened wedges. The wedges shall have a Brinell hardness number not less than

370. Wedge-tightening bolts shall be provided from the factory with heads which break away when proper torque is reached. The split-ring harnesses shall be connected and tensioned by threaded rods and nuts. The split-ring harnesses shall be protected against corrosion with a high quality factory-applied coating. Nuts, bolts, and threaded rods shall be either stainless-steel or protected against corrosion with a field-applied bitumastic coating approved by the Engineer.

Locking gaskets shall consist of a rubber gasket conforming to AWWA C111 embedded with stainless-steel toothed gripping elements.

7.1.1 Pre-Approved Products

Series 1700 or 1100HD Bell Restraint Harness as manufactured by EBAA Iron, Inc. Field Lok 350 gaskets as manufactured by U.S. Pipe

7.2 Joint Restraints for Mechanical Joints with DI Pipe

Joint restraints for DI Mechanical Joints with DI pipe shall be capable of restraining the thrust force created at two times the rated working pressure of the pipe or fitting to which they are attached.

Joint restraints for mechanical joints shall consist of a ductile iron mechanical joint gland conforming to ASTM A536. The gland shall conform to AWWA C111 and shall grip the spigot end of the pipe with individual bolt-tightened wedges. The wedges shall have a Brinell hardness number not less than 370. Wedge-tightening bolts shall be factory provided with heads which break away when proper torque is reached. The DI gland shall be protected against corrosion with a high-quality factory applied coating. Nuts and bolts shall be either stainless-steel or protected against corrosion with a field-applied bitumastic coating approved by the Engineer.

7.2.1 Pre-Approved Products

ROMAGRIP as manufactured by Romac Industries

Megalug Series 1100 or 1100SD as manufactured by EBAA Iron, Inc.

7.3 Joint Restraints for Mechanical Joints with PVC Pipe

Joint restraints for DI Mechanical joints with PVC pipe shall meet or exceed the requirements of ASTM F1674.

The gland shall consist of ductile iron conforming to ASTM A536 and shall conform to AWWA C111. Restraint shall be provided by individual bolt-tightened wedges which grip the spigot end of the adjacent pipe. Wedge-tightening bolts shall be factory provided with heads which break away when proper torque is reached. The spacing and number of bolt tightened wedges shall be designed by the manufacturer specifically for type of pipe they will grip. The DI gland shall be protected against corrosion with a high quality factory applied coating. Nuts and bolts shall be either stainless-steel or protected against corrosion with a field-applied bitumastic coating approved by the Engineer.

7.3.1 Pre Approved Products

ROMAGRIP for PVC as manufactured by Romac Industries STARGRIP #4000 as manufactured by Starpipes

EBAA Iron Series 1600.

FORD Meter Series 1390 Uni-Flange Restraint.

7.4 Joint Restraints for PVC Push-On Joints

Joint restraints for PVC pipe push-on joints shall meet or exceed the requirements of ASTM F1674. Joint restraints for PVC pipe push-on joints shall consist of bell restraint harnesses. Bell restraint harnesses for PVC pipe shall consist of two serrated split-ring, harnesses manufactured from ductile iron conforming to ASTM A536. One serrated split-ring harness shall grip the bell end of the pipe behind the bell. The other serrated split-ring harness shall grip the spigot end of the adjacent pipe. The serrated split-ring harnesses shall be tightened onto the pipe barrel with a bolt on either side. The two pipe gripping harnesses shall be connected by threaded rods and nuts. The ductile iron serrated split-ring harnesses shall be protected against corrosion with a quality factory-applied coating. Nuts, bolts and threaded rods shall be either stainless-steel or protected against corrosion with a field applied bitumastic coating approved by the Engineer.

7.4.1 Pre-Approved Products

Series 1600 Bell Restraint Harness as manufactured by EBAA Iron, Inc.

8. VALVES

8.1 Air Release Valves

AWWA C504, rubber seated, iron body, bronze disc, resilient replaceable seat, water or lug ends, ten position lever handle.

Valve Type: Float operated, with operating pressures up to 150 psi

8.1.1 Pre-Approved Products

CRISPIN Air & Vacuum Release Valve AL Series.

Valve Box: Concrete water meter box. Christy B-9 or San Diego.

8.2 Butterfly Valve

8.2.1 Pre-Approved Products

Smith-Cooper Series 0160L Lug Type

8.3 Combination Air/Vacuum Relief Valve

Air/Vacuum valves shall be fully automatic float operated valves designed to exhaust large quantities of air during the filling of a piping system and close upon liquid entry. The valve shall re-open during draining or if a negative pressure occurs.

Valves shall be manufactured and tested in accordance with American Water Works Association (AWWA) Standard C512.

Valves used in potable water service shall be certified to NSF/ANSI 61 Drinking Water System Components - Health Effects.

Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited, certifying body.

Valve sizes 3 in. (76 mm) and smaller shall have full size NPT inlets and outlets equal to the nominal valve size. The body inlet connection shall be hexagonal for a wrench connection.

Valve sizes 4 in. (100 mm) and larger shall have bolted flange inlets with threaded or plain outlets and protective hoods to prevent debris from entering the valve. Flanges shall be in accordance with ANSI B16.1 for Class 125 or Class 250 iron flanges and ANSI B16.5 for Class 150 or Class 300 steel flanges.

The valve shall have two additional NPT connections for the addition of Air Release Valves, gauges, testing, and draining.

