



CITY OF MISSOULA

MONTANA

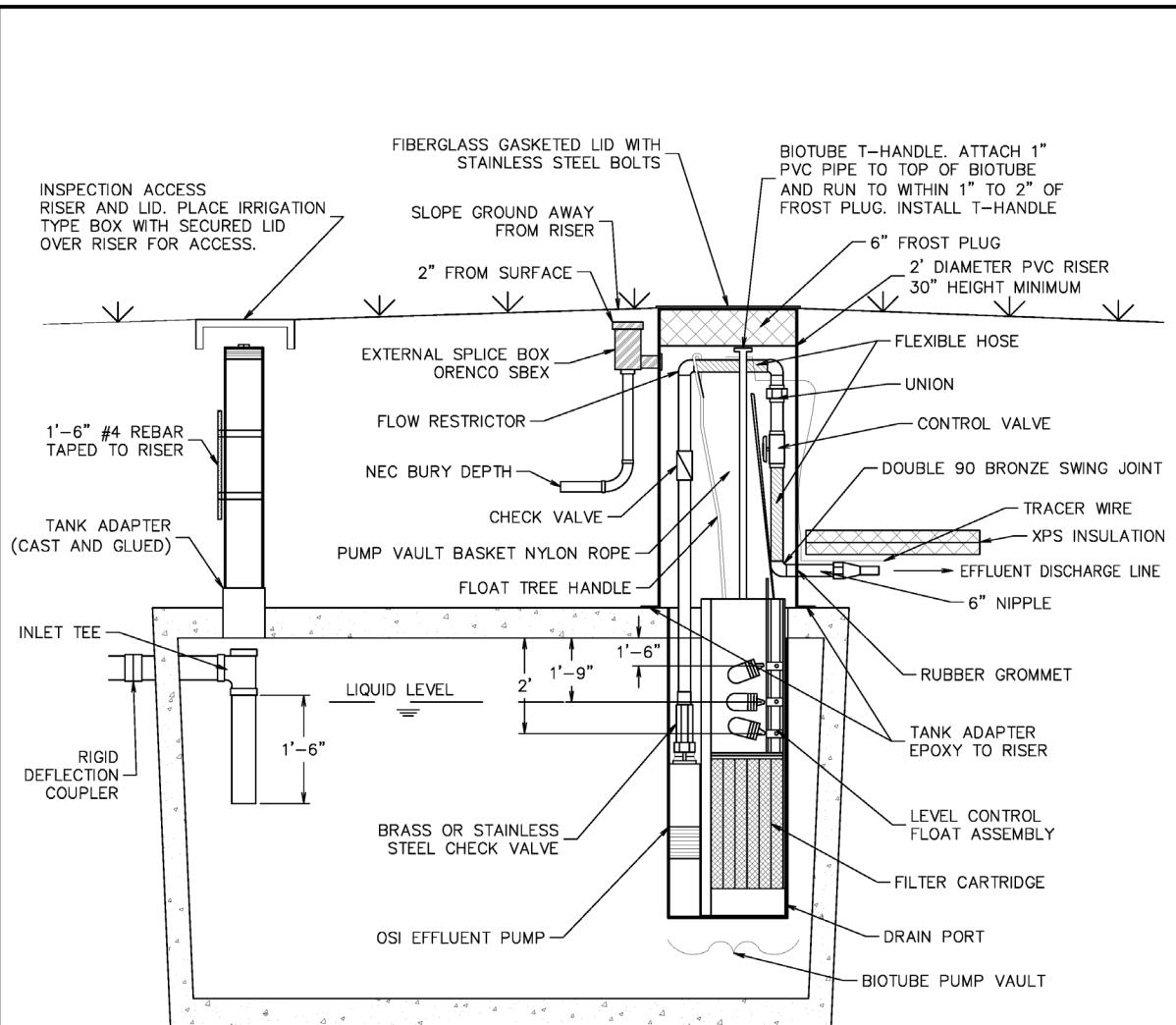
STANDARD INSTALLATION MANUAL

FOR

RESIDENTIAL ON-SITE S.T.E.P. SYSTEM

SANITARY SEWER CONNECTION

SPECIFICATIONS AND DRAWINGS



GENERAL NOTES:

- CONSTRUCTION MATERIALS AND PROCEDURES SHALL COMPLY WITH MONTANA PUBLIC WORKS STANDARD SPECIFICATIONS (MPWSS), 7TH EDITION, APRIL 2021, AS MODIFIED BY THE MISSOULA CITY PUBLIC WORKS STANDARDS AND SPECIFICATIONS MANUAL, APPENDIX 2-A (STANDARD MODIFICATIONS TO MPWSS), CURRENT EDITION.

 MISSOULA City of Missoula Engineering Division	Residential S.T.E.P. Tank		
	 Approved By Utility Project Manager – Ross Mollenhauer, PE	Adopted: 09/28/2020 Revised: 01/01/2023	STD - 540

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I. DEFINITIONS

Service Line, Gravity

The unpressurized wastewater line extending from the residence to the STEP system tank.

Service Line, Pressure

The pressurized wastewater line extending from STEP system to the STEP sewer main.

STEP System

Septic Tank Effluent Pump System

MCPWSS

Missoula City Public Works Standards and Specifications Manual

MPWSS

Montana Public Works Standards and Specifications

II. PURPOSE

This manual has been created for the installation of on-site septic tank effluent pump (STEP) systems for private residence sanitary sewer. STEP systems are permitted for only private residential sewer; other applications will require an Engineers design and City of Missoula approval. This manual is designed for individual residential or duplex structures, installed by private contractors. This information supplements requirements in *Missoula City Public Works Standards and Specifications Manual* (MCPWSS), [Chapter 5, Section 5.3.3](#).

III. FUNCTION

A STEP system is similar to a traditional septic system except that instead of disposing of liquid waste through a leach field, liquid waste is pumped to a STEP sewer main. Sewage is conveyed from the private residence to the STEP tank by gravity. The STEP tank separates and retains solid waste while liquid waste is pumped to a STEP sewer main. Solid waste is periodically pumped from the tank as part of regular maintenance.

IV. SERVICE LINES

All pipe shall be clearly marked on the outside showing manufacturer's name, pipe size, ASTM standard, strength class or thickness, and type.

1. Gravity

A. Pipe Material

Gravity service lines, fittings, and appurtenances connecting the new STEP tank to the existing building sewer pipe or to primary tanks shall be installed in accordance with MCPWSS, [Chapter 5, Section 5.3.3](#).

B. Fittings

Fittings, and appurtenances connecting the new STEP tank to the existing building sewer service line(s) shall be installed in accordance with the MCPWSS, [Chapter 5, Section 5.3.3](#).

C. Cleanouts

Gravity cleanouts shall be installed in new gravity service lines in accordance with current City of Missoula and Uniform Plumbing Code standards. See City of Missoula [Standard Drawing 521](#).

