Technical Specifications STEP ELECTRICAL

- 1.0 General. This section covers Basic Electrical requirements including electrical demolition, 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.
- <u>2.0 Materials</u>. Materials shall be per applicable sections of the specifications, and as specified herein or shown on the drawings. All materials shall conform to the City of Missoula current standard 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. With seal offs.
 - B. Electrical Metallic Tubing. (EMT) 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.
 - <u>D.</u> <u>Building Wire.</u> 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.
 - <u>F.</u> <u>Miscellaneous Junction Boxes</u>: Sheet metal boxes, NEMA Type 3R. (1) Disconnect: Non-fused knife disconnect lockable.
 - G. Wiring Connectors, Grounding Lugs and Tap/Splice Fittings: 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.
 - <u>H. Meter Main</u>: 125A or 200A continuous duty. Combination meter and main circuit breaker for 120/240V, single phase, three-wire service. Overhead or

underground feed as required. Meet Northwestern Energy current specifications. Size to match existing service. Breakers shall be identified as 'Sewer' and shall have matching locks, installed by electrician, on STEP sewer breakers.

- <u>I.</u> <u>Miscellaneous Supporting Devices:</u> 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.
- <u>J. Self Adhesive Label:</u> shall be provided by the City of Missoula, upon final approval of the STEP system.
- K. Underground Warning Tape: 3" wide, black letters with red background. "Caution Buried Electrical Line Below". Installed 6" to 8" below finished grade.
- L. Level Control & Alarm Floats: Float assembly shall meet current City of Missoula approved Orenco float assembly with City of Missoula approved Orenco splice box. 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. Splice box shall be complete with four cord grips (for 3 floats and a pump cord). All connections in tank junction boxes shall be stranded wire only, and connected with Partsmaster step down crimp and shrink preinsulated heat shrinkable butt connectors or approved equivalent.

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, ½ h.p. They shall meet current City of Missoula specifications. All floats shall be classified for Class I Division II locations. All floats shall be supplied with 17' long cords with no splices. The cords shall not be shortened during installation.

M. Pump Control and Alarm Panels:

For 1,000 gallon and 1,500 gallon STEP tanks (residential): use the current City of Missoula standard Orenco Simplex Pump control panel. 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: energized 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.

The 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 will not be supplied with the individual control panel.

Type EY seal offs shall be installed vertically on conduit runs only, below the control box and 18" above finished grade.

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 box. Disconnect shall be within 6' of control panel, and visible from control panel. The lock shall be provided by the City of Missoula and shall be the property of the City of Missoula.

The control panels shall be supplied with a padlock and key set. All padlocks on the project shall be keyed alike with a common key, provided by the City of Missoula and shall be the property of the City of Missoula.

3.0 Installation.

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 listing requirements.

Use stranded conductors or multiconductor cable. Use conductors not smaller than 10 AWG for power circuit with 30 AMP circuit breaker and 12 AWG for control circuits. Pull all conductors into raceway at the same time. Use suitable wire pulling lubricant for cable assemblies. Protect exposed cable from damage. Use suitable cable fittings and connectors. Clean conductor surfaces before installing lugs and connectors. Make splices, taps and terminations to carry full amapcity 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.

Install electrical boxes as shown in City of Missoula Residential STEP Manual. Provide bonding to meet Regulatory Requirements. Equipment grounding conductor: provide separate, insulated conductor within each circuit. Terminate each end on suitable lug, bus, or bushing. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

Make electrical connections in accordance with equipment manufacturer's instructions. Provide suitable strain-relief clamps and fittings for cord connections at splice box in tank riser. Use correct crimping tool.

Splice boxes shall be installed in the STEP tank riser in accordance with the instruction from the supplier or manufacturer. The control panel shall be installed on the permanent structure. The fastening device shall be of sufficient size and length to securely fasten the panel.

STEP CHECKLIST (Electrical)

Use conductors not smaller than **10AWG** 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. Proper **grounding**.

Non-fused Knife Switch Disconnect that can be locked into non-energized or energized position, installed between the main meter box and the control panel. Disconnect shall be within 6' of control panel, and visible from control panel. Placement of disconnect and control panel—Are there **obstructions** that prevent the boxes from being opened easily? **Proper fittings** used to connect Control Panel and Disconnect to conduit. **Neutral shall not be broken between Control Panel and Breaker.**

In control panel look for wiring diagram, wire size and placement (see diagram), only 1 wire per lug on bar.

Type EY seal offs, with EYC sealing compound or Chico compound, installed vertically on conduit runs only.

Conduit or cable at correct **trench depth.** Conduit 90 degree downsweep directly out of j-box to meet 18" code. **24" trench depth** for sewer cable, with **red marking 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.

Inside riser look at **j-box placement**, <u>correctly crimped</u> and heated **step-down butt connectors**, no **water** in j-box, no **extra** wires or **wirenuts**, cord grips secured, <u>No</u> **splices** in pump or float cords, j-box lid screws.

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

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

*** Make sure to secure riser lid ***

¹Apply white tape at all terminations. ²Apply green tape at all terminations.

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