The valve body shall provide a through flow area equal to the nominal valve size. A bolted cover with alloy screws and flat gasket shall be provided to allow for maintenance and repair.

Floats shall be unconditionally guaranteed against failure including pressure surges. The float shall have a hexagonal guide shaft supported in the body by circular bushings to prevent binding from debris. The float shall be protected against direct water impact by an internal baffle.

The resilient seat shall provide drop tight shut off to the full valve pressure rating. The seat shall be a minimum of .5 in. (12 mm) thick on 2 in. (50 mm) and larger valves and secured in such a manner as to prevent distortion. Valves with working pressures above 400 psig (2760 kPa) shall have metal seats with synthetic seals.

On valve sizes 4 in. (100 mm) and larger, the cover shall be fitted to the valve body by means of a machined register to maintain concentricity between the top and bottom guide bushings at all times. The float shall be double guided with a guide shaft extending through the float to prevent any contact with the body. A resilient bumper shall be provided to cushion the float during sudden opening conditions.

The valve body, cover, and baffle shall be constructed of ASTM A536 Grade 65-45-12 ductile iron.

The float, guide shafts, and bushings shall be constructed of Type 316 stainless-steel. Non-metallic guides and bushings are not acceptable. Resilient seats shall be Buna-N. Class 300 steel valves shall have a 316 stainless-steel Seat with Buna-N seal to provide an initial contact to Buna-N with final metal to metal contact to prevent over compression of the resilient seal.

An optional Regulated Exhaust Device shall be provided when specified to reduce pressure surges due to column separation or rapid changes in velocity and pressure in the pipeline. The Regulated Exhaust Device shall be mounted on the inlet of the Air/Vacuum Valve, allow free air flow in and out of the valve, close upon rapid air exhaust, and control the air exhaust rate to reduce pressure surges. The device shall have a flanged globe-style body with a center guided disc and seat assembly. The disc shall have threaded holes to provide adjustment of the air exhaust rate through the valve. The holes shall provide for a flow area of 5% of the nominal valve size. The material of the body shall be consistent with the Air/Vacuum Valve. The seat and disc shall be bronze.

A stainless-steel screened outlet shall be provided for outdoor installations.

Valve interiors and exteriors shall be coated with an NSF/ANSI 61 certified fusion bonded epoxy in accordance with AWWA C550 when specified.

Low Durometer seat shall be furnished for low pressure application.

All Air (Release, Vacuum, etc) Valves installed in vaults or flood prone locations shall include an inflow preventer to prevent the introduction of contaminated water through the air valve outlet. The inflow preventer shall allow the admittance and exhausting of air while preventing contaminated water from entering during normal operating conditions. The inflow preventer shall be flow tested by an independent third party to certify performance. The third party shall be an approved testing lab of the American Society of Sanitary Engineers.

The manufacturer shall demonstrate a minimum of five (5) years' experience in the manufacture of air valves. When requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals.

The exterior of the valve shall be coated with a universal alkyd primer.

Air/Vacuum Valves shall include the following accessories: screen, traffic rated enclosure.

8.3.1 Pre-Approved Products

- Air/Vacuum Valves shall be CRISPIN Air

- Vacuum Release Valve AL Series or A.R.I. D-040 series Combination Air

8.4 Gate Valves

Underground main line valves and service valves 4 inches and larger in diameter shall be iron body, resilient seated gate valves conforming to AWWA C509 or C515.

The wedge or “gate” of the valve shall consist of bronze or ductile iron completely encapsulated with sealing rubber. The sealing rubber shall be permanently bonded to the wedge. The waterway of the valve shall have a diameter equal to the nominal diameter of the valve and be smooth, unobstructed, and free of surface irregularities.

The stem stuffing box shall be serviceable with valve fully open and subjected to full rated working pressure.

Valves shall be equipped with a 2-inch square ductile iron operating nut, and the valve shall open when turned to the left (counter-clockwise). Valve stems shall not rise out of the body when the valve is operated. The operating nut shall be securely keyed into the stem at the factory, and shall be capable of withstanding repeated operation to the satisfaction of the Engineer.

All bolts on the valve shall consist of stainless-steel. Valves shall be equipped with o-ring seals at all pressure retaining joints.

Furnish one valve key per contract or delivery order as applicable.

8.4.1 Interior/Exterior Coating

All iron parts except the operating nut shall be coated with fusion bonded epoxy, conforming to AWWA C550 and certified by an ANSI accredited organization to be in compliance with NSF/ANSI 61.

8.4.2 Joints

Valve ends shall be either flanged or restrained mechanical joints conforming to AWWA C111, and pertinent sections of these specifications.

8.4.3 Pre-Approved Products

Resilient Seated Gate Valve as manufactured by the Clow Valve Company

8.5 Corporation Stops

Corporation stops shall be male iron pipe thread by male iron pipe thread.

8.5.1 Pre-Approved Products

No-lead brass corporation stops as manufactured by The Ford Meter Box Company, marked “NL”

8.6 Check Valves

8.6.1 Meter Check Valve

Meter check valves for use with 5/8-inch bypass meters shall consist NO Lead brass, shall be female iron pipe threaded on both ends, and shall be suitable for use at pressures not less than 150 psi.

8.6.2 Pre-Approved Products

Check Valve Model 402BT from Flomatic

8.7 Pressure Reducing Valves

Meter check valves for use with 5/8-inch bypass meters shall consist NO Lead brass, shall be female iron pipe threaded on both ends, and shall be suitable for use at pressures not less than 150 psi.