2. Pressure

A. Pipe Material

Pressure service lines shall be installed between the STEP system and the sewer main. The contractor shall use polyethylene pipe. The sewer pressure service line shall be 1-inch AWWA C901-17 Iron Pipe Size 250 PSI polyethylene pipe. See City of Missoula [Standard Drawing 539](#).

B. Fittings

Materials in contact with sewage effluent shall be made from copper alloy Number C83600 in accordance with the chemical and mechanical requirements of ASTM B62 or ASTM B584. This alloy contains nominally 85% copper and 5% each tin, lead, and zinc. The fittings shall be "Insta-Tite" H 15426 by Mueller or approved equal. The fittings shall be installed per manufacturer's recommendations.

C. Tracer Wire

Trace wire shall be installed per MCPWSS [Chapter 5, Section 5.3.2.A.4](#)

D. Warning Tape

A continuous ribbon of marking tape shall be placed in the trench 12 inches (plus or minus 3 inches) below the surface. The marking tape shall be placed in all trenches. Warning tape shall meet the requirements of the City of Missoula's Standard Modifications to MPWSS [Section 02221, Section 2.4.A.](#)

E. Testing

All sewer pressure service lines shall be subjected to a hydrostatic or air pressure test. The hydrostatic or air test pressure shall be 100 psi. There shall be no allowable loss for leakage from 1-inch pipe. There shall be no pressure loss over a 15-minute test period.

Service line from the force main to curb stop shall be tested if it is a new installation that has not been previously tested.

Service line from the curb stop to STEP tank shall be tested by closing the curb stop and pressurizing the sewer pressure service line to the test pressure.

Whenever it is necessary to replace defective material or correct workmanship, the hydrostatic or air test shall be reconducted until a satisfactory test is obtained.

3. Trench and Bedding

Service line bedding shall be installed in accordance with the MCPWSS, [Chapter 5, Section 5.3.3.](#)

Two or more pressure service lines may be installed in a common trench. The Inspector will review the placement of the sewer service saddles or tees and the alignment of the sewer pressure service line.

Sewer pressure service line burial depth shall be a minimum of 60 inches cover over the top of the pipe, except under driveways, parking areas, and sidewalks, where a minimum of 72 inches is required

4. Boring

Boring must be approved by the City of Missoula Engineer or his/her designated agent. The routing of the service line shall be reviewed prior to approval. Bores shall satisfy trenching burial depth requirements. The pipe material can be either SCH 40 PVC or HDPE class 250 and must have tracer wire.

V. VALVES, SADDLES, AND MISCELLANEOUS MATERIALS

1. Corporation Stops

Corporation stops shall be installed for sewer pressure service lines. Corporation stops shall be Mueller 300 Series Ball Valves, Ford FB400 Series, or approved equal with iron pipe size inlet, iron pipe size outlet, and shall be 1 inch minimum.

2. Check Valves

Check valves shall be installed on sewer pressure service lines and at other locations shown on drawings. Check valves shall be bronze, or PVC swing check valves designed for use with corrosive fluids and shall have a Buna-N Seal on a swing gate, which lifts to allow for full-unobstructed flow. The PVC material shall be Type 1 (NSF). It shall have a working pressure of 150 psi and shall require only $\frac{1}{2}$ psi backpressure for complete closure. It shall be as manufactured by KBI, or approved equal. Check valves shall be installed level and straight.

3. Curb Stops

Curb stops for buried curb valves shall be Mueller 300 Series Ball Valve, Ford B Series, or approved equal.

Curb box risers shall be extension type, stationary rod, Minneapolis pattern, 1-1/4-inch diameter and shall be Mueller H-10302 or approved equal and shall say "Sewer." Curb box lids must have cast iron plugs. No plastic or brass plugs will be allowed. Tracer wire shall be looped loosely over the curb box. The box shall be final set so that the top of the box is at finished ground elevation.

4. Saddles

Tapping saddles shall be installed for sewer service connections to STEP force mains. Saddles shall be band-type designed for use on PVC pipe. The material shall be grade 304 stainless steel for the shell, bolts, washers, nuts, and iron pipe size tapped outlet. Gaskets shall be NBR compounded rubber complying with ASTM D 2000 MBC 610. Saddles shall be Romac Style 306 or approved equal. Fittings and appurtenances to be buried shall be designed for direct burial applications

5. Traffic Lid

Traffic-bearing lids shall be installed where exposed to vehicular traffic and in locations designated by the Inspector. Traffic-bearing lids and rings shall be USF 1310 Ring and AE Cover or equal for 24-inch risers. Traffic-bearing lids and rings shall be USF 7621 ring and cover or equal for the 6-inch riser. Lids shall be labeled "Sewer." In areas not exposed to vehicular traffic, lids shall be according to [Section VI.C.2.](#) of this appendix.

VI. PUMP ASSEMBLIES

This section covers the furnishing and installation of the effluent pump assemblies, including pumps, motors, pump vaults, risers, and appurtenant work. Orenco Systems shall manufacture all pump assemblies.

1. Warranty on Effluent Pumps and Motors

All effluent pumps and motors shall have a 5-year manufacturer's warranty. Defects discovered during the first year of the manufacturer's warranty will be corrected by the Contractor. Defects discovered during the final 4 years of the manufacturer's warranty will be administered by the City of Missoula. Pump warranty shall begin on date of acceptance by the Inspector.

2. Materials

A. Simplex pumps for typical 1,000- and 1,500-gallon STEP tanks

The effluent pumps shall be Orenco Systems, Inc., Effluent Pump, submersible turbine type capable of delivering 10 gpm against total discharge head of 165 feet or equivalent. Pumps will be provided with an orifice installed in the discharge piping to restrict flow to a maximum of 9 gpm over any head condition. Pumps shall be furnished with a brass or stainless-steel check valve in the discharge head.

Pumps shall be stainless steel. All wetted fasteners shall be 300-series stainless steel. Pumps shall be listed by an approved testing laboratory such as UL or CSA for use as effluent pump.

Motors shall be two wire, single phase, submersible motors. Motors shall be $\frac{1}{2}$ HP, 115 volt, 60 HZ. Motor shall be thermally protected with an automatic-reset feature. Motors shall be equipped with built in lightning arrestors.

All pump motors shall be supplied with cables 20 feet in length and no splices. The cables shall be heavy duty, extra hard usage, rubber insulated, oil-resistant neoprene, and water-resistant jackets. The cables shall not be shortened during installation. Power cable motor-end termination shall be epoxy-sealed to prevent oil-wicking, or liquid intrusion from the outside in case of damage to the jacketing and insulation. Cable shall be rated for NEC Severe Service "S." Cable sealing/strain relief shall consist of a corrosion-resistant gland nut, washer, and Buna-N packing.