8.7.1 Pre-Approved Products

CRD-L Direct Acting Pressure Reducing Valve

8.7.2 Pre-Approved Product Specifications & Technical Data

<u>Temperature Range</u>	
Water:	to 140°F (70°C) Max
<u>Materials</u>	
Body and Cover:	Low Lead Bronze
<u>Pressure Ratings</u>	
Maximum Inlet Pressure:	400 psi (25 Bar)
Maximum Differential Pressure:	150 psi (10 Bar)
Minimum Differential Pressure:	14.5 psi
<u>Others</u>	
Diaphragm:	EPDM
Disc:	EPDM
Strainer:	Inline Mesh

8.8 Pressure Sustaining Valves

8.1.1 Pre-Approved Products

Cla-Val 50-90 or 650-90 Pressure Sustaining Valves

9. FIRE HYDRANTS

Fire hydrants shall include a hydrant head, hydrant bury and break-away features conforming to AWWA C503 and these specifications.

Furnish two hydrant wrenches per contract or delivery order as applicable. Furnish two traffic safety flange repair kits including all couplings, flanges, gaskets and connections necessary to replace a broken safety flange.

9.1 Hydrant Head

Hydrant heads shall be all bronze, 6-inch diameter, wet-barrel units. Hydrant heads shall be of the "steamer" variety, having two 2 ½-inch outlets and one 4 ½-inch outlet.

Hydrant outlets shall have National Standard hose threads. Hydrant outlet valves shall be operable by a pentagon shaped nut. Outlets shall be capped. Caps shall consist of either bronze or plastic and shall contain a rubber gasket. Hydrant caps shall have chains attached. All hydrants and caps shall be painted with "Safety Red" enamel.

9.1.1 Pre-Approved Products

2060 as manufactured by the Clow Valve Company. J-3760 as manufactured by James Jones Company.

9.2 Hydrant Bury

The hydrant bury shall consist of ductile iron. The hydrant bury shall be sized so that the face of the flange is 2-4 inches above finished grade. The buried end of the hydrant bury shall be a mechanical joint conforming to AWWA C111. The interior and exterior of the hydrant bury shall be coated with fusion bonded epoxy which conforms to AWWA C116 and is certified by an ANSI accredited organization to be in compliance with NSF/ANSI 61.

9.2.1 Pre-Approved Products

Ductile Iron Hydrant Bury as manufactured by the Clow Valve Company

9.3 Break Away Features

The hydrant head shall be attached to the bury with a break away spool and stainless-steel bolts and nuts. One set of flange bolts shall be hollow break away bolts, having a combined ultimate strength less than the yield strength of the hydrant head or bury.

The breakaway spool shall consist of ductile iron and shall have an ultimate strength less than the yield strength of the hydrant head or bury. The interior of the breakaway spool shall be

coated with fusion bonded epoxy coating which conforms to AWWA C116 and is certified by an ANSI accredited organization to be in compliance with NSF/ANSI 61. The exterior shall be primed and painted with “post international yellow” enamel to match the hydrant.

10. METER

10.1 Electromagnetic Flowmeter

10.1.1 Pre-Approved Products

MJK MagFlux 7200 Electromagnetic Flowmeter MJK297213-150-00

10.1.2 Pre-Approved Product Specifications & Technical Data

Display Unit	
Enclosure rating:	Enclosure rating Dust- and waterproof IP 67, NEMA 6 (when mounted on Converter)
Housing material:	Housing material Polycarbonate, glass-reinforced
Protection lid:	Protection lid Transparent polycarbonate
Display:	Display 1.5" x 2.7" white backlit LCD-display (64 x 128 pixels) with softkeys
Indication:	Indication of flow, flow direction, volume, totalizers, configuration and graph
Clock:	Clock Real-time clock with built-in battery backup
Communication:	Communication MODBUS® RTU-mode 9600 baud 2-wire RS 485,
Interface:	Interface RS 485 for connection to 1 - 4 MagFlux Converters or SCADA system
	Interface USB 1,1 type mini B, Female
Memory:	Memory 256 Kb Flash Memory, 20,000 entries with date, time and value
Temperature range:	Temperature range -5 - 150° F
Converter	
Accuracy:	Accuracy +/- 0.1% of reading

Measuring range:	Min. range = 0 - 0.6 ft / sec.
	Max. range = 0 - 30 ft / sec
Min. liquid conductivity:	≥ 5 mS
Analog output:	One active 4 - 20 mA, galvanically isolated (max. load 800 Ω)
Digital outputs:	One voltage-free electromechanical relay (max. 50 VDC / 1 A)
	One optically isolated MOSFET relay (max. 50 VAC / VDC / 120 mA)
	Programmable for totalizer counter, batch counter, high/low flow, system error, empty pipe and flow direction.
Digital inputs:	One, max. 30 V DC, < 5 VDC = 0 (low), > 10 VDC = 1 (high), pulse length > 100 ms
Communication:	MODBUS® RTU-mode, 9600 baud, 2-wire RS 485, slave-mode
Analog output:	2 years on cable, probe, and ODO sensor cap
Interface:	RS 485 for connection to Display Unit or PLC
Power supply:	24 V AC, 50 / 60 Hz \pm 10 % or
	115 V AC, 50 / 60 Hz \pm 10 % or
	230 V AC, 50 / 60 Hz \pm 10 %
Power consumption:	10 W
Cabinet material:	Polycarbonate, glass-reinforced
Enclosure rating:	NEMA 6X, IP 67
Temperature range:	-5 - 150° F
Weight:	1.0 kg
CE approvals:	EN 61000-6-4:2001, EN 61000-6-2:2001
Connection Box	
Cabinet material:	Polycarbonate, glass-reinforced
Temperature range:	' - 20 ... 200° F

10.2 Water Meter

All new water meters 5/8" – 1" shall be manufactured by the Sensus Corporation using the iPERL model. All water meters 1 1/2" and larger shall be manufactured by the Sensus Corporation using the OMNI model (turbo+, compound and fire line).