B. Pump Vault

Pump vaults shall be internal type as shown on the City of Missoula Standard Drawing 540, and shall be removable for access into the STEP tank for septage pumping. All tanks shall have a 3/8-inch polyurethane rope attached to the vault around lifting handles. The rope shall be long enough so that the loop reaches the top of the riser when extended upwards. The pump vault shall be of sufficient size and structural integrity to house and support the pumping equipment necessary for transportation of effluent. The pump vault shall conform to current City of Missoula standards and practices. The pump vault and appurtenances shall be protected from solids larger than 1/8 inch.

C. Risers

Risers shall be required for access to internal vaults, equipment, and access into the STEP tanks for septage pumping. Orenco Systems, Inc or equivalent shall provide the risers. All risers shall be constructed of ribbed PVC, fiberglass, and shall be water and gas tight constructed. Risers shall be the diameter as shown on City of Missoula Standard Drawing 540, and shall be of uniform diameter to allow removal of internal vaults without removing splice boxes, etc. All risers shall be a minimum length of 30 inches and shall vary depending on the burial depth of tanks. Risers shall be attached to the tanks such that a watertight seal is provided. Epoxy required to adhere the PVC risers to concrete shall be a two-part epoxy as supplied by the manufacturer or equivalent manufacturer approved epoxy. Risers may have one spliced joint. The spliced joint shall not be located in the top 30 inches of the riser. Orenco Systems, Inc. PVC splice rings supplied by the manufacturer shall make the splice. The insert ring shall be joined to both sections of riser with a two-part epoxy supplied by the manufacturer or manufacturer approved epoxy for the riser. The joints shall be made per the manufacturer's recommendations, and shall be watertight.

Risers shall be insulated with insulation plugs, Orenco Systems Inc. model INS 246 or approved equal. Neoprene grommets shall be installed for discharge piping and electrical conduit to assure a watertight seal.

The lid shall be a flat fiberglass, green in color, with a non-skid aggregate finish. The lid shall be the diameter required to fit the riser and shall be supplied with a minimum of two stainless steel bolts. All STEP tank risers are required to have an insulation plug.

D. Discharge Piping

Discharge piping will consist of a Orenco Systems, Inc. hose and valve assembly or approved equal. The 1-inch discharge piping shall include a ball valve, check valve, Spears SCH 80 quick disconnect union, flow control disk ¼ inch, high pressure (250 psi) PVC hose, internal flexible hose, two 90-degree bronze swing joints, and bronze or stainless steel nipple. An anti-siphon valve shall be required when STEP pump elevation equals or exceeds STEP force main elevation or when required by inspector.

E. Installation

Electrical work and controls shall conform to the National Electrical Code and be inspected by the City of Missoula Electrical Inspector in accordance with the STEP electrical permit.

The slope of finished grade away from the top of risers located in unpaved areas shall be one inch in four feet. The top of the riser lid shall be flush with finished grade. When installed on a slope the riser lid shall be set flush with the uphill side.

F. Final Acceptance

The Contractor shall test each pump assembly. All pumps, switches, alarms, controls and appurtenant work shall be checked for proper operation. This test shall be done in the presence of the Inspector and clean water shall be used for all tests. The Contractor shall test the operation of the STEP tank and

assembly by raising the water level to active the high-level float alarm. The contractor shall then start the pump and pump the tank water down to the off switch. They shall then override the off switch and pump down to the redundant off switch. The tank shall then be refilled with water to the level of the on switch and pumped down to the off switch.

The start and test shall be completed prior to taking the existing sewer system out of service. All deficiencies shall be corrected.

Upon completion of installation and approved electrical inspection, Contractor shall request a final acceptance test from the City of Missoula Utility Inspector. The City of Missoula Utility Inspector will coordinate with Wastewater Collections staff and the installation contractor to meet on site to ensure proper operation for all pumps, switches, alarms, controls, and appurtenant work. Contractor warranty period shall commence on the date of final acceptance of STEP system. Contractor warranty shall be 1 year for the STEP system and appurtenances; Contractor warranty shall be 2 years for work performed in the right of way.

VII. STEP TANKS

This section covers the furnishing and installation of the tanks for the STEP system.

1. Materials

STEP tanks shall be precast concrete conforming to the requirements of DEQ Circular 4 Section 5.1.7.1. Manufacturers currently producing STEP system tanks conforming to City of Missoula standards include Hunton Pre-Cast Concrete, Inc. in Missoula, Montana.

All installation in vehicle traffic areas, such as driveways and parking lots require a load distribution slab according to the requirements of [Section VII.3.A.](#) of this appendix. Tanks for single-family residences shall be 1,000-gallon size. Tanks for duplexes shall be 1,500-gallon size.

2. Shared Systems

A duplex or two adjacent townhouses may share a single 1,500-gallon STEP system if the conditions of Missoula City PWSSM Chapter 5 Section 5.3.5 are met. Tanks for larger units or commercial units shall be designed by a Montana Licensed Professional Engineer on an individual basis and approved by the City.

STEP tanks shall be designed to accept the pump assemblies and screened vaults. Tanks shall be structurally sound and watertight, have tank manufacturer identification, and shall have a 6-year manufacturer's warranty certificate furnished to the Inspector at the time of installation. Tank warranty shall not limit liability to replacement cost of the tanks. The Contractor shall be responsible to correct any defects discovered during the first year of the manufacturer's warranty. Defects discovered during the final five years of the manufacturer's warranty will be administered by the City of Missoula. Tank warranty shall begin on the date of acceptance by the Inspector.

All tanks shall have a serial number and shall be clearly marked to show size, class, date of manufacture, and the words, "City of Missoula STEP Tank".

3. Installation

A. Tank

The tank shall be located a minimum of 10 feet from any building foundation or permanent structure. The Contractor shall be responsible for setting tank grade as determined by specifications and requirements for depth of tank cover and minimum gravity pipe slope.

Tanks installed in vehicle traffic areas (such as alleys, driveways, and parking lots) shall be overlain by a load distributing slab. The slab shall be cast-in-place reinforced concrete. The slab shall be centered over the tank and shall extend 1 foot horizontally beyond the tank footprint. At a minimum, the slab shall be a uniform 6 inches thickness with #5 rebar spaced six inches on center, each direction, centered in the slab. Minimum rebar cover shall be 3 inches. Slab edges shall have an additional #5 rebar running the length of each edge with bar center 3 inches from slab edge. Minimum concrete compressive strength shall be 4,500 psi. Deviations from the minimum slab requirements may be allowed if stamped by a Montana Licensed Professional Engineer and meeting HS-20 requirements. Traffic lids furnished in accordance with Section V.5 shall be cast into the slab.

All tank installations, which involve interruption of sewer service, shall be installed as follows:

1. The tank will be installed and tested for exfiltration.
2. Once the electrical portion of the project has been approved, connected and the pump assembly is in operation, the existing sewer may be connected to the STEP tank.

Tanks shall be installed on a level base of bedding material at thickness specified by tank manufacturer. The bedding material base shall be installed on undisturbed original subsoil. All unauthorized excavation below the bedding material shall be replaced with 2-½ inch minus drain rock. Tank bedding material shall be as specified in the MCPWSS [Chapter 5, Section 5.3.1.F.2](#). The tank manufacturer's requirement for bedding gradation and placement may be more stringent. If so, the manufacturer's requirements shall be followed.

B. Leakage Tests

All tanks shall be subjected to field leakage tests. The Contractor shall notify the city at least 24 hours prior to the field leakage test. The Inspector shall witness all field leakage tests. The Inspector may reject any tank that fails the leakage test. When leakage occurs, the Inspector will re-inspect and test the tank after the approved repair method has been done. Clean water for testing shall be furnished by the Contractor.

After the tank has been set, testing may commence. Tanks shall be tested in accordance with [DEQ Circular 4 Section 5.1.7.1](#). "Holds water" shall be defined as no measurable loss over a 2-hour period. Prior to the test, the tank shall be completely filled with water so that water extends 6 inches into the riser. The Contractor shall allow a 24-hour soak time for tank walls to absorb water. After soak time is complete and immediately prior to the leak test, the Contractor shall replace any lost water so that water in the riser is six inches over top of the tank. The test will be conclusive, and failure will necessitate a re-inspection. The test will be conducted using clean domestic water only. No domestic sewage effluent shall be allowed in the tank until after the final acceptance of the system has been performed and approved in the presence of the Inspector.

4. Removal of Septic Tanks, Seepage Pits, or Cesspools

Septic tanks, seepage pits and cesspools shall be removed in accordance with the Uniform Plumbing Code and this document.

Every septic tank, seepage pit, or cesspool which has been abandoned, decommissioned, or to which no waste is connected by a plumbing fixture shall be pumped and completely filled with earth, sand, gravel, concrete, or other approved material. Alternatively, septic tanks, seepage pits, or cesspools may be removed by the contractor. Septic tanks, seepage pits and cesspools that are removed shall be pumped, exposed, demolished, and then all saturated soil, concrete rings, and other associated materials removed and disposed of by the contractor. The excavation shall be backfilled to grade and compacted to 95% theoretical maximum proctor density per ASTM D698. Excavation for removal of existing septic tanks, seepage pits or cesspools which results

in excavation below the foundation of new tanks or new pipe shall be replaced to the level of the tank or pipe bedding material with soil backfill compacted to 95% theoretical maximum proctor density per ASTM D698. Up to a two-foot thickness of 2-½ inch minus drain rock may be used as backfill material.

In locations where removal of the existing tank, seepage pit, or cesspool causes an interruption of sewage flow from a property, the Contractor shall provide temporary sewer service by pumping or bypassing the existing flow. The temporary system shall remain in service until the new STEP system for the property is in service.

VIII. INSULATION

Insulation shall be in accordance with Missoula City PWSSM, [Chapter 5, Sections 5.3.1, 5.3.3, and 5.3.6](#); City of Missoula Standard Modifications to MPWSS [Section 02724](#); and City of Missoula [Standard Drawing 539](#) and [Standard Drawing 540](#).

IX. ELECTRICAL

This section covers basic electrical requirements including metal conduit, nonmetal conduit, fittings and conduit bodies, building wire, control cable, wiring connectors and connections, pull and junction boxes, equipment grounding conductors, bonding, electrical connections to pump equipment and controls, conduit and equipment supports, non-fused knife switch disconnects, anchors and fasteners, nameplates and labels, level control and alarm floats and pump control, alarm panels, and seal offs. All items shall be installed in accordance with the National Electrical Code and state and municipal codes. All items shall be inspected and approved by the Building Division Electrical Inspector for the City of Missoula. All products shall be installed in accordance with manufacturer's instructions and Underwriters Laboratories listed requirements.

1. Materials and Installation

Materials shall be as specified herein or shown on the drawings. All materials shall conform to the City of Missoula current standard, National Electric Code, and shall be listed and classified by Underwriters Laboratories, Inc.

A. Metal Conduit

Rigid steel conduit: ANSI C80.1. Fittings and Conduit Bodies: ANSI/NEMA FB 1; all steel fittings.

B. Electrical Metallic Tubing

ANSI C80.3; galvanized tubing. Fittings and Conduit Bodies: ANSI/NEMA FB1; steel, compression type.

C. Nonmetallic Conduit

NEMA TC 2; Schedule 40 PVC. Fittings and Conduit Bodies: NEMA TC 3 with seal offs, type EY for vertical applications, with EYC sealing compound or Chico compound, and installed below Control Panel and 18 inches above finished grade.

D. Building Wire

Single conductor insulated wire, copper, rated 600 volts. Insulation, ANSI/NFPA 70, Type THHN/THWN.

E. Multiconductor Cable

Seven conductor, 600V power and control cable rated for direct burial, copper. Insulation, conductors: THHN/THWN. Cable: PVC jacket. The following wire color coding shall be used to wire the Orenco control panel: Black, Orange, Red, Blue, Yellow, Brown, Red w/ Black Dash. Neutral and ground conductors shall be identified in field with color tape at all terminations and splices.

F. Junction Boxes

External PVC Junction Box shall be mounted on riser in accordance with manufacturer recommendations. Water, extra wires, or wire nuts shall not be permitted in junction boxes. Cord grips shall be secured. Junction box shall be complete with four cord grips for 3 floats and a pump. Connections in junction boxes shall be stranded wire only and connected with Parts Master step down crimp and shrink pre-insulated heat shrinkable butt connectors or approved equal.

G. Disconnect and Control Panel

A non-fused knife switch disconnect that can be locked into energized and non-energized position shall be installed between the main meter box and the control panel. The non-fused knife switch disconnect shall be mounted a minimum of 42 inches and maximum 60 inches above finish grade. Disconnect shall be within 6 feet of control panel and visible from control panel. Proper fittings shall be used to connect control panel and disconnect to conduit; caulking or silicone will not be accepted. Neutral shall not be broken in disconnect. Disconnect and control panel shall be installed such that no obstructions prevent the boxes from being easily accessed and fully opened. The control panel and disconnect shall be supplied with a padlock and key set, keyed alike with a common key, provided by the City of Missoula, and shall be the property of the City of Missoula.

Control panels shall have a provision for a field installed elapsed time meter and event counter kit, stainless steel latch, internal 120-volt circuit breaker sized and rated for pump served, and control circuit fuse and disconnect sized per manufacturer requirements. Both the pump circuit breaker and control circuit fuse shall be rated for 10,000 AMP interrupt current. Elapsed time meter and even counter kits must be obtained separately for individual control panel. Place wire diagram, with wire size and placement in control panel. Use only 1 wire per lug on bar. Provide bonding to meet regulatory requirements. Equipment grounding conductor: provided separate, insulated conductor within each unit. Terminate each end on suitable lugs, bus, or bushing. Inspect grounding and bonding system conductors and connections for tightness and proper installation. The control panel shall be installed on a permanent structure in a protected location using a fastening device of sufficient size and length to securely fasten the panel.