10.2.1 Pre-Approved Products

- Sensus iPERL Smart Water Meter 1"
- OMNI+ Turbo (T²) Water Meter 6"

10.2.2 Pre-Approved Products Specifications & Technical Data

iPERL Smart Water Meter

Electromagnetic Flow Measurement System

SPECIFICATIONS

Service	Measurement of potable and reclaim water, and Residential Fire Service (UL 327b). 0-100% humidity. Fully submersible. IP68+ rated.			
Temperature Ranges	Water operating: Ambient air operating: Storage air:	33 °F (0.55 °C) to 80 °F (26.7 °C) -22 °F (-30 °C) to 140 °F (60 °C) -30 °F (-34.4 °C) to 158 °F (70 °C)		
Starting Flow	5/8" (DN 15 mm) size: 0.03 gpm (0.007 m3/h)	5/8" x 3/4" (DN 15x20 mm) size: 0.03 gpm (0.007 m3/h)	3/4" (DN 20 mm) size: 0.03 gpm (0.007 m3/h)	1" (DN 25 mm) size: 0.11 gpm (0.025 m3/h)
Low Flow Range (±3%)	5/8" (DN 15 mm) size: >0.10 gpm (0.025 m3/hr) to <0.18 gpm (0.041 m3/hr)	5/8" x 3/4" (DN 15 mm) size: >0.10 gpm (0.025 m3/hr) to <0.18 gpm (0.041 m3/hr)	3/4" (DN 20 mm) size: >0.10 gpm (0.025 m3/hr) to <0.18 gpm (0.041 m3/hr)	1" (DN 25 mm) size: >0.3 gpm (0.068 m3/hr) to <0.4 gpm (0.09 m3/hr)
Normal Water Operating Flow Range (±1.5%)	5/8" (DN 15 mm) size: 0.18 to 25 gpm (0.04 to 5.7 m3/hr)	5/8" x 3/4" (DN 15x20 mm) size: 0.18 to 35 gpm (0.04 to 8.0 m3/hr)	3/4" (DN 20 mm) size: 0.18 to 35 gpm (0.04 to 8.0 m3/hr)	1" (DN 25 mm) size: 0.4 to 55 gpm (0.09 to 12.5 m3/hr)
Maximum Operating Pressure	5/8", 5/8" x 3/4", and 3/4" size: 200 psi (13.8 bar) 1" size: 175 psi (12.1 bar)			
Measurement Technology	Solid state electromagnetic flow			
Register	Hermetically sealed, 9-digit programmable electronic register			
Capacity	10,000,000 gallons, 1,000,000 cubic feet or 100,000 m3 capacity			
Register Resolution	.01 gallons/imperial gallons, .001 cubic foot, or .0001 m3			
Conformance to Standards	Meets the requirements of NSF 61, Annex G and NSF 372. Exceeds the most current revision of AWWA Standard C-715.			
Materials	External housing - Thermal polymer Flowtube - Composite polymer or a bronze alloy flowtube with a composite polymer internal core		Electrode - Silver/silver chloride Register cover - Hermetically sealed glass	

OMNI+ Turbo (T²) Water Meter

1-1/2", 2", 3", 4", 6", 8" and 10"