H. Wiring Connectors, Grounding Lugs and Tap/Splice Fittings

Electrical connections shall be in accordance with equipment manufacturer's instructions. Provide suitable strain-relief clamps and fittings for cord connections that are UL approved for wire size and purpose intended. Butt connectors shall be Partsmaster 20366650 step down crimp and shrink, and 16-20 to 12-14 AWG and 29366655 step down crimp and shrink 14-16 to 10-12 or approved equivalent. Use correct crimping tool.

I. Meter Main

Provide a 125A or 200A continuous duty, combination meter and main circuit breaker for 120/240V, single phase, three-wire service. Provide overhead or underground feed as required, meeting Northwestern Energy current specifications, and sized to match existing service. Breakers shall be identified as "Sewer" and shall have matching locks, installed by electrician, on STEP sewer breakers.

J. Miscellaneous Supporting Devices

Provide materials, sizes and type of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.

K. Underground Warning Tape

Provide 3-inch-wide underground warning tape marked "Caution Buried Electrical Line Below" with black letters on a red background. Ensure it is installed 6 to 8 inches below finished grade. Install conduit or cable at correct trench depth with conduit 90-degree down-sweep directly out of junction box to meet

18-inch code. Ensure a 24-inch trench depth for sewer cable and include red identifying/warning tape. Sewer cable application to have approved compression sealed fitting (such as Huston Wire & Cable BICC 424-UNO2 Cable Seal) to prevent vapors, gases, or liquids.

L. Level Control & Alarm Floats

Float assembly shall be Orenco float assembly with City of Missoula approved Orenco splice box or approved equal. Float assembly shall be complete with high water alarm float, on/off float, redundant off and low level float, all cord assemblies and wire markers.

All pump vaults shall have a single PVC float assembly with floats positioned to provide space for the floats to operate without interference between floats. All floats shall be rated 120V, 13 amps maximum pump running current, 85 amps locked rotor, $\frac{1}{2}$ h.p. All floats shall be classified for Class I Division II locations. All floats shall be supplied with 17-foot-long cords with no splices and shall not be shortened during installation. Do not splice or shorten 20-foot-long pump cords during installation.

M. Pump Control and Alarm Panels

Tanks

For 1,000-gallon and 1,500-gallon STEP tanks, use Orenco Simplex Pump control panel or approved equal. The alarm activates the high liquid level alarm light and buzzer. The buzzer may be silenced by pressing the illuminated “Push To Silence” button on the front of the control panel. The alarm light will remain on until the high level condition is corrected.

On/Off Float

Energizes the motor contactor, which switches on the power to the pump. The float is in the up position when this occurs. De-energizes the motor contactor, which switches off the power to the pump. The float is in the down position when this occurs.

Redundant Off and Low Level Alarm

Switches off the power to the pump. This also activates the alarm light and buzzer. The float is in the down position when this occurs.

N. Conductors

Use conductors not smaller than 10 AWG for power circuit with single pole 30 AMP circuit breaker and 12 AWG for control circuits. Use stranded conductors or multiconductor cable. 30 AMP breaker shall be identified as Sewer and shall have matching lock, installed by electrician, on STEP sewer breaker. Pull all conductors into raceway at the same time using suitable wire pulling lubricant for cable assemblies. Cable shall be protected from damage at all times. Use suitable cable fittings and connectors. Clean conductor surfaces before installing lugs and connectors. Make splices, taps and terminations to carry full ampacity of conductors with not perceptible temperature rise. Tape uninsulated conductors and connector with electrical tape to 150% of insulation rating of conductor. Inspect wire and cable for physical damage and proper connection. Verify continuity of each circuit conductor.

DIRECT BURY (Sewer Cable)
12 AWG Conductor Cable Color Coding and Labeling

Wire Color Terminal Connection in Orenco Panel

Black.....	1
-----	2
Orange.....	3
Red	4
Blue	5
Yellow.....	6
Brown.....	7 ¹
Red w/Black Dash	Ground Lug ²

NOTES

¹Apply white tape at all terminations.

²Apply green tape at all terminations.

CONDUIT
12 AWG Conductor Cable Color Coding and Labeling

Wire Color Terminal Connection in Orenco Panel

Black.....	1
-----	2
Orange.....	3
Red	4
Blue	5
Yellow.....	6
Brown.....	7 ¹
Green	Ground Lug ²

NOTES

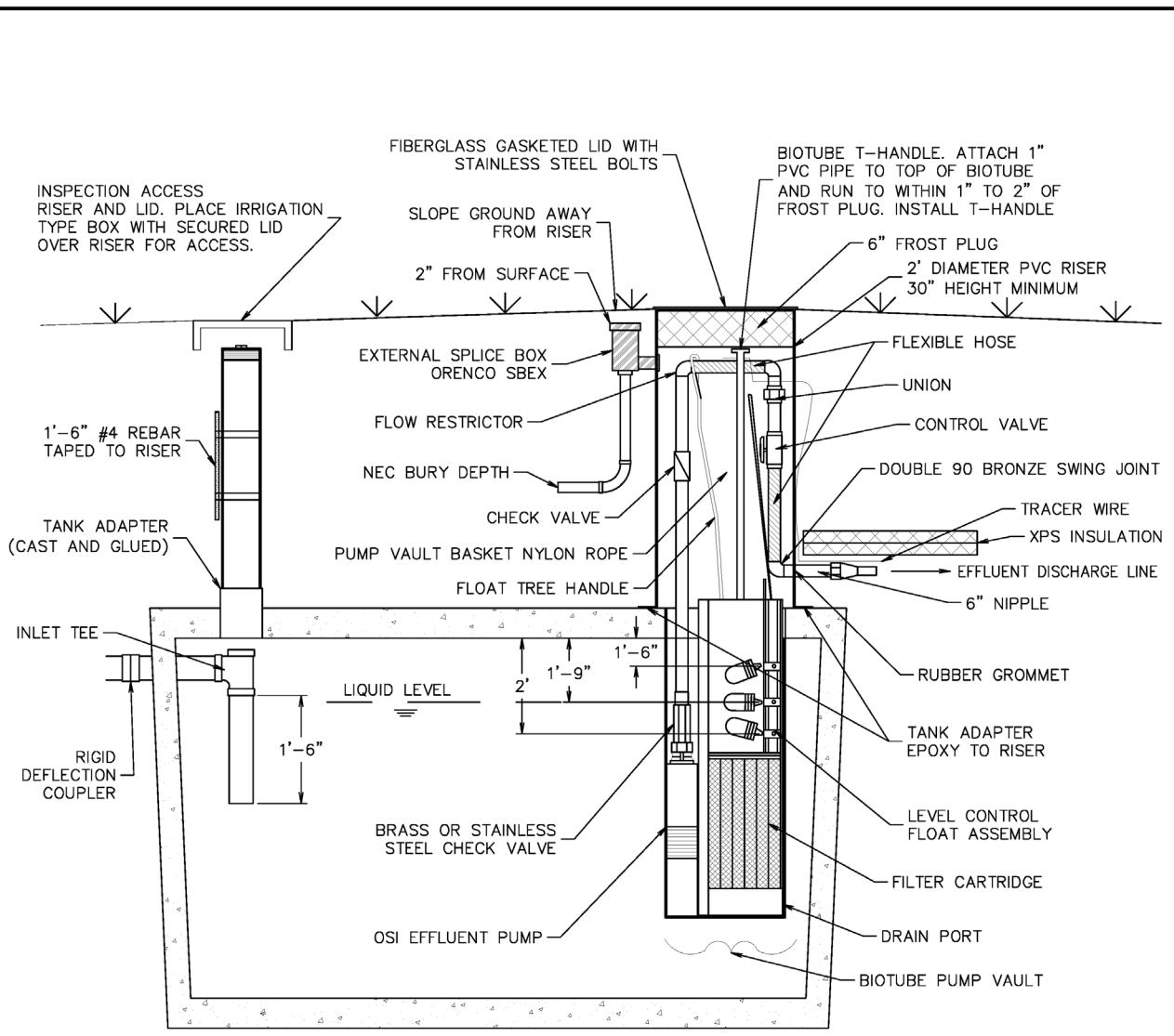
¹Apply white tape at all terminations.