SPECIFICATIONS

Service	Measurement of potable and reclaim water. IP68 Rated. Storage temperature: -22 °F (-30 °C) to 155 °F (68.3 °C)	Operating temperatures: Air: -22 °F (-30 °C) to 150°F (65.6 °C) Water: 33 °F (0.6 °C) to 80 °F (26.7 °C)
Operating Range (100% ± 1.5%)	1-1/2": 1.25 - 200 GPM (0.28 - 45 m ³ /hr) 2": 1.5 - 250 GPM (0.34 - 57 m ³ /hr) 3": 2.5 - 650 GPM (0.57 - 148 m ³ /hr) 4": 3 - 1250 GPM (0.68 - 284 m ³ /hr)	6": 4 - 2500 GPM (0.91 - 568 m ³ /hr) 8": 5 - 3500 GPM (1.1 - 795 m ³ /hr) 10": 6 - 5500 GPM (1.4 - 1249 m ³ /hr)
Low flow (95% - 101.5%)	1-1/2": 0.75 GPM (0.17 m ³ /hr) 2": 1.0 GPM (0.23 m ³ /hr) 3": 1.5 GPM (0.34 m ³ /hr) 4": 2.0 GPM (0.45 m ³ /hr)	6": 2.5 GPM (0.57 m ³ /hr) 8": 4 GPM (0.91 m ³ /hr) 10": 5 GPM (1.1 m ³ /hr)
Maximum Continuous Operation	1-1/2": 160 GPM (36 m ³ /hr) 2": 200 GPM (45 m ³ /hr) 3": 500 GPM (114 m ³ /hr) 4": 1000 GPM (227 m ³ /hr)	6": 2000 GPM (454 m ³ /hr) 8": 3500 GPM (795 m ³ /hr) 10": 5500 GPM (1249 m ³ /hr)
Maximum Intermittent Operation	1-1/2": 200 GPM (45 m ³ /hr) 2": 250 GPM (57 m ³ /hr) 3": 650 GPM (148 m ³ /hr) 4": 1250 GPM (284 m ³ /hr)	6": 2500 GPM (568 m ³ /hr) 8": 4700 GPM (1067 m ³ /hr) 10": 7000 GPM (1590 m ³ /hr)
Pressure Loss	1-1/2": 6.9 psi @ 160 GPM (0.48 bar @ 36 m ³ /hr) 2": 7.0 psi @ 200 GPM (0.48 bar @ 45 m ³ /hr) 3": 5.1 psi @ 500 GPM (0.35 bar @ 114 m ³ /hr) 4": 8.7 psi @ 1000 GPM (0.60 bar @ 227 m ³ /hr)	6": 8.2 psi @ 2000 GPM (0.57 bar @ 454 m ³ /hr) 8": 5.1 psi @ 3500 GPM (0.35 bar @ 795 m ³ /hr) 10": 7.2 psi @ 5500 GPM (0.50 bar @ 1249 m ³ /hr)
Maximum Operating Pressure	200 PSI (13.8 bar)	
Flange Connections	U.S. ANSI B16.1 / AWWA Class 125	
Test Ports	NPT	
Register	Fully electronic sealed register with programmable registration (Gal. /Cu.Ft. / Cu. Mtr. / Imp. Gal. / Acre Ft.)	Programmable AMR/AMI reading and pulse outputs Guaranteed 10-year battery life
NSF Approved Materials	Maincase: Coated Ductile Iron Measuring Chamber: Thermoplastic Rotor "Floating Ball": Thermoplastic Radial Bearings: Hybrid Thermoplastic Thrust Bearings: Sapphire/Ceramic Jewel	Magnets: Ceramic Strainer Screen: Stainless Steel Strainer Cover: Coated Ductile Iron Test Plug: Stainless Steel

11. PUMP

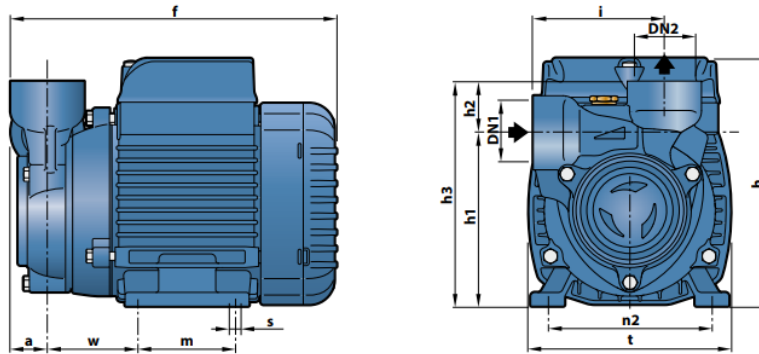
11.1 Residential Pump

11.1.1 Pre-Approved Products

PQm Pedrollo

11.1.2 Pre-Approved Product Specifications & Technical Data

DIMENSIONS AND WEIGHT





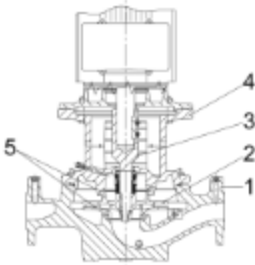
MODEL		PORTS		DIMENSIONS mm												kg	
Single-phase	Three-phase	DN1	DN2	a	f	h	h1	h2	h3	i	m	t	n2	w	s	1~	3~
PQm 60	PQ 60	1"	1"	22	192	145	101	30	131	76	55	118	94-100	53	7	4.8	4.8
PQm 61	PQ 61	½"	½"	21	191			32.5	133.5	75.5						4.9	4.9
PQm 65	PQ 65	1"	1"	22	220	152	113	30	143	78	80	120	100			6.9	6.2
PQm 80	PQ 80				256	181 *	121		151	83	90	142	112	62.5		9.7	9.7
PQm 90	PQ 90	¾"	¾"				126	27	153	84						9.9	8.9
PQm 100	PQ 100			29	322.5	211	140	28	168	88	100	164	125	95	9	14.1	14.0
PQm 200	PQ 200	1"	1"		342.5											15.2	15.2
PQm 300	PQ 300															—	17.8