²Apply green tape at all terminations.

X. PART III - DRAWINGS

Please note that full-sized versions of the following standard drawing as well as additional drawings are available online on the [MCPWSS Standard Drawings](#) web page.

1. Standard Drawing 540 Residential STEP Tank

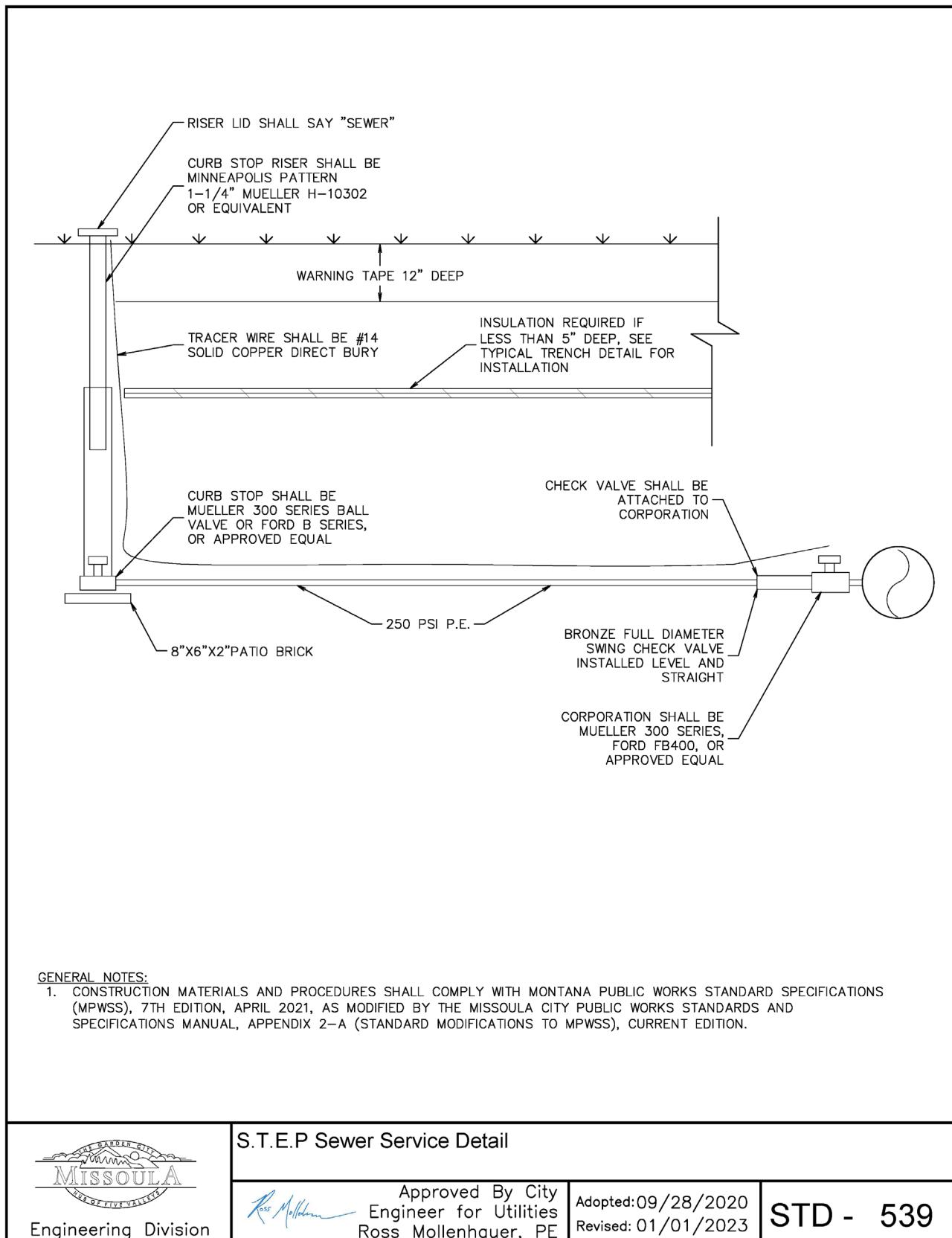


GENERAL NOTES:

- CONSTRUCTION MATERIALS AND PROCEDURES SHALL COMPLY WITH MONTANA PUBLIC WORKS STANDARD SPECIFICATIONS (MPWSS), 7TH EDITION, APRIL 2021, AS MODIFIED BY THE MISSOULA CITY PUBLIC WORKS STANDARDS AND SPECIFICATIONS MANUAL, APPENDIX 2-A (STANDARD MODIFICATIONS TO MPWSS), CURRENT EDITION.

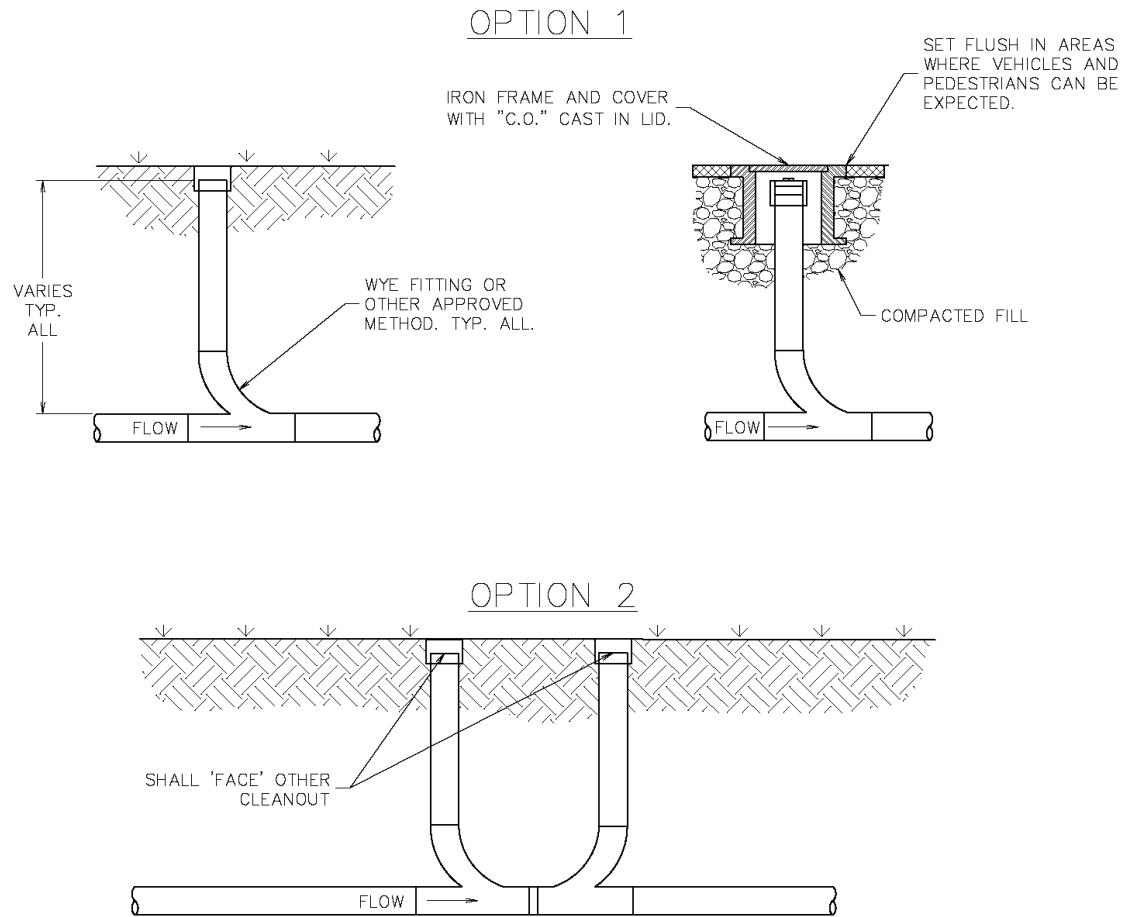
 Engineering Division	Residential S.T.E.P. Tank		
	 Approved By Utility Project Manager – Ross Mollenhauer, PE	Adopted: 09/28/2020 Revised: 01/01/2023	STD - 540

2. Standard Drawing 539 STEP Sewer Service Detail



 MISSOULA <small>THE CITY OF FIVE VALLEYS</small>	S.T.E.P Sewer Service Detail		
Engineering Division	 Approved By City Engineer for Utilities Ross Mollenhauer, PE	Adopted: 09/28/2020 Revised: 01/01/2023	STD - 539

3. Standard Drawing 521 Typical Cleanout Details



GENERAL NOTES:

1. CONSTRUCTION MATERIALS AND PROCEDURES SHALL COMPLY WITH MONTANA PUBLIC WORKS STANDARD SPECIFICATIONS (MPWSS), 7TH EDITION, APRIL 2021, AS MODIFIED BY THE MISSOULA CITY PUBLIC WORKS STANDARDS AND SPECIFICATIONS MANUAL, APPENDIX 2-A (STANDARD MODIFICATIONS TO MPWSS), CURRENT EDITION.
2. TWO-WAY CLEANOUTS SHALL BE PLACED WITHIN TWO FEET (OR APPROVED DISTANCE) OF THE STRUCTURE. SINGLE-FAMILY AND DUPLEX RESIDENTIAL SERVICES MAY UTILIZE A TWO-WAY CLEANOUT WITH A SINGLE RISER. ALL OTHER SEWER SERVICES SHALL UTILIZE OPTION 2 ABOVE. ADDITIONAL CLEANOUT ARE REQUIRED EVERY 100 FEET OF DISTANCE OR TOTAL CHANGE OF HORIZONTAL DIRECTION OF 135 DEGREES OR MORE.
3. CLEANOUTS SHALL BE PLACED WITHIN TWO FEET (OR APPROVED DISTANCE) OF THE STRUCTURE AND EVERY 100 FEET OF DISTANCE OR TOTAL CHANGE OF HORIZONTAL DIRECTION OF 135° OR MORE.
4. ALL CLEANOUTS SHALL BE EXTENDED TO FINISHED GRADE. CLEANOUTS INSTALLED UNDER ASPHALT OR CONCRETE SHALL HAVE A METAL RING AND COVER WITH "C.O." CAST IN THE LID SET TO GRADE.
5. CLEANOUTS SHALL BE THE SAME SIZE AND MATERIAL AS THE SANITARY SEWER PIPE.
6. UPON APPROVAL MANHOLES CAN BE SUBSTITUTED FOR CLEANOUTS WITH A MAXIMUM DISTANCE OF 300 FEET BETWEEN MANHOLES.
7. OPTION TWO MUST BE USED WHEN THERE IS NO UP STREAM CLEANOUT OR TERMINAL CLEANOUT.

 Engineering Division	Typical Clean-out Details		
	 Approved By City Engineer Kevin J. Slovarp	Adopted: 03/2004 Revised: 01/01/2023	STD - 521

XI. FORMS AND TEMPLATES

1. Residential STEP System Checklist

- _____ : Riser Lid Slightly Above Grade, External J-Box 2 inches Below Grade
- _____ : Rebar at 6-inch tank cleanout, cleanout buried 4 inches below grade
- _____ : Frost plug
- _____ : J-Box Connections
- _____ : Flow Restrictor
- _____ : 30 Amp Breaker w/Breaker Lock, Labeled "Sewer" at house service panel
- _____ : Check Wire Connections in Control Panel, Wiring Diagram
- _____ : Correct Disconnect, Hole Drilled for On Position
- _____ : # 10 Wire from House to Disconnect
- _____ : Anti-Siphon (when necessary)
- _____ : Tank Warranty - Give to Inspector
- _____ : Valve Box Operates, Stamped "Sewer", In Asphalt/Concrete Requires Cast Iron Lid Labeled "Sewer"
- _____ : Tracer Wire on Valve & Inside Riser
- _____ : Check for Leaks
- _____ : All Floats & Tethers Adjusted and Working Properly
- _____ : Cords Tied Up
- _____ : Check Valves Installed - Brass or stainless steel at Pump, Plastic across from Union/Ball Valve, In-Line Checkvalves if Shared Valve
- _____ : Lid Bolted Down w/Stainless Screws

2. Sample STEP Easement

RESIDENTIAL ON-SITE MUNICIPAL SANITARY SEWER SYSTEM EASEMENT

THIS CONVEYANCE, Made this **DATE** day of **MONTH, YEAR**, by and between **PROPERTY OWNERS' NAME(S)**, referred to as the "Owner", and the City of Missoula, a municipal corporation in the County of Missoula, State of Montana, Grantee.