11.2 Vertical Centrifugal Pump

11.2.1 Pre-Approved Products

Grundfos TP 150-610/4 A-F-B-BAQE-VW4

11.2.2 Pre-Approved Product Specifications & Technical Data

<div>  <div> Company name: Created by: Phone: Date: 27/03/2024 </div> </div>	
Qty.	Description
1	<p>TP 150-610/4 A-F-B-BAQE-VW4</p>  <p>Note! Product picture may differ from actual product</p> <p>Product No.: 97927127</p> <p>Single-stage, close-coupled, volute pump with in-line suction and discharge ports of identical diameter. The pump is of the top-pull-out design, i.e. the power head (motor, pump head and impeller) can be removed for maintenance or service while the pump housing remains in the pipework.</p> <p>The pump is fitted with an unbalanced rubber bellows seal. The shaft seal is according to EN 12756. Pipework connection is via PN 16 DIN flanges (EN 1092-2 and ISO 7005-2).</p> <p>The pump is fitted with a fan-cooled asynchronous motor.</p> <p>The product's minimum efficiency index (MEI) is greater or equal to 0.70. This is by the Commission Regulation (EU) considered as an indicative benchmark for best-performing water pump available on the market as from 1 January 2013.</p> <p>Cast-iron parts have an epoxy-based coating made in a cathodic electro-deposition (CED) process. CED is a high-quality dip-painting process where an electrical field around the products ensures deposition of paint particles as a thin, well-controlled layer on the surface.</p> <p>Pump</p>  <p>1: Pump housing 2: Impeller 3: Stub shaft 4: Pump head/motor stool 5: Wear rings</p> <p>The pump housing is provided with a replaceable brass neck ring to reduce the amount of liquid running from the outlet side of the impeller to the inlet side.</p> <p>The impeller is secured to the shaft with a nut.</p> <p>The pump is fitted with an unbalanced rubber bellows seal with torque transmission across the spring and around the bellows. Due to the bellows, the seal does not wear the shaft, and the axial movement is not prevented by deposits on the shaft.</p> <p>Seal faces:</p> <ul style="list-style-type: none"> Rotating seal ring material: carbon graphite, metal-impregnated Stationary seat material: silicon carbide (SiC) <p>Due to the favourable lubricating properties of carbon graphite, the seal is suitable for use even under poor lubricating conditions, such as hot water.</p>



Company name:

Created by:

Phone:

Date:

27/03/2024

Qty.	Description
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1	<p>However, under such conditions, wear on the carbon graphite face can be expected, and seal life will be reduced .</p> <p>The material pairing is not recommended for liquids containing particles as this will result in wear on the SiC face.</p> <p>Secondary seal material: EPDM (ethylene-propylene rubber)</p> <p>EPDM has excellent resistance to hot water. EPDM is not suitable for mineral oils.</p> <p>A circulation of liquid through the duct of the air vent screw ensures lubrication and cooling of the shaft seal.</p> <p>The flanges have tappings for mounting of pressure gauges.</p> <p>The motor stool forms connection between the pump housing and the motor, and is equipped with a manual air vent screw for venting of the pump housing and the shaft seal chamber. The sealing between motor stool and pump housing is an O-ring.</p> <p>The central part of the motor stool is provided with guards for protection against the shaft and coupling. The pump shaft is fastened directly on the motor shaft with key and set screws.</p>
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Motor

The motor is a totally enclosed, fan-cooled motor with principal dimensions to IEC and DIN standards. Electrical tolerances comply with IEC 60034.

The motor is flange-mounted with free-hole flange (FF).

Motor-mounting designation in accordance with IEC 60034-7: IM B 5, IM V 1 (Code I) / IM 3001, IM 3011 (Code II).

The motor efficiency is classified as IE4 in accordance with IEC 60034-30-1.

The motor has thermistors (PTC sensors) in the windings in accordance with DIN 44081/DIN 44082. The protection reacts to both slow- and quick-rising temperatures, e.g. constant overload and stalled conditions.

Thermal switches must be connected to an external control circuit in a way which ensures that the automatic reset cannot cause accidents. The motors must be connected to a motor-protective circuit breaker according to local regulations.

A variable speed drive makes adjustment of pump performance to any duty point possible. If the motor is to be connected to a variable speed drive, the pump must be ordered with an electrically insulated motor bearing.

Further product details

Cast-iron parts have an epoxy-based coating made in a cathodic electro-deposition (CED) process. CED is a high-quality dip-painting process where an electrical field around the products ensures deposition of paint particles as a thin, well-controlled layer on the surface.

Technical data

Controls:

Frequency converter: None

Liquid:

Pumped liquid: Water

Liquid temperature range: 0 .. 120 °C

Selected liquid temperature: 20 °C

Density: 998.2 kg/m³

Technical:

Pump speed on which pump data are based: 1780 rpm

Rated flow: 339 m³/h

Rated head: 55 m

Actual impeller diameter: 345 mm

Code for shaft seal: BAQE

Curve tolerance: ISO9906:2012 3B

Materials:

Pump housing: Cast iron
EN-GJL-250
ASTM class 35

Impeller: Bronze
CuSn10-C



Company name:
Created by:
Phone:

Date: 27/03/2024

Qty.	Description
1	<p>Installation:</p> <p>Range of ambient temperature: -20 .. 55 °C</p> <p>Maximum operating pressure: 16 bar</p> <p>Max pressure at stated temp: 16 bar / 120 °C</p> <p>Type of connection: DIN</p> <p>Size of connection: DN 150</p> <p>Pressure rating for connection: PN 16</p> <p>Port-to-port length: 1000 mm</p> <p>Flange size for motor: FF500</p> <p>Electrical data:</p> <p>Motor type: SIEMENS</p> <p>Rated power - P2: 75 kW</p> <p>Mains frequency: 60 Hz</p> <p>Rated voltage: 3 x 400/690 V</p> <p>Rated current: 131/76 A</p> <p>Starting current: 1000 %</p> <p>Cos phi - power factor: 0.86</p> <p>Rated speed: 1791 rpm</p> <p>IE efficiency: IE4 96,2%</p> <p>IE Efficiency class: IE4</p> <p>Motor efficiency at full load: 96.2 %</p> <p>Motor efficiency at 3/4 load: 96.3 %</p> <p>Motor efficiency at 1/2 load: 95.9 %</p> <p>Number of poles: 4</p> <p>Enclosure class (IEC 34-5): IP55</p> <p>Insulation class (IEC 85): F</p> <p>Motor No: 92871574</p> <p>Others:</p> <p>Minimum efficiency index, MEI ≥: 0.70</p> <p>Net weight: 966 kg</p> <p>Gross weight: 1010 kg</p> <p>Shipping volume: 1.83 m³</p>

12. TANK

12.1 10,000 Gallon Break Tank

12.1.1 Pre-Approved Products

Synder Industries, Inc. 10,000 Gallon Low Vertical Water Storage Tank 144"D x 161"H

12.1.2 Pre-Approved Product Specifications & Technical Data

Capacity:	10,000 gal
Height:	163 in
Diameter:	144 in
Material:	High Density Polyethylene (HDPE)
Specific Gravity:	1.0 (Water use only)
Lid Size/Type:	24" Vented Manway
Fill Opening:	24"
Top Fitting:	1-1/2" bulkhead fitting (63931)
Bottom Fitting:	2" bulkhead fitting (63683)
Certifications:	NSF/ANSI-61
SKU:	WG100

12.2 528 Gallon Pressure Tank

12.2.1 Pre-Approved Products

Grundfos GT-U-4000 PN 10 DN 65 V

12.2.2 Pre-Approved Product Specifications & Technical Data

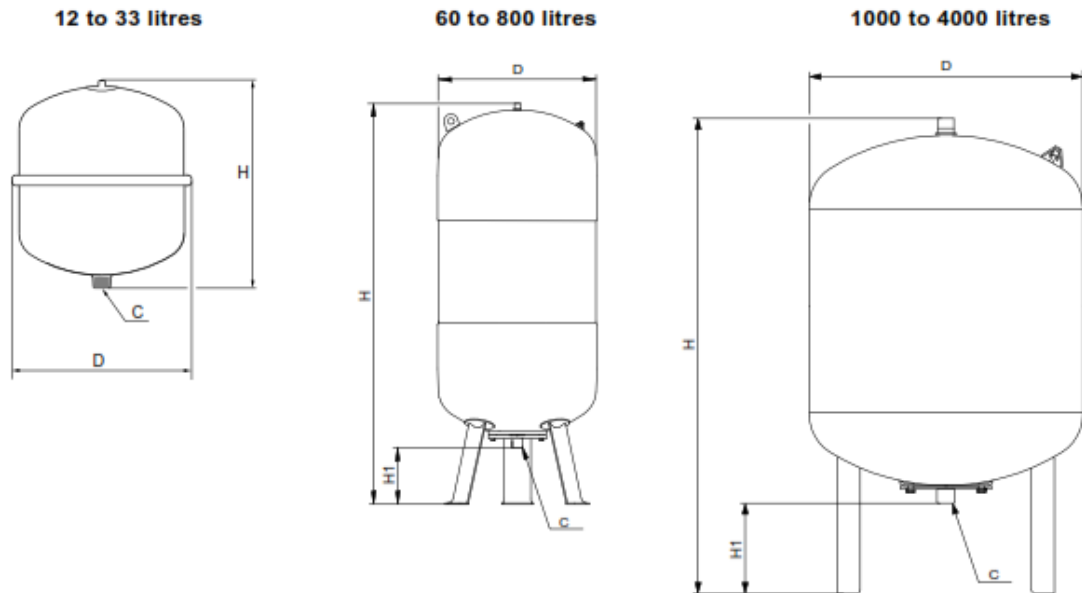
GT-U, 10 bar

Vertical installation.

Maximum pressure: 10 bar.

Precharge pressure: 4 bar.

Dimensions, weights and product numbers



TM03 1681 2809 - TM03 8257 2809 - TM03 8258 0518

Fig. 5 Dimensional sketches

Tank type	Size [l]	Dimensions [mm]				Gross weight [kg]		Replaceable bladder	Product number	
		D	H	H1	C	Stainless-steel flange	Coated flange		Stainless-steel flange	Coated flange
GT-U-12 PN 10 G 3/4 V	12	280	307	-	G 3/4	2.5	-	-	96989120	-
GT-U-25 PN 10 G 3/4 V	25	280	520	-	G 3/4	5.5	-	-	96573253	-
GT-U-33 PN 10 G 3/4 V	33	354	454	-	G 3/4	6.7	-	-	96573254	-
GT-U-60 PN 10 G 1 V	60	409	734	-	G 1	14.3	-	-	96989123	-
GT-U-80 PN 10 G 1 V	80	480	745	153	G 1	26	17	•	96573255	96573266
GT-U-100 PN 10 G 1 V	100	480	750	153	G 1	30	22	•	96573257	96573267
GT-U-200 PN 10 G 1 1/4 V	200	634	967	150	G 1 1/4	50	50	•	96573258	96573268
GT-U-300 PN 10 G 1 1/4 V	300	634	1267	150	G 1 1/4	50	55	•	96573259	96573269
GT-U-400 PN 10 G 1 1/4 V	400	740	1245	139	G 1 1/4	76	76	•	96603444	96603450
GT-U-500 PN 10 G 1 1/4 V	500	740	1475	133	G 1 1/4	85	78	•	96573260	96573280
GT-U-600 PN 10 G 1 1/2 V	600	740	1859	263	G 1 1/2	161	161	•	96603445	96603451
GT-U-800 PN 10 G 1 1/2 V	800	740	2325	263	G 1 1/2	187	200	•	96603446	96603452
GT-U-1000 PN 10 G 1 1/2 V	1000	740	2604	263	G 1 1/2	258	258	•	96603447	96603453
GT-U-1500 PN 10 DN 65 V	1500	1200	1991	286	DN 65	-	535	•	-	96573283
GT-U-2000 PN 10 DN 65 V	2000	1200	2451	291	DN 65	-	710	•	-	96573284
GT-U-3000 PN 10 DN 65 V	3000	1500	2521	320	DN 65	-	1050	•	-	96573285
GT-U-4000 PN 10 DN 65 V	4000	1500	3070	320	DN 65	-	1140	•	-	96603454