WITNESSETH:

"Owner", does hereby grant, convey and warrant to the City of Missoula, its successors and assigns, a permanent easement and right-of-way over, under and across the following described real property:

Legal Description: **SUBDIVISION NAME, BLOCK NUMBER, LOT NUMBER, GEOCODE**

Street Address: **PROPERTY ADDRESS**

"Owner" grants to the City of Missoula, its successors and assigns an easement over, under, and across the above-described property for the purpose of constructing, operating, maintaining, repairing, altering, or reconstructing a STEP (septic tank effluent pump) sanitary sewer collection system. Each pumping unit shall consist of septic tank, pumping system, electrical conduit, and cable to the building, control panel, force main, service box, and related appurtenances. The City of Missoula will be responsible to pump the septic tank when required. "Owner" shall replace the existing sewer service from the tank to the limits of vertical plumbing within the building if found defective. The building gravity service line from the building to the tank is not a part of the STEP system.

This easement is for the benefit of all properties now or hereafter served by the sanitary sewer system of the City. The Grantor acknowledges that they are the lawful owner(s) and seized of the real property over which and upon the easement described herein are granted, and that they have good and lawful right and authority to grant said easement.

The Owner will cause an on-site STEP sanitary sewer system to be installed by a licensed and bonded contractor on the above-described property. The system is to be installed in conformance with all current City requirements for designs, materials, specifications, inspections, warranties, licenses, lien releases and permits. The system approved is to provide service for **PROPERTY ADDRESS** defined as the approved use. Upon acceptance and approval by the City, the "Owner" herein transfers and assigns rights in title and interest to these STEP sanitary sewer facilities to the City of Missoula and warrants them to be free of all liens, claims or encumbrances.

The City of Missoula and "Owner" concur and agree that constructing, repairing, altering, or reconstructing of said sewer improvements by the City of Missoula shall be accomplished in such a manner that the private improvements existing on this described parcel of real property shall be disturbed to the least extent possible.

The City of Missoula and "Owner" agree that "Owner" shall undertake no alteration of the installed sewer system(s), including covering access to pump basin cleanouts, and the lockout switch, without the prior written approval of the City of Missoula. Any damage by "Owner" or their agents shall be repaired by the City of Missoula at "Owner's" expense.

"Owner" and City agree that "Owner" has incurred no displacement costs or relocation costs by virtue of the Agreement. The City agrees to furnish, install, operate and maintain the pump system in a reasonable condition and to do the work in a workmanlike manner, promptly, neatly, and with as little interference to the real property and improvements thereon of Owner as reasonably practicable.

Ownership of the STEP system on the described parcel of real property shall remain with the City of Missoula.

It is understood that the agreement by the City to operate and maintain the STEP system applies to domestic sewage only. The following STEP systems, related units, and wastes are specifically excluded from City operation and/or maintenance.

- a) Oil and sand interceptors and related pumps and vaults.
- b) Grease and/or garbage interceptors and related pumps and vaults.
- c) Industrial pretreatment systems.
- d) Any commercial or industrial waste other than domestic sewage.

“Owner” and City agree that the on-site STEP sanitary sewer system is designed and approved only for the above sited approved use. “Owner” may not alter or change the approved use without written approval by the City Engineer of the City of Missoula. Any alterations or changes in the approved use will require “Owner” to bring the entire system into conformance with all Federal, State and/or City of Missoula's current standards, regulations, codes, and/or requirements for sanitary sewer systems applicable for the change in use and sewer system. The cost related thereto shall be the sole responsibility of “Owner.”

Binding Effect.. This grant of Easement, which shall be recorded at the Missoula County Clerk and Recorder's Office, is binding upon the heirs, executors, personal representatives, assigns and successors of the parties hereto and shall run with the land.

OWNER(S)

OWNER'S NAME

STATE OF MONTANA)

) ss.

County of Missoula)

OWNER'S NAME

On this **DATE** day of **MONTH, YEAR**, before me, the undersigned, a Notary Public for the State of Montana, personally appeared **PROPERTY OWNERS' NAME(S)**, known to me to be the person/s whose name/s is/are subscribed to the within instrument and acknowledged to me that he/she executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my Official Seal on the day and year in this certificate first above written.

Printed Notary Name: _____

(SEAL)

Notary Public for the State of Montana,

Residing at _____ Montana.

My Commission Expires:_____.

MM/DD/YYYY

CITY OF MISSOULA ACCEPTANCE

ATTEST:

BY:

Claire Trimble, City Clerk

Andrea Davis, Mayor

(SEAL)

3. Sample of Tank Manufacturer Warranty

**TANK MANUFACTURER'S CERTIFICATION,
WARRANTY AND GUARANTEE
CITY OF MISSOULA FOR
SANITARY SEWER S.T.E.P. SYSTEMS**

PROPERTY LEGAL DESCRIPTION: _____
PROPERTY ADDRESS: _____

Hunton Precast Concrete, Inc. (Manufacturer) certifies, warranties and guarantees to the City of Missoula , (Property Owner), _____ (Contractor) and _____ (Engineer) that this S.T.E.P tank has been manufactured in accordance with City of Missoula standard specifications and approved submittals related thereto and is structurally sound and 100% watertight in normal use for a period of six years from the issue date of the system start-up and substantial completion by the City of Missoula.

If this S.T.E.P. tank develops structural deficiencies or leaks due to non-compliance with project documents or a defect in materials or workmanship during the life of the warranty, Hunton Precast Concrete, Inc. will repair or replace the tank.

Hunton Precast Concrete, Inc. will bear the re-installation costs of the tank in question in conformance with City standards and specifications and site restoration.

A representative of Hunton Precast Concrete, Inc. shall have the opportunity to be onsite to witness excavation and removal of the tank for the purpose of determining the cause of failure.

Hunton Precast Concrete, Inc. shall have a representative available for warranty excavation witness within forty-eight (48) hours of receipt of notice from _____ (Contractor) or The City of Missoula, or _____ (contractor) or the City may proceed with excavation, removal and/or repairs under warranty.

This warranty shall be null and void if the tank is improperly installed or misused. No other warranties, either expressed or implied, are hereby made for failure due to circumstances beyond Hunton Precast Concrete, Inc.'s control.

Tank Size: _____ Class: _____ Weight: _____ Serial #: _____

Date Manufactured: _____

Date of passing factory leak test: _____

Signature: _____
(Manufacturer's Authorized Corporation Official)

Date: _____

NOTE: All products supplied with and used in the fabrication of this tank are American made.