Note: For some GT-U tanks, the bladder is available as a spare part. The part number can be found on Grundfos.com (GPC).

13. APPURTENANCES

13.1 Valve Boxes

Two-piece slip style valve box ¼-inch nominal diameter. Length: Sufficient for depth of bury indicated on plans. Cover: Locking with pentagon nut and clearly marked as “water”

13.1.1 Pre-Approved Products

Tyler Pipe 6855 valve box and lid Rich 920 or 925 valve box and lid

13.2 Repair Clamps

Repair clamps shall consist of a stainless-steel band tensioned with stainless-steel nuts and bolts. A watertight seal shall be provided by a waffled mat-type gasket certified by an ANSI accredited organization to be in compliance with NSF/ANSI 61.

13.2.1 Pre-Approved Products

EZ-MAX Repair Clamp as manufactured by Total Piping Solutions, Inc. SS1 – Stainless Seal as manufactured by Romac Industries, Inc.

13.3 Tapping Saddles and Tapping Sleeves

Tapping saddles and sleeves shall conform to AWWA C800 and these specifications.

The subsections below are arranged in hierarchical order. Any tapping saddle or sleeve specified for a particular water main type may also be used on the water main types listed in the sections below it.

13.3.1 Tapping Sleeves for Steel Water Mains

Tapping sleeves used to tap steel water mains shall consist entirely of stainless-steel and utilize all stainless-steel hardware. Tapping sleeves for services smaller than 4 inches shall have female iron pipe threads. Sleeves for services larger than 4 inches shall be flanged in accordance with AWWA C111. A watertight seal against the main shall be provided by a waffled mat-type gasket certified by an ANSI accredited organization to be in compliance with NSF/ANSI 61.

13.3.2 Pre-Approved Products

SST, SSTIII Stainless-steel Tapping Sleeve as manufactured by Romac Industries, Inc. EZ-Tap Plus as manufactured by Total Piping Solutions, Inc.

FAST Tapping Sleeve as manufactured by The Ford Meter Box Company, Inc.

13.3.3 Tapping Saddles for PVC Water Mains

Tapping saddles used to tap PVC water mains shall consist entirely of brass or bronze, and utilize all brass or bronze hardware. Tapping saddles shall have female iron pipe threads of the appropriate size. Tapping saddles shall be

equipped with a single, wide strap which fully encircles the main. The strap shall not be hinged to the tapping saddle, but shall attach with bolts on both sides. Watertight seal against the main shall be provided by a rubber gasket certified by an ANSI accredited organization to be in compliance with NSF/ANSI 61.

13.3.4 Pre-Approved Products

202NS as manufactured by Romac industries

13.3.5 Tapping Saddles for A-C and CI Water Mains

Tapping saddles used to tap A-C and CI water mains shall consist entirely of brass or bronze, and utilize all brass or bronze hardware. Tapping saddles shall have female iron pipe threads of the appropriate size. Tapping saddles shall have dual straps which connect to the saddle on both sides with bolts, and fully encircle the main. Watertight seal against the main shall be provided by a rubber gasket certified by an ANSI accredited organization to be in compliance with NSF/ANSI 61.

13.3.6 Pre-Approved Products

202B as manufactured by The Ford Meter Box Company, Inc.

13.3.7 Tapping Saddles for DI Mains

Tapping saddles used to tap DI mains shall consist entirely of brass or bronze, and utilize all brass or bronze hardware. Tapping saddles shall have female iron pipe threads of the appropriate size. Straps shall not be hinged to the tapping saddle, but shall attach to the saddle on both sides with bolts, and fully encircle the main. Watertight seal against the main shall be provided by a rubber gasket certified by an ANSI accredited organization to be in compliance with NSF/ANSI 61.

13.3.8 Pre-Approved Products

101B as manufactured by The Ford Meter Box Company, Inc.

13.4 Wrapping Tape

Pipe wrapping tape shall be 2" wide 10-mil polyvinyl tape.

13.4.1 Pre-Approved Products

Polyvinyl pipe tape as manufactured by Calpico, Inc.

13.5 Tracer Wire And Box

Provide #10 AWG jacketed solid copper wire, type THHN/THWN. Provide 4-inch Schedule 40 PVC pipe and a 4-inch PVC threaded watertight plug as a box for terminations or junctions of tracer wire. Use underground waterproof splice materials.

13.6 Warning Tape

Supply detectable warning tape that is a minimum of 6 inches wide for maximum 24" depth, blue or striped blue, and have a printing that warns of a water line below.

13.7 Pipeline Marker Posts

Posts: Equal to Carsonite composite utility marker CUM-375, blue